

SECOND EDITION

Handbook of
**AFRICAN
MEDICINAL
PLANTS**



Maurice M. Iwu



CRC Press
Taylor & Francis Group

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Preface to the Second Edition

The first edition of the *Handbook of African Medicinal Plants* was published in 1993 to provide a concise and easy reference of the major medicinal plants of Africa and an introduction to traditional African medicine. It presented a collation of the key literature available at that time on the description, constituents, and uses of the plants; this information was otherwise scattered in several publications. The volume addressed the needs of those involved in the discovery and development of modern medicines from African plants, as well as the interests of practitioners of herbal medicine who needed information on the plants used in African ethnomedicine. The book was well received by scholars in both academia and industry as a source of secondary information on the plants it covered. After 20 years, it has become necessary to revise and review the volume not only to update the literature on the medicinal plants covered in the first edition of the book but also to provide an objective review of the plants that have come into current use as phytomedicines and were largely unknown in 1993. The status of some of the plants as major herbal medicines has also changed dramatically during these two decades.

Several events and developments in the field of pharmacognosy and related disciplines have influenced the changes contained in the present edition. A major fundamental change was based on the publication in 2009 of an updated classification of the orders and families of flowering plants by the Angiosperm Phylogeny Group (APG) along with two companion papers, one a linear arrangement of the taxa and a second treating the land plants above the rank of order. These papers were combined with full synonymy and bibliographic information along with an index to the names. Following the widespread adoption of the APG schemes, a comprehensive guide called *The Plant List* was produced in 2010 by an international collaboration led by the Royal Botanic Gardens, Kew (United Kingdom) and the Missouri Botanical Garden. The plant names and family classifications in this edition have been revised to conform to the APG classification system, which is available on the Internet (*The Plant List, Version 1*, <http://www.theplantlist.org>).

In the “Catalog of Major African Medicinal Plants” (Chapter 2), certain plant families have been dropped to conform to the new taxonomic reclassification; however, the “old” names of the plant families are shown but without any genus or species listed after them. Instead, readers should check the plant names in the “new” families where they belong. Notable examples are the plants that belong to Papilionaceae, Caesalpiniaceae, and Mimosaceae, which have now been grouped under their parent family Leguminosae. Similarly, all the plants under the large plant family Apocynaceae are now grouped together instead of their former listings in the subgroups. Plants catalogued under Palmae are now listed with the Arecaceae, Taccaceae into Dioscoreaceae, Leeaceae into Vitaceae, Cruciferae into Brassicaceae, Agavaceae and Aloeaceae into Asparagaceae, and Gramineae into Poaceae, and plants under the family Capparidaceae are now listed as Capparaceae. Other changes are shown in the catalog. Several genera and species have been renamed according to the new classifications and the synonyms streamlined to adopt the accepted names of the genera and species listed. Some plant names have remained “unresolved,” and the original names have been retained in this volume to provide a placeholder for the subject medicinal plants pending the resolution of the taxonomic classification of such plants.

There has also been a paradigm shift of a kind in the conceptual framework in the study of medicinal plants. In 1993, a typical pharmacognostical study of medicinal plants focused on the isolation of different types of alkaloids, terpenoids, and glycosides as substances that were indicative of the bioactivity of the plant. Flavonoids and related phenolics as well as glucans, iridoids, and polysaccharides were considered ubiquitous and unimportant metabolites. With a better understanding of the role of oxidative stress in the pharmacogenesis and etiology of many diseases, the significance of phenolic compounds in the modulation of the antioxidant status of tissues and their role in disease prevention are now better appreciated. The pharmacological studies in the past were

also restricted mainly to bioassays aimed at the identification of biologically active compounds for the development of single-chemical compounds as active pharmaceutical ingredients. In addition to this approach, investigators now include in their search botanical medicines or phytomedicine with well-defined chemical constituents that can be used as phytopharmaceuticals.

The period since the publication of the first edition has witnessed tremendous expansion in the study of African medicinal plants and traditional African medicine. The literature on the subject has also increased severalfold; some journals and specialized Internet resources are now available to assist scholars and investigators in these areas of study. Perhaps of greatest value is the new body of literature on Southern African medicinal plants and traditional medicine that became available since the political changes that occurred in South Africa in 1994. It is hard to imagine how inadequate our knowledge of African medicinal plants was without the huge and distinct flora of South Africa. This edition has been greatly enriched by the many excellent volumes on Southern African medicinal plants that were not generally available in 1993.

African medicinal plants have also gained some recognition as dietary supplements, and with the increased use of herbal products as dietary supplements in developed countries, a new vista has been opened in the use of medicinal plants in global health care delivery. Some of the pharmacognostical profiles in this edition include sections on agriculture, commerce, and dosage forms to cater to this new use of medicinal plants. The dietary supplements and health food applications of these plants come with far more challenges than when herbs were used only as an alternative to main-line chemically defined single-entity pharmaceuticals. It is no longer sufficient to conduct proximate analysis of a given plant medicinal ingredient. Background information on the plant material, including source, age, time of collection and method of cultivation/collection, chemical profile, and bioassays, has become necessary in the evaluation of a given plant species. The treatment of plants as biomass for the isolation of biologically active compounds for drug discovery and development is entirely different from the processes required when plants are used as herbal products. The herbal product is a therapeutic entity in which the ecosystem, botany, chemistry, and biological activity are interlinked indexes in the determination of the drug's identity and activity. The presence or absence of extraneous materials, pesticides, residual extraction solvents, heavy metals, and uptake of environmental pollutants in the plant affects the identity and quality of a given herb.

In Chapter 2 of this volume, "Catalog of Major African Medicinal Plants," new information from reports of recent ethnobotanical field studies has been used to update the data. In the early 1990s, the International Center for Ethnomedicine and Drug Development at Nsukka, Nigeria, owned by the Bioresources Development and Conservation Programme (BDCP), conducted an extensive ethnobotanical study in Nigeria and Cameroon in collaboration with the defunct Shaman Pharmaceuticals, Incorporated, formerly based in the United States in California. Another project, the International Cooperative Biodiversity Group (ICBG), sponsored by the U.S. National Institutes of Health, Department of Agriculture, and U.S. National Science Foundation, involved major ethnobotanical fieldwork in Nigeria and Cameroon by the BDCP. The two projects also independently gathered ethnobotanical information from several African countries through direct bilateral agreements with U.S.-based agencies such as the National Cancer Institute. During the same period, Strathclyde University's Institute for Drug Research (United Kingdom) established collaborative arrangements with several African universities, and the collections sometimes included the ethnomedical uses of the plants.

There has been an exponential increase in the number of publications on the use, chemical composition, and biological activities of medicinal plants during the last 20 years. The information from these sources has been most valuable in updating the data on the pharmacognostical profiles of the African plants selected for inclusion in Chapter 3 of this volume. The availability of Internet-based resources, which did not exist in 1993, has greatly enriched this revision. These include the Plant Resources of Tropical Africa" (PROTA), a Web database in English and French, which has detailed information on the taxonomy, ethnography, and properties of many African plants. Many reference

publications and compendia of monographs, such as Neuwinger's *Traditional African Medicine*; African Herbal Pharmacopoeia; AfricMed, which contains a compilation of ethnobotanical information and summary of biological assays by InterCEDD (International Centre for Ethnomedicine and Drug Development) at Nsukka; and the Nigerian Herbal Pharmacopoeia, published by the Federal Ministry of Health (2008), were useful in preparing this update.

Although the *Handbook of African Medicinal Plants* has become widely used and cited by many scholars, it remains a "handbook" and should be used as such. It should never be considered an encyclopedia on African medicinal plants. Over 1100 references have been provided to enable obtaining further details of the plants discussed.

I am indebted to the following persons and institutions for the permission to use their photographs to illustrate some of the plants: T. F. Okujagu, director general of the Nigerian Natural Medicine Development Agency (NNMDA); Michel Tchimene and staff of InterCEDD; Steven Foster (<http://www.foster.com>); and Marco Schmidt, Stefan Dressler, Günter Baumann, Ulrich Meve, Tilman Musch, Stefan Porembski, Philippe Birnbaum, Anne Mette Lykke, and Wilma Dijkstra, through the courtesy of West African Plants photo database (<http://www.westafricanplants.senckenberg.de>).

I am immensely grateful to my editors, John Sulzycki and Jill Jurgensen of Taylor and Francis Group, for their support and encouragement in the preparation of this edition. My gratitude goes also to my family and the staff of Bioresources Development Group for their extensive assistance in making this book possible.

It is my hope that this book will help to address a major paradox in this subject, namely, that while there has been a phenomenal growth in global medicinal plant trade, exports from Africa have not contributed much to the overall international trade in herbs and natural products in general. Africa has unfortunately remained only a minor player in the global natural products market. Lack of practical information on African medicinal plants has been a major factor in the underutilization of African plants in global medicinal plant trade and industrial production of herbal medicinal products. The publication of the *Handbook of African Medicinal Plants* in 1993 contributed immensely to the increased interest and awareness of the enormous potential that exists in the use of African medicinal plants and herbs. It is my expectation that this edition will further provide the necessary information to scholars, herbalists, and industrialists interested in the sustainable utilization of African medicinal plants for human health.

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CHAPTER 1

Introduction

BACKGROUND

Africa is a huge continent that straddles the equator, extending from 37° N and 35° S and endowed with an enormous wealth of plant resources. Over 50,000 distinct species are known to occur in sub-Saharan Africa alone, and the continent is home to more than a quarter of recorded angiosperm taxa in the world. Of the known species, more than 25% have been used for several centuries in traditional medicine for the prevention and treatment of diseases. With over 1000 languages spoken in about 3000 dialects and with individuals living in more than 50 independent countries, Africa presents a veritable treasure of cultural and genetic resources, including medicinal plants. Its unique and diverse indigenous cultures have produced a rich heritage of traditional knowledge on the uses of plants for healing, for communications with the gods, and for food. The enormous biodiversity in its tropical forests, savannas, veldts, and unique environments of sub-Saharan Africa is due to its peculiar geography. It has no marginal oceanic trenches and subduction zones, so it lacks the extensive mountain ranges found in the Americas, but much of the southern half of the continent rests on a high plateau close to 1000 meters above sea level, broken only by the southern extension of the Great Rift Valley and the slightly lower basin of the Congo River. It has been suggested that it is the great latitudinal range that gives it an enormous variety of climates, and that this variability is responsible for the continent's extreme diversity of ecosystems and biodiversity.¹

HISTORICAL PERSPECTIVE

The African continent is believed to have the oldest known human habitation and is generally considered the cradle of human civilization. The ancient kingdoms and empires of Africa, such as Kmt, Nubia, Ethiopia, Songhai, Bini, Oyo, Zimbabwe, Dogon, and Mende, as well as Nupe, Borno, Mandingo, Jukun, Nri, and Somali, had extensively codified healing recipes. The history of healing arts in Africa can be traced back to about 3200 BC, during the reign of Menes, the first pharaoh of ancient Egypt. Athothis, the son of Menes, was credited with knowledge of many therapeutic preparations.² The honor of being the first African physician, in a scientific sense, actually belongs to the great Imhotep, who lived in about 2980 BC, during the reign of Pharaoh Zosar of the Third Dynasty. Imhotep was an accomplished architect, and the step pyramid at Saqqarah is among his numerous works. He was also a scribe and a high-ranking administrator in the pharaoh's court, a high priest, and a renowned healer, who by 525 BC had become deified as the god of medicine. Another ancient African physician is the scholar and scribe Hesy-Re, who lived about 2600 BC. According to the writer Paul Ghalioungui, Hesy-Re was the chief of dentists and physicians during the Third Dynasty (iii), a period in African history usually associated with the building of the pyramids.

The ancient African healers had an elaborate *materia medica*, which consisted of mixtures of various herbs, animal parts, minerals, and clays. The Ebers Papyrus, one of the oldest in medical literature, listed several recipes used by ancient African healers. The list, however, was dominated by numerous food plants, in keeping with the belief at that time that "every disease to which men are liable is occasioned by the substances whereon they feed" (p. 42).³ Even today, there is no clear distinction in traditional African medicine regarding when an herb ceases to be a health food and when it becomes a medicine. In traditional African medicine, many food plants are used for therapeutic purposes, and medicines are not viewed as "necessary poisons." This is in contrast to Western orthodox medicine, in which drugs are seen as poisons that in low doses may cure diseases. One of the most unfortunate ironies of herbal medical practice is that while African medicine consists primarily of herbs and health foods, modern herbal producers and phytopharmaceutical manufacturers seldom, if ever, include African medicinal plants in their lists. But, that is beginning to change with the advent of "nutraceuticals" or dietary supplements in the Western system of medicine.

African *materia medica* do not consist of dietetics alone, but include many potent herbs. Few African healing herbs are recognized in modern pharmacopoeias; the list includes calabar bean (*Physostigma venenosum*), *Strophanthus*, areca nuts, kino, *Salix*, kola, the African periwinkle (*Catharanthus roseus*), and the devil's claw (*Harpagophytum procumbens*). It is interesting to note that, in several instances, there are African varieties of many "official" drugs. The African *Rauvolfia vomitoria*, for example, has a higher content of the antihypertensive alkaloid reserpine and the antiarrhythmic drug ajmaline than the better-known species of the genus *Rauvolfia*. Another example is the willow plant, *Salix capensis*, which has been used in southeastern Africa for centuries as a painkiller and antipyretic; it is known to contain esters of salicylic acid, a compound whose acetylated form is the universal analgesic, aspirin. The ginger cultivated in Nigeria is valued by consumers more than the Asian and Caribbean varieties. Although there are many research publications available on the constituents and biological activity of medicinal plants from Africa, the development of therapeutic agents from African medicinal plants has remained a somewhat neglected subject. The study of African medicinal plants also has not been taken as seriously or documented as fully as in other traditional societies, such as the Indian and Chinese. Our knowledge of African medicinal plants is rather limited. The little available information is often fragmented, and most African medicinal legends have become distorted by several centuries of continuous waves of invasion and conquest of various parts of Africa.

The documentation of medicinal uses of African plants is becoming increasingly urgent because of the rapid loss of the natural habitat of some of these plants due to anthropogenic activities. The continent is estimated to have about 216,634,000 hectares of closed forest areas with a calculated annual loss of about 1% due to deforestation; many of the medicinal plants become extinct before they are even documented. Africa has one of the highest rates of deforestation in the world; for example, Cote d'Ivoire and Nigeria have 6.5% and 5.0% deforestation per year, respectively; the global rate is 0.6%. Habitat conversion threatens not only the loss of plant resources but also traditional community life and cultural diversity and the accompanying knowledge of the medicinal value of several endemic species. The vegetation of Africa can be classified into a number of phytocoria, that is, regions within which a substantial proportion of the plants are endemic, following the scheme proposed by White.⁴ These include (1) Mediterranean North Africa, (2) the cape region of South Africa, (3) tropical Africa, and (4) Madagascar. Within tropical Africa, the major ecosystems are (1) forests; (2) seasonal tropical vegetation (which consists of woodland, bushland and thicket, grassland, shrublands); (3) deserts; (4) montane and afroalpine ecosystems; (5) wetlands; (6) lakes; and (7) coastal vegetation. The majority of the plants found in Africa are endemic to the continent, with the Republic of Madagascar having the highest rate of endemism, 82%. The island contains over 12,000 species in its original forest areas, and 4900 of these species are found only on that island.⁵ There is therefore an urgent need to document not only the uses but also the constituents and pharmacological activity of these plants. Over 5000 plants are known to be used for medicinal

purposes in Africa, but only a few have been described or studied. This book provides an overview of the small fraction of the species that have been scientifically investigated.

CURRENT TOPICS

African medicinal plants are considered here from two viewpoints: as sources of biologically active compounds and as elements in the complex equation of healing. At first glance, the two aspects may appear very different and even conflicting, but a closer inquiry will reveal a common ground in the two modes of medicinal plant utilization in traditional African medicine. Included is information on the physical characteristics of the plants, including size, shape, color, texture, and taste, which have traditionally served as important criteria in their selection for therapeutic purposes. Be aware that a significant proportion of plants was selected on the basis of their physical resemblance to an organ of the body, which is akin to the folk healing system called the “doctrine of signatures” ascribed to various medical traditions ranging from American Indian to ancient Chinese.

The volume gives a concise description of the materia medica of an enormous and extensively varied continent, with well over 2000 distinct tribes, many diverse cultures, and several unique floras. The first part of the book includes a catalog of the plants used as ingredients for the preparation of traditional remedies, including their medicinal uses and the part of the plant used. Following the catalog is a pharmacognostical profile of 170 of the major herbs, arranged alphabetically according to botanical names and plant families. A brief description of each herb, including the diagnostic features of the leaves, flowers, and fruits, is provided. The monographs contain the botanical names, common names, synonyms, African names, habitat and distribution, ethnomedicinal uses, chemical constituents, and reported pharmacological activity, with references cited from over 1100 publications. The book is illustrated with photographs of some of the plants. A table of plants used as remedies for specific maladies is included, as well as an index of pharmacological activities.

The second part of the book provides an introduction to African traditional medicine. The aim is to situate medicinal plant use within the general African culture and to explain how such cultural frameworks fit into the methods of healing in traditional African medical systems. This aspect of healing is what is generally considered the symbolic aspect of traditional African medicine. Symbols in traditional African medicine contain the scientific concepts, which are tangible and extensive while retaining the intensity and potency of the mythical and religious components. It is this aspect of healing that offers the individual a mythical but necessary sanctuary from the harsh edges of daily existence.

The second section of the book also addresses the problems associated with the negative image of traditional African medicine. The popular image of the African medicine man is that of the fabled witch doctor, with his exotic paraphernalia of feathers, cowries, and animal skin, muttering meaningless incantations and dispensing worthless potions to his equally ignorant clients. Even the herbs dispensed are considered harmful, and when they are found efficacious, the detractors of traditional medicine are quick to dismiss them as chance discoveries. The incantations and the rhythm of the drums are said to be weird sounds and part of the mumbo jumbo designed to “hood-wink the superstitious savages who are under their spell.” The reality of African medicine is far more complex than is generally understood. Only a few appreciate the real capabilities of African medicine. African medicine is concerned with power: the utilization of human energy, the environment, and the cosmic balance of natural forces as tools in healing. In the African world, the natural environment is a living entity whose components, the land, sea, atmosphere, and faunas and floras, are bound to humans in an intrinsic manner. The *Handbook of African Medicinal Plants* presents an outline of this relationship as it concerns humans and plants.

In this introduction, it is pertinent to state that the African medical system does not fall into the sphere of what is known as “alternative medicine,” but it is rather a complementary but different

medical system that uses medicine in a more-or-less conventional manner for the treatment of diseases. It employs, in a fundamental sense, the same basic methods as Western medicine, with additional contributions from the spiritual dimension, which gives the healing depth and meaning within the African cosmology and experience. It cannot be reduced to simple herbalism. African traditional medicine should also not be seen as a substitute for qualitative health care for the rural poor or (in the name of conservation of cultural biodiversity) be misconstrued by politicians as a social alibi to mask the inadequacies of public health programs. It is only one possible tool in health care.

Earlier attempts by some writers have been faulted by the constant importation and superimposition of preconceived values and concepts to the evaluation of events that they hardly understood. Some analysts use contemporary perspectives to pass verdicts on events that took place in a different era, sometimes taken completely out of their original context. Many of the authors of books on African culture and religion forget that the gods they discussed in those pages were considered real by those who fashioned them and had once moved humans to acts of consummate worship and inspired leaders to successful military campaigns. Few of the commentators ever wondered why many of the practices they considered primitive still hold sway in the minds and lives of many educated Africans.

Definitions are often limited to our ability to fit new experiences or concepts into our preconceived categories and patterns. One is often reminded of the passage in Borges that was made famous by Michael Foucault⁶ in his monumental work, *The Order of Things*, in which a certain ancient Chinese encyclopedia stated as follows: “Animals are divided into: (a) belonging to the Emperor, (b) embalmed, (c) tame, (d) sucking pigs, (e) sirens, (f) fabulous, (g) stray dogs, (h) included in the present classification, (i) frenzied, (j) innumerable, (k) drawn with a very fine camelhair brush, (l) et cetera, (m) having just broken the water pitcher, (n) that from a long way off look like flies.” Foucault concluded “in the wonderment of this taxonomy, that the thing we apprehend in one great leap, the thing that, by means of a fable, is demonstrated as the exotic charms of another system of thought, is the limitation of our own, the stark impossibility of thinking that.” But, he explained that each of the categories mentioned can be assigned a precise meaning and a demonstrable content, and the classification distinguishes carefully the very real animals (those that are frenzied or have just broken the water pitcher) and those that belong to fantastic entities (fabulous animals or sirens). The possibility of dangerous mixtures or forced powers of contagion have to be exorcised to retain the meanings within that system of thought. In traditional African medicine, we are faced with a system of medicine that does not fit into the familiar landmarks of the Western thought process, and that is the problem. For example, the association between rituals and healing is often misinterpreted by foreigners who isolate them out of their context. The familiar question has been: What were they (the plants and artifacts) used for? What do they do? And, most people are disappointed when they receive the correct answer: “Nothing.”

The bulk of this volume, however, provides scientific documentation of the correlation between the observed folk use and demonstrable biological activity, as well as the characterized constituents of the plants. It is essential that the study of traditional medicine, if it is not to become chimerical and lose itself in arbitrary speculation, must begin with the dry, structural, and systematic analysis of the methods and the objects used in the healing practice. Studies of anthropology, botany, chemistry, pharmacology, and even clinical evaluation of the remedies are useful standpoints to begin such inquiry. But, the investigation must not stop with such structural studies, for healing is deeply rooted in humanity; these studies, when properly considered and handled, should lead back to it. This is the fundamental approach adopted in this book. It is a book on medicinal plants used in African traditional medicine and is also a handbook of African plants with medicinal values. The plants are presented both as drugs, ready and complete as they are, and as vessels with chemical constituents that possess pharmacological activity.

Several medicinal plants of Africa have been investigated for their chemical components, and some of the isolated compounds have been shown to possess interesting biological activity. A few

have been found active even in controlled clinical evaluation. The results of these investigations provide insights only into a part of the picture, not the whole activity of healing. Healing is not to be viewed simply as a lifeless product of molecules reacting with cells and tissues, but as a production, not as an act that ends with the administration of remedies, but as an activity that includes all aspects of living. It presents itself to us as the recurring work of the spirit, not as a finished and final product; if it were not so, but was sterile and inert, then the humanistic aspect of healing would be lost. For symbols to hold any meaning, the validation has to be recognized within the practitioner's primary experience, beliefs, and perception of the world around the practitioner. The validity of the traditional medical system, therefore, does not depend on the results of secondary evaluation but on the utility of the experience to the subscribers of that system of healing.

It is not my intention to repeat all the facts and arguments that have been raised in the past to support the general thesis that certain objects, artifacts, rituals, and things used in traditional African medicine are symbols whose meaning is the only path to understanding the complex process of healing in Africa. In a book devoted to medicinal plants, one can only offer very condensed and concise "statements" on the subject and refer the reader to earlier publications and the references listed at the end of each section.

The basic point is that African traditional medicine has a systematic methodology of its own. The fact that it may not conform to the present level of knowledge in *de facto* science should not be held against it. The cures dispensed by the medicine man are not all products of chance, but results of years of careful experimentation and painstaking observations. The pharmacopoeia of the African medicine man is rich with cures for many diseases that afflicted him, including herbs for snakebite, whooping cough, dysentery, infectious diseases, diabetes, and the expulsion of intestinal worms. Modern practitioners of the profession have given indications that they can cure intractable human diseases, such as cancer and various immune deficiency disorders.

The herbs discussed in this book were selected after a careful study of the available literature and from the results of field studies conducted by the Phytotherapy Research Laboratory of the University of Nigeria, Nsukka, in the 1990s and now undertaken by the International Centre for Ethnomedicine and Drug Development (InterCEDD). There are three different plant lists. The first is a catalog of the plants used as ingredients of polyprescriptions for one or more diseases. Only plants cited in authenticated sources are listed. The selection has been limited to those species that are used widely and occur in fairly large areas of the continent. The second list contains major plants used specifically for a given disease state; in most cases, the active constituents are included. The original list published in the earlier edition of this book was from a selection made from an informal survey in which 12 acknowledged experts in African medicinal plants were asked to indicate the species they considered to be among the 100 most important therapeutic agents from their geographic zones. Only about 30 plants were finally included in all the subsets compiled by my sources, and I selected the final list of 162 plants to be profiled as representing the major medicinal plants of Africa. In this edition, the list has been expanded to over 170 plants. As in the previous case, the selection was based on many factors, including frequency of use, known biological activity, chemical constituents, and relative importance based on the main therapeutic indications of the species. Some arbitrariness in the selection was inevitable, and some better-known species were not included solely because such species were of very limited distribution or were considered not native to the continent. Minor species that are used in a manner similar to that of better-known species are also excluded. It is my sincere hope that this book will help in a better understanding of African medicine and medicinal herbs. The treatment modalities and the therapeutic agents discussed here should be evaluated within the social context in which they are employed.

In presenting this volume, I am under no illusion that it will spontaneously remove the skepticism and suspicion people have about traditional African medicine. It is my hope, however, that it will stimulate some awareness and perhaps an appreciation of a system of medicine that has sustained a people for so many generations. I have not attempted to offer justifications for some of the

traditional practices that are anachronistic to “civilized” tastes and which should be discarded. I have merely provided explanations of our medical practice and way of life.

No attempt has been made to present an account of traditional African medicine that will be comprehensive enough to reflect all aspects of the healing methods used in Africa. The heterogeneous nature of the actual traditional medical practice is clearly recognized; indeed, no single paradigm of medical practice applies to the entire continent. Only the general concepts and the essential features that are common to the majority of the tribes are presented here. Readers are advised to consult the references for details.

It was also not possible to list all the medicinal plants used in Africa. Only species with sufficient documentation or those considered important from a therapeutic point of view are listed. The references have been limited to the relevant key literature, and several cross-references have been omitted for brevity. The chemical structures of the compounds isolated from the plants have also not been included in a deliberate effort to make the book appealing to both experts and non-experts alike.

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Catalog of Major African Medicinal Plants

INTRODUCTION

This chapter contains a list of over 2000 plants used in traditional medical practice in Africa. The plants are arranged according to families and listed alphabetically. The modern system of plant classifications as proposed by the Angiosperm Phylogeny Group (APG) has been adopted for this edition. In the earlier edition, plants belonging to the large family Leguminosae were listed under the subfamilies Caesalpinaceae, Mimosaceae, and Papilionaceae, but they have now been grouped together under the family Leguminosae. Similarly, plants belonging to the family Apocynaceae have been grouped together. Certain plant families have been renamed and others merged for ease of classification. Readers are advised to use the Index of Species, Genera, and Families at the end of the book to search for plants not listed under a familiar family.

The column in Table 2.1 on medicinal uses of the plants is mainly from the collation of several published sources and correspondents. The diseases treated and the biological activities are used interchangeably in this column to reflect the actual format used in the original reports. Pharmacological terms have been used for the activities of the plants employed in the treatment of disease conditions that are not adequately described by healers in modern pathological terms, which means that the usage has to be interpreted in the broadest sense possible. Some seemingly contradictory responses received on the use and biological activities of some of the plants are retained since it is now known that the activity of plant extracts depends on several factors and may sometimes have opposite effects, depending on the method of preparation, dosage, and physiological state of the patient. The activities listed in this chapter are based on neither the results of pharmacological studies nor the reports of controlled clinical trials. They are based entirely on reported ethnomedical uses.

The plant parts included in the catalog are mainly those commonly used for the preparation of remedies for the conditions listed under the specific plant. In most cases, various parts of a plant could be used for treating specific diseases, and, perhaps more important, the therapeutic activity and the toxicity may reside in different parts of the plant. In most cases, the plant parts are listed in order of preference or frequency of use, with the most frequently used plant part listed first.

Key references have been provided as a guide to sources of additional information on the individual plants. The literature citations are limited only to reference works and books on African ethnobotany. These include the Plant Resources of Tropical Africa (PROTA), a web database in English and French that has detailed information on the taxonomy, ethnography, and properties of many African plants.¹ Many reference publications and compendia of monographs, such as Neuwinger's *African Traditional Medicine*,² *African Herbal Pharmacopoeia*,³ the AfricMED database, which contains a compilation of ethnobotanical information and a summary of biological assays by InterCEDD (International Centre for Ethnomedicine and Drug Development) at Nsukka,⁴ and the *Nigerian Herbal Pharmacopoeia*,⁵ published by the Federal Ministry of Health (2008), were useful in preparing this update. In many cases, no reference has been cited, which indicates that the information was derived from multiple sources in journals or data from the AfricMED database at InterCEDD Nsukka (Nigeria).

Table 2.1 Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
Acanthaceae			
<i>Acanthus arboreus</i>	Epilepsy, mental disorders, whooping cough, snakebite	Leaves, twigs	4
<i>Acanthus montanus</i>	Childbirth, antacid, cough suppressant, rheumatism, purgative, abscesses, stomachache	Leaves, stem bark	4–7
<i>Acanthus pubescens</i>	Gastrointestinal disorders, laxative, body pain, chest pain, eczema, allergic dermatitis, liver inflammation	Leaves	8
<i>Adhatoda buchholzii</i>	Anti-inflammatory, fish poison	Fruits, whole plant	6, 7, 9, 10
<i>Andrographis paniculata</i>	Cold, flu, bronchitis, fevers, liver tonic	Aerial parts	4
<i>Anisotes ukambensis</i>	Skin diseases	Leaves, stem	
<i>Asystasia gangetica</i>	Analgesic, cough treatment	Aerial parts	
<i>Asystasia macrophylla</i>	Fevers, pain	Leaves	
<i>Avicennia africana</i>	Enema for piles; applied for parasitic, skin diseases	Stem bark, leaves	7
<i>Barleria micrantha</i>	Laxative, hemorrhoids	Aerial parts	
<i>Barleria opaca</i>	Laxative, hemorrhoids, snakebite, cerebro-malaria	Leaves	6, 7
<i>Barleria taitensis</i>	Anti-inflammatory	Leaf/stem	
<i>Blepharis linariifolia</i>	External use in embrocation, pains	Seeds, leaves	11
<i>Brillantaisia cicutricosa</i>	Anemia, liver diseases	Leaves	
<i>Brillantaisia owariensis</i>	Stomachache, cathartic	Roots, leaves	6
<i>Crabbea velutina</i>	Antifungal, anti-inflammation	Leaves, stem bark	7
<i>Crossandra flava</i>	Fever	Leaves	
<i>Crossandra subcaulis</i>	Anti-infectives, skin diseases	Leaves	
<i>Dicliptera laxata</i>	Diuretic, indigestion, flatulence	Leaves	
<i>Duosperma kilimandscharicum</i>	Anti-infective	Aerial parts	
<i>Dyschoriste perrottetii</i>	Eye irritation, inflammation	Seed (coat)	9
<i>Dyschoriste radicans</i>	Anti-infectives, skin diseases	Aerial parts	
<i>Ecbolium revolutum</i>	Potherb	Aerial parts	
<i>Ecbolium viride</i>	Poultice	Leaves	
<i>Hygrophila auriculata</i>	Female hygiene, skin infection, earache	Leaves, stem bark	6
<i>Hypoestes aristata</i>	Viral infections, cold, malaria	Root bark	6, 11
<i>Isoglossa laxiflora</i>	Anti-infective	Aerial parts	

<i>Justicia betonica</i>	Fevers	Aerial parts	
<i>Justicia caerulea</i>	Laxative, fevers	Aerial parts	
<i>Justicia caudata</i>	Pain relief	Leaves	
<i>Justicia flava</i>	Diarrhea, menstrual pains, dysentery, fevers, yaws, tonic	Leaves	6, 7, 12
<i>Justicia insularis</i>	Antipyretic, general pain relief, earache	Leaves	6, 11
<i>Justicia nyassana</i>	Fevers	Leaves	4
<i>Lankasteria elegans</i>	Venereal diseases, cough, bronchitis	Leaves	7
<i>Lepidagathis heudelotiana</i>	Purgative, wound dressing, weak decoction in fevers	Seeds, stem, roots	6
<i>Lepidagathis scariosa</i>	Fevers	Stem/leaves	
<i>Mackaya bella</i>	Laxative, fevers	Aerial parts	4
<i>Mellera lobulata</i>	Indigestion	Leaves	
<i>Mimulopsis violacea</i>	Venereal diseases, fevers, dysentery	Leaves	19
<i>Monechma hispidum</i>	Diarrhea, smoke from burnt leaves inhaled for colds	Leaves	6, 7
<i>Nelsonia canescens</i>	Yellow fever, eye inflammation, salt substitute	Juice, leaves	6
<i>Neuracanthus africanus</i>	Fevers, pain, skin infections	Aerial parts	
<i>Neuracanthus tephrophyllus</i>	Skin diseases	Aerial parts	
<i>Phaulopsis barberi</i>	Stomachache, cathartic	Leaves	
<i>Phaulopsis ciliata</i>	Toothache, wound dressing	Fruits, leaves	6, 7
<i>Phaulopsis imbricata</i>	Pain relief	Aerial parts	
<i>Pseuderanthemum hildebrandtii</i>	Venereal diseases, snakebite, stomachache	Leaves, whole plant	7
<i>Pseuderanthemum ludovicianum</i>	Anti-infective	Leaves	
<i>Rhinacanthus nasutus</i>	Diuretic, indigestion, flatulence	Leaves, root	19
<i>Ruellia megachlamys</i>	Fevers, pain	Leaves	
<i>Ruellia patula</i>	Local analgesic, fevers	Leaves	7
<i>Sclerochiton boivinii</i>	Skin diseases, snakebite	Whole plants	
<i>Stenandrium guineense</i>	Diarrhea, skin diseases	Leaves	11
<i>Thunbergia alata</i>	Fevers, pain	Aerial parts	
<i>Thunbergia erecta</i>	Febrifuge, wound dressings	Leaves	6, 7
<i>Thunbergia guerkeana</i>	Fevers	Leaves	
<i>Thunbergia natalensis</i>	Blood pressure	Aerial parts	
<i>Whitfieldia elongata</i>	Skin diseases, snakebite, love potion	Seeds, stem	19

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
Adiantaceae (Pteridaceae)			
<i>Cheilanthes hirta</i>	Fever, anti-infective	Aerial parts	4
<i>Pellaea calomelanos</i>	Abdominal pains, convulsion, postpartum, analgesic	Whole herb	11
<i>Vittaria guineensis</i>	Headache	Roots, leaves	19
Agavaceae (see Asparagaceae)			
Aizoaceae			
<i>Carpanthea pomeridiana</i>	Anti-inflammatory	Aerial parts	
<i>Carpobrotus acinaciformis</i>	Gargle, laxative	Leaves	
<i>Carpobrotus dimidiatus</i>	Dysentery, diarrhea, sore throat	Leaves	
<i>Conophytum bilobum</i>	Sedative, analgesic, anti-infective	Leaves, roots	19
<i>Delosperma ecklonis</i>	Stomachache	Aerial parts	
<i>Delosperma nakurense</i>	Pain relief	Aerial parts	
<i>Drosanthemum hispidum</i>	Tonic, laxative	Aerial parts	
<i>Galenia africana</i>	Skin infections	Aerial parts	
<i>Ginus oppositifolius</i>	Headache, rheumatism, fevers	Leaves	7, 11
<i>Gisekia pharmaceoides</i>	Tonic, laxative	Young leaves, stems	
<i>Jordaaniella spongiosa</i>	Skin infections	Aerial parts	
<i>Melanthus minor</i>	Fever, tonic	Aerial parts	
<i>Mesembryanthemum crystallinum</i>	Antianxiety	Leaves	
<i>Mesoklema elatum</i>	Anti-inflammatory	Stem	
<i>Psilocaulon utile</i>	Poultice	Young leaves, stems	
<i>Ruschia spinosa</i>	Skin infections	Aerial parts	
<i>Sceletium tortuosum</i>	Mood enhancer, tonic	Aerial parts	
<i>Stoeberia utilis</i>	Fever, skin infections	Leaves, seeds	
<i>Tetragonia tetragoniodes</i>	Vegetable, in salads, tonic, fevers	Aerial parts	
<i>Zaleya pentandra</i>	Colds, throat infection	Leaves	
		Aerial parts	4

Alismataceae			
<i>Limnophyton obtusifolium</i>	Skin infections	Leaves	
<i>Sagittaria guayanensis</i>	Anemia, rickets, malnutrition, debility (body wash)	Leaves	
Amaranthaceae			
<i>Achyranthes aspera</i>	Arthritis, muscular pains, circumcision wounds, abortifacient, diarrhea, dysentery, dysmenorrhea, hypermenorrhea, coughs, cachectic alopecia, expel placenta and dead fetus, antifertility, furuncle, hemorrhoids, eye inflammation, syncope, splenomegaly	Whole plant	7, 11, 14
<i>Achyropsis avicularis</i>	Fever, nausea caused by biliousness, clear stomach of bile	Roots	14
<i>Achyropsis leptostachya</i>	Articular rheumatism, bilious nausea, fevers, coughs, emetic	Roots	11, 14
<i>Aerva lanata</i>	Sore throat remedy, bronchitis, laxative	Leaves	7
<i>Alternanthera sessilis</i>	Constipation, fevers, headache, neuralgia, lactation, diarrhea	Leaves, stem	6, 11
<i>Amaranthus caudatus</i>	Mild laxative, backache	Leaves	
<i>Amaranthus cruentus</i>	Popular vegetable, nutraceutical, malnutrition	Leaves, tender stem	
<i>Amaranthus hybridus</i>	Bulk laxative, arthritis, skin diseases	Leaves	11
<i>Amaranthus hypochondriacus</i>	Liver disease	Leaves	
<i>Amaranthus spinosus</i>	Gastrointestinal disorders, hemorrhoids, arthritis	Leaves, fruits	11
<i>Amaranthus viridis</i>	Cough remedy, purgative	Leaves, fruits	6
<i>Atriplex nummularia</i>	Insecticide, external pain relief	Leaves, stem	
<i>Blutaparon vermiculare</i>	Inflammation, fevers, hernia pains	Roots	7
<i>Celosia argentea</i>	Mild laxative, backache	Leaves	7
<i>Celosia hastata</i>	Dysentery, skin diseases, anthelmintic, arthritis	Leaves	7, 19
<i>Celosia trigyna</i>	Anthelmintic, rheumatism, stomachache, rituals, skin disease, embrocation for pains	Fruits, leaves	7
<i>Centemopsis conferta</i>	Gum inflammation, teething problems in babies	Roots	
<i>Centemopsis kirkii</i>	Swellings, anodyne	Aerial parts	
<i>Chenopodium album</i>	Anthelmintic, eye diseases, blood diseases, heart, spleen	Aerial parts	
<i>Chenopodium opulifolium</i>	Muscular-skeletal system disorders, subcutaneous cellular tissue disorders	Aerial parts	
<i>Cyathula cylindrica</i>	Anthelmintic, pain relief, diarrhea	Leaves	7, 11, 15
<i>Cyathula prostrata</i>	Anti-inflammatory, antiviral, dysentery	Leaves	11
<i>Digera muricata</i>	Cooked vegetable, famine food	Aerial parts	
<i>Exomis microphylla</i>	Pain relief, poultice for boils	Leaves, stem	

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Leucosphaera bainesii</i>	Gastrointestinal disorders, hemorrhoids, gastric bleeding, wounds, inflammations	Roots, whole plant	4, 14
<i>Pandiaka heudelotii</i>	Postpartum medication, tonic	Leaves	6
<i>Pandiaka lanuginosa</i>	Anti-inflammatory local application	Whole plant	
<i>Psilotrichum elliotii</i>	Hemostatic, analgesic, snakebite, aphrodisiac	Leaves, roots	19
<i>Psilotrichum scleranthum</i>	Pain relief, aphrodisiac, menorrhagia	Root bark	19
<i>Pupalia lappacea</i>	Sore throat, fevers, anti-infective	Leaves	6, 11
<i>Salicomia pachystachya</i>	Vegetable, diuretic	Leaves	
<i>Salsola somalensis</i>	Tapeworm, purgative, gonorrhea, female sterility, testicular problems	Roots, whole plant	14
<i>Suaeda aegyptiaca</i>	Fertility, wound healing	Leaves	4
<i>Suaeda monoica</i>	Hemostatic, female sterility, asthma	Roots, leaves	14
Amaryllidaceae			
<i>Agapanthus africanus</i>	Chest problems, ease childbirth, expel placenta, expectorant, cardiac problems, emetic, paralysis	Rhizomes, roots	4, 14
<i>Alium ascalonicum</i>	Fevers, embrocation	Bulbs, leaves	11
<i>Alium cepa</i>	Carminative, rubefacient, anticholestremic, antidiabetic, antimicrobial, antitussive	Bulb (rhizome)	11
<i>Alium sativum</i>	Hypertension, diabetes, anti-inflammatory, bronchitis	Rhizomes	7
<i>Boophane disticha</i>	Burns, wound dressing, skin diseases, rituals	Bulb, flowers	7, 11
<i>Clivia miniata</i>	Fever, ease childbirth, snakebite, infertility, urinary infections	Roots, bulbs	14
<i>Crinum macowanii</i>	Venereal diseases, increase lactation or blood volume, anxiolytic	Bulbs, leaves	6, 11
<i>Crinum papillosum</i>	Inflammatory diseases, fevers	Bulbs, whole plant	11
<i>Crinum stuhlmannii</i>	Toothache, fevers, skin diseases	Whole plant	11
<i>Hymenocallis littoralis</i>	Skin infection, antipyretic, rheumatic pains, amenorrhea	Leaves, roots	16
<i>Nerine bowdenii</i>	Anti-inflammatory	Corms	4
<i>Scadoxus multiflorus</i>	Scabies, poultice for local inflammation	Bulbs, whole plant	11
<i>Tulbaghia leucantha</i>	Bronchial congestion, asthma, insanity	Whole plant	16
<i>Ungernia indica</i>	Anti-inflammatory, pain relief	Bulbs	11
Anacardiaceae			
<i>Anacardium occidentale</i>	Arthritis, colds, and steam therapy for malaria	Leaves, fruits	7
<i>Antrocaryon micrastrer</i>	General tonic, laxative	Leaves	16

<i>Haematostaphis barteri</i>	Diarrhea, sleeping sickness	Stem bark	7
<i>Harpephyllum caffrum</i>	Dysentery, tonic, exudate for skin	Leaves, stem bark	
<i>Lannea acida</i>	Dysentery, digestive system disorders, skin diseases, beriberi, schistosomiasis, hemorrhoids, eye infections	Leaves	
<i>Lannea afzelii</i>	Jaundice, liver diseases, yellow fever, diarrhea		
<i>Lannea alata</i>	Skeletal-muscular disorders, fractures, infections, malaria	Roots, leaves	
<i>Lannea microcarpa</i>	Mouth blisters, rheumatism, sore throat, dysentery, cathartic, abscess and boils, colic, body swelling, coughs	Leaves, stem, roots	
<i>Lannea stuhlmannii</i>	Pain relief, tonic, antifungal	Leaves, fruits	7, 19
<i>Lannea welwitschii</i>	Hemorrhoids, epilepsy, anti-inflammatory, analgesic	Stem bark	
<i>Mangifera indica</i>	Leaves in malaria teas, anthelmintic, oral health	Leaves	6, 7
<i>Ozoroa cinerea</i>	Throat infection, hypertension, male fertility	Leaves, stem	
<i>Ozoroa insignis</i>	Vermifuge, stomachache	Leaves	6, 7
<i>Pseudospondias microcarpa</i>	Wound dressing, stomachache	Stem bark, leaves	
<i>Rhus pyroides</i>	Diarrhea, wound dressing	Leaves, fruits	6, 7
<i>Rhus tenuinervis</i>	Traveler's diarrhea, skin diseases, bee sting prevention, pains	Leaves, fruits	
<i>Sclerocarya birrea</i>	Bark infusion used with natron for dysentery, tonic, exudate for skin diseases	Fruits, leaves, exudate	6
<i>Searsia tomentosa</i>	Skin diseases, fevers	Leaves, seeds	
<i>Sorindeia grandifolia</i>	Diabetes, tooth cleaning, painful menstruation, general body	Roots, stem	7
<i>Sorindeia madagascariensis</i>	Tonic, obesity, beverage, pains, rickets, venereal diseases, insanity	Fruits	
<i>Spondias mombin</i>	Diarrhea, external applications	Fruits, stem, leaves	7
<i>Trichoscypha acuminata</i>	Bronchitis, headache, fevers, anthelmintic, aphrodisiac, female infertility, rheumatism, hemorrhage in pregnancy, tonic, ulcers	Stem bark, leaves	
<i>Trichoscypha arborea</i>	Prevent miscarriage, amenorrhea, fruit pulp as tonic	Stem bark, fruits, leaves	
Ancistrocladaceae			
<i>Ancistrocladus abbreviatus</i>	Measles, fevers	Aerial parts	7
<i>Ancistrocladus barteri</i>	Anti-infective	Leaves	
<i>Ancistrocladus korupensis</i>	Fevers, tumors, anti-infective agent	Leaves	4
Anisophylleaceae			
<i>Anisophyllea boehmii</i>	Blepharitis (external eye application)	Leaves, sap	14
<i>Anisophyllea laurina</i>	Toothache, dental ache, wounds, anxiety	Leaves, twigs	14

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Anisophyllea laurina</i>	Wound dressing, anthelmintic, fevers, astringent	Leaves	6, 11
<i>Anisophyllea purpurascens</i>	Pain killer, emetic	Aerial parts	
<i>Poga oleosa</i>	Emollient, laxative, skin diseases, toothache, gonorrhea	Kernel, leaves	6, 11
Annonaceae			
<i>Annickia chlorantha</i>	Fever, sleeping sickness, malaria, dysentery, liver diseases	Stem bark, roots	6, 7
<i>Annickia polycarpa</i>	Malaria, cutaneous leishmaniasis, ulcers, jaundice, antiseptic	Stem	
<i>Annona muricata</i>	Fever, cicatrizant for wounds, sudorific for children	Leaves	7
<i>Annona senegalensis</i>	Wound healing, chest colds, diarrhea, dysentery	Gum, roots	6
<i>Annona squamosa</i>	Skin eruptions, insecticide	Leaves	6, 7
<i>Annonidium friesianum</i>	Insecticide, astringent	Stem bark	
<i>Artabotrys aurantiacus</i>	Stomach pain, abortifacient, smallpox, embrocation for pain	Roots, leaves	
<i>Artabotrys brachypetalus</i>	Impotence, infertility, abdominal pain, convulsions	Roots	14
<i>Artabotrys modestus</i>	Stomachache, diarrhea, nausea, anti-inflammatory	Leaves, roots	7
<i>Artabotrys stenopetalus</i>	Gastrointestinal disorders, splenomegaly, aphrodisiac, fertility	Leaves, roots	
<i>Asteranthe asterias</i>	Antimalarial, antitrypanosomiasis and antimycotic activity	Aerial parts	
<i>Cleistopholis patens</i>	Hemostatic agent for fresh wounds	Exudate from leaves	7
<i>Cyathocalyx pruniferus</i>	Skin diseases, antiparasitic	Stem bark, twigs	
<i>Dennettia tripetala</i>	Cough, appetite stimulant	Fruits, leaves	6
<i>Hexalobus crispiflorus</i>	Purgative, emetic, venereal diseases, wounds, furuncle, swollen gland		
<i>Hexalobus monopetalus</i>	Fevers, mouth infections, inflammation, headache, diabetes, dysmenorrhea, colic, swollen glands, body pains, wounds	Stem bark, roots, twigs	19
<i>Isolana campanulata</i>	Bronchial infections, skin diseases, fevers, hematuria, bilharzia, tonic	Roots, stem bark	8
<i>Mkilua fragans</i>	Antimicrobial, antifungal, pain relief	Aerial parts, volatile oil	
<i>Monanthotaxis trichantha</i>	Headache, fevers	Leaves	6, 7
<i>Monodora angolensis</i>	Purgative, roots for urethral stricture	Stem, roots	7
<i>Monodora myristica</i>	Carminative, antiparasitic	Fruits, leaves	6
<i>Monodora tenuifolia</i>	Parasitic skin diseases, dysentery, rituals	Fruits, leaves	7
<i>Neostenanthera myristicifolia</i>	Tumors	Leaves, roots	11
<i>Ophrypetalum odoratum</i>	Earache, sinusitis	Leaves	
<i>Pachypodanthium barteri</i>	Dropsy, swellings, edema, gout, tumors, cancers; vermifuge	Leaves, seeds	

<i>Pachypodanthium staudtii</i>	Insecticide, astringent	Seeds, leaves	
<i>Piptostigma calophylla</i>	Anti-infective, fever	Stem bark	
<i>Polyalthia suaveolens</i>	Blackwater fever, anthelmintic, stomachache	Stem bark	8
<i>Polyceratocarpus scheffleri</i>	Diarrhea, inflammation	Stem bark	
<i>Popowia congensis</i>	Stomachache, diarrhea, colds, bronchial congestion	Fruits, whole plant	7
<i>Sphaerocoryne gracilis</i>	Diarrhea, inflammation, flu	Whole plant	4
<i>Uvaria afzelii</i>	Tonic, inflammation of bladder, kidneys	Leaves	7
<i>Uvaria angolensis</i>	Liver disorders, tonic, skin diseases	Stem bark, roots	7
<i>Uvaria chamae</i>	Hemorrhoids, malaria, kidney and liver infections	Leaves, stem, roots	7, 9
<i>Uvariendron anisatum</i>	Head cold, embrocation	Aerial parts	
<i>Uvariopsis guineensis</i>	Analgesic, antispasmodic, tonic	Root bark	16
<i>Xylopia acutiflora</i>	Fevers, headache, colds	Stem bark	16
<i>Xylopia aethiopica</i>	Carminative, restorative soup after birth tonic, analgesic	Fruits, whole plant	11
<i>Xylopia parviflora</i>	Skin infections, colds	Stem bark, fruits	7, 16
<i>Xylopia quintasii</i>	Wound dressing, mouthwash, bronchitis	Whole plant	7
<i>Xylopia staudtii</i>	Headache, colds, sinus decongestant	Stem bark, fruits	7
<i>Xylopia villosa</i>	Colds, fevers, embrocation	Stem bark, leaves	7
Apiaceae (Umbelliferae)			
<i>Alepidea amatymbica</i>	Antimalarial, headache, coughs, fever, respiratory infections, asthma, chest problems, rheumatism, abdominal pains	Aerial parts, roots	4
<i>Alepidea longifolia</i>	Fevers, analgesic	Leaves, fruits	11
<i>Alepidea peduncularis</i>	Antipyretic, cough, respiratory tract diseases	Roots, leaves	4, 11
<i>Ammodaucus leucotrichus</i>	Colds, bronchitis, chest complaints	Seeds, young leaves	6, 7
<i>Apium graveolens</i>	Arthritis, rheumatism and inflammation of the joints, diuretic and emmenagogue, against dengue fever	Stalks, seeds	
<i>Arctopus echinatus</i>	Venereal diseases, epilepsy	Roots	14
<i>Arctopus stoechadifolia</i>	Gonorrhea, rheumatism	Stem, roots	4
<i>Carum carvi</i>	Antispasmodic, antimicrobial, dyspeptic complaints, gastrointestinal spasm, bloating and fullness, eye, stimulant	Fruits, aerial parts	
<i>Centella asiatica</i>	Skin diseases, dyspeptic complaints, worms, fevers, insomnia, wound healing, stimulant	Leaves, whole plant	3
<i>Centella coriacea</i>	Rheumatic pains	Aerial parts	4

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Eryngium foetidum</i>	Carminative, anti-inflammatory, topical headache remedy, boils	Leaves	6, 7
<i>Ferula assa-foetida</i>	Carminative, anti-inflammatory, digestive	Rhizome, roots	4, 14
<i>Ferula communis</i>	Antifertility, uterotonic	Roots	14
<i>Haplosciadium abyssinicum</i>	Veterinary medicine, skin diseases	Leaves	4
<i>Lichtensteinia interrupta</i>	Chronic cough, colds, tuberculosis, anthelmintic, bronchitis	Roots	11, 14
<i>Lichtensteinia kolbeana</i>	Chest complaints, stimulant	Roots	4
<i>Oenanthe palustris</i>	Nausea, fevers, asthenia, chest pains	Leaves	14
<i>Oenanthe procumbens</i>	Coughs, bronchitis	Seeds	4
<i>Peucedanum fraxinifolium</i>	Diuretic, depurative, fevers, stomachache	Leaves, exudate	6
<i>Steganothaenia araliacea</i>	Dysentery, fevers, epilepsy, respiratory system disorders, asthma, coughs, sore throat, tumors, amenorrhea, adenopathy, toothache, diarrhea, threatened abortion, allergic swellings, female sterility, malaria, elephantiasis	Roots, leaves, stem	4, 11, 14
Apocynaceae			
<i>Acokanthera oblongifolia</i>	Tapeworm, snakebite, poisoning	Stem wood, leaves	11, 15
<i>Acokanthera oppositifolia</i>	Headache, toothache, abdominal pain, colds, measles, blood poisoning, dysentery	Stem bark, leaves	4, 17
<i>Acokanthera schimperi</i>	Weak infusion for syphilis, arrow poison, antifertility	Stem bark, roots	11, 15
<i>Adenium multiflorum</i>	Venereal diseases, topical ulcers, late applied to carious tooth	Leaves, stem, roots	6, 7
<i>Adenium obesum</i>	Wound healing, ulcers, carious tooth, cardiac tonic	Stem, roots	7
<i>Alafia barberi</i>	Inflammatory, fevers	Stem, leaves	7
<i>Allamanda carthartica</i>	Wound healing, rituals	Roots, leaves	11
<i>Alstonia boonei</i>	Fevers, tumors, aphrodisiac	Roots, stem bark	7
<i>Alstonia congensis</i>	Malaria, fevers, arthritis	Stem, leaves, roots	7
<i>Ancylobotrys amoena</i>	Stomachache, ear infection, dysmenorrhea	Leaves, exudates	
<i>Apocynum cannabinum</i>	Stem bark infusion as purgative, roots as abortifacient, arrow poison	Stem bark, roots	7
<i>Asclepias pedunculata</i>	Inflammation, purgative	Leaves	4
<i>Callichilia barberi</i>	Tonic, laxative, dizziness, anxiety	Leaves	7, 11
<i>Callichilia subsessilis</i>	Dizziness, tumors, anthelmintic, venereal infections	Roots, stem bark	7
<i>Calotropis procera</i>	Embrocation, latex as purgative, venereal diseases, leaf juice for headache and catarrh, conjunctivitis, skin diseases, wound healing	Leaves, latex	6, 7
<i>Caralluma dalzielii</i>	Tonic, aphrodisiac, analgesic	Stem	6, 19

<i>Carissa bispinosa</i>	Aphrodisiac, pulmonary diseases, venereal diseases	Stem bark, leaves	4
<i>Carissa (edulis) spinarum</i>	Toothache, tonic, aphrodisiac, inflammation, digestive system disorders, genitourinary disorders, infections/infestations, antifertility, pain, poisonings, muscular-skeletal disorders, respiratory diseases	Leaves, roots, latex	6, 7, 17
<i>Catharanthus roseus</i>	Laxative, antidiabetic, rheumatism, hypertension, leukemia, Hodgkin's disease, flatulence, stomach disorders, measles	Leaves, flowers, with plant	11
<i>Catharanthus trichophyllus</i>	Malaria, fevers	Roots, leaves	11
<i>Cerbera manghas</i>	Weak decoction as diuretic, arrow poison, local analgesic	Stem bark, latex	11
<i>Cerbera odollam</i>	Skin diseases, arrow poison	Stem bark, roots	11
<i>Cryptolepis sanguinolenta</i>	Fevers, antimicrobial, headache, malaria, anti-inflammatory, hepatitis, diabetes, upper respiratory tract infections	Roots, stem, leaves	6, 19
<i>Cynanchum ellipticum</i>	Anti-inflammatory agent, fevers	Whole plant	4
<i>Cynanchum obtusifolium</i>	Stimulant, pains	Aerial parts	
<i>Dictyophleba lucida</i>	Venereal diseases	Stem bark, leaves	
<i>Diplorhynchus condylocarpon</i>	Weak infusion given for syphilis, arrow poison	Stem bark, roots	11, 15
<i>Dregea rubicunda</i>	Laxative, arthritis	Leaves, fruits	
<i>Funtumia africana</i>	Wound and burn dressing, root decoction for incontinence, urinary tract infection	Leaves, roots	7, 9
<i>Funtumia elastica</i>	Male impotence, tonic for hemorrhoids, skin infection	Stem, twigs	9
<i>Gomphocarpus stenophyllus</i>	Diarrhea, venereal diseases	Leaves, stem, roots	6
<i>Gymnema sylvestre</i>	Tonic, anti-inflammatory, snakebite remedy, destroy sense of taste	Roots, stem	6, 7
<i>Haplophyton cimicidum</i>	Venereal diseases, hypotensive, fevers	Roots, stem bark	16
<i>Holarhena floribunda</i>	Analgesic, antiparasitic, antimicrobial, dysentery, syphilis	Roots, stem bark	6, 7
<i>Hoodia gordonii</i>	Appetite suppressant, hemorrhoids, tuberculosis, cancer, indigestion	Stems	18
<i>Hunteria congolana</i>	Geriatric memory aid, blood pressure, aphrodisiac	Aerial parts	
<i>Hunteria umbellata</i>	Bitter tonic, anthelmintic, piles, yaws, diabetes, cardiologic	Leaves	
<i>Kanahia laniflora</i>	Abortifacient, central nervous system (CNS) activity, diuretic, convulsion in children	Leaves	14
<i>Landolphia dulcis</i>	Antiparasitic, fevers	Roots, stem bark	6, 7
<i>Landolphia kirkii</i>	Tuberculosis, female sterility	Roots, leaves	6, 7
<i>Landolphia owariensis</i>	Colic, venereal diseases, teeth cleaning	Twigs, leaves, stem	6, 7
<i>Leptadenia lancifolia</i>	Venereal diseases, stomachache, flatulence	Roots	7, 19
<i>Lochnera rosea</i>	Maniac syndrome, diabetics, ritual	Roots, leaves	7
<i>Marsdenia latifolia</i>	Anthelmintic, laxative, arthritic pains, mouth sores, chew sticks	Stem, leaves, fruits	6, 11
<i>Mascarenhasia arborescens</i>	Essential oil as insecticide	Leaves, exudates	

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Mondia whiteii</i>	Malaria, aphrodisiac, uterine stimulant, gastrointestinal disorders, constipation, anorexia, bilharzia, refreshing drink, schistosomiasis, cough, bronchitis, chest complaints and expectorant	All parts of the plant	4, 14
<i>Nerium oleander</i>	Skin infections, dysentery, cardiotoxic, diaphoretic, diuretic, emetic, scabies, expectorant, sternutatory, poisonous	Leaves, latex	4, 7, 11
<i>Orbea dummeri</i>	Painkiller, fever	Aerial parts	
<i>Pachycarpus lineolatus</i>	Infertility, aphrodisiac, tonic, abortifacient, carminative	Roots	6, 7, 19
<i>Parquetina gabonica</i>	Fever, gonorrhea	Leaves	
<i>Pentarrhinum insipidus</i>	Leaves and fruits as vegetables, boil dressing	Aerial parts	
<i>Pergularia daemia</i>	Expectorant, diarrhea, fever, emetic	Fruits, leaves	9, 11
<i>Periploca linearifolia</i>	Fevers, antibacterial	Aerial parts	
<i>Periploca nigrescens</i>	Anti-infective, fever	Aerial parts	
<i>Picralima nitida</i>	Malaria, sleeping sickness, local anesthetic, memory enhancer, analgesic, arthritis, cough, aphrodisiacs, diabetes, mental illness	Seeds, stem, roots	6, 7
<i>Pleioceras barteri</i>	Abortifacient, urethritis, emmenagogue	Roots, stem	6
<i>Plumeria rubra</i>	Laxative, fevers, skin diseases, antianxiety	Leaves, roots, latex	6, 7
<i>Rauvolfia caffra</i>	General body swelling, rheumatism, pneumonia	Stem bark, leaves	7, 11
<i>Rauvolfia marni</i>	Hypertension, fever	Roots, stem bark	
<i>Rauvolfia mombasiana</i>	Fevers, anxiety states, malaria	Roots, stem bark	6, 7
<i>Rauvolfia vomitoria</i>	Fevers, sedative in manic syndromes, hypertension, emetic	Roots, stem, leaves	6, 7
<i>Sarcostemma viminalae</i>	Genitourinary disorders, ulcers, lactation, rituals, tonic	Aerial parts	
<i>Schizoglossum heudelotianum</i>	Fevers, stomachache	Tubers	
<i>Schizozygia coffaeoides</i>	Application to sores, dysentery	Roots	19
<i>Secamone afzelii</i>	Juice applied externally for abscesses, purgative, poisonous	Leaves	14
<i>Stathmostelma welwitschii</i>	Edema, leaves as purgative	Stem, roots	
<i>Strophanthus eminii</i>	Local pain, arrow poison	Seeds, stem	7, 11
<i>Strophanthus gratus</i>	Poison, rituals, severe constipation	Leaves, seeds	7
<i>Strophanthus hispidus</i>	Cardiac insufficiency, arrow poison	Seeds	11
<i>Strophanthus kombe</i>	Arrow poison, ritual, body pains	Seeds, leaves	6
<i>Strophanthus sarmentosus</i>	Poison, syphilis	Seeds, leaves	7
<i>Tabernaemontana brachyantha</i>	Vermifuge, fevers, topical anti-infective	Bark, twigs	11

<i>Tabernaemontana crassa</i>	Conjunctivitis, constipation, headache, colds, sinusitis, fatigue, hematuria, ovarian problems, gonorrhea, kidney pain, anthrax, rheumatism, insanity, skin parasites, filariasis, abscess, pains	Stem, leaves, roots, sap	4, 14
<i>Tabernaemontana elegans</i>	Aphrodisiac, cancer, pulmonary diseases, venereal diseases, hypermenorrhea (as vaginal wash), tuberculosis, wounds	Roots, endocarp	14
<i>Tabernaemontana glandulosa</i>	Pain, poultice for boils, ingredient in ordeal poisons	Roots, stem, leaves	11, 15
<i>Tabernaemontana holstii</i>	Local pains, fevers, constipation, stomachache, sleep aid, conjunctivitis, headache, fatigue, cuts	Roots, fruits	7, 11, 14, 16
<i>Tabernaemontana pachysiphon</i>	Lymphatic glandular swelling, breast inflammation in women, purgative, stomachache, headache, scabies, hypnotic	Fruit sap, leaves, roots	14
<i>Tabernanthe iboga</i>	Debilitating illness of unknown origin, aphrodisiac, hallucinogen, tonic, neurasthenia, fevers, tonic	Roots, stem bark	16
<i>Tacazzea apiculata</i>	Aerial parts for fevers, roots as anti-infective	Aerial parts, roots	
<i>Thevetia nerifolia</i>	Febrifuge, local analgesic, arrow poison ingredient	Leaves, fruits, latex	11
<i>Urechites subrecta</i>	Arrow poison, purgative, skin diseases, edema	Stem bark, roots	16
<i>Voacanga africana</i>	Diuretic, infant tonic and convulsion prophylaxis	Roots, stem bark	16
<i>Xysmalobium undulatum</i>	Stomachache, bitter tonic	Tubers	16
Aponogetonaceae			
<i>Aponogeton distachyos</i>	Aquarium plant, wound healing	Aerial parts	
<i>Aponogeton ulvaceus</i>	Veterinary medicine	Leaves	
<i>Ilex mitis</i>	Ritual wash, laxative	Leaves, seeds	
Aquifoliaceae			
Araceae			
<i>Amorophophallus aphyllus</i>	Snakebite remedy, local application for pains	Tubers	6, 11
<i>Anchomanes difformis</i>	Constipation, cough, rubefacient, edema	Roots, leaves	6
<i>Cercestis camerunensis</i>	Ingredient in a liver medicine, antiemetic	Leaf	
<i>Colocasia esculenta</i>	Cosmetics, abortifacient, whitlow, potherb, rheumatism, throat pain, hemorrhoids, abscess	Tubers, leaves	6
<i>Culcassia scandens</i>	Tonic, diaphoretic, stomachache, pneumonia, rheumatism, colic, otitis, gonorrhea	Leaves	16
<i>Diefenbachia maculata</i>	Skin eruptions, topical anti-inflammatory, poisonous	Aerial parts	4, 17
<i>Pistia stratiotes</i>	Skin diseases, cough and fevers	Aerial parts	

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Xanthosoma sagittifolium</i>	Boiled leaves good laxative for infants, tubers to reduce swelling, rituals	Leaves, tubers	19
<i>Zamioculcas zamiifolia</i>	Earache, skin diseases	Leaves	6, 19
<i>Zantedeschia albomaculata</i>	Skin diseases, fevers	Aerial parts	
Araliaceae			
<i>Cuphocarpus inermis</i>	Tonic, cough, inflammation, aphrodisiac	Roots, whole plant	7
<i>Cussonia arborea</i>	Leprosy, painful menstruation, biliousness, epilepsy, purgative, convulsion in children, skin diseases	Leaves, aerial parts, roots	7
<i>Cussonia paniculata</i>	Beverage, ingredient in colic remedy	Roots	16
<i>Cussonia zimmermannii</i>	Venereal diseases, fevers, bronchitis	Leaves, roots	6, 7
<i>Hydrocotyle mannii</i>	Headache, liver diseases, viral infections, anti-inflammatory	Leaves, stem bark	11
<i>Polyscias fulva</i>	Fever and malaria, enema to treat colic, and purgative	Stem bark	
<i>Schefflera abyssinica</i>	Malaria, inflammation, insanity	Leaves, flowers (nectar)	
Areaceae			
<i>Areca catechu</i>	Tonic, laxative	Fruits, leaves	16
<i>Borassus aethiopicum</i>	Bronchial complaints, coughs, asthma	Fruits, sap	6, 7
<i>Cocos nucifera</i>	Poison antidote, cardiac tonic, refreshing drink	Fruits	6, 7
<i>Elaeis guineensis</i>	Analgesic (roots), leaves antibacterial, oil poison antidote	Leaves, root, fruits	6
<i>Hyphaena guineensis</i>	Oxytocic, dysmenorrhea, premenstrual pain	Terminal buds, stem pit	4, 14
<i>Hyphaena thebaica</i>	Exhaustion, jaundice, stomachache, bladder infections, blood in urine, trachomatous conjunctivitis	Leaves, root, fruits	14
<i>Laccosperma secundiflorum</i>	Vermifuge, tonic, fevers, dysentery	Shoot, sap	16
<i>Pandanus veitchii</i>	Dysentery, gastroenteritis, ashes as salt substitute	Stem bark, leaves	16
<i>Phoenix dactylifera</i>	Tonic, refreshing drink, young bud as laxative	Sap, fruit, bud	7
<i>Phoenix reclinata</i>	Tonic drink, thorn ingredient in remedy for pleurodynia and pleurisy	Sap, juice	6
<i>Raphia hookeri</i>	Promote lactation, syphilis	Sap	7
Aristolochiaceae			
<i>Aristolochia alba</i>	Stomach, tonic, malaria and other fevers, local analgesic, ingredient in quinea worm remedy	Roots	7
<i>Aristolochia angustifolia</i>	Dysentery, cough, sore throat, fevers, snakebite	Roots	6, 7

Asclepiadaceae (APG: Apocynaceae)

Asphodelaceae (see Asparagaceae, Xanthorrhaceae)

Asparagaceae

<i>Agave sisalana</i>	Anti-inflammatory	Sap, leaves	6, 11
<i>Albuca abyssinica</i>	Arrow poison ingredient, aphrodisiac, rheumatism, otitis	Bulb	
<i>Aloe babadensis</i>	Skin care, tonic, guinea worm, wound dressing, vertigo	Exudate, leaves	4, 6, 8
<i>Aloe bakeri</i>	Antiviral, wound dressing, inflammation	Leaves, exudate	11
<i>Aloe excelsa</i>	Jaundice, asthma, abdominal pains	Leaves	6
<i>Aloe ferox</i>	Wound dressing, laxative	Leaves, exudate	6
<i>Aloe secundiflora</i>	Antiviral, analgesic, antifungal	Leaves	6
<i>Asparagus africanus</i>	General tonic, malnutrition, bronchial infections, syphilis, diuretic, hematuria	Leaves	4–7
<i>Asparagus asparagoides</i>	CNS disorders, sore eyes, gastrointestinal disorders, purgative	Aerial parts, roots	4, 7
<i>Asparagus flagellaris</i>	Syphilis, otitis, stomach cramps, wounds, dermatosis, angina	Roots, twigs	
<i>Asparagus laricinus</i>	Conjunctivitis, whitlow, lumbar pain, gonorrhea	Whole plant	
<i>Asparagus racemosus</i>	Schistosomiasis, fevers, anti-inflammatory	Root pulp	
<i>Asparagus rubicundas</i>	Stomachache, tonic	Aerial parts	
<i>Dracaena afromontana</i>	Skin diseases	Aerial parts	
<i>Dracaena angustifolia</i>	Gonorrhea, joint swelling and pains, hair loss	Leaves	
<i>Dracaena arborea</i>	Antifungal, abortifacient, angina, epilepsy, smallpox, gonorrhea, inflammation of the uterus, headache, tachycardia, convulsion	Stem bark, leaves	14
<i>Dracaena ellenbeckiana</i>	Skin diseases	Fruits	
<i>Dracaena fragrans</i>	Tropical fever remedy, anti-infective, anti-inflammatory, rheumatism, anemia, measles, palpitation, labor pains	Fruits, leaves, roots	6, 7, 14
<i>Dracaena laxissima</i>	Venereal diseases, skin eruptions	Roots	6
<i>Dracaena mannii</i>	Vermifuge, coughs, edema, cardiac pain, toothache, fish poison, antifungal, syncope, skin care, vomiting, spleen pain, abscess, mouthwash	Stem bark, leaves	8, 14
<i>Dracaena reflexa</i>	Pootherb, anti-inflammatory	Stem	
<i>Dracaena usambarensis</i>	Antifungal, abortifacient, dysentery, epilepsy, smallpox, gonorrhea, coughs, diuretic, malaria, stomachache	Fruit, stem bark, leaves	4, 14
<i>Drimia altissima</i>	Anti-inflammatory, tonic, skin diseases	Bulbs, leaves	6, 11
<i>Drimia elata</i>	Emetic, expectorant	Bulbs	11

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Drimys maritima</i>	Hypertension, cardiac insufficiency, tonic	Bulbs	11
<i>Eriosepermum andongense</i> +A571	Aphrodisiac, tonic for fetus	Tuber	11
<i>Eriosepermum flagelliforme</i>	Abscess, furuncle, lupus, aphrodisiac, poultry to increase egg production and for diseases	Roots, leaves	14
<i>Eucomis undulata</i>	Abdominal distension, stomachache, topical painkiller	Bulb (fruit)	11
<i>Ledebouria camerooniana</i>	Abscess, wounds	Leaves	14
<i>Ledebouria cooperi</i>	Prenatal medication after first trimester of pregnancy, inebriate boys during circumcision	Bulbs	14
<i>Ledebouria ovatifolia</i>	Gastrointestinal disorders, influenza, back pain, increase girls' breast development in puberty, purgative	Bulbs	14
<i>Ledebouria revoluta</i>	Lumbago, rash, wounds, sores	Bulbs	14
<i>Ornithogalum longibracteatum</i>	Wounds	Bulbs	14
<i>Ornithogalum thyrsoides</i>	Inflammation, wound dressing	Bulbs, aerial parts	4
<i>Sansevieria ehrenbergii</i>	Analgesic, tonic	Leaves	11
<i>Sansevieria liberica</i>	Fevers, tonic	Roots, leaves	11
Asteraceae (see Compositae)			
Balanophoraceae			
<i>Thonningia sanguinea</i>	Bronchial asthma, vermituge, skin diseases, dysentery, sore throat	Flower, roots, stem	9
Basellaceae			
<i>Basella alba</i>	Laxative, conjunctivitis, fevers, vegetable	Aerial parts	17
Begoniaceae			
<i>Begonia macrocarpa</i>	Vegetable, fever remedy ingredient	Leaves	
<i>Begonia mannii</i>	Antiseptic	Leaves	
<i>Begonia meyeri-johannis</i>	Wound healing	Leaves	
Berberidaceae			
<i>Berberis holstii</i>	Stomach disorders, wound dressing, ash given to newborn	Leaves	
Bignoniaceae			
<i>Crescentia cujete</i>	Skin infections	Fruits, leaves	7, 11

<i>Fernandoa adolfi-friderici</i>	Malaria, antidiabetic, severe coughs	Stem	4
<i>Fernandoa madagascariensis</i>	Fevers, pains	Leaves, flowers	
<i>Jacaranda mimosifolia</i>	Skin diseases, fish poison, antiparasitic	Leaves, seeds	16
<i>Kigelia africana</i>	Dysentery, constipation, wound dressing, boils, malaria, aphrodisiac, kidney diseases, solar keratosis, diarrhea, cosmetics, dysentery, inflammation, malaria	Roots, stem, leaves	6, 7
<i>Kigelia moosa</i>	Fevers, antiparasitic, cosmetics, antimicrobial		
<i>Markhamia lutea</i>	Fevers, flu, antimicrobial, coughs, conjunctivitis, stomachache	Leaves, roots	6
<i>Markhamia tormentosa</i>	Dropsy, gout, diuretic, painkiller conjunctivitis	Leaves, stem, fruits	7
<i>Newbouldia laevis</i>	Febrifuge, wound dressing, stomachache	Aerial parts	
<i>Rhigozum obovatum</i>	Anti-infective	Stem, leaves	6, 7
<i>Spathodea campanulata</i>	Fevers, wound dressing, constipation, gastrointestinal disorders, malaria, schistosomiasis vector, antidiabetic		
<i>Stereospermum acuminatissimum</i>	Dressing for sores and wounds, hemostatic agent	Stem bark, leaves	7
<i>Stereospermum kunthianum</i>	Skin eruptions, venereal diseases, wound dressing, coughs (pods)	Stem bark, pods	7, 16
<i>Tabebuia rosea</i>	Fevers, antiparasitic	Stem bark, leaves	16
<i>Tecomaria capensis</i>	Tonic, skin infections, fevers	Roots, stem	
<i>Bixa orellana</i>	Febrifuge, cosmetic dye, anti-infective	Leaves, fruits	7
Bixaceae			
Bombacaceae (see Malvaceae)			
Boraginaceae			
<i>Amebia hispidissima</i>	Root dye for skin eruptions, leaves for edema, yellow fever	Roots, leaves	6, 11
<i>Bourreria teitensis</i>	Children's skin diseases, eczema	Aerial parts	
<i>Cordia abyssinica</i>	Tonic, fatigue and exhaustion; with fruits of <i>Hibiscus cannabinus</i> , nose bleeding, anthelmintic, headache, vomiting in pregnancy	Stem, bark	7, 16
<i>Cordia aurantiaca</i>	Vermifuge, inflammation	Exudate, leaves	6, 11
<i>Cordia monoica</i>	Ritual peace plant, malaria, vomiting in children, genitourinary disorders, fever; sensory disorders, eye infections, retained placenta	Leaves, stem bark	
<i>Cynoglossum coeruleum</i>	Antipyretic, antimicrobial, snakebite, antispasmodic, cramps, pregnancy pains	Stem bark, roots	11, 16
<i>Echiostachys incanus</i>	Skin diseases	Leaves, stem bark	
<i>Ehretia amoena</i>	External application for pains, backache	Aerial parts	
<i>Ehretia coerulea</i>	Back pain, wound healing	Leaves, stem bark	6, 7

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Ehretia cyamosa</i>	Dysentery, infantile convulsion, bath for fevers, laxatives, dysmenorrhea, aphrodisiac, scabies, gastric ulcers	Roots, leaves, juice	7
<i>Ehretia obtusifolia</i>	Analgesic, toothache, painful menstruation, infertility in women	Leaves, roots	16
<i>Ehretia trachyphylla</i>	Skin infections, amenorrhea, fevers	Stem bark	6
<i>Heliotropium indicum</i>	Fevers, eye lotion, threatened abortion, abortion, wound dressing, vermifuge	Leaves	7
<i>Lithospermum arvense</i>	Purgative, measles, fevers	Leaves	6, 11
<i>Lobostemon fruticosus</i>	Stomachache, anti-infective	Aerial parts	6, 11
<i>Trichodesma africanum</i>	Fevers, anti-inflammatory, diarrhea	Leaves	6, 11
<i>Trichodesma zeylanicum</i>	Fevers, analgesic, scorpion bite	Leaves	
Brassicaceae			
<i>Amoracia rusticana</i>	Rubifacient, bronchitis, inflammation	Roots	6, 11
<i>Brassica juncea</i>	Galactagogue, insect repellent, tonic	Leaves, oil	16
<i>Brassica napus</i>	Skin diseases, embrocation	Seed oil, leaves	6, 11
<i>Brassica rapa</i>	Skin infections, snakebite, potherb	Seed oil, leaves	11
<i>Erucastrum arabicum</i>	Famine vegetable, skin diseases, high blood pressure	Aerial parts	16
<i>Heliphilla suavisima</i>	Tonic, divination ritual	Leaves	6, 11
<i>Lepidium africanum</i>	Cough remedy, embrocation for sprains	Leaves	16
<i>Lepidium sativum</i>	Bacterial and fungal infections, diarrhea, dysentery, cough, poison antidote	Whole herb, seeds	11
<i>Nasturtium officinale</i>	Anthrax remedy	Leaves, stem	11
<i>Raphanus raphanistrum</i>	Hemorrhoids, malaria, skin diseases	Seeds	
Bromeliaceae			
<i>Ananas comosus</i>	Arthritis, venereal diseases, laxative, skin eruptions	Fruits, leaves	11
Bruniaceae			
<i>Berzella lanuginosa</i>	External use in cosmetics	Aerial parts	
<i>Brunia alopecuroides</i>	External use		
<i>Nebelia paleacea</i>			

Burseraceae

<i>Boswellia hildebrandtii</i>	Diuretic, wound dressing, gonorrhea	Roots	6
<i>Boswellia sacra</i>	Anti-inflammatory, wound healing, acne, amenorrhea, cancer, analgesic, diuretic, antiseptic, cystitis, cervical spondylosis, carminative, expectorant, genital infections, sedative, ulcers	Sap (resin)	18
<i>Canarium madagascariense</i>	Sedative, analgesic	Stem exudate, leaves	11
<i>Canarium schweinfurthii</i>	Coughs, exudate for venereal diseases	Fruits, stem bark	6
<i>Commiphora africana</i>	Stem chew sticks, stomachic carminative, colds, rituals, migraine, anemia, dysentery, gonorrhea, arthritis, dysmenorrhea, aphrodisiac, threatened abortion, scrotal swelling, gonorrhea, snakebite, malaria, jaundice	Exudates, leaves, stem	11, 14
<i>Commiphora dalzielii</i>	Insecticide	Stem bark, resin	
<i>Commiphora edulis</i>	Dysentery, wound dressing, disinfectant, aphrodisiac	Stem bark, resin, roots	14
<i>Commiphora erlangiana</i>	Stomachache, expulsion of placenta after childbirth, gargle	Roots, juice	16
<i>Commiphora madagascariensis</i>	Antipyretic, analgesic, antimicrobial, anti-inflammatory	Exudate, leaves	6
<i>Commiphora mollis</i>	Hypermenorrhagia, toothache, fever, digestive disorders	Twigs, leaves	14
<i>Commiphora myrrha</i>	Inflammations, mouthwash, stomachache, stimulant, wound dressing, purgative, snakebite	Gum resin, sap, oil	18
<i>Commiphora pilosa</i>	Toothache, fevers, sore throat, purgative	Fruits, latex	11
<i>Commiphora pteleifolia</i>	Analgesic, antimicrobial	Exudate, leaves	6
<i>Dacryodis edulis</i>	Parasitic skin diseases, wound dressing, fevers	Stem exudate, leaves	16
<i>Pachylobus barteri</i>	Antidiarrhea, coughs	Exudate, leaves	6, 11
<i>Santiria trimera</i>	Whooping cough, anthelmintic, chest problems, yaws, diarrhea, lumber pains, scabies, pulmonary pains	Stem bark	4, 14

Cactaceae

<i>Opuntia dillenii</i>	Inflammation, rheumatism	Whole plant, roots	
<i>Opuntia ficus-indica</i>	Diarrhea, burns (radiation therapy), general pains, hair growth, ulcers, cosmetics for blemishes, swellings, wound dressing	Whole plant, leaves	
<i>Opuntia tuna</i>	Convulsions, diuretic, rheumatism, tumors, gonorrhea, body stiffness	Leaves, twig	
<i>Opuntia vulgaris</i>	Digestive disorders, intestine, diarrhea, injuries, hemostatic	Stem, exudate, leaves	
<i>Nopalea cochenillifera</i>	Inflammation, eyes, muscular-skeletal system disorders, pain, earache, toothache, subcutaneous tissue disorder, rheumatism	Exudate, whole plant	

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Rhipsalis baccifera</i> <i>Rhipsalis cassytha</i>	Earache, chest complaints, gonorrhea, purgative Inflammation, skin disorders	Aerial parts, roots Aerial parts	
Caesalpiniaceae (see Leguminosae)			
Calophyllaceae			
<i>Calophyllum inophyllum</i>	Rheumatism, analgesic, psoriasis, sore eyes, hemorrhoids, ulcers, phthiasis, orchitis, lung affections, purgative, gonorrhea, dysentery	Leaves, seed oil	
<i>Calophyllum tacamahaca</i>	Hypertension, diuretic	Leaves, stem bark	
<i>Endodesmia calophylloides</i>	Filariasis—as a topical application to the eyes	Leaf sap	
<i>Mammea africana</i>	Fevers, skin infections, diarrhea, bronchitis, anthelmintic, rheumatism	Fruits, leaves, bark	16
<i>Mesua ferrea</i>	Hemostatic, antidyenteric and antidiarrhetic, childbirth	Seed oil, flowers	
Campanulaceae			
<i>Cyphia glandulifera</i>	Emetic, stomachache	Leaves	
<i>Lightfootia nodosa</i>	Skin diseases	Aerial parts	
<i>Lobelia stuhlmannii</i>	Anti-infective	Aerial parts	19
<i>Wahlenbergia erecta</i>	Pains, fever, local embrocation	Leaves	
Canellaceae			
<i>Cinnamosma fragrans</i>	Antiseptic	Aerial parts	
<i>Warburgia salutaris</i>	Malaria, colds, cough, rheumatism	Aerial parts	
<i>Warburgia ugandensis</i>	Flu, fevers, pains, stomachache, gastrointestinal disorders	Stem bark, roots	6
Cannabaceae			
<i>Celtis gomphophylla</i>	Cardiovascular disorders, fevers, menstrual pains	Roots	
<i>Celtis philippensis</i>	Antispasmodic, fevers, diarrhea, eczema	Whole plant	
<i>Celtis tessmannii</i>	Body pains, diarrhea, severe headache	Roots	
<i>Celtis zenkeri</i>	Epilepsy, coughs, elephantitis, analgesic, body pains	Leaves, stem bark	
<i>Trema guineense</i>	Cough, bronchitis congestion, asthma, anthelmintic, antispasmodic, female infertility	Stem bark, leaves	11
<i>Trema orientalis</i>	Coughs, sore throat, asthma, bronchitis, gonorrhea, yellow fever, toothache, vermifuge, antiplasmodium	Aerial parts	

Capparaceae (Capparidaceae)

<i>Boscia senegalensis</i>	Venereal diseases, malaria, wound dressing, diabetes, stomachache, dressing, aphrodisiac, eyewash	Leaves, berries	11
<i>Bulcholia coriacea</i>	Ritual, seeds and young twigs as stimulants	Aerial parts	
<i>Cadaba farinosa</i>	Antiviral, analgesic	Leaves	6, 7
<i>Capparis decidua</i>	Fevers, vermifuge, chronic arthritis, jaundice	Roots, fruit	6
<i>Capparis fascicularis</i>	Muscular-skeletal disorders, anti-infective, used as pickles, chutney	Aerial parts	
<i>Crateva adansonii</i>	Earache, analgesic, wound dressing	Roots, stem bark	7
<i>Eudenia eminens</i>	Aphrodisiac, earache remedy, conjunctivitis	Seeds, roots	7
<i>Maerua aethiopica</i>	Analgesic, labor, fever	Aerial parts	4
<i>Maerua angolensis</i>	Local pain relief, oral hygiene	Stem	6
<i>Maerua kirkii</i>	Mouth sores, fevers	Leaves	7
<i>Maerua triphylla</i>	Earache, fevers, anti-infective	Leaves, fruits	6, 7
<i>Ritchiea capparoides</i>	Sleeping sickness, filariasis, guinea worm, tonic	Roots, leaves	7
<i>Ritchiea reflexa</i>	Anthelmintic, anti-inflammatory, earache remedy	Roots	
<i>Ritchiea simplicifolia</i>	Anti-inflammatory, tonic	Roots	6
<i>Thilachium monophyllum</i>	Stimulant, aphrodisiac	Whole plant	14
<i>Thilachium panduriforme</i>	Toothache, fevers, malaria, headache, snakebite, aphrodisiac, abdominal pain, anthelmintic	Leaves, stem, roots	7, 14

Caprifoliaceae

<i>Sambucus africana</i>	Antiphlogistic, cholagogue, diaphoretic, diuretic, expectorant	Aerial parts	4
<i>Valeriana capensis</i>	Epilepsy, hysteria, nervous disorders	Roots	11

Caricaceae

<i>Carica papaya</i>	Refreshing drink, fevers, malaria steam therapy, wound dressing; seeds as abortifacient, digestive aid	Leaves, fruits, seeds	6
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Caryophyllaceae

<i>Drymaria cordata</i>	Analgesic, cough remedy	Leaves	6, 7
<i>Polycarpea linearifolia</i>	Tonic, rituals	Leaves	7
<i>Silene macrostylo</i>	Skin diseases	Aerial parts	

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
Casuarinaceae			
<i>Casuarina equisetifolia</i>	Toothache, dysentery	Leaves	6, 7
Celastraceae			
<i>Cassine matabelica</i>	Fevers, aphrodisiac, diarrhea, to reduce vaginal opening, pain	Roots, stem bark	
<i>Cassine papillosa</i>	Sores, venereal diseases	Whole plant, roots	
<i>Cassine transvaalensis</i>	Menorrhagia, dysmenorrhea, diuretic, venereal diseases	Roots, stem bark	
<i>Catha edulis</i>	Stimulant, antidepressant, colds, influenza, nervous system	Leaves	7
<i>Celastrus madagascariensis</i>	Fevers, arthritis, earache	Leaves	
<i>Celastrus paniculatus</i>	CNS disorders, ritual	Aerial parts	
<i>Elaeodendron buchananii</i>	Diarrhea, skin diseases, abdominal pains, infertility, coughs	Roots, leaves	6
<i>Elaeodendron croceum</i>	Constipation, dysentery, syphilis, ordeal poison, snakebite	Roots, stem bark	
<i>Gymnosporia putterlickioides</i>	Laxative, urinary tract infection	Leaves	
<i>Gymnosporia senegalensis</i>	Gastrointestinal remedy, anthelmintic, laxative, dysentery	Root bark, leaves	6
<i>Hippocratea myriantha</i>	Induction of labor, uterine contractions, dysentery, abdominal pains, headache, high blood pressure	Aerial parts	
<i>Loeseneriella africana</i>	Malaria, spleen inflammation, aphrodisiacs, menstrual pains, chew stick for teeth cleaning, sores, skin diseases	Aerial parts	
<i>Maytenus buchananii</i>	Wound dressing, mouth infections, gastrointestinal disorders	Stem bark, leaves	6, 7
<i>Maytenus heterophylla</i>	Viral infections, anti-inflammatory	Leaves, roots	6
<i>Maytenus senegalensis</i>	Dysentery, colic, antimicrobial	Roots, leaves	7
<i>Mystroxydon aethiopicum</i>	Respiratory tract infections, stomachache, anemia, coughs	Aerial parts	
<i>Reissantia indica</i>	Fevers, poultice for rheumatism, heated leaves after childbirth	Aerial parts	
<i>Salacia kraussii</i>	Tapeworm, epilepsy in children	Roots, stem	11
<i>Simicratea welwitschii</i>	Antifungal, antimicrobial, pain relief, hepatitis	Root bark	9
Chenopodiaceae (see Amaranthaceae)			
Chrysobalanaceae			
<i>Acioa edulis</i>	Ritual, skin diseases	Whole plant	
<i>Acioa barteri</i>	Root decoction in cardiac remedy, pains	Roots, leaves	6

<i>Afrolicania elaeosperma</i>	Topical analgesic, cosmetic stimulates hair growth	Seed oil, leaves	6
<i>Dactyladenia barteri</i>	Purgative, skin diseases	Leaves, root bark	
<i>Magnistipula bandwuelensis</i>	Diarrhea	Stem bark	
<i>Magnistipula tessmannii</i>	Diarrhea, fevers, colic	Stem bark	
<i>Maranthes cuneatifolia</i>	Jedi-jedi; venereal infections	Stem bark	
<i>Maranthes polyandra</i>	Genitourinary diseases, genital stimulants/depressants; pains, febrifuge, skin, mucosal venereal diseases, skeletal muscle	Leaves, roots	
<i>Parinari capensis</i>	Genitourinary system disorders, fertility, catharacts, ear drops	Root, stem bark	
<i>Parinari curatellifolia</i>	Cardiovascular stimulant, pneumonia, coughs, pain in labor	Fruits, leaves, stem	
<i>Parinari excelsa</i>	Insanity; vermifuges; diarrhea, dysentery, blood disorder, tonic, wound dressing	Stem bark, roots, fruit	6, 7
<i>Parinari macrophylla</i>	Toothache, malaria, leprosy, aphrodisiac, venereal diseases, epilepsy, abortifacient	Aerial parts	
Cleomaceae			
<i>Cleome (Gynandropsis) gynandra</i>	Rubefacient and vesicant, rheumatism, oil substitute for olive oil, potheerb	Aerial parts	
Clusiaceae			
<i>Allanblackia floribunda</i>	Local pain relief, cosmetics application, antiviral	Fruits, leaves	6, 7
<i>Garcinia afzelii</i>	Laryngitis, diabetes, aphrodisiac, diarrhea, stimulant, chew sticks	Seeds, stem, root	
<i>Garcinia epunctata</i>	Diarrhea, diuretic, coughs, stomachache	Stem bark, leaves	
<i>Garcinia huillensis</i>	Aphrodisiac, tumors, hypertension, anthelmintic	Roots, stem bark	
<i>Garcinia kola</i>	Cough, inflammation of the respiratory tract, diabetes, stimulant, aphrodisiac, poison antidote, tumors, arterial hypertension, hepatitis	Seeds, stem, root	6, 19
<i>Garcinia livingstonei</i>	Cough, fevers, parasitic diseases	Fruits, stem	7, 11, 15
<i>Garcinia mannii</i>	Oral hygiene, aphrodisiac, cough, diarrhea, dysentery	Roots, fruits	6, 7
<i>Garcinia ovalifolia</i>	Dysentery, hypotension, diabetes, bronchitis, cough, laryngitis	Leaves, seeds	
<i>Garcinia punctata</i>	Purgative, constipation, aphrodisiac, headache, colic, pharyngitis	Leaves, seeds, stem bark	
<i>Garcinia smeathmannii</i>	Inflammation, eye infection, purgative, wounds, male sterility	Fruits, leaves, stem	6, 11
<i>Ochrocarpus africanus</i>	Venereal diseases, skin infections	Stem bark, roots	17
<i>Pentadesma butyracea</i>	Vermifuge, fever, skin diseases, genital stimulants/depressants	Fruits, leaves	11
<i>Symphonia gabonensis</i>	Diuretic, wound dressing, venereal diseases	Stem bark, gum	17
<i>Symphonia globulifera</i>	Stomachic, appetite stimulant, gonorrhea, diuretic, tonic		

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
Cochlospermaceae (Bixaceae)			
<i>Cochlospermum planchonii</i>	Jaundice, circulatory disorders, gonorrhea, cardiac palpitations, genitourinary system disorders, menstruation, constipation	Leaves, rootstock, stem	
<i>Cochlospermum religiosum</i>	Naso-pharyngeal affections, sedatives, "katira-gum" or "kadayaga-gum"	Fruit-pod, resins	
<i>Cochlospermum tinctorium</i>	Skin colorant, burn, stomach ache, diarrhea, urethritis, pain, emmenagogue, postpartum medication, edema, epilepsy, dysmenorrhea, schistosomiasis, pneumonia, bronchitis, conjunctivitis, gastritis, indigestion, skin infections	Roots, fruit, leaves	7
<i>Cochlospermum vitifolium</i>	Digestive system disorders, hepatitis, eye infections	Leaves, flowers	
Colchicaceae			
<i>Gloriosa minor</i>	Stomach pain, aphrodisiac	Roots	14
<i>Gloriosa superba</i>	Anthemintic, animal poisoning, smallpox, impotence, hydrocele, rheumatism, neuralgia, arthritis, aphrodisiac, coughs, hemorrhoids, female sterility, skin parasites, ulcers, toothache, breast enlargement, insanity	Fruits, leaves, roots	4, 16
Combretaceae			
<i>Anogeissus leiocarpus</i>	Fevers, anthemintic	Fruit, roots	6, 7
<i>Combretum bauchiense</i>	Aphrodisiac, tonic	Roots	
<i>Combretum collinum</i>	Dysentery, gastrointestinal disorders, ulcers, malaria, jaundice	Roots	
<i>Combretum dolichopetalum</i>	Stomach disorders, tonic	Leaves, roots	11
<i>Combretum glutinosum</i>	Diuretic, constipation, fevers, dysentery, epilepsy, jaundice, high blood pressure, caries, toothache, fatigue, urinary tract infections	Latex, leaves, roots	
<i>Combretum micranthum</i>	Guinea worm, diuretic, wound healing, fevers, diabetes	Leaves, fruits, stem	6
<i>Combretum molle</i>	Fevers, diarrhea, dysentery, colic, wound dressing, anthemintic, abortifacient, stomachache	Leaves	7
<i>Combretum nigricans</i>	Colic, intestinal complaints, rheumatism, cough	Leaves, stem, roots	
<i>Combretum paniculatum</i>	Convulsions, diarrhea, dysentery, anthemintic, infertility	Root bark	
<i>Combretum schumannii</i>	Wound dressing, fevers, colic		
<i>Guiera senegalensis</i>	Added to food to increase lactation, general tonic, blood restorer after exhausting conditions, general prophylactic for children, fevers, diarrhea, dysentery, prevention of leprosy, externally used as poultice for swelling and skin diseases	Leaves, fruits	6
<i>Pteleopsis myrtifolia</i>	Antiseptic, insecticide	Aerial parts	
<i>Quisqualis indica</i>	Vermifuge, antiseptic lotions	Leaves	7

<i>Strephonema pseudocola</i>	General tonic, skin diseases	Aerial parts	
<i>Terminalia avicennioides</i>	Diarrhea, ascites, edemas, epilepsy, wounds, dysentery, burns	Roots, leaves	
<i>Terminalia catappa</i>	Diarrhea, vermifuge, hemorrhoids	Stem bark, leaves	7
<i>Terminalia glaucescens</i>	Headache, burns, coughs, hernia, viral hepatitis, ulcers, diarrhea	Leaves, root bark, fruits	
<i>Terminalia ivorensis</i>	Arthritis, diuretic, hemorrhoids, malaria, gonorrhea, aphrodisiac	Stem bark, leaves	6
<i>Terminalia macrocarpa</i>	Jaundice, hemorrhoids, tuberculosis, cough, fever, otitis, wounds	Roots	
<i>Terminalia mollis</i>	Diarrhea, vermifuge, hemorrhoids, gonorrhea, digestive aid	Roots, stem bark	
<i>Terminalia sericea</i>	Diabetes, diarrhea, schistosomiasis, skin diseases, gonorrhea	Roots	
<i>Terminalia stenostachya</i>	Epilepsy, poison antidote, diarrhea	Roots	
<i>Terminalia superba</i>	Labor, hemorrhoids, dysentery, gingivitis, diuretic, pains	Fruits, bark, leaves	7
Commelinaceae			
<i>Aneilema aequinoctiale</i>	Kwashiorkor, colds	Leaves	14
<i>Aneilema beniniense</i>	Fever, amenorrhea, rickets	Aerial parts	14
<i>Aneilema hockii</i>	General tonic, aphrodisiac, female infertility	Root	6, 7
<i>Coleotype laurentii</i>	Angina, pharyngitis	Whole plant	14
<i>Commelina africana</i>	Fever, eye inflammation	Leaves	6, 7
<i>Commelina lagosensis</i>	Ophthalmia, fevers	Leaves	6, 7
<i>Commelina latifolia</i>	Skin diseases	Leaves	7
<i>Palisota hirsuta</i>	Sore throat, cough, toothache, steam bath, antimicrobial	Stem, leaves	7
<i>Pollia condensata</i>	Abortifacients, generally healing; kidneys, diuretics	Stem, leaves, musilage	
Commiphorae (see Burseraceae)			
Compositae			
<i>Acanthospermum hispidum</i>	Stomachache, skin infections, venereal diseases, bronchitis, fevers	Leaves, volatile oil	6
<i>Acnella oleracea</i>	Toothache, throat and gum infections, immune booster, dysentery, rheumatism, malaria (prevention and treatment)	Roots, leaves	17
<i>Ageratum conyzoides</i>	Fevers, wound dressing, cuts, headaches, conjunctivitis	Leaves, flowers	6
<i>Ambrosia maritima</i>	Fevers, inflammation, vermifuge	Leaves	6
<i>Artemisia afra</i>	General tonic, colds, influenza, cough, sore throat, asthma, colic, pneumonia, indigestion, constipation, flatulence, gastritis, gout, diabetes, malaria, wounds, headache, earache, parasitic, measles, vermicifuge	Leaves, twigs, oil	11, 18

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Artemisia macivarae</i>	Fevers, wound healing	Leaves	6
<i>Artemisia ramosa</i>	Anthelmintic, colic, indigestion	Whole plant, leaves	6, 11
<i>Aspilia africana</i>	Pulmonary hemorrhage, wound dressing, fevers, anti-inflammatory	Leaves	9
<i>Aspilia latifolia</i>	Febrifuge, headache, hemorrhage	Leaves	11
<i>Athanasia parviflora</i>	Malnutrition, poultice	Seeds	
<i>Berkheya barbata</i>	Pain relief, fevers	Aerial parts	
<i>Bidens bipinnata</i>	Conjunctivitis, earache, hemostatic, potherb, inflammation	Leaves, whole plant	6, 19
<i>Bidens pilosa</i>	Fungal infections, insecticide, body pains, dysentery, conjunctivitis, anemia, snakebite, inflammation, high blood pressure, filariasis, intercostal neuralgia, psoriasis, wounds, oxytocic	Leaves, flowers	6, 14, 19
<i>Brachylaena huillensis</i>	Schistosomiasis, diabetes	Aerial parts	
<i>Calendula officinalis</i>	Mild sedative, antiseptic, antifungal, local anti-inflammatory, wound healing	Leaves, flowers	16
<i>Carduus nyassanus</i>	Skin diseases, tonic	Aerial parts	
<i>Centaurea alexandrina</i>	Purgative, labor pains	Leaves	6, 11
<i>Centipeda minima</i>	Eye infection/inflammation, nasal inflammation, colds, malaria, hepatitis, diabetes mellitus, eczema, vermifuge, anodyne, antitussive, depurative, diuretic, sternutatory	Aerial parts	4, 17
<i>Chamaemelum nobile</i>	Anodyne, anti-inflammatory, antispasmodic, fevers, nervine, stomachic, tonic, vasodilator, toothache, earache, aromatherapy, neuralgia	Aerial parts	4
<i>Chromolaena odoratus</i>	Cough, malaria, smallpox, yellow fever	Leaves	
<i>Chrysanthemoides monilifera</i>	Genitourinary disorders, male impotence, infections, diuretic	Leaves	
<i>Chrysocoma ciliata</i>	Gout, rheumatism, syphilis, wounds, varicose ulcers, jaundice, typhoid fever, erysipelas, leukorrhea, constipation	Aerial parts, roots	14
<i>Cineraria geifolia</i>	Skin diseases	Aerial parts	
<i>Conyza attenuata</i>	Cough remedy, analgesics	Leaves, stem bark	19
<i>Conyza borariensis</i>	Anti-inflammatory, skin diseases, ringworm	Aerial parts	
<i>Conyza pyrrhopappa</i>	Malaria, nosebleeds, dizziness, tonsillitis, insanity	Leaves, root bark	14
<i>Conyza sumatrensis</i>	Conjunctivitis, fever in babies, eye injury, diarrhea, purgative, tuberculosis, malaria, mycosis, fractures, headache, paralysis, skin diseases, asthma, burns	Leaf sap, roots, leaves	4, 14
<i>Cotula abyssinica</i>	Influenza, nose, colds, internal applications for fevers	Aerial parts	17
<i>Cotula anthemoides</i>	Influenza, respiratory diseases, coughs, headache, digestive system disorders, infections/infestations, pain	Aerial parts	4

<i>Crassocephalum crepidioides</i>	Sleeping sickness, epilepsy, burns, sore eyes, earache, breast cancer, colic, flatulence	Aerial parts	
<i>Crassocephalum rubens</i>	Stomachic, liver complaints and colds, externally for burns, sore eyes (filaria), earache, leprosy, breast cancer	Leaves	
<i>Cyanara amplexicaulis</i>	Tonic, stomach, purgative	Whole plant	4, 19
<i>Cyanara scolymus</i>	Liver dysfunction, diuretic	Leaves, fruits	6
<i>Dichrocephala integrifolia</i>	Filaria, blennorrhoea, leukorrhoea, insect bites, diuretic, swellings, ulcers	Aerial parts	4, 17
<i>Diconia anomala</i>	Sore throat, toothache	Leaves	7
<i>Didelta carnosia</i>	Fevers, skin diseases	Aerial parts	
<i>Echinops hoehneltii</i>	Ritual, skin diseases	Aerial parts	
<i>Eclipta prostrata</i>	Skin diseases, mycosis of fingers and feet, leprosy, herpes, elephantiasis, hemorrhoids, ringworm, anti-inflammatory, bronchitis, asthma, bronchitis, tuberculosis	Leaves	4, 7, 19
<i>Elephantopus scaber</i>	Malaria, fevers, tonic, parasitic skin infections	Leaves	6
<i>Elytropappus rhinocerotis</i>	Fevers, diuretic, skin infections, smoke in mental disorders	Leaves	
<i>Emilia coccinea</i>	Wound dressing, sores, syphilis, and sinusitis	Leaves	
<i>Emilia sonchifolia</i>	Convulsions, eye inflammation, wound dressing	Leaves	6
<i>Erlangea cordifolia</i>	Measles, respiratory infection, venereal diseases	Leaves, flowers	4, 19
<i>Erlangea tormentosa</i>	Anti-infective, stomachic	Leaves	6
<i>Ethulia conyzoides</i>	Infections, anthelmintic, inflammation, dysentery, eyes	Aerial parts	
<i>Eupatorium odoratum</i>	Wound dressing, skin infection	Leaves, whole plant	11
<i>Euryops jacksonii</i>	Veterinary medicine, fevers	Leaves	
<i>Flaveria australasica</i>	Skin diseases	Leaves	
<i>Galinsoga parvifolia</i>	Antimicrobial, jaundice, fevers	Leaves	4, 19
<i>Geigeria filifolia</i>	Headache, colds	Leaves	
<i>Grangea maderaspatana</i>	Irregular menstruation, antiseptic, postpartum tonic, coughs, anodyne, hysteria	Leaves	
<i>Guizotia scabra</i>	Worm infestations, malaria, constipation, salmonella infection, ulcers, stomachache, dyspepsia, gastritis, syphilis, and gonorrhea	All plant parts	4
<i>Gutenbergia cordifolia</i>	Skin infections, parturition (especially during second stage of labor), tachycardia, sterility, tuberculosis, fever, dysmenorrhea	Leaves, twigs	14
<i>Gynura procumbens</i>	Kidney diseases, arthritis, rheumatism, painkiller, diarrhea, dysentery, febrifuges, diuretic	Leaves	4, 17

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Gynura pseudochina</i>	Skin diseases: scabies, stings, pimples; regulate menses, fevers, hemostatic, antipyretic, vulnery, breast tumors, herpes infections, sore throats, herpes simplex and herpes zoster infections	Leaves, musilage	4
<i>Helichrysium odoratissimum</i>	Analgesic, anti-inflammatory and anti-infective, smoke in ritual	Leaves	4, 19
<i>Inula glomerata</i>	Skin diseases, yellow fever, measles	Leaves	17
<i>Lactuca inermis</i>	Venereal diseases, vermifuge, sores, ulcers, leprosy, antispasmodic, digestive, diuretic, hypnotic, eczema, palpitation, narcotic, sedative	Leaves, roots	
<i>Lactuca sativa</i>	Anaphrodisiac, anodyne, carminative, diuretic, febrifuge, hypoglycemic, hypnotic, narcotic, parasiticide, emollient, sedative	Aerial parts	4, 17
<i>Lactuca taraxacifolia</i>	Infertility, arthritis, yaws, skin diseases	Leaves, whole plant	6
<i>Launaea cornuta</i>	Malaria, typhoid fever, venereal diseases, hookworm, inflammation, pain, respiratory disorders, sensory disorders, gastric ulcer, marriage ritual as part of bride's family gift	Leaves, rhizome	17
<i>Launaea intybacea</i>	Lactation stimulant, ease birth in goats	Aerial parts	17
<i>Launaea nana</i>	Yellow fever, colds, venereal diseases	Leaves	4, 19
<i>Launaea taraxacifolia</i>	Lactation stimulant, multiple births and ease birth in livestock, febrifuge, arthritis	Leaves	4
<i>Leysera gnaphaloides</i>	Heart disease, infections/infestations, lungs, tuberculosis, coughs, appetite stimulant, bronchitis, heart diseases	Aerial parts	
<i>Matricaria glabrata</i>	Sedative, fevers, headache	Flowering parts	11
<i>Matricaria recutita</i>	Carminative, anagelsics, gout, infantile convulsion	Flowers, leaves	11
<i>Melanthera scandens</i>	Emetic, cough, anodyne, topical application for febrile conditions	Aerial parts	
<i>Microglossa afzeli</i>	Toothache, fevers, anthelmintic	Leaves	6
<i>Microglossa pyrifolia</i>	Yellow fever, abortifacient, toothache relief, labor pains, anthelmintic, colds, aphrodisiac, filariasis	Leaves, whole plant	7
<i>Mikania cordata</i>	Headache, anti-inflammatory	Leaves	6, 7
<i>Mikaniopsis bambuseti</i>	Fevers, coughs, bronchial catarrh	Leaves, stem bark	
<i>Osteospermum monocephalum</i>	Mental illness, neoplasms	Leaves, roots	
<i>Othonna cylindrica</i>	Inflammation, fevers	Leaves	
<i>Pentzia incana</i>	CNS disorders, pain, respiratory problems, stomachache	Leaves	
<i>Pluchea dioscoridis</i>	Roots used to enhance childbirth, leaves as abortifacient	Roots, leaves	
<i>Pseudognaphalium declinatum</i>	General tonic	Leaves	

<i>Pterocypsel indica</i>	Insomnia, anxiety, neuroses, hyperactivity in children, dry coughs, whooping cough, rheumatic pain	Leaves	4
<i>Pteronia onobromoides</i>	Cosmetics, skin diseases		
<i>Pulicaria crispa</i>	Fevers, headache, inflammation, wound healing, anti-infective	Aerial parts	4
<i>Solanecio angulatus</i>	Mild laxative, fertility treatment for women	Leaves	7
<i>Solanecio biafrae</i>	Vegetable, wound dressing, tea as tonic, cough, heart problem	Leaves, stem	6, 7
<i>Sonchus oleraceus</i>	Anti-infective, abortifacient, liver diseases (hepatitis), sedative, stomachic, diuretic, opium addiction, warts, genitourinary system disorders, inflammation, cancer	Leaves, sap	4, 17
<i>Sparganophorus sparganophora</i>	Convalescent vegetable, tonic, fevers	Leaves	
<i>Spilanthes mauritania</i>	Stomachache, diarrhea	Leaves	6, 7
<i>Spilanthes uliginosa</i>	Toothache, hemostatic, analgesic, insecticide, anti-infective	Leaves	6, 8
<i>Stoebe aethiopica</i>	Stomachache, coughs	Aerial parts	
<i>Tarconanthus camphoratus</i>	Pain relief, restlessness, anxiety states, fever, coughs, bronchitis, insomnia, asthma, mild narcotic, rheumatism, headache, inflammation, abdominal pain	Leaves, twigs, roots	4, 19
<i>Tridax procumbens</i>	Fevers, coughs, bronchial catarrh, dysentery, diarrhea; leaf juice possesses antiseptic, insecticidal, and parasitocidal properties	Whole plant	16
<i>Vernonia amygdalina</i>	Stomachic, febrifuge, cough, diabetes, antiseptic; root is very poisonous	Leaves, stem bark	7
<i>Vernonia auriculifera</i>	Fevers, medicinal container, tonic	Leaves	19
<i>Vernonia brachylaenoides</i>	Tonic, incontinence of urine, anthelmintic, skin diseases, cough remedy	Leaves, stem	6, 11
<i>Vernonia colorata</i>	Febrifuge, jaundice, abscess, diuretic, painful joints, fevers	Leaves, stem bark	7
<i>Vernonia conferta</i>	Cough, stomachache, antiparasitic, aphrodisiac, diarrhea	Leaves, stem	7
<i>Vernonia guineensis</i>	Emetic, aphrodisiac, jaundice, fever	Roots, leaves	7, 16
<i>Vernonia nigritana</i>	Diuretic, purgative, emetic, antiparasitic, febrifuge	Roots, leaves, stem	
<i>Vernonia oligocephalus</i>	Stomachache, abdominal pain during pregnancy, rheumatism, diabetes	Leaves	11
<i>Vernonia perrottetii</i>	Malaria, jaundice, cataract, headache, fevers	Leaves, whole plant	
<i>Xanthium strumarium</i>	Edema, arthritis, rheumatism, malarial fever, herpes, erysipelas, bladder infections, ulcers, hives, goiter, toothache	Aerial parts	
Connaraceae			
<i>Agelaea insignis</i>	Chew stick, mouth infections, fruits as anti-inflammatory	Stem, fruits	6
<i>Agelaea paradoxa</i>	Laxative, oral care	Leaves, fruits	
<i>Agelaea pentagyna</i>	Gonorrhea, dysentery	Leaves	6, 7
<i>Byrsocarpus coccineus</i>	Fevers, jaundice, inflammation, venereal diseases, tumors	Whole plant, fruits	7

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Byrsocarpus orientalis</i>	Diarrhea, dysentery, fevers	Fruits, leaves, stem	6, 7
<i>Castanola insignis</i>	Chew stick, mouth infections, leaves as laxative, tonic	Stem, leaves	7
<i>Cnestis ferruginea</i>	Laxative, malaria, coughs, mouth odor, teeth cleaning	Fruits, stem	6, 7
<i>Connarus africanus</i>	Bark as general tonic, hemostatic, wound dressing; root and seeds taken as purgative and vermifuge	Roots, seeds, stem	6, 7
<i>Rourea thomsonii</i>	Digestive system disorders, skin infections	Aerial parts	
Convolvulaceae			
<i>Calonyction proximum</i>	Laxative, tonic	Aerial parts	
<i>Dichondra micrantha</i>	Diuretic, febrifuge, styptic; whole plant for treating diarrhea	Leaves, whole plant	
<i>Evolvulus alsinoides</i>	Skin infections, venereal diseases	Fruits, leaves	11
<i>Ipomoea aquatica</i>	Mental illness, constipation, gastrointestinal problems	Leaves, whole plant	
<i>Ipomoea argenteaurata</i>	Spermatogenesis, hyperthermia, kwashiorkor	Leaves, whole plant	
<i>Ipomoea ascarifolia</i>	Rheumatism, gynecological problems, tetanus, abortifacient, proteinuria in pregnancy, fractures, postpartum bleeding	Leaf sap, twigs, roots	14
<i>Ipomoea batatas</i>	Purgative, tonic, dysentery, abscess, to expel placenta, burns	Leaves	6, 11
<i>Ipomoea digitata</i>	Aphrodisiac, demulcent, lactagogue and cholagogue, fever, bronchitis, spleen and liver; for menorrhagia, debility, and fat accumulation	Roots, leaves	
<i>Ipomoea involucrata</i>	Liver disorders; leaves are mild laxative	Leaves	11
<i>Ipomoea obscura</i>	Rituals in rain making, insanity, dysentery, fevers, sores, aphthae	Leaves, roots	
<i>Ipomoea ommaneyi</i>	Pain relief, antipyretic, laxative	Leaves	11
<i>Ipomoea pes-caprae</i>	Laxative, purgative, antihistamine, emetic	Whole plant, leaves, roots	18
<i>Ipomoea turbinata</i>	Laxative, tonic	Roasted seeds	7
<i>Merremia aegyptia</i>	Laxative, dressing of burns	Aerial parts	
<i>Merremia angustifolia</i>	Fevers, gonorrhea	Tuber, root	6, 11
<i>Merremia kentrocaulosa</i>	Skin diseases, anti-inflammatory	Leaves, fruits	6, 11
<i>Seddera latifolia</i>	Stimulant	Leaves	
<i>Turbina stenosisiphon</i>	Rituals, headache	Leaves, tubers	

Cornaceae	
<i>Alangium chinense</i>	Mental illness, coughs
<i>Alangium salviifolium</i>	Diarrhea, asthma; fruits as purgative, leprosy, antifungal
<i>Cornus (Afrocrania) volkensii</i>	Poultice for boils, fevers
<i>Curtisia dentata</i> (Curtisiaceae)	Diarrhea, stomach disorders, blood tonic, pimples, aphrodisiacs
Crassulaceae	
<i>Bryophyllum pinnatum</i>	External application on male circumcision, burns, cough, damaged skin
<i>Cotyledon orbiculata</i>	Onchocerciasis, ear infections, boils, pain relief, epilepsy, skin warts
<i>Crassula muscosa</i>	Pain relief, anti-infective
<i>Kalanchoe crenata</i>	Inflammation, anti-infective agent, earache, poison antidote
<i>Kalanchoe densiflora</i>	Antiseptic, anti-inflammatory, counterirritant
<i>Tylecodon paniculatus</i>	Anti-infective agent, skin disorders
Cruciferae (see Brassicaceae)	
Ctenolophonaceae	
<i>Ctenolophon englerianus</i>	Skin diseases, externally for body pains
Cucurbitaceae	
<i>Acanthosicyos horridus</i>	Stomachache, urine retention (prostate enlargement)
<i>Acanthosicyos naudinianus</i>	Snakebite
<i>Bambekea racemosa</i>	Abortifacient, suppurating swellings, mumps, sore throat
<i>Blastania fimbripila</i>	Veneral diseases, skin diseases
<i>Citrullus colocynthis</i>	Fevers, skin infections, laxative
<i>Coccinia cordifolia</i>	Conjunctivitis, skin diseases
<i>Corallocarpus welwitschii</i>	Palpitation, circulatory system disorders, neoplasms, anodyne, cardiac problems
<i>Cucumeropsis edulis</i>	Vermifuge, purgative, cooked as vegetable
<i>Cucumis aculeatus</i>	Arrow poison, ritual, gonorrhea, sensory system disorders
<i>Cucumis africanus</i>	Laxative, vegetable, skin diseases
<i>Cucumis dipsaceus</i>	Digestive system disorders, poison antidote, cuts, vegetable
<i>Cucumis melo</i>	Purgative, skin infections, emetic, diuretic, vermifuge

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Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Cucurbita pepo</i>	Vegetable for soup, laxative, seeds are vermifuge, pulp used in burns, boils, anti-inflammatory	Fruits, leaves	11
<i>Kedrostis foetidissima</i>	Central nervous system disorders, epilepsy, appetite stimulant, snakebite, infections	Leaves	4, 17
<i>Kedrostis gijef</i>	Stomachache, poison, respiratory system disorders	Aerial parts	17
<i>Lagenaria breviflora</i>	Healing rituals, stimulant	Fruits, leaves	6, 11
<i>Lagenaria guineensis</i>	Fevers, skin infections		
<i>Lagenaria siceraria</i>	Soft tumors, poultice for fractures	Pod, leaves	6, 11
<i>Lagenaria sphaerica</i>	Anthelmintic, inflammation, young fruits are edible, wounds	Pod, leaves	
<i>Luffa cylindrica</i>	Parasitic skin diseases, body ache, laxative	Fruits, leaves	6, 11
<i>Momordica charantia</i>	Bronchitis, anti-infective, diabetes, abortifacient	Fruits, roots	7, 11
<i>Momordica foetida</i>	Stomachache, poison, abortifacient, diabetes	Pod, leaves	11
<i>Momordica spinosa</i>	Diabetes, muscle spasm, body pains	Fruits, leaves, root	6
<i>Mukia maderaspatana</i>	Oxytotic, convulsions, female sterility, scabies, wounds	Leaves, aerial parts	14
<i>Telfairia occidentalis</i>	Laxative, root is considered very poisonous	Leaves	11
Cunoniaceae			
<i>Cunonia capensis</i>	Laxative	Aerial parts	
Cupressaceae			
<i>Juniperus procera</i>	Young twigs for intestinal worms, vaginal wash as birth control, seed cones as a sudorific and emmenagogue, resin as stimulant	Stem, seed cones, resin	
Cyanasteraceae (see Tecophilaeaceae)			
Cyatheaceae			
<i>Cyathea dregei</i>	Cosmetics, pain relief	Leaves	
Cycadaceae			
<i>Encephalartos barteri</i>	Rituals, burial rites, fruits antiviral	Whole plant, fruits	6
Cyperaceae			
<i>Carex chlorosaccus</i>	Laxative, coughs, anti-infective	Aerial parts	

<i>Carex cognata</i>	Skin inflammation	Leaves	
<i>Cyperus alternifolius</i>	Anti-inflammatory, edema, skin diseases	Leaves	6, 11
<i>Cyperus esculentus</i>	Aphrodisiac, carminative, digestive, diuretic, emmenagogue, stimulant, tonic, flatulence, indigestion, colic, diarrhea, dysentery, debility, excessive thirst, genitourinary system disorders, mental disorders, nutritional disorders	Rhizome, aerial parts	
<i>Cyperus longus</i>	Colds, laryngitis, digestive disorders, earache	Tubers	
<i>Cyperus papyrus</i>	Cough remedy, analgesic	Leaves, stem bark	6, 11
<i>Cyperus prolifer</i>	Female sterility, stomach diseases	Roots, sap	
<i>Cyperus rotundus</i>	Indigestion, genitourinary system disorders, menstruation, emmenagogue, schistosomiasis, venereal diseases, coughs, carminative, contraceptive, diaphoretic, diuretic, antimicrobial	Tubers, aerial parts	
<i>Kyllinga erecta</i>	Insecticide, carminative, colds	Rhizome	6
<i>Mariscus umbellatus</i>	Skin diseases, anti-inflammatory	Rhizome	11
<i>Scleria boivinii</i>	Irregular and profuse menstruation, coughs, eye problems, gonorrhea, cerebral malaria, snakebite, diaphoretic	Aerial parts, leaves	14
<i>Scleria racemosa</i>	Coughs, gonorrhea, ease childbirth, wounds	Leaves, twigs, roots	
Davalliaceae (Pteridophyta)			
<i>Davallia denticulata</i>	Infections, pains	Aerial parts	
<i>Nephrolepis biserrata</i>	Antiparasitic, stomachaches, pains	Frond	
<i>Nephrolepis undulata</i>	Nasopharyngeal affections; pulmonary troubles, tuberculosis, antiparasitic, stomachaches, muscular pains, rituals	Frond	
Dichapetalaceae			
<i>Dichapetalum albidum</i>	Menstrual cramp, pain relief	Leaves	
<i>Dichapetalum madagascariense</i>	Leaf sap for liver disorders, stem exudate insecticide, skin infections	Exudates, leaf, stem	
<i>Dichapetalum ruhlandii</i>	Antiviral, analgesic	Leaves, stem bark	6
<i>Dichapetalum toxicarium</i>	Seed for tumors, rodenticide	Fruits, seeds	
<i>Tapura fischeri</i>	Stomachache	Aerial parts	

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
Dilleniaceae			
<i>Dillenia indica</i>	Coughs, externally for skin diseases, in solution as soap	Aerial parts	
<i>Hibbertia coriacea</i>	Seeds as tonic, leaves in fevers	Aerial parts	
<i>Tetracera boiviniana</i>	Ritual antiviral, anti-infective	Root	7
<i>Tetracera litoralis</i>	Malaria, fevers	Aerial parts	
Dioscoreaceae			
<i>Dioscorea alata</i>	Leaves used for fevers	Tubers, leaves	6
<i>Dioscorea bulbifera</i>	Poultice for pains, fetish	Leaves, tuber	6, 11
<i>Dioscorea cayenensis</i>	Wound healing, diuretic	Tuber, leaves	6
<i>Dioscorea dumetorum</i>	Diabetes, fever, ritual, arrow poison	Tuber, leaves	11
<i>Dioscorea rotundata</i>	Antidiarrhea, poultice	Tuber, leaves	11
<i>Tacca leontopetaloides</i>	Vermifuge	Roots	6
Dipsacaceae (Caprifoliaceae)			
<i>Scabiosa columbaria</i>	Menstruation problems, venereal diseases, skin infections, baby powder, eye diseases, cosmetics, dandruff, flatulence	Aerial parts	
Dipterocarpaceae			
<i>Dipterocarpus alatus</i>	Measles, conjunctivitis, venereal diseases	Whole herb	6
<i>Monotes engleri</i>	Stomach, skin eruptions	Leaves, stem, roots	
Droseraceae			
<i>Drosera cistiflora</i>	Fevers, cough	Leaves, flowers	
<i>Drosera indica</i>	Anodyne, antiviral	Leaves	7
<i>Drosera madagascariensis</i>	Skin diseases, malaria	Aerial parts	
Ebenaceae			
<i>Diospyros abyssinica</i>	Dysentery, malaria, jaundice	Roots, stem bark	
<i>Diospyros crassiflora</i>	Leaf sap for eye inflammation, extract for yaws	Aerial parts	
<i>Diospyros ferrea</i>	Chew sticks for tooth cleaning, stomachache	Leaves, sticks	
<i>Diospyros gabunensis</i>	Lotion for sores, wound dressing, pains	Leaves, inner bark	11

<i>Diospyros mespiliformis</i>	Fevers, dysentery, skin eruptions, root used as abortifacient, jaundice, leprosy, vermifuge, headache, malaria, cough, ulcers	Leaves, roots, bark	11
<i>Euclea crispa</i>	Viral infections, rheumatic pains	Aerial parts	11
<i>Euclea divinorum</i>	Externally for leprosy, headache, toothache, chew sticks, gonorrhea, gastrointestinal disturbances, cancer, ulcers, wounds, arthritis, miscarriage, jaundice, snakebites	Aerial parts	17
<i>Euclea undulata</i>	Toothache, body pains, inflammation, circulatory disorders	Stem bark, roots	4
Elatinaceae			
<i>Bergia decumbens</i>	Kidney diseases, stomachache	Fruits	11
<i>Bergia guineensis</i>	Local application for scabies, yaws, skin diseases; bronchitis, venereal infections, main ingredients in Hausa weaning tonic “dauri”	Whole plant	6, 11
Ericaceae			
<i>Agauria salicifolia</i>	Vermifuge, local pain remedy, hemostatic	Leaves	6, 11
<i>Erica arborea</i>	Skin diseases, burnt ash for measles	Aerial parts	
<i>Philippia excelsa</i>	Fevers, pain relief	Leaves	
Eriospermaceae (see Asparagaceae)			
Erythroxylaceae			
<i>Aneulophus africanus</i>	Ritual, depression, external application for pain	Aerial parts	
<i>Erythroxylum boivinianum</i>	Colds, fragrance	Leaves	16
<i>Nectaropetalum kaessneri</i>	Fevers, skin diseases, dysentery, rheumatism, cough, enterobiasis	Aerial parts	4, 17
Euphorbiaceae			
<i>Acalypha ciliata</i>	Coughs, rituals, wound dressing	Fruits, leaves	7
<i>Acalypha fruticosa</i>	Root in goat bone soup for liver diseases, convulsions, fever, colds, swellings of the scrotum, leaves for eye infection, inflammation, stomachache, epilepsy, toothache, tea	Roots, leaves	
<i>Acalypha indicum</i>	Anthelmintic, eye inflammation	Leaves	11
<i>Acalypha integrifolia</i>	Astringent, purgative, skin infection, fevers, anthelmintic	Leaves	
<i>Acalypha racemosa</i>	Tonic, general healing, tea in convalescence, vegetable	Leaves, young shoots	
<i>Acalypha wilkesiana</i>	Antimycotic, antibacterial, wound dressing	Leaves	7

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Alchomea cordifolia</i>	Malaria mixtures, skin infections, purgative	Roots, leaves	6
<i>Alchomea floribunda</i>	Intoxicant, aphrodisiac, tonic, fevers, wounds, skin infections	Root, leaves, stem bark	
<i>Alchomea laxiflora</i>	Malaria, inflammatory and infectious diseases, pain, chew sticks	Aerial parts	
<i>Argemuellera macrophylla</i>	Purgative, emetic for poisoning, aphrodisiac	Leaf sap, leaves	17
<i>Chamaesyce hirta</i>	Gonorrhea, amoebic dysentery, asthma, diuretic, diarrhea, aphrodisiac, angina, amenorrhea, oxytocic, headache, rheumatism, colds, arterial hypertension	Whole plant, leafy twigs	14
<i>Cleistanthus bipindensis</i>	Stem bark chewed as tonic, fevers, cough	Stem bark	
<i>Cleistanthus polystachyus</i>	Laxative, skin infection, fevers	Leaves, fruits	
<i>Clutia abyssinica</i>	Antiviral, antipyretic, analgesic, fever, cough, tonic, childbirth, intestinal worms, influenza, colds, fever, indigestion, malaria	Leaves	7
<i>Clutia heterophylla</i>	Veterinary medicine: anthrax in cattle	Leaves, stalks, roots	
<i>Clutia pulchella</i>	Fevers, stomachache, diarrhea, dysentery, sprains, enema	Leaves, roots	
<i>Clutia robusta</i>	Antiviral, analgesic	Leaves	6
<i>Croton amabilis</i>	Dysentery, fever, convulsions, measles	Leaves	7
<i>Croton caudatus</i>	Laxative, skin infection, fevers	Leaves, fruits	6, 7
<i>Croton dichogamus</i>	Antiviral, antipyretic	Leaves	6
<i>Croton gratissimum</i>	Anxiety, measles, coughs, malaria, dysmenorrhea, chest pain, syphilis, arterial blood pressure, fever, jaundice, gonorrhea	Roots, leaves, seeds	14
<i>Croton gubouga</i>	Malaria, drastic purge, infusion of the root to fatten thin babies	Stem bark, root	11
<i>Croton haumanianus</i>	Purgative, rheumatism, gonorrhea, stomach cramps, abscesses, epilepsy, low blood pressure, genitourinary infections, aphrodisiac	Stem bark, leaves	4
<i>Croton jatrophioides</i>	Antimicrobial, antiviral, anti-inflammatory	Exudates, leaves	7
<i>Croton lobatus</i>	Rheumatic pains, purgative, male sexual asthenia, hypertension, female sterility, parasitosis, gynecological problems, coughs	Leaves, whole plant	14
<i>Croton macrostachyus</i>	Malaria, rheumatism, tapeworm, purgative, malaria, venereal diseases, trypanosomiasis, smallpox, chicken pox, measles	Leaves, fruits, roots	17
<i>Croton megalobotrys</i>	Malaria, body pain, purgative, worms, abortifacient	Stem bark, roots, leaves	14
<i>Croton menyhartii</i>	Analgesic, antipyretic, dysmenorrhea, hepatitis	Leaves, fruits	7
<i>Croton polytrichus</i>	Antiviral, anti-inflammatory	Stem bark	6
<i>Croton pseudopulchellus</i>	Antiviral, antitussive	Leaves, roots	7
<i>Croton sylvaticus</i>	Chest pain, inflammation, uterine problems, purgative, abdominal problems, fever, tuberculosis, elephantiasis	Leaves, stem	14

<i>Cyrtogonone argentea</i>	Stomachache, purgative, anodyne	Stem bark	
<i>Dischostemma glaucescens</i>	Antiviral, insect bites	Seed, bark	16
<i>Discoglypemma caloneura</i>	Purgative, abortion, poisoning	Seeds	4, 19
<i>Drypetes afzelii</i>	Anti-infective	Leaves	
<i>Elaeophorbia drupifera</i>	Local pain relief, purgative, scorpion bite	Latex, leaves	6, 7
<i>Euphorbia aegyptiaca</i>	Anthelmintic, harsh purgative, gonorrhea, rabies	Whole plant, fruits	6
<i>Euphorbia balsamifera</i>	Anthelmintic, vesicant, diuretic, leukorrhea, hemorrhoids	Leaves, exudate	7
<i>Euphorbia breviaristulata</i>	Wounds and sores, hemorrhoids	Latex	
<i>Euphorbia bupleurifolia</i>	Severe skin diseases, cancerous sores, emetic, purgative	Latex, leaves	11
<i>Euphorbia candelabrum</i>	Toxic but diluted latex used for coughs and tuberculosis, eye tumors, arrow poison ingredient, purgative, infertility	Latex, leaves	11
<i>Euphorbia convolvuloides</i>	Smallpox, measles, urethritis, cough, bronchitis, urinary tract infections	Leaves	6
<i>Euphorbia cratonoides</i>	Cough remedy, decongestant, pain relief, viral infections	Leaves, exudate	
<i>Euphorbia deightonii</i>	Ordeal poison ingredient, caries, purgative	Latex	
<i>Euphorbia gossypina</i>	Coughs, conjunctivitis, warts, laryngitis	Latex, leaves	6, 7
<i>Euphorbia hirta</i>	Cough remedy, asthma, anthelmintic, diarrhea, dysentery, antimicrobial, stomachache, eye inflammation	Whole plant, stem	
<i>Euphorbia pulcherrima</i>	Bronchitis, cough, conjunctivitis, dysentery	Whole plant, latex	16
<i>Euphorbia tirucalli</i>	Cough, purgative, diabetes, gonorrhea, threatened abortion	Latex, leaves	
<i>Flueggea leucopyrus</i>	Dysentery, malaria, epilepsy, gonorrhea, aphrodisiac	Roots, stem bark	4
<i>Flueggea virosa</i>	Diarrhea, aphrodisiac, hernia, malaria, kidney, schistosomiasis, venereal diseases, intercostal pain, female sterility, headache, jaundice, threatened abortion, dysmenorrhea, bronchitis, pneumonia, geriatric tonic	Roots, stem, leaves	4, 11, 14
<i>Heywoodia lucens</i>	Skin infections, antimicrobial	Aerial parts	
<i>Hyaenanche globosa</i>	Externally for skin infections, arrow poison ingredients	Seed, leaves	11
<i>Hymenocardia acida</i>	Stomachache, trypanosomiasis, coughs; smallpox, fevers, diarrhea, dysentery, menstrual pains, female infertility, swellings, cough, epileptic fits, tuberculosis, pneumonia	Leaves, stem, roots	4, 14, 19
<i>Hymenocardia ulmonoides</i>	Fevers, cough, inflammatory diseases, childbirth, asthma, hemorrhoids, threatened abortion, epilepsy, bronchitis, gonorrhea	Leaves, stem, roots	14
<i>Jatropha curcas</i>	Fevers, venereal diseases, dysentery, kidney pain, hypertension, diuretic, spermatorrhea, abortifacient, rheumatism, malaria, syphilis, toothache, bronchitis, rectal prolapse, purgative, cough, abscess	Fruits, leaves, latex	17
<i>Jatropha gossypifolia</i>	Purgative, arterial hypertension, abdominal pain, headache, wounds	Leaves, stem bark, roots	

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Jatropha hirsuta</i>	Wounds, sores, hemorrhoids, fevers, root extract as enema	Roots	
<i>Jatropha multifida</i>	Purgative, inguinal lymphadenitis, fever, oral candidamycosis, wounds, burns, gonorrhea, hemostatic, urinary tract infections	Root bark, leaves, latex	
<i>Jatropha spicata</i>	Skin eruptions, anti-infective, purgative, gonorrhea	Roots, seeds	
<i>Jatropha zeyheri</i>	Headaches, coughs, purgative, blood purifier, wound dressing, uterine pains, irregular menstruation, emetic, body pain	Tubers, young shoots	16
<i>Lachnostylis hirta</i>	Coughs, purgative, sores	Aerial parts	
<i>Macaranga barteri</i>	Anti-infective, intercostal neuralgia, fever, anthelmintic	Seeds	
<i>Macaranga capensis</i>	Insanity, skin diseases, sunburn	Stem bark	
<i>Macaranga heterophylla</i>	Gonorrhea, amenorrhea, abortifacient, cough, snakebite	Leaves, stem bark, roots	
<i>Macaranga hurifolia</i>	Tuberculosis, purgative, gastrointestinal disorders	Stem bark, sap, twigs	
<i>Macaranga kilimandscharica</i>	Angina, postpartum pain, schistosomiasis	Leaves, stem bark, roots	
<i>Macaranga monandra</i>	Female sterility, cough, dyspnea, threatened abortion, snakebite	Stem bark, twigs	
<i>Macaranga spinosa</i>	Toothache, bronchitis, headache, liver inflammation, lung problems, stomatitis, asthma, rheumatism, mouthwash, cough	Stem bark, leaves, sap	
<i>Maesobotrya barteri</i>	Dysentery, measles, gonorrhea, aphrodisiac, coughs, diarrhea, wounds	Leaves, stem bark	
<i>Maesobotrya floribunda</i>	External application for prickly heat, measles, leprosy, syphilis, edema	Leaves	
<i>Maesobotrya klaineana</i>	Anthelmintic, fevers, abscess, rheumatism, edema	Fruit pulp, leaves	6
<i>Mallotus opositifolius</i>	Dysentery, hemorrhage	Leaves, fruits	7
<i>Mannihot esculenta</i>	Pothenb, diabetes	Leaves, tubers	6
<i>Manniophytum africanum</i>	Venereal diseases, cough, bronchitis	Stem	16
<i>Manniophytum flavum</i>	Skin infections, stomachache, venereal diseases	Stem bark, twigs	16
<i>Maprounea africana</i>	Rituals, purgative, eye bath, sap for dressing penis after circumcision	Roots, sap	7
<i>Mareya micrantha</i>	Febrifuge, local analgesic, abortive	Leaves, roots	7
<i>Mareya spicata</i>	Purgative, abortifacient, skin diseases, stomachache, constipation	Leaves, bark	7
<i>Margaritaria discoidea</i>	Fevers, cough, inflammatory diseases, childbirth, CNS, kidneys, diuretics; menstrual cycle; stomach troubles, skin	Root bark	7
<i>Micrococca mercurialis</i>	Fever in children, headache, filariasis, otitis	Sap, leaves	4, 14
<i>Milbraedia fallax</i>	Chest problems, purgative, antisyphilitic, expectorant	Whole herb	11
<i>Monadenium lugardae</i>	Fevers, gonorrhea, chest problems, divination rituals	Leaves	11

<i>Necepsia afzelli</i>	Abortifacient, skin diseases	Leaves	6, 7
<i>Neoboutonia glabrescens</i>	Circulatory disorders, tonic	Leaves, seeds	
<i>Oldfieldia somalensis</i>	Colds, fevers, infertility	Roots	7
<i>Protomegabaria stapfiana</i>	Skin diseases, animal treatment	Whole plant	
<i>Pseudolachnostylis maproneifol</i>	Purgative, stomach spasm, amenorrhea, cough, muscular pains	Roots	6
<i>Pycnocoma macrophylla</i>	Purgative (strong)	All plant parts	17
<i>Ricinodendron heudelotii</i>	Purgative, guinea worm extraction	Latex, leaves	6, 7
<i>Ricinus communis</i>	Purgative, wound dressing, lactation	Seed, leaves	7
<i>Sapium indicum</i>	Influenza, measles	Roots	6, 7
<i>Sclerocroton cornutus</i>	Root bark decoction to facilitate childbirth to contract uterine muscles, female sterility, cough, river blindness, insect and snakebite	Aerial	
<i>Securinega antsingyensis</i>	Diarrhea, dysentery, fever	Stem bark	
<i>Securuneqa virosa</i>	Snakebite (tropical), backache, bronchitis, coughs, edema, contraception, infertility, menorrhagia, aphrodisiac, depressed fontanel, abdominal pains, diarrhea	Roots	7
<i>Spirostachys africana</i>	Purgative in constipation and kidney diseases, leprosy	Stem, roots	11
<i>Spondianthus preussii</i>	Animal poison, weak decoction used under supervision for fevers, bark decoction as mouthwash for toothache, stomachache, pains during pregnancy, fruits for cough, ritual	Leaves, stem bark, fruits	
<i>Suregada zanzibariensis</i>	Ankylostomiasis caused by parasitic hookworms; gonorrhea, stomachache, schistosomiasis, chest pain, hernia, pneumonia, chicken pox, purgative	Roots, stem bark	
<i>Synadenium biocompacta</i>	Leprosy remedy, skin diseases, purgative	Stem	
<i>Synadenium glaucescens</i>	Purgative	Leaves	11
<i>Synadenium grantii</i>	Earache remedy, leprosy, fevers	Roots, leaves	16
<i>Tetracarpidium conophorum</i>	Headache remedy, tonic, aphrodisiac, ritual	Leaves, fruits	7
<i>Tetrorchidium didymostemon</i>	Purgative, fevers, edema	Stem bark, leaves	16
<i>Thecacoris spathulifolia</i>	Hernia, tonsillitis, snakebite, abdominal pain, and gonorrhea	Roots, stem bark	
<i>Tragia bentharii</i>	Abortifacients, ecbolics; dropsy, swellings, edema, gout; skin infections, venereal diseases	Aerial parts	
<i>Tragia brevipes</i>	Rheumatism, poliomyelitis, elephantiasis, gonorrhea, purgative for children, ease childbirth, stomachache, diarrhea, gastroenteritis, promote conception, tapeworm	Leaves, twigs, roots	4, 17
<i>Tragia okanyua</i>	Urethritis, abortion enema, labor induction, pain, antifertility, antimicrobial	Whole plant, roots	6
<i>Vernicia fordii</i>	Anthelmintic for animals, externally for skin diseases	Kernel oil	16

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
Fabaceae (see Leguminosae)			
Flacourtiaceae (Salicaceae, etc.)			
<i>Aphloia theiformis</i>	Fever, diuretic, rheumatism, ulcer, jaundice, gastrointestinal infections, emetic, impetigo, nail infection	Fruits, leaves, bark, roots	18
<i>Calantica cerasifolia</i>	Aphrodisiac, stimulant, tonic, abdominal pains, dizziness	Aerial parts	4
<i>Caloncoba brevipes</i>	Skin disease, cutaneous leishmaniasis, headache	Leaves, inner bark	6, 7
<i>Caloncoba echinata</i>	Inflammations, skin eruptions, sores	Fruits, leaves	7, 11
<i>Caloncoba glauca</i>	Migraine, syphilis, leprosy, liver diseases	Stem, leaf sap, seed oil	
<i>Caloncoba welwitschii</i>	Epilepsy, anthelmintic, arterial hypertension, abscess		
<i>Dovyalis caffra</i>	Tonic, refreshing drink, flavoring agent		
<i>Dovyalis rhamnoides</i>	Rheumatism, flavor	Fruits, leaves	16
<i>Flacourtia indica</i>	Cough, headache, skin disease, mouth- and throat washes, malaria, muscular-skeletal system disorders, rheumatism	Fruits	11
		Leaves, fruits	7
<i>Homalium subsuperum</i>	Colic, tonic for women after childbirth, malaria	Stem bark, roots	11
<i>Kiggelaria africana</i>	Protective medicine for the kraal, rituals, tonic, skin diseases	Stem bark, fruits	16
<i>Lindackeria dentata</i>	Stomachache, local analgesic	Fruits, roots	6
<i>Oncoba bukobensis</i>	Migraine, syphilis, leprosy, liver diseases	Stem, leaf sap, seed oil	
<i>Oncoba spinosa</i>	Colds, fever, female infertility, dysentery, dizziness, malaria	Fruits, leaves	6
<i>Phyllobotryon spathulatum</i>	External application for inflammation	Leaves	
<i>Rawsonia lucida</i>	Tonic, refreshing drink, fever	Fruits	
<i>Scottellia klaineana</i>	Stomachache, diuretic, purgative, edema	Roots	17
Flagellariaceae			
<i>Flagellaria guineensis</i>	Dental caries, gonorrhea, parasitic infections, spleen pains	Aerial parts	
<i>Flagellaria indica</i>	Diuretic, astringent, stomachache, induces infertility	Leaves	
Gentianaceae			
<i>Anthocleista amplexicaulis</i>	Malaria, jaundice, constipation, anxiety state	Stem bark	
<i>Anthocleista djalonenis</i>	Colic, diarrhea, malaria, jaundice, diabetes, leprosy, venereal diseases, edema, scrotal elephantiasis, irregular menstruation, cirrhosis, hepatitis, gonorrhea, abortifacient	Stem bark, roots	6, 7

<i>Anthocleista grandiflora</i>	Epilepsy, diabetes, high blood pressure, laxative, diarrhea, asthma, kidney diseases, tapeworm, venereal diseases, malaria	Stem bark	
<i>Anthocleista madagascariensis</i>	Malaria, jaundice, urinary antiseptic, anxiety state, dysentery, emetic, cough, gonorrhea, tonic, induction of labor	Stem bark, roots	
<i>Anthocleista nobilis</i>	Diabetes, inflammation, abscess, diuretic, leprosy, venereal diseases, edema, scrotal elephantiasis, diarrhea, headache, hepatitis	Stem, leaves	6, 7
<i>Anthocleista procera</i>	Purgative, diuretic, leprosy, venereal diseases, inflammation, fever, cold, abortifacients, ecbolics, dropsy, antidotes (venomous stings, bites, etc.), induce labor, dizziness, scrotal elephantiasis	Stem bark, leaves	
<i>Anthocleista schweinfurthii</i>	Female infertility, stomachache in women, venereal diseases, hernia, bronchitis, malaria, ovarian problems, fever, abscesses, anthelmintic	Stem bark, leaves, roots	
<i>Anthocleista vogeli</i>	Anti-inflammatory, antidiabetes, wound dressing, stomachache in women, ovarian problems, venereal diseases, hernia, bronchitis, fever, induction of labor	Stem bark, leaves	6, 7
<i>Canscora alata</i>	Fevers, convulsions, analgesic	Leaves, juice	
<i>Canscora decussata</i>	Convulsions, fevers, skin infections, nervous disorders, stomachache	Leaves, juice	11
<i>Canscora diffusa</i>	Laxatives, paralysis, epilepsy, convulsions, spasm	Leaves	17
<i>Enicostema hyssopifolium</i>	Fevers, abdominal pains	Roots	11
Geraniaceae			
<i>Erodium cicutarium</i>	Dysentery, tonic	Leaves	16
<i>Erodium moschatum</i>	Diarrhea, dysentery, antipyretic	Leaves	11
<i>Geranium aculeolatum</i>	Diarrhea, epigastric pains, tachycardia, coughs, purgative, yaws	Leaves	
<i>Geranium arabicum</i>	Diarrhea, astringent, hemorrhage, hemorrhoids, anthelmintic	Leaves	
<i>Geranium canescens</i>	Dysentery, colic, diarrhea, fever, bronchitis, anthelmintic	Leaves, roots	
<i>Geranium incanum</i>	Bronchitis, anthelmintic	Roots, leaves	6, 7
<i>Monsonia biflora</i>	Dysentery, typhoid fever, hemorrhoids	Leaves	11
<i>Monsonia senegalensis</i>	Tonic, fevers	Leaves	
<i>Pelargonium alchemilloides</i>	Lotion for wounds, abscesses drained with <i>Malva parviflora</i>	Leaves	11
<i>Pelargonium antidysentericum</i>	Diarrhea, dysentery, antipyretic	Aerial parts	
<i>Pelargonium cucullatum</i>	Colic, nephritis, suppression of urine, diarrhea, wound dressing	Leaves	11
<i>Pelargonium luridum</i>	Diarrhea, abdominal pain, wound dressing, back pain, nausea, vomiting	Leaves, stem, roots	
<i>Pelargonium ramosissimum</i>	Neuralgia, colds, tonic, stomachache	Leaves	11
<i>Pelargonium reniforme</i>	Dysentery, diarrhea, delay of menstruation, bronchitis, wound dressing	Leaves, roots	16
<i>Sarcocaulon burmanni</i>	Abortifacient, diarrhea remedy	Skin bark, leaves	16
			<i>Continued</i>

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Gisekia pharnaceoides</i>	Gisekiaceae Inflammation, purgative, boils	Leaves	6
<i>Gnetum africanum</i>	Gnetaceae Purgative, tonic, vegetable, male tonic, piles, high blood pressure, antidotes (venomous stings, bites), ease childbirth, painkiller	Leaves, stem	6, 11
<i>Gnetum buchholzianum</i>	Constipation, potherb, tonic, ease childbirth	Leaves, stem	6, 17
<i>Scaevola plumieri</i>	Goodeniaceae Bath for fevers, indigestion, wound dressing, diuretic, inflammation	Leaves	7
<i>Scaevola taccada</i>	Tuberculosis, anticontraceptive, abscesses, menstrual problems, edema, chill, scrotal swellings, skin ailments, swellings, elephantiasis	Leaves, roots	4
<i>Scaevola thunbergii</i>	Antispasmodic, stomachache	Leaves	4
<i>Grubbia tomentosa</i>	Gramineae (see Poaceae) Grubbiaceae Anti-inflammatory, cosmetics	Aerial parts	
<i>Wachendorfia thyrsiflora</i>	Guttiferae (see Clusiaceae, Calophyllaceae, Araliaceae) Haemodoraceae Anti-inflammatory, skin diseases, venereal diseases	Roots	
<i>Trichocladus ellipticus</i>	Hamamelidaceae Indigestion, laxative, anti-inflammatory	Stem bark	6
<i>Heliconia bihai</i>	Heliconiaceae Respiratory system disorders	Leaves	17
<i>Afrotyrax lepidophyllus</i> <i>Hua gabolii</i>	Huaceae Stem bark as a famine food, fevers Fevers, anti-infective agent	Stem bark Stem bark	

<i>Sacoglottis gabonensis</i>	Humiriaceae Dermatitis, fevers, emetic, ovarian troubles, vaginal infections, diarrhea, gonorrhea, abdominal pain, hypertension, diabetes, hip baths to promote muscle tone after childbirth	Fruits, leaves, stem	7, 14
<i>Hydnora solmsiana</i>	Hydnoraceae Anti-infective, anti-inflammatory	Leaves, stem bark	6, 7
<i>Hydrilla verticillata</i> <i>Najas pectinata</i> <i>Ottelia ulvifolia</i> <i>Vallisneria spiralis</i>	Hydrocharitaceae Detergent, abscesses, boils, wounds, debris in the wound Skin infections, cosmetics Antiparasitic, dropsy, swellings, edema, gout, fevers Aperitif, demulcent, stomachic, women's complaints	Whole plant Aerial parts Leaves Aerial parts	
<i>Hydrostachys imbricata</i> <i>Hydrostachys insignis</i>	Hydrostachyaceae Wound healing, hypertension Fevers, antimicrobial, anti-inflammatory	Aerial parts Submerged parts	
<i>Harungana madagascariensis</i> <i>Harungana montana</i> <i>Hypericum aethiopicum</i> <i>Hypericum revolutum</i> <i>Psorospermum ferbrifugum</i> <i>Vismia guineensis</i> <i>Vismia micrantha</i> <i>Vismia orientalis</i>	Hypericaceae Acute stomachache and toothaches, dysentery, hemorrhoids Puberty tonic for females, enema for backache and pain in the groin Infertility, bronchial infections, fevers, measles Fevers, tonic Leprosy, skin disease, mouth infections Fevers, skin diseases, jaundice, vertigo, mosquito repellent Coughs, viral infection, fevers Acne treatment, syphilitic sores, tonic, fevers	Leaves, roots, stem Leaves, root pulp Stem, leaves, fruits Aerial parts Roots Leaves Stem bark, leaves Roots	6, 19 11 4, 19 6 14 6, 7 6, 7
<i>Curculigo pilosa</i> <i>Hypoxis colchicifolia</i>	Hypoxidaceae Fever, sterility, dysmenorrhea, epilepsy, stiffness of limbs Impotence, mental disorders, hysteria, diuretic, snake repellent	Rhizome Tubers	14

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Hypoxis hemerocallidea</i>	Tonic, burns, prostate problems, urinary infections, chronic polyarthritis, prostate hypertrophy	Tubers	18
<i>Hypoxis obtusa</i>	Venereal diseases, heart pains, infertility, general pains, aphrodisiac	Tuber	11
Icacinaceae			
<i>Alsodeiopsis poggei</i>	Genital stimulant/depressant	Roots	17
<i>Apodytes dimidiata</i>	Intestinal parasites, earache, insanity	Root, leaves	17
<i>Icacina trichantha</i>	Aphrodisiac, male impotency, soft tumors	Tubers, leaves	6, 7
<i>Lavigeria macrocarpa</i>	Children's cold, catarrh, sinusitis	Buds	
<i>Leptaulus daphnoides</i>	Male impotence, body swellings	Roots	
<i>Leptaulus zenkeri</i>	Aphrodisiac	Roots	14
<i>Pyrenacantha staudtii</i>	Jaundice, postpartum medication	Fruits, leaves	6, 7
<i>Rhaphiostylis beninensis</i>	Fevers, infant tonic, prenatal medication, mouthwash, sores	Seeds, leaves	7
Iridaceae			
<i>Aristea alata</i>	Sprains, skin ailments	Bulb, leaves	
<i>Aristea ecklonii</i>	Coughs, fever, syphilis	Aerial parts	
<i>Babiana hypogaea</i>	Fever, venereal diseases, diarrhea	Aerial parts, corms	4
<i>Bobartia indica</i>	Fever, anti-infective	Leaves	4
<i>Chasmanthe aethiopica</i>	Dysentery, fevers	Aerial parts	4
<i>Crocoshmia aurea</i>	Dysentery, malaria, articular rheumatism	Leaves, bulbs, roots	4
<i>Crocoshmia paniculata</i>	Dysentery, diarrhea, infertility	Corms	14
<i>Diets iridioides</i>	Dysentery, hypertension, stomach problems	Rhizome	11, 14
<i>Gladiolus dalenii</i>	Constipation, angina, female sterility, snakebite, antifertility, anti-implantation, headache, dystocia, candidiasis, ear inflammation, wounds, dysentery	Corms, fruits	4, 14
<i>Gladiolus gregartus</i>	Female sterility, fever, dermatosis, purgative	Bulbs	14
<i>Gladiolus sericeo-villosus</i>	Dysmenorrhea, expel placenta, dysentery, swollen joints	Roots	4
<i>Homeria collina</i>	Skin infections, not taken internally	Aerial parts	4
<i>Ixia latifolia</i>	Female sterility, dermatosis	Aerial parts	4
<i>Micrathus tubulosus</i>	Inflammation, purgative	Aerial parts, roots	4

<i>Moraea flaccida</i>	Fevers, diarrhea	Aerial parts	4
<i>Sparaxis grandiflora</i>	Dysentery	Aerial parts	4
Irvingiaceae			
<i>Desbordesia insignis</i>	Stomachache, headache, chicken pox	Stem bark	4
<i>Irvingia excelsa</i>	Severe headache, topical preparation on scarification	Stem bark	
<i>Irvingia gabonensis</i>	Gastrointestinal diseases, fevers, dysentery, liver diseases, gonorrhea, body pain, diarrhea, edema, aphrodisiac, toothache	Stem, seeds, fruits, roots	6, 7
<i>Irvingia grandifolia</i>	Lumbar pain, aphrodisiac, rheumatism, stomachache, kidney pain, sexual asthenia, hypermenorrhea, ovarian and vaginal problems	Leaves, twigs, stem bark	
<i>Irvingia tenuinucleata (wombolu)</i>	Febrifuge, diabetes, diarrhea, wounds, obesity, analgesic, scabies, poison antidote	Kernel, leaves, stem bark	4
<i>Klainedoxa gabonensis</i>	Genital stimulants/depressants, small pox, measles, venereal diseases, arthritis, rheumatism, chicken pox, yaws, astringent	Stem bark, twigs, roots	4, 17
<i>Phyllocosmus africanus</i>	Diarrhea, dizziness, dysmenorrhea, anodyne	Stem bark	14
Ixonanthaceae			
Labiatae (see Lamiaceae)			
Lamiaceae			
<i>Achyrospermum aethiopicum</i>	Diabetes, stomachache, colds	Leaves, whole plant	6, 7
<i>Achyrospermum radicans</i>	Toothache, diabetes, cardiac edema	Leaves	11, 14
<i>Achyrospermum schimperi</i>	Coughs, insanity, purgative, ritual in spirit possession	Leaves, roots	4
<i>Acrotome inflata</i>	Enemas, helminth worm infections, malaria, pain relief, gallbladder treatment, inflammation, infections, poisonings, respiratory system disorders, externally for breast pains, coughs, digestive system disorders	Aerial parts	
<i> Aoellanthus pubescens</i>	Fevers, carminative	Leaves	6, 11
<i>Ajuga alba</i>	Abortifacient, oxytocic, colic, psoriasis, sciatic pain syndrome	Leaves	14
<i>Ajuga remota</i>	Diabetes, hypertension, fevers, toothache, dysentery, skin diseases, inflammation	Leaves	4, 14
<i>Ballota africana</i>	Hemorrhoids, asthma, bronchitis, insomnia, hysteria, fever, liver problems, cardiac diseases, chronic lung problems	Leaves	14
<i>Becium angustifolium</i>	Dysentery, skin diseases, hair restoration	Roots	4, 11
<i>Clerodendrum buchholzii</i>	Embrocation for rheumatism, snakebite, cold in the chest (with pepper)	Leaves	7

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Clerodendron capitatum</i>	Severe stomach pains, otitis, edema of various types, epilepsy, rheumatism, febrifuge, toothache, angina, scrotal elephantitis	Roots, leaves, stem	16
<i>Clerodendrum glabrum</i>	Antiviral, antipyretic, ascites, worms, rashes, fractures, convulsions	Leaves	6, 11
<i>Clerodendrum glabrum</i>	Anthelmintic, insanity, muscular-skeletal system disorders, nervous disorders, poisonings, respiratory disorders, skin/subcutaneous cellular tissue disorders	Roots, leaves, stem	17
<i>Clerodendrum incisum</i>	Analgesic, antiviral, malaria, palpitation	Leaves, stem bark	6, 11
<i>Clerodendrum myricoides</i>	Analgesic, antipyretic, constipation, stomachache, diarrhea, abortifacient, gonorrhea, syphilis, laryngitis, splenomegaly	Leaves, roots	6, 14
<i>Clerodendrum polycephalum</i>	Jaundice, syncope, epilepsy, coughs	Leaves, twigs	14
<i>Clerodendrum rotundifolium</i>	Diarrhea, malaria, rheumatism, tapeworm, ulcers, abortifacient	Leaves, roots	
<i>Clerodendrum splendens</i>	Dysentery, malaria, hemorrhoids, diarrhea, sexual asthenia, burns, wounds, heavy menstruation, abdominal pain	Leaves, roots	
<i>Clerodendrum umbellatum</i>	Abdominal pain, wounds, dizziness, liver and spleen problems	Leaves	14
<i>Clerodendrum uncinatum</i>	Malaria, purgative, snakebite, expectorant, schistosomiasis	Leaves, roots	
<i>Clerodendrum welwitschii</i>	Bronchitis, intercostal pain, tachycardia, tonic for children	Leaves	
<i>Coleus dazo</i>	Anti-inflammatory, fevers, tonic	Leaves, roots	11
<i>Coleus dysentericus</i>	Stomachic, eye lotion, additive to dysentery remedy	Leaves	11
<i>Endostemon gracilis</i>	Convulsions, secondary amenorrhea	Leaves	14
<i>Endostemon tereticaulis</i>	Diuretic, kidney problem, hypertension	Roots	4
<i>Erythrochlamys (Ocimum) spectabilis</i>	Diabetes, hypertension, fevers, dysentery	Aerial parts	14
<i>Fuerstia africana</i>	Malaria, gastric ulcers, tapeworm, conjunctivitis, earache, eye inflammation, tongue infection	Aerial parts, leaves	
<i>Geniosporum rotundifolium</i> (<i>Platostoma rotundifolium</i> ?)	Liver inflammation, epilepsy, diarrhea, purgative, insanity, elephantitis, anthelmintic, expel placenta, skin diseases, burns, kwashiorkor, spirit possession	Aerial parts, roots	14
<i>Gmelina arborea</i>	Wound dressing, insecticide	Fruit juice	6
<i>Gmelina elliptica</i>	Laxative, wound dressing	Leaves, fruits	6
<i>Haumaniasrum caeruleum</i>	Fever, bath, headache remedy	Leaves	7
<i>Holostylon baumii</i>	Head lice, skin inflammation	Roots	
<i>Hoslundia opposita</i>	Antipyretic, carminative, cough remedy, antipsoriatic	Leaves, flowers	6
<i>Hyptis pectinata</i>	Carminative, chronic bronchitis, painful menstruation	Leaves	11
<i>Hyptis suaveolens</i>	Respiratory tract infections, colds, skin disease, female hygiene	Leaves, stem	6
<i>Iboza multiflora</i>	Parasitic skin diseases, fevers, catarrh	Whole parts, leaves	6, 11

<i>Leonotis goetzei</i>	Coughs, fevers, spice for bronchial pains	Aerial parts	
<i>Leonotis leonuris</i>	Carminative, bronchitis, analgesic	Leaves	6
<i>Leonotis mollissima</i>	Stomachache, diarrhea	Leaves, oil	11
<i>Leonotis nepetifolia</i>	Parasitic skin infections, stomachache, steam inhalation for catarrh, inflammations, asthma, nervous system disorders, abortifacient	Leaves, root	11
<i>Leonotis ocymifolia</i>	Respiratory system disorders, leaves, hypertension, thorax, coughs, circulatory problems, gallbladder, gastric pains, snakebite, pains	Leaves, roots	
<i>Leucas calostachys</i>	Chest pains, pneumonia, stomach spasm	Leaves	6, 11
<i>Leucas lavandulifolia</i>	Chronic leg sores, dermatosis, antelmintic	Aerial parts	17
<i>Leucas martinicensis</i>	Respiratory system, colds, digestive disorders, fevers, hysteria, anodyne	Leaves	17
<i>Mentha aquatica</i>	Anodyne, antiseptic, antispasmodic, astringent, carminative, cholagogue, diaphoretic, emetic, refrigerant, stimulant, stomachic, tonic, vasodilator	Leaves, aerial parts	4, 17
<i>Mentha spicata</i>	Colds, stomachache, fevers, headaches, digestive disorders, antiemetic, antispasmodic, carminative, diuretic, restorative, stimulant, stomachic	Leaves, aerial parts	4, 6, 7
<i>Ocimum basilicum</i>	Sedative, stomachache, dizziness, otitis, sinusitis, carminative, flu, fevers, coughs, infertility, ophthalmia	Aerial parts, roots, seeds	
<i>Ocimum gratissimum</i>	Febrifuge, colds, stomachic, carminative, gonorrhea, rheumatism, bronchitis, antelmintic, diarrhea, dyspnea, convulsion, mosquito repellant, hemorrhoids, purgative, whooping cough, angina, eye and ear diseases	Leaves, roots	4, 11, 14
<i>Ocimum kilimandscharicum</i>	Carminative, skin diseases, fevers	Volatile oil, leaves	6, 11
<i>Ocimum suave</i>	Colds, cough, mosquito repellant, oral hygiene, fevers	Leaves, whole herb	6, 7
<i>Orthosiphon aristatus</i>	Kidney complaints, nephritis, gallstone, diabetes, jaundice, gout, rheumatism, arteriosclerosis, urinary tract infections	Leaves	14
<i>Orthosiphon parvifolius</i>	Syphilis, jaundice	Roots	4
<i>Orthosiphon thymiflorus</i>	Malaria, jaundice, fevers, gonorrhea	Leaves, whole plant	14
<i>Platystoma africanum</i>	Coughs, headache, fevers	Leaves	6
<i>Plectranthus barbatus</i>	Stomachache remedy, purgative, measles, fevers, oxytocic, tonsillitis, rheumatism, chicken pox, dysentery, conjunctivitis	Leaves, roots	1, 19
<i>Plectranthus bojeri</i>	Conjunctivitis, abscess, pneumonia, cardiac pains, snakebite	Leaves, roots	
<i>Plectranthus caninus</i>	Toothache, venereal diseases	Leaves	
<i>Plectranthus laxiflorus</i>	Rheumatism, abdominal pain, cough, purgative, fever, wounds, breast abscess, fractures, mouthwash for toothache	Aerial parts	
<i>Plectranthus sylvestris</i>	Chest pain, abdominal pain, ingredient for malaria therapy	Leaves, roots	4, 19
<i>Premna chrysoclada</i>	Fever, kidney diseases, venereal infections, dysentery	Roots, leaves	6, 11

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Premna hispida</i>	Fevers, gastrointestinal pains, earache, toothache, body ache, mouthwash	Leaves	7
<i>Pycnostachys eminii</i>	Coughs, colds, rectal prolapse, inflammation, oxytotic, anthelmintic, chicken pox, measles	Leaves	14
<i>Pycnostachys erici-rosenii</i>	Lumbago, insanity, tonic in pregnancy, colic, abdominal pain, abortifacient, cough	Leaves, roots	4, 14
<i>Pycnostachys reticula</i>	Hypertension, dizziness, toothache, neuralgia	Leaves, roots	14
<i>Pycnostachys urticifolia</i>	Aphrodisiac, earache, cataract, insanity, constipation, abdominal pain in babies	Roots, leaves	14
<i>Rosmarinus officinalis</i>	Brain tonic, carminative, diaphoretic, diuretic, aperient, asthma, emmenagogue, stimulant, stomachic, astringent, baldness, headaches, bruises, colds, nervous tension, sore throat	Aerial parts	17
<i>Salvia nilotica</i>	Lumbago, rectal prolapse, vaginal prolapse, insanity, wounds, impetigo, spirit possession, oxytotic, kwashiorkor	Leaves	4, 14
<i>Salvia officinalis</i>	Menopausal syndrome, epilepsy, rheumatism, excess salivation, antihydrotic, antiseptic, antispasmodic, aromatherapy, astringent, carminative, cholagogue, galactofuge, stimulant, tonic, vasodilator, insect bites, throat, mouth and gum infections, vaginal discharge	Leaves, aerial parts	17
<i>Salvia stenophylla</i>	Respiratory diseases, convulsions, colic, meteorism, heartburn, flatulence, colds, chronic indigestion, wounds, sore throat	Aerial parts, leaves	14
<i>Solenostemon ocyroides</i>	Colic, instillation for headaches and fever, prenatal medication, labor pains	Leaves	7
<i>Stachys spathulata</i>	Leg pains, anemia, galactagogue, tonic	Aerial parts, leaves	14, 17
<i>Stoebe aethiopica</i>	Stomachache, coughs	Aerial parts	4
<i>Tectona grandis</i>	Wound dressing, hemostatic	Stem bark, leaves	16
<i>Tinnea aethiopica</i>	Bronchitis, swollen feet (externally)	Leaves	4, 14
<i>Tinnea barberi</i>	Conjunctivitis, convulsion, aesthenia in children, sickle cell anemia	Leaves, stem bark	14
<i>Tinnea zambesiaca</i>	Convulsions, snakebite, wounds	Leaves, roots	14
<i>Vitex agnus-castus</i>	Women's complaints, infertility caused by hormonal imbalance, aphrodisiac, diaphoretic, diuretic, galactagogue, paralysis, pains in the limbs, general weakness, ophthalmic, sedative, fevers, menopause symptoms	Berries, leaves	17
<i>Vitex doniana</i>	Cough, skin infections, control bleeding after childbirth, galactagogue, headache, stiffness, measles, rash, fever, chicken pox, hemiplegia, tonic, anodyne, febrifuge, respiratory diseases, jaundice, diarrhea	Leaves, fruits	6, 17
<i>Vitex fischeri</i>	Tonic, body pains	Fruits, leaves	
<i>Vitex grandifolia</i>	Diarrhea, bronchitis, rickets, sores, fever, toothache, general tonic (fruit juice), rheumatism, stomachic	Leaves, fruits	14

<i>Vitex negundo</i>	Chronic bronchitis, insecticide, fevers, sedative, tonic, antibacterial, antitumor, astringent, expectorant, vermifuge, sores, rheumatism	Leaves, roots	4
<i>Vitex strickeri</i>	Poultice as anti-inflammatory, snakebite	Leaves	6
<i>Vitex triflora</i>	Diaphoretic, diuretic, anthelmintic, hemorrhoids, colds, headache, watery eye, asthmatic cough, hemorrhoids, rheumatism, antispasmodic, mastitis, swollen testicles	Leaves	4
Lauraceae			
<i>Agathophyllum aromaticum</i>	Fevers, headache, colic, meteorism, intestinal pain, swellings, sprains, inflammations, abscess, sinusitis	Leaves, volatile oil	4, 14, 17
<i>Bellishmidia mannii</i>	Diarrhea, cough, bronchitis, intercostal pain, rheumatism, dysentery, headache	Fruits	17
<i>Cassythia ciliolata</i>	Carminative, stomachache, anti-infective	Aerial parts	
<i>Cassythia filiformis</i>	Cough, venereal diseases, suppression of lactation after stillbirth, pains, promotes hair growth, antiparasitic, headache, malaria, fever, nephritis, edema, hepatitis, urinary problems, diarrhea, ulcers	Whole plant	6
<i>Cinnamomum camphora</i>	Analgesic, anthelmintic, antirheumatic, antispasmodic, abortifacient, aromatherapy, cardiotonic, carminative, diaphoretic, odontologic, rubefacient, sedative, stimulant, muscle pains, hysteria, fevers, balms for chilblains, chapped lips, cold sores, skin diseases	All plant parts	4, 14, 17
<i>Cinnamomum porrectum</i>	Carminative, stomachache, anti-infective, childbirth, anti-infective	All plant parts	
<i>Cinnamomum verum</i> (<i>C. zeylanicum</i>)	Spice for health food, carminative, nausea and vomiting, diaphoretic	Stem bark, leaves	11
<i>Hypodaphnis zenkeri</i>	Health tonic, diabetes	Stem bark, leaves	
<i>Ocotea bullata</i>	Headache, emotional and nervous disorders, urinary diseases	Stem	17
<i>Ocotea usambarensis</i>	Malaria, backache, whooping cough, swellings, boils, wounds	Aerial parts	4, 17
<i>Ravensara anisata</i>	Colic, appetite stimulant, tonic, wounds	Stem, leaves	14
<i>Ravensara aromatica</i> (see <i>Agathophyllum aromaticum</i>)			
<i>Tylostemon mannii</i>	Dysentery, appetite stimulant, headache lotion	Seeds, stem, leaves	11
Lecythidaceae			
<i>Brazzeia congoensis</i>	Skin infections, otitis, eye inflammation	Roots	
<i>Brazzeia klainei</i>	Stomachache	Stem bark	
<i>Brazzeia soyauxii</i>	Measles, fevers	Stem	
<i>Crateranthus talbotii</i>	Analgesic, cough	Leaves	
<i>Napoleonaea heudelotii</i>	Cough, fevers, a remedy for inguinal hernia	Fruit, stem, bark	6, 7
			<i>Continued</i>

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Napoleonaea imperialis</i>	Tonic, analgesic, cough, asthma	Fruit, leaves	7, 11
<i>Oubanguia africana</i>	Backache, hemorrhoids	Leaves, stem bark	
<i>Oubanguia alata</i>	Pains, fever, body swellings	Stem bark	
<i>Petersianthus macrocarpus</i>	Bronchitis, venereal diseases, expectorant	Roots, stem bark	6, 11
<i>Scytopetalum klaineianum</i>	Skin eruptions, fast-acting purgative	Stem bark	
<i>Scytopetalum tieghemii</i>	Coughs, leprosy, purgative, skin diseases	Leaves, roots	
Leeaceae (see Vitaceae)			
Leguminosae (Fabaceae)			
<i>Abrus precatorius</i>	Leaves for colic, convulsion, bronchial diseases	Seeds, leaves	7
<i>Acacia abyssinica</i>	Boils, stimulant, fevers	Leaves	
<i>Acacia albida</i>	Childbirth, fevers, coughs, diarrhea	Leaves, fruits	6, 7
<i>Acacia amblyophylla</i>	Convulsions, female sterility, meningitis, insanity, snake charm	Roots, whole plant	
<i>Acacia ataxacantha</i>	Analgesic, burns, sores, angina, convulsion, toothache, syphilis	Leaves	
<i>Acacia gourmaensis</i>	Malaria, coughs, corneal opacity, sterility, stomachache, fevers, gonorrhea, impotence, rectal prolapse, painful menstruation	Stem bark, leaves	
<i>Acacia kamerunensis</i>	Toothbrush, toothache, aphrodisiac, nervous tension, fevers, epilepsy, coughs, gonorrhea, migraine, whitlow, rheumatism	Stem, leaves	
<i>Acacia karoo</i>	Cardiotonic, general body pain, aphrodisiac, dizziness, dysentery	Roots, stem bark	
<i>Acacia macrostachya</i>	Dysentery, otitis, snakebite, toothache, stomach disorders	Root, stem pith and bark	
<i>Acacia nilotica</i>	Pneumonia, aphrodisiac, indigestion, pharyngitis, diarrhea, nerve stimulant, toothache, wounds, digestive candidamycosis	Leaves, fruits, roots	
<i>Acacia polyacantha</i>	Rheumatism, fatigue, syphilis, asthma, body aches, epilepsy	Roots, leaves, twig bark	
<i>Acacia robusta</i>	Malaria, bubonic plague, dysmenorrhea, female sterility, schistosomiasis, gonorrhea, abdominal pains, skin ailments	Various plant parts	6, 7
<i>Acacia senegal</i>	Dysentery, diarrhea, gonorrhea remedy, anti-inflammatory, constipation, stomach disorders, antitussive, expectorant, astringent, colds, ophthalmia, antidote, hemorrhage, sore throat, typhoid, urinary tract infection	Fruits, bark, latex, leaves, gum exudate	
<i>Acacia sieberiana</i>	Tapeworm, bilharzia, hemorrhage, orchitis, colds, diarrhea, gonorrhea, kidney problems, syphilis, ophthalmia, rheumatism, circulatory disorders, acne, hemostatic, inflammation, dropsy	Leaves, stem, gum	
18			

<i>Acacia tortilis</i>	Gastrointestinal disorders, anti-infective, fevers, asthma, edema	Stem bark	
<i>Acacia xanthophloea</i>	Indigestion, sickle cell anemia, emetic for malaria, eye infection	Stem bark	
<i>Adenocarpus mannii</i>	Skin diseases, inflammation	Stem	14
<i>Adenodolichos paniculatus</i>	Burns, toothache, amenorrhea, liver enlargement, gonorrhea, colic, dermatosis	Leaves, roots	4
<i>Aeschynomene abyssinica</i>	Stomachache, vermifuge	Roots	
<i>Aeschynomene mimosifolia</i>	Antiviral, analgesic	Leaves, twigs	6, 7
<i>Aeschynomene multicaulis</i>	Caries, rectal prolapse, colds, tonic in pregnancy	Root pulp, leaves	
<i>Aeschynomene nyassana</i>	Coughs, aphrodisiac, expectorant, tonic	Roots	
<i>Aeschynomene schimperi</i>	Severe cardiac palpitation, coughs	Roots	
<i>Afromosia laxiflora</i>	Headache, infant teething problems, venereal diseases, arthritis, eye inflammation	Leaves, stem, root	6, 7
<i>Azelia africana</i>	Constipation, fever, vomiting, edema, tachycardia, hypertension, bronchitis, lung complaints, rheumatism, aphrodisiac, epilepsy, dysmenorrhea, migraine, stomachache, trypanosomiasis, anodyne	Roots, stem bark, leaves	17
<i>Azelia bella</i>	Intestinal parasites, diarrhea, menstruation problems, tonic, hemorrhoids, rheumatism, skin diseases, constipation	Stem bark, leaves	
<i>Azelia quanzensis</i>	Schistosomiasis, gonorrhea, abdominal pains, pneumonia, malaria, uterine complaints, threatened abortion, snakebites, aphrodisiac, toothache, gum bleed, conjunctivitis	Roots, stem bark	4, 17
<i>Albizia adianthifolia</i>	Filariasis, anodyne, bronchitis, diarrhea, dizziness, coughs, asthma, toothache, gum inflammation, gonorrhea, worms, conjunctivitis, oxytocic, bleeding during pregnancy, headache, mental illness, fevers, eczema, abdominal pains, sinusitis	Stem, fruits, leaves, roots	16
<i>Albizia amara</i>	Analgesic, fevers	Leaves, fruits	7
<i>Albizia anthelmintica</i>	Fevers, skin diseases, tapeworm, venereal diseases, colic, contraceptive, worms, headache, syncope, epilepsy, malaria, female infertility, coughs, mental illness, fevers, chest pain, abdominal pains	Stem bark, roots	16
<i>Albizia ferruginea</i>	Dysentery, jaundice, bronchitis, gonorrhea, analgesic, worms, skin diseases, anthelmintic, abortifacient, suppurating pimples, stiffness of limbs, head lice, convulsions, wounds, malaria	Stem bark, roots, twigs	14
<i>Albizia lebbeck</i>	Antiprotozoal, anthelmintic, earache	Pods, leaves	11
<i>Albizia lebbeck</i>	Dysentery, bronchial asthma, eczema, insect bite, allergy, piles, hernia, malaria, gonorrhea, scrofulous swellings, diarrhea	Leaves, stem bark, seeds	4
<i>Albizia versicolor</i>	Anthelmintic, abdominal pain, venereal diseases, swollen glands, skin rashes, eye inflammation, headache, impotence, anemia, colds, cardiac problems, sinusitis	Stem bark, roots	4, 14
<i>Albizia zygia</i>	Bronchitis, diarrhea, malaria, dizziness, filariasis, coughs, asthma, corneal opacity, diuretic, fevers, syncope, insanity	Stem bark, roots	

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Alysicarpus glumaceus</i>	Insanity, impotence, coughs, wounds, bruises, inflammation of oral cavity, spirit possession	Leaves, roots	4, 14
<i>Alysicarpus rugosus</i>	Fevers, marasmus, tonic, asthma, insanity	Roots, aerial parts	4, 17
<i>Amblygonocarpus schweinfurthii</i>	Wound dressing, inflammation	Pods	6
<i>Amphimas ferrugineus</i>	Dysmenorrhea, blennorrhea, poison antidote, mumps	Leaves, roots	
<i>Amphimas pterocarpoides</i>	Anemia, dysentery, threatened abortion, impotence, mumps, dysmenorrhea, blood in urine, gonorrhea	Stem bark, resin	
<i>Angylocalyx oligophyllus</i>	Bladder inflammation, anthelmintic, colds, snakebite, gonorrhea, tonic	Stem bark, roots	14
<i>Angylocalyx pyraetii</i>	Fevers, stomachache, purgative	Stem bark	14
<i>Anthonotha acuminata</i>	Edema, eye infections	Leaf sap	
<i>Anthonotha crassifolia</i>	Red dye for rituals, intercostal pains, insecticide	Fruits, leaves, roots	6, 7
<i>Anthonotha fragrans</i>	Insecticide, skin diseases	Stem bark, leaves	
<i>Anthonotha gillettii</i>	Constipation, intercostal pains, diuretic, edema	Stem bark	
<i>Anthonotha macrophylla</i>	Anthelmintic, hernia, difficult childbirth, jaundice, snakebite, abscess, diarrhea, dysentery; skin diseases, painkiller, fevers	Leaves, stem bark	
<i>Aphanocalyx heitzii</i>	Whooping cough, yaws, rituals	Stem bark	17
<i>Arachis hypogaea</i>	Emollient, laxative	Seed oil	11
<i>Aspalathus linearis</i>	Tea substitute, antispasmodic, stuffy nose, emetic, antioxidant, vomiting, diarrhea and other mild gastric complaints, milk allergy, eczema, hay fever and asthma in infants	Leaves, roots	4, 14, 17
<i>Astragalus africanus</i>	Laxative, tonic	Leaves	6
<i>Astragalus gummifer</i>	Wound healing, laxative	Leaves, exudate	11
<i>Aubrevillea kerstingii</i>	Gonorrhea, hernia, threatened abortion, dropsy, gout, edema, kidney diseases, swellings, diuretics, laxatives	Roots, stem bark	4, 17
<i>Baphia capparidifolia</i>	Skeletal muscle disorders, inflammation	Stem	17
<i>Baphia massaiensis</i>	Pregnancy/birth/puerperium disorders, dizziness, tonic	Leaves, stem bark	17
<i>Baphia nitida</i>	Inflammation, skin infections, jaundice, diabetes, chew sticks, ritual, painful menstruation, epilepsy, venereal diseases	Roots, leaves, stem	6
<i>Bauhinia acuminata</i>	Stomach disorders, malaria	Stem bark, roots	7
<i>Bauhinia esculenta</i>	Laxative, antiparasitic	Leaves	6, 7
<i>Bauhinia rufescens</i>	Malaria, skin diseases	Leaves	6, 11
<i>Bauhinia simplicifolia</i>	Carminative, kidney ailments, soft tumors	Fruits, volatile oil	6

<i>Berlinia bracteosa</i>	Diarrhea and vomiting in children, purgative, edema, jaundice, toothache and caries, otitis, pneumonia, colic, anthelmintic	Stem bark, leaves	
<i>Berlinia confusa</i>	Earache, facilitate childbirth, blood circulation, constipation, tonic	Leaves	
<i>Berlinia grandiflora</i>	Febrifuge, purgative, tonic, hemorrhoids, liver complaints, vermifuge, cholagogue, antiemetic, wounds, sores	Stem bark, leafy twigs	
<i>Bobgunnia fistuloides</i>	Venereal diseases, irregular menstruation, filariasis, scabies, fevers, diarrhea, hypermenorrhea	Stem bark	
<i>Bobgunnia madagascariensis</i>	Jaundice, syphilis, constipation, anthelmintic, hemostatic, antiseptic, febrifuge, venereal diseases, gastritis, pneumonia, rheumatism, emetic, headache, breast abscess, coughs, leprosy	Fruits, leaves, stem, roots	17
<i>Brachystegia boehmii</i>	Abdominal pain, lumbago, female sterility, constipation, wounds, malaria, dizziness	Roots, stem	14
<i>Brachystegia eurycoma</i>	Anthelmintic, stomachache, jaundice, wounds	Seeds, leaves	6, 7, 18
<i>Brachystegia spiciformis</i>	Stomachache, constipation, diarrhea, opthalmia, insanity	Roots, leaves, stem bark	14
<i>Brachystegia zanguebarica</i>	Dysmenorrhea, aphrodisiac, jaundice, anemia, wounds, rectal prolapse, amenorrhea, anthelmintic, conjunctivitis	Stem, roots	
<i>Burkea africana</i>	Fever, gonorrhea	Roots	
<i>Caesalpinia bonduc</i>	Fever, headache, chest pain, anthelmintic, diabetes, rubefacient, jaundice, diarrhea, skin eruptions, diuretic, venereal diseases, antidepressant, rheumatism	Leaves, roots	4, 17
<i>Caesalpinia pulcherrima</i>	Febrifuge, antidiarrheal, emmenagogue, laxative, genitourinary disorders, menstruation	Fruits, leaves	7
<i>Caesalpinia sappan</i>	Tuberculosis, diarrhea, dysentery, antioxidative, anti-inflammatory, hepatoprotective, cytotoxin, wounds, hypoglycemic, xanthine oxidase inhibition, sedative, pulmonary diseases, ease childbirth, postpartum tonic	Stem, leaves, seeds	4, 11, 17
<i>Caesalpinia volkensii</i>	Aphrodisiac, gonorrhea, bilharzia, retinoblastoma, abdominal pain in pregnancy, stomach ulcers	Buds, leaves, seeds	4, 17
<i>Cajanus cajan</i>	Antiviral, antistickness, blood pressure, skin infections	Leaves, seeds	8
<i>Calliandra portoricensis</i>	Fevers, diarrhea, infantile convulsions	Leaves, whole plant	9
<i>Calopogonium mucunoides</i>	Malaria, diarrhea	Leaves, roots	
<i>Calpocalyx aubrevillei</i>	Abdominal pain	Stem bark	4
<i>Calpocalyx breviracteatus</i>	Stomachache, mouthwash, externally for painful breasts in women	Stem bark	14
<i>Calpocalyx dinklagei</i>	Gastrointestinal disorders, irregular menstruation	Stem bark	4
<i>Canavalia ensiformis</i>	Fevers, measles, skin eruptions	Young buds, leaves	6, 11

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Cassia abbreviata</i>	Bilharzia, venereal diseases, pneumonia, malaria, heavy menstruation, snakebites, purgative, stomachic, abortifacient, vermifuge, gastrointestinal disorders, uterus complaints, aphrodisiac, diarrhea, fevers	Leaves, twigs, roots	4
<i>Cassia fistula</i>	Laxative, pains, insecticide, rituals, skin diseases	Fruits, leaves	6, 7
<i>Cassia sieberiana</i>	Laxative, febrifuge, hemorrhoids, bilharzia, leprosy, bloody dysentery, stomachache, venereal diseases, febrifuge, skin diseases, sterility, aphrodisiac, dropsy, malaria	Leaves, fruits, roots	7
<i>Cassia surattensis</i>	Parasitic skin diseases, purgative	Fruits	6, 7
<i>Clitoria tematea</i>	Constipation, to induce menstruation, emetic, jaundice, threatened abortion at late stage of pregnancy	Seeds, roots, leafy twigs	4
<i>Craibia affinis</i>	Respiratory system disorders	Stem	14
<i>Craibia brownii</i>	Coughs, respiratory tract infection	Stem bark	4
<i>Crotalaria agatiflora</i>	Splenomegaly, chest pain, shortness of breath, tachycardia, expel placenta, suppurating otitis, abortifacient	Leaves, roots	14
<i>Crotalaria cleomifolia</i>	Amenorrhea, burns, vaginal prolapse	Leaves	4
<i>Crotalaria laburnifolia</i>	Headache, coughs, female infertility, septic dermatitis, gonorrhea, severe dysuria, snakebite, rectal prolapse	Leaves	14
<i>Crotalaria pallida</i>	Fevers, headache, rectal prolapse, wounds	Whole plant, twigs	14
<i>Crotalaria podocarpa</i>	Ophthalmia, smallpox, skin diseases	Seeds, whole plant	11
<i>Crotalaria retusa</i>	Skin eruptions, rituals, febrifuge in small doses, colic, rheumatism, insanity, purgative, conjunctivitis	Fruits, leaves, stem	4, 6
<i>Crotalaria spectabilis</i>	Scabies, impetigo, skin cancer	Leaves	4
<i>Crotalaria vasculosa</i>	Hernia, scabies, ophthalmia, malaria, otitis	Aerial parts	4
<i>Crudia gabonensis</i>	Digestive system disorders	Exudate, stem	17
<i>Crudia senegalensis</i>	Digestive system disorders	Exudate	17
<i>Cullen coryllifolium</i>	Furuncles, scabies, wounds, stiffness of limbs, oral care	Fruits, twigs	14
<i>Cyclopia intermedia</i>	Stomachic, stimulant, urinary system, tonic	Stem, leaves	18
<i>Cylicodiscus gabunensis</i>	Migraine, anodyne, vomiting, venereal diseases, malaria, psoriasis, rheumatism, stomachache	Leaves, stem	17
<i>Cynametra megalophyta</i>	Measles, chicken pox, kwashiorkor	Stem bark, leaves	4, 14, 17
<i>Cytisus scoparius</i>	Diuretic, chest complaints, hypertension, jaundice, toothache	Flowering tops	6, 11
<i>Dalbergia hostilis</i>	Pains, fever lotion	Leaves, stem	6
<i>Dalbergia saxatilis</i>	Cough, bronchitis, smallpox, scabies, yaws	Leaves	9

<i>Dalbergiella wewitschii</i>	Anthelmintic, wound dressing	Leaves	6
<i>Daniellia ogea</i>	Coughs, snakebite, malaria, gonorrhea, asthma	Leaves, gum	14
<i>Daniellia oliveri</i>	Tonic, fevers	Stem bark, leaves	16
<i>Daniellia oliveria</i>	Gonorrhea, bronchitis, kidney troubles, lumbago, headache	Leaves, seeds	4
<i>Daniellia thurifera</i>	Coughs, skin diseases, rituals	Gum exudate	17
<i>Delonix regia</i>	Febrifuge, diarrhea	Fruits, leaves	7, 19
<i>Delonix regia</i>	Fevers, toothache, schistosomiasis, diarrhea	Leaves, stem bark	
<i>Desmodium adscendens</i>	Colic, fevers, cough, wound dressing, skin diseases, convulsions, venereal diseases	Roots, leaves	6
<i>Desmodium barbatum</i>	Dilation of vagina, antiparasitic, anti-inflammatory, analgesic	Stem bark, leaves	6, 16
<i>Desmodium gangeticum</i>	Fevers, skin diseases, anxiety states	Stem, leaves	6
<i>Detarium macrocarpon</i>	Dysentery, syphilis	Fruits, leaves	6, 7
<i>Detarium microcarpum</i>	Rheumatism, diuretic, urogenital infections, hemorrhoids, caries, biliousness, stomachache, intestinal worms, venereal diseases, astringent, dysentery, diarrhea	Leaves, fruits, roots	
<i>Detarium senegalense</i>	Hemostatic, postpartum medication, ritual plant, tuberculosis, emetic, kidney pain, spinal tuberculosis, syphilis, cough, rheumatism, leprosy, fever, trypanosomiasis, dysentery, anemia, diuretic, astringent	Fruits, leaves	6
<i>Dialum aubrevillei</i>	Antispasmodic, analgesic, laxative	Leaves	7
<i>Dialum dinklagei</i>	Antitussive, anti-infective	Fruits, leaves	6, 7
<i>Dialum guineense</i>	Bronchial complaints, cough, mouthwash, diarrhea, febrifuge	Fruits, leaves	6
<i>Dichrostachys cinera</i>	Analgesic, antiviral, leprosy, snakebite, vermifuge, dysentery, headaches, toothaches, elephantiasis	Fruits, leaves, roots	4, 16
<i>Dioclea hexandra</i>	Coughs, rheumatism, scabies, upper respiratory disease in children	Seeds	14
<i>Dioclea reflexa</i>	Rheumatism, diarrhea (root is molluscicidal), antiparasitic, tonic, stimulant	Leaves, whole plant	6
<i>Distemonanthus benthamianus</i>	Colds, shingles, skin diseases, fevers, furuncles, abscess, hepatitis, epilepsy, bronchitis, rheumatism, fevers, malaria, palpitation	Stem bark, leaves	4, 7, 17
<i>Dolichos kilimandscharicus</i>	Antiviral, laxative	Leaves, green fruits	7
<i>Dolichos trilobus</i>	Diarrhea, gastrointestinal disorders	Starch from tubers	4
<i>Entada africana</i>	Hemostatic, antiseptic, antiparasitic, abortifacient, febrifuge	Leaves, stem bark, roots	
<i>Eriosema glomerata</i>	Wound dressing, venereal diseases	Roots, leaves	16
<i>Erythrina abyssinica</i>	Antimicrobial, toothache, hepatitis	Leaves, stem bark	16
<i>Erythrina mildbraedii</i>	Muscular pains, sore throat	Leaves, fruits	6
<i>Erythrina senegalensis</i>	Dysentery, cough, fevers, ingredient in ordeal poison, toothache, convulsions, venereal diseases, circulatory disorders	Roots, leaves	6

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Erythrina vogelii</i>	Pains, rheumatism, bronchial complaints, gonorrhea, hematuria, poison antidote	Leaves, stem	
<i>Erythrophleum africanum</i>	Scabies, dysmenorrhea, leprosy, cardiac diseases, insanity	Leaves, stem, roots	
<i>Erythrophleum ivorense</i>	Purgative, emetic, smallpox, ulcers, rheumatism, cardiogenic	Twig bark	
<i>Erythrophleum lasianthum</i>	Fever, hysteria, headache, general body pains, migraine, poison	Stem bark	
<i>Erythrophleum suaveolens</i>	Ordeal poison, sneezing powder for confirmation of death, malaria, smallpox, tuberculosis, headache, colds, sinusitis, syphilis, abortifacient, anthelmintic, body pains, rheumatism, rodenticide, poison, hypotensive	Stem bark, leaves	6
<i>Galega lindblomii</i>	Skin eruptions, scabies		
<i>Gigasiphon macrosiphon</i>	Rheumatism, bronchitis, venereal diseases	Aerial parts	4
<i>Gilbertiodendron dewevrei</i>	Sterility, asthma, facilitate childbirth, otitis, dysentery, burns, whitlow	Aerial parts	4
<i>Gilbertiodendron limba</i>	Pelvic inflammation in women, fevers, ulcers	Stem bark	
<i>Gilircidia sepium</i>	Skin itching, insect repellent, wound dressing, rheumatism, fever, fractures, gangrene, headache, itch, prickly heat, rheumatism, skin tumors, ulcers, urticaria, wounds	Stem bark, leafy twigs	
<i>Glycyrrhiza glabra</i>	Demulcent, expectorant	Leaves, stem bark, roots	
<i>Gossweilerodendron balsamiferu</i>	Viral infection, bronchitis	Roots	6, 16
<i>Griffonia simplicifolia</i>	Aphrodisiac, purgative, diarrhea, vomiting, stomachache	Stem exudate	7
<i>Griffonia simplicifolia</i>	Wound healing, enema, kidney ailment, vomiting, depression, headache, chew stick, sickle cell anemia	Whole plant	9, 16
<i>Guibourtia coleosperma</i>	Fevers, mental problems, headache, venereal diseases, postpartum healing, stomachache, wound healing, coughs	Seeds, leaves	4, 18
<i>Guibourtia tessmannii</i>	Convulsions, diarrhea, lumbago, hernia, malaria, anemia, female infertility, typhoid fever, hemorrhoids, cancer, sexually transmittable diseases, hepatitis	Leaves, roots	4, 17
<i>Hylodendron gabunense</i>	Aphrodisiac, respiratory tract infections, venereal diseases, induction of labor, mouthwash, toothache, women sterility	Stem bark	14
<i>Hymenaea courbaril</i>	Mouth ulcers, diabetes, stomachic, astringent, balsamic, vermifuge, hemostatic	Exudate, fruits, stem	4, 14
<i>Hymenaea verrucosa</i>	Kidney disease, diuretic, vermifuge, anthelmintic, irregular menstrual cycle, genitourinary disorders	Exudate, fruits, stem	14
<i>Hymenostegia afzelii</i>	Coughs, colds, catarrh, gonorrhea, aphrodisiac, hemorrhoids	Roots	4
<i>Hoffmannseggia burchellii</i>	Wounds, sores	Fresh roots	14

<i>Indigofera arrecta</i>	Digestive system disorders, colic, irregular menstruation, genitourinary disorders, female infertility, gonorrhea, sedative, stomachic, febrifuge, vermifuge, abortive, diuretic, purgative, snakebites, epilepsy, jaundice	Aerial parts, roots	14, 17
<i>Indigofera dendroides</i>	Skin diseases, lotion for yaws, severe eye inflammation	Fruits, leaves	11
<i>Indigofera emarginella</i>	Sore eyes, hair lice, abdominal pains	Leaves, roots	
<i>Indigofera spicata</i>	Pain relief, tonic, antimicrobial	Fruits, leaves	11
<i>Indigofera tinctoria</i>	Chest pain, bronchitis, skin diseases, splenomegaly, epilepsy, syphilis, hydrophobia, asthma, toothache, leprosy	Aerial parts, roots	11
<i>Isobерlinia angolensis</i>	Abscess, convulsions, female sterility, persistent cough, wounds	Stem resin, leaves, stem	
<i>Isobерlinia dalzielii</i>	Inflammation, poison antidote	Stem exudate	7
<i>Isobерlinia tomentosa</i>	Arrow poison, skin diseases, wound dressing, stomachache	Leaves, bark	
<i>Julbernardia globiflora</i>	Conjunctivitis, vaginal wash to contract the canal, leprosy, snakebite, constipation, depression	Stem bark, roots	17
<i>Julbernardia paniculata</i>	Dysentery, syphilis, mouth ulcers	Stem bark	14
<i>Julbernardia seretii</i>	Wounds, anti-inflammatory, skin diseases	Stem bark	4, 14
<i>Kerstingiella geocarpa</i>	Dysentery, venereal diseases, fevers, diabetes	Fruits, leaves	6, 11
<i>Lebruniodendron leptanthum</i>	Wounds, anti-inflammatory, skin diseases	Stem bark	4
<i>Leonardoxa africana</i>	Wounds, skin diseases	Aerial parts	4
<i>Leptoderris fasciculata</i>	Cough remedy, dysentery, hiccups	Stem bark	6
<i>Leucaena leucocephala</i>	Internal pains, eye problems, emmenagogue, anthelmintic	Stem. roots, seeds	
<i>Lonchocarpus capassa</i>	Laxative, skin diseases, fevers, convulsion	Stem bark, leaves	7
<i>Lonchocarpus cyanescens</i>	Externally for inflammation, venereal diseases	Roots, whole plant	6
<i>Lonchocarpus sericeus</i>	Skin diseases, stomachache, laxative, anticonvulsant	Stem bark, leaves	6
<i>Macrobolbium chevalieri</i>	Skin diseases, colds, antimicrobial	Leaves, green fruits	6
<i>Macrobolbium macrophylla</i>	Embrocation for swelling and pains, venereal diseases	Leaves, fruits	6
<i>Melolobium burchellii</i>	Dysentery, venereal diseases, skin inflammation	Leaves, fruits	6
<i>Mezoneuron benthamianum</i>	Urethritis, venereal diseases, dysentery, anthelmintic	Stem bark	4
<i>Microberlinia brazzavillensis</i>	External embrocation for rheumatism, edema of the legs	Leaves, stem, roots	9
<i>Milletia aboensis</i>	Cold, migraine	Leaves	
<i>Milletia congolensis</i>	Viral diseases, fevers	Fruits, leaves	6
<i>Milletia laurentii</i>	Liver complaints, diabetes, hernia, skin diseases, constipation, fever, rheumatism, expectorant, skin diseases, vermifuge, epilepsy, smallpox, edema, sores, abscesses, insecticide	Fruits, leaves	6, 7
		Stem bark	4, 17

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Milletia stuhlmannii</i>	Stomachache, skin diseases	Roots	
<i>Milletia thonningii</i>	Bronchitis, mouth infections, anthelmintic, laxative	Leaves, roots	7
<i>Mucuna pruriens</i>	Anthelmintic, tonic	Seed, leaves	6, 7
<i>Mundulea sericea</i>	Abortifacient, malaria, aphrodisiac, fever, male impotence, repel or kill crocodiles, stomachache, furunculosis, emetic, insecticide, fumigation extract, poison antidote	Stem bark, roots, leaves	14, 17
<i>Neorautaneania mitis</i>	Fungal infections, antiparasitic, scabies	Tubers	4, 19
<i>Newtonia buchananii</i>	Abscess, abortifacient, aphrodisiac	Stem bark	
<i>Newtonia duparquetiana</i>	Anthelmintic, meteorism	Stem bark, roots	
<i>Newtonia hildebrandtii</i>	Skin diseases, anthelmintic	Roots	
<i>Oddoniodendron micranthum</i>	Fevers, anti-inflammatory	Stem bark	4
<i>Ormocarpum kirkii</i>	Abortifacient, pain relief	Leaves, fruits	1, 19
<i>Ostryoderris stuhlmannii</i>	Inflammation, skin diseases, fevers, earache	Stem bark, roots	6, 11
<i>Pachyelasma tessmannii</i>	Diarrhea, abortifacient	Fruits	17
<i>Parkia bicolor</i>	Rheumatism, smallpox, measles, toothache, measles, sores, conjunctivitis, female infertility, venereal diseases	Stem bark, leaves, roots	4, 17
<i>Parkia biglobosa</i>	Seasoning, respiratory diseases, skin infections, genitourinary system, digestive system diseases, parasitic infections, arterial hypertension	Seeds, stem bark, leaves	4, 17
<i>Parkia clappertoniana</i>	Tonic, diarrhea	Leaves, fruits	7
<i>Parkia filicoidea</i>	Ointment for inflammation, eyewash, astringent	Fruits, leaves	11
<i>Peltophorum africanum</i>	Tonic, fevers, pain relief, wounds, venereal diseases, toothache, anthelmintic, respiratory diseases, genitourinary disorders, ease childbirth	Leaves	4, 6, 17
<i>Peltophorum pterocarpum</i>	Astringent, pain at childbirth, sprains, bruises, swellings, eye troubles, muscular pains, sores, gargle, toothache	Stem	17
<i>Pentaclethra macrophylla</i>	Anthelmintic, wound dressing	Fruits, leaves	7
<i>Phaseolus lunatus</i>	Antiparasitic, coughs	Leaves, fruits	6
<i>Phaseolus vulgaris</i>	Skin diseases, diet for elevated blood pressure	Leaves, seeds	6, 11
<i>Phyostigma venenosum</i>	External analgesic, ritual, ordeal poison, nervous system disorders	Seeds	6, 7
<i>Pilostigma thonningii</i>	Hemorrhoids, guinea worms, diarrhea, dysentery, respiratory diseases, snakebites, piles		
<i>Piptadeniastrum africanum</i>	Aphrodisiac, tonic, enema, urethritis, abortifacient, stomachache, cough, bronchitis, headache, mental disorders, hemorrhoids, genitourinary infections, dysmenorrhea	Fruits, leaves	6, 7, 17

<i>Platycephalum voense</i>	Laxative, anti-inflammatory	Aerial parts	4
<i>Prosopis africana</i>	Anxiety states, analgesic	Leaves	7, 16
<i>Pseudovigna argentea</i>	Abscesses	Root	14
<i>Psoralea (Cullen) spicata</i>	Galactagogue, skin diseases	Stem	4
<i>Pterocarpus angolensis</i>	Headache, depressed fontanel, gonorrhea, hypermenorrhea, abortifacient, schistosomiasis, abortifacient, mouth ulcers	Stem bark, fruits, roots	
<i>Pterocarpus mildbraedii</i>	Diarrhea, fevers, urinal antiseptic	Leaves, fruits, roots	6
<i>Pterocarpus santalinoides</i>	Antidiarrhea, abortifacient, amebic dysentery, fevers, hemorrhoids, trypanosomiasis	Leaves, roots, twigs	7
<i>Pterocarpus seriaceus</i>	Dysentery, diarrhea, fever, malaria, venereal diseases, toothache, skin diseases	Leaves, stem bark	
<i>Pterocarpus soyauxii</i>	Fevers, diarrhea, wound dressing, toothache, gonorrhea, cough, excessive menstruation, inflammations, edemas, whitlow, incipient hernia, uterine hemorrhage, dysentery, antifungal	Leaves, stem bark	7
<i>Pterolobium stellatum</i>	Stomachic, infertility, urinary system, tuberculosis, snakebite	Roots, leaves	4
<i>Rhynchosia albissima</i>	Aphrodisiac, male impotence, purgative	Root	14
<i>Rhynchosia hirta</i>	Otitis, sciatic pain syndrome, ease childbirth, expel placenta, schistosomiasis, kwashiorkor, stomachache	Roots, leaves	14
<i>Rhynchosia minima</i>	Cardiac pain, diarrhea, schistosomiasis, tuberculosis, venereal diseases, bladder and kidney problems, menopausal problems	Roots, leaves	14
<i>Rhynchosia nyasica</i>	Breast abscess, jaundice, coughs, tuberculosis	Leaves, roots	14
<i>Rhynchosia resinosa</i>	Diarrhea, abdominal pain, dysmenorrhea, sterility, expel maggots from wounds, dilation of birth canal	Roots, whole plant	4
<i>Rhynchosia sublobata</i>	Tachycardia, gallbladder disorders, diarrhea, toothache	Roots, stem	4, 14
<i>Samanea saman</i>	Convulsions, venereal diseases	Leaves, fruits	16
<i>Schotia brachypetala</i>	Diarrhea, heartburn, hangovers, nervous conditions, insanity, fontanel depression in babies	Stem bark, roots	4, 17
<i>Scorodophloeus zenkeri</i>	Rheumatism, headache, genitourinary problems, aphrodisiac, purgative, measles, enlarged spleen	Leaves, stem bark	4, 14
<i>Senna absus (Senna insularis)</i>	Antimicrobial, analgesic	Leaves	6
<i>Senna alata</i>	Abortifacient, labor, external application for skin diseases	Fruits, leaves	8
<i>Senna alexandrina</i>	Purgative, ascites, dyspepsia, wound dressing	Leaves, pods	6, 7
<i>Senna angustifolia (C. Alexandrina)</i>	Laxative, postpartum	Leaves, pods	16
<i>Senna hirsuta</i>	Coughs, sedative, analgesic	Leaves	11

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Senna occidentalis</i>	Coffee substitute, skin diseases, diabetes, anthelmintic, malaria, hematuria, arthritis, rheumatism, diarrhea, dysentery; insanity, leprosy, paralysis, epilepsy, convulsions, spasm; tumors, cancers, yaws, extrusion of guinea worm, laxative	Leaves, flowers, w/plant	4, 17
<i>Senna sophora</i>	Malaria, fevers, anthelmintic, rheumatism, anti-inflammatory	Leaves, shoots, roots	
<i>Senna tora</i>	Fever, pneumonia, arthritis, cough, purgative, anthelmintic	Whole plant, leaves, root	
<i>Sesbania grandiflora</i>	Externally for rheumatism, inflammations, and skin diseases; muscular-skeletal system disorders, malaria, coughs	Roots, leaves	17
<i>Sesbania sericea</i>	Stimulant, coffee substitute, fevers, restorative	Seeds, aerial parts	14
<i>Sesbania sesban</i>	Local application for inflammation, increased lactation in cows, stomachic, genitourinary system disorders, gonorrhea, syphilis, spasmodic fits in children	Leaves	4, 11
<i>Sphenostylis stenocarpa</i>	Diarrhea, elephantitis, convalescing diet	Seeds, leaves	7
<i>Stylosanthes erecta</i>	Poison antidote, colds, aphrodisiac, pneumonia, dysentery, headache, rheumatism, snakebite, venereal diseases, scabies	Roots, leaves, herbs	6, 7
<i>Sutherlandia frutescens</i>	Cancer, colds, flu, asthma, tuberculosis, bronchitis, rheumatism, rheumatoid arthritis and osteoarthritis, liver problems, hemorrhoids, piles, bladder, uterus and “women’s” complaints, diarrhea and dysentery, stomach ailments, heartburn, peptic ulcers, backache, diabetes, varicose veins, inflammation, HIV/AIDS	Leaves, aerial parts	4, 14, 17
<i>Tamarindus indica</i>	Tonic, cardiac disorders, laxative, fevers	Leaves, fruits	7
<i>Tephrosia vogelii</i>	Parasitic skin diseases, diuretic, cough	Pods, leaves	7, 11
<i>Tetradberlinia polyphylla</i>	Hemorrhoids, diarrhea, skin diseases	Stem bark	
<i>Tetrapleura tetraptera</i>	Flatulence, jaundice, fevers, convulsions	Fruits, whole plant	6, 7
<i>Trigonella foenum-graecum</i>	Antidiabetic, indigestion, tonic, rheumatism, cough, liver and spleen disorders	Seeds, leaves	11
<i>Tylosema fassoglensis</i>	Diarrhea, stomachic, fevers	Stem, leaves	6, 7
<i>Vigna radiata</i>	Paralysis, rheumatism, coughs, fevers, liver ailments	Seeds, leaves	6
<i>Vigna unguiculata</i>	Oil ingredient in poultice, leaves mild laxative	Seeds, fruits	6
<i>Voandzeia subterranea</i>	Venereal diseases, skin infections, tonic	Leaves, seeds	11
<i>Xeroderris stuhlmannii</i>	Eye inflammation, colds, elephantiasis	Whole plant, roots	11
<i>Xylia evansii</i>	Oral hygiene, wound dressing	Twigs, leaves	7
<i>Xylia hoffmannii</i>	Circulatory system disorder, wounds	Aerial parts	4
<i>Zornia glochidiata</i>	Aphrodisiac, premature male ejaculation, epilepsy, digestive system disorders, ease childbirth, kwashiorkor in children, venereal diseases	Roots, leaves	4, 17
<i>Zornia latifolia</i>	Aphrodisiac, conjunctivitis, fevers	Leaves	

<i>Zornia pratensis</i>	Digestive system disorders, ease childbirth	Aerial parts	
<i>Zornia setosa</i>	Stomachache, male tonic	Aerial parts, fresh roots	
<i>Lepidobotrys staudtii</i>			
	Lepidobotryaceae		
	Aphrodisiac, diarrhea, diuretic, nausea	Stem bark, roots	14
	Liliaceae		
<i>Plants previously listed under this family have now been reclassified under Asparagaceae, Amaryllidaceae, and Xanthorrhoeaceae.</i>			
	Linaceae		
<i>Hugonia castanea</i>	Rheumatism, general body pain, ascariasis	Roots, leaves	4
<i>Hugonia macrophylla</i>	Gonorrhea, blood in urine, ease childbirth	Roots	14
<i>Hugonia planchonii</i>	Bronchitis, whooping cough, chronic cough, dermatosis	Leaves, roots	4, 6, 11
<i>Hugonia platysepala</i>	Abdominal pain, diarrhea, insanity, conjunctivitis	Leaves, roots	14
<i>Linum usitatissimum</i>	Digestive complaints, high cholesterol, skin infections, coronary and kidney diseases, hormonal problems, malignant tumors, coughs, inflammation, gonorrhea	Seeds	4, 17
	Loganiaceae		
<i>Gardneria angustifolia</i>	Embrocation of swellings, tonic, skin infections	Leaves, stem	7
<i>Mostuea hirsuta</i>	Antipyretic, skin diseases, syphilis	Roots	6
<i>Nuxia floribunda</i>	Fevers, cough, indigestion, influenza, infant convulsions, rituals	Leaves	11
<i>Spigelia anthelmia</i>	Anthelmintic	Leaves, stem, roots	6
<i>Strychnos aculeata</i>	Abortifacient, ascites, emetic, scrotal elephantitis, guinea worm, gonorrhea, expectorant, trypanosomiasis	Seeds, stem, leaves	14
<i>Strychnos cocculoides</i>	Abdominal pain, diarrhea, uterine pain, gonorrhea, colic, sterility, snakebite, eczema, threatened abortion	Stem, leaves, roots	
<i>Strychnos densifibra</i>	Ordeal poison, externally for pains	Fruits, leaves, roots	6, 7
<i>Strychnos henningsii</i>	General tonic, worm infestation in children, malaria, rheumatism, gynecological problems, chest pain, internal injuries	Leaves, stem bark, roots	17
<i>Strychnos icaia</i>	Skin diseases, gastrointestinal disorders, malaria, diuretic, insanity, snake repellent, abortifacient, anthelmintic	Leaves, roots, stem	4, 6, 7
<i>Strychnos nux-vomica</i>	Stimulant, sprains, general pains, colitis	Seeds, leaves	6, 7
<i>Strychnos odorata</i>	Potherbs, fevers, deodorant	Leaves	7

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Strychnos pungens</i>	Epilepsy, emetic, diarrhea, headache, eye diseases, respiratory system disorders, insanity, inflammation	Stem, roots, leaves	4, 14
<i>Strychnos spinosa</i>	Venereal diseases, tonic, fevers, wound dressing, conjunctivitis, dysentery, poison antidote, sexual asthenia, otitis, headache, malaria, snakebite, sterility, trypanosomiasis	Fruits, leaves	4, 6, 14
<i>Strychnos usambarensis</i>	Local pain relief, tonic, treatment of general "weakness"	Stem bark, leaves	7
<i>Usteria guineensis</i>	Coughs, parasitic skin infections, bronchitis	Roots, leaves	6
Loranthaceae			
<i>Erianthemum dregei</i>	Headache	Leaves	7
<i>Globimetula braunii</i>	Chest problems	Stem	14
<i>Globimetula oreophila</i>	Stomachache	Exudate	4
<i>Oliverella hildebrandtii</i>	Epilepsy in children (convulsions)	Leaves	14
<i>Oncocalyx fischeri</i>	Toothache, anti-inflammatory	Leaves, stem bark	7
Lycopodiaceae			
<i>Lycopodium cernuum</i>	Embrocation for body pains	Whole plant	11
<i>Lycopodium clavatum</i>	Headache, diuretic, antispasmodic, skin infections	Whole plant	11
Lythraceae			
<i>Lagerstroemia speciosa</i>	Diabetes, wound dressing, anti-infective	Fruits, old leaves	16
<i>Lawsonia inermis</i>	Cosmetics, skin dye for measles, childbirth, abortifacient, emmenagogue, diarrhea, trypanosomiasis, gonorrhea	Leaves, stem, roots	6, 7
<i>Nesaea sagittifolia</i>	Hematuria, blackwater fever	Leaves, whole plant	11
<i>Punica granatum</i>	Diarrhea, vermifuge, antibacterial, antiviral, astringent, cardiac, demulcent, emmenagogue, refrigerant, stomachic, colic, dysentery, leukorrhea, diabetes, tonic, beverage	Fruits, aerial parts	6, 7
<i>Sonneratia acida</i>	Fevers, hemostatic, antiparasitic	Stem bark, fruits	16
<i>Trapa natans</i>	Fever, headache, tonic	Fruits	4, 17

Maisideniaceae (Apocynaceae)

<i>Gongronema angolense</i>	Anti-inflammatory, weight gain during lactation	Leaves, aerial parts	4
<i>Gongronema latifolium</i>	Stomachic, tonic, appetite stimulant, obesity, malaria, diabetes, hypertension, cough, intestinal worms, dysentery, dyspepsia	Leaves, aerial parts	4, 7

Malpighiaceae

<i>Acridocarpus congolensis</i>	Aphrodisiac, sexual asthenia, high blood pressure, anemia	Stem bark, roots	14
<i>Acridocarpus plagiopteris</i>	Fevers, sleeping sickness, vermifuge, aphrodisiac	Roots	6, 7
<i>Acridocarpus spectabilis</i>	Skin infections, anti-inflammatory, urinary tract problems, wounds	Roots	14
<i>Caucanthus auriculatus</i>	Skin infections, anti-inflammatory	Aerial parts	4
<i>Flabellaria paniculata</i>	Wound dressing, skin infections	Leaves	6, 7
<i>Heteropterys (Banisteria) leona</i>	Antiparasitic, tropical application for fevers and headache	Leaves, seeds, pods	6, 7

Malvaceae

<i>Abelmoschus esculentus</i>	Expectorant, asthma, anemia, cardiac problems, wounds, poultice for sprains, measles, anal and gum inflammations, ease childbirth, emollients, postpartum hemorrhage, gonorrhea	Fruits, leaves	4, 6, 14
<i>Abelmoschus moschatus</i>	Stomachic, digestive disorders, fevers, snakebite, rheumatism	Fruits, leaves	7
<i>Abutilon grandiflorum</i>	Mental illness, tonic, fevers	Leaves, roots	6
<i>Abutilon mauritianum</i>	Venereal diseases, emollient, periodic fevers, malaria, diarrhea, gonorrhea, inflammation, bronchitis, catarrh, ease childbirth and expel placenta, dysentery	Leaves, juice	4, 6
<i>Adansonia digitata</i>	Urinary tract disorders, diaphoretic for fevers, kidney, anti-inflammatory, mild diarrhea, asthma, fatigue, dysentery, kidney and bladder diseases, expectorant, astringent, tonic	Stem bark, leaves, fruits	6
<i>Ancistrocarpus densispinosus</i>	Dressing of circumcision wound, headache	Juice	11
<i>Azanza garckeana</i>	Liver diseases, painful menstruation, coughs, chest pain, female infertility, earache, venereal diseases, respiratory disorders, genitourinary ailments	Roots	4
<i>Bombax buonopozense</i>	Venereal diseases, constipation, antiviral	Leaves	6, 7
<i>Buettneria cordata</i>	Tonic, cough, cut stems yield potable water	Leaves	6
<i>Carpodiptera africana</i>	Aphrodisiac, conjunctivitis	Stem, roots	17
<i>Ceiba pentadra</i>	Stimulant, laxative	Roots, leaves	7
<i>Christiana africana</i>	Dysentery, diarrhea, palpitations, gonorrhea	Leaves, stem, roots	17

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Cienfuegosia heteroclada</i>	Convulsions in children, malaria	Leaves	4
<i>Cistanthera papaverifera</i>	Anthelmintic, skin diseases	Roots	6, 7
<i>Clappertonia ficifolia</i>	Fever in children	Roots	
<i>Corchorus olitorius</i>	Tonic, diuretic, laxative, vegetable for soups	Leaves, seeds	6, 7
<i>Desplatsia chrysochlamys</i>	Aphrodisiac, rheumatism, stomachache	Fruits, leaves, sap	14
<i>Desplatsia dewevrei</i>	Gonorrhea, angina, cardiac problems, wounds, insanity	Stem bark, leaves, fruits	4
<i>Duboscia macrocarpa</i>	Tuberculosis, nausea, toothache, mouthwash	Stem bark, fruits	
<i>Glyphaea brevis</i>	Vermifuge, venereal diseases, aphrodisiac, analgesic, indigestion	Fruits, juice, root	6
<i>Gossypioides kirkii</i>	Coughs	Leaves	14
<i>Gossypium arboreum</i>	Dysentery; emmenagogue; poultice of leaves and seed kernels used as dressing for sores, bruises, and swellings; roots used as abortifacient; seed paste applied for headache	Leaves, roots, whole parts	4, 7
<i>Gossypium herbaceum</i>	Abortifacient, earache, aphrodisiac, contraceptive	Roots, stem, seeds	14
<i>Gossypium hirsutum</i>	Dysmenorrhea, coughs, convulsions, furuncle, colic, hemorrhage, fevers, palpitation, anemia	Aerial parts, fruit, roots	14
<i>Grewia bicolor</i>	Sedative, insanity, anti-infective, intercostal pain, pleurisy, stomachache, CNS diseases, chest pain, swollen legs	Roots, twigs	7
<i>Grewia carpinifolia</i>	Female infertility, facilitates childbirth, anthelmintic, tonic	Leaves, fruit, root	6, 7
<i>Grewia coriacea</i>	Hemorrhoids, anthelmintic, yaws	Fruit pulp, leaves	
<i>Grewia forbesii</i>	Fevers, diabetes, aphrodisiac, lumbago, dysentery, malaria	Leaves, roots	11
<i>Grewia mollis</i>	Prenatal bath for difficult birth, wound dressing, stomachache, sweetening agent, diarrhea, myositis, rickets, body pains	Stem bark, leaves	6, 7
<i>Grewia tenax</i>	Tuberculosis, anemia, tonic, purgative, anthelmintic	Fruits, stem bark, roots	
<i>Grewia trichocarpa</i>	Skin ailments, ascariasis, furuncle, coughs, colds, abscess	Leaves, roots	
<i>Grewia villosa</i>	Syphilis, spleen, eye ache, stomachaches, wound dressing, muscular-skeletal system disorders, nutritional disorders, pregnancy/birth/puerperium disorders, anemia, pain, respiratory system disorders, sensory system disorders	Leaves, fruits	
<i>Heritiera utilis</i>	Aphrodisiac, skin diseases, leprosy, spasm, diarrhea, dysentery, paralysis, epilepsy, convulsions	Stem	17
<i>Hermannia depressa</i>	Metabolic disorders, diaphoretic, abdomen, anodyne, respiratory disorders, ease childbirth, coughs	Roots, whole plant	4, 17
<i>Hermannia gracilis</i>	Coughs, ease childbirth, anodyne	Whole plant	4

<i>Hibiscus acetosella</i>	Insanity, sexual asthenia, anemia, body pain	Leaves, flower calyx	4, 14
<i>Hibiscus asper</i>	Poison antidote, emollient, aphrodisiac, urethritis, external application, source of fiber	Fruits, leaves	6, 7
<i>Hibiscus cannabinus</i>	Syphilitic sores, conjunctivitis, jaundice, coughs, eczema, female sterility, hemorrhoids, boils, gonorrhea, malaria, irregular menstruation, tuberculosis, impotence	Leaves, root pulp	4, 14
<i>Hibiscus fuscus</i>	Coughs, pneumonia, tonsillitis, sciatic pain syndrome, diuretic, asthma, fevers, male impotence, tuberculosis		14
<i>Hibiscus micranthus</i>	Bronchitis, kidney problems, stomachache, convulsions, snakebite, wounds, threatened abortion	Whole plant, roots	4, 14
<i>Hibiscus sabdariffa</i>	Sexual asthenia, poulitice, cough, peristalsis, diuretic, mouthwash, toothache, laxative, boils, bronchitis, conjunctivitis, ease childbirth, hypotensive, tonic	Calyx, epicalyx, leaves, seeds	18
<i>Hibiscus surattensis</i>	Urinary tract inflammation, venereal diseases, coughs, inflammation of the uterus, diarrhea, abdominal pain, abscess, wounds, chicken pox, threatened abortion	Leaves	4, 14
<i>Hildegardia barberi</i>	Arterial hypertension	Leaves	14
<i>Hildegardia erythrophylon</i>	Diarrhea, skin infections	Stem	4
<i>Mansonia altissima</i>	Aphrodisiac, yaws, scabies, syphilis, leprosy	Stem, roots	4, 17
<i>Nesogordonia kabingaensis</i>	Dental problems, chew sticks	Leaves, twigs	17
<i>Pavonia senegalensis</i>	Diarrhea, ease childbirth, puerperium disorders	Roots	4
<i>Pavonia urens</i>	Diarrhea in babies, cough, insanity, impotence, ulcers, nausea, abdominal pain during pregnancy, oxytocic	Leaves, roots	4, 17
<i>Sida acuta</i>	Inflammations, catarrh, dysentery, nephritis, fevers, chest pain, convulsions, whitlow, swollen limbs, aphrodisiac, dystocia, male impotence	Leaves, stem, roots	4, 7, 14
<i>Sida alba</i>	Skin diseases, oral snakebite treatment, dysentery	Leaves	4, 6
<i>Sida cordifolia</i>	Anti-inflammatory, abortifacient, dysmenorrhea, diabetes, pneumonia, rheumatism, fevers, wounds, lumbago, breast abscess, dysentery, oxytocic	Roots	4, 7
<i>Sida linifolia</i>	Postcoital contraceptive, wounds, ulcers, uterine fibroma, chicken pox, abortifacient, abscess, jaundice, insomnia	Leaves, aerial parts	14
<i>Sida rhombifolia</i>	Demulcent, emollient for phthisis, diarrhea, snakebite, abortifacient, hypertension, pneumonia, splenomegaly, toothache, stomatitis, dizziness	Whole plant, leaves	6, 7, 14
<i>Sida serratifolia</i>	Pulmonary tuberculosis, diarrhea, gonorrhea	Roots	14
<i>Sida stipulata</i>	Rheumatism, inflammations, pneumonia, diarrhea	Leaves	4
<i>Sida veronicifolia</i>	Hypertension, threatened abortion, splenomegaly, syphilis, dysmenorrhea, oxytocic for childbirth	Leaves, whole plant	14
<i>Thespesia danis</i>	Abdominal swelling, severe menstrual pain, gonorrhea, back pain, hematuria	Roots	14

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Triumfetta cordifolia</i>	Dysentery, diarrhea, fevers	Leaves	11
<i>Triumfetta rhomboidea</i>	Angina, pneumonia, anti-inflammatory, headache, snakebites, pregnancy/birth/ puerperium disorders, diarrhea, dysentery, gonorrhea, hypertension	Leaves, stem bark, roots	
<i>Urena lobata</i>	Pneumonia, rheumatism, fevers, wounds, malaria, colds, dysentery, enteritis, goiter, indigestion, coughs, leukorrhea, rheumatism, tonsillitis, respiratory diseases	Roots, leaves, seeds	4, 17
Marantaceae			
<i>Maranta arundinacea</i>	Constipation, rituals	Leaves	7
<i>Marantochloa congensis</i>	Diarrhea, constipation, painful and abundant menstruation	Roots, leaf sap	
<i>Marantochloa leukantha</i>	Epilepsy, insanity, aphrodisiac, antidote for venomous stings, lactation stimulants (including veterinary), painkillers, emetics, pulmonary troubles, gonorrhea, stomachache	Leaves, roots	
<i>Marantochloa purpurea</i>	Bronchitis, coughs, epilepsy, insanity, ulcers	Leaves, seeds	
<i>Megaphrynium macrostachyum</i>	Jaundice, epilepsy, madness, poison antidote, weaning babies	Leaves, sap, fruits	
<i>Thalia geniculata</i>	Diarrhea, stem as divining rod, fevers	Leaves	16
<i>Thaumatococcus daniellii</i>	Liver disorders, laxative, sweetener for diabetics	Fruits, leaves	6, 7
Melastomataceae			
<i>Calvoa orientalis</i>	Diuretic, tonic, poison antidote	Roots	6, 7
<i>Cidemia hirta</i>	Wounds, colds, stomachache	Leaves	4
<i>Dichaetanthera africana</i>	Pulmonary problems, fevers, wounds, bronchitis	Leaves	14, 17
<i>Dichaetanthera corymbosa</i>	Fevers, vegetable	Leaves	17
<i>Dichaetanthera oblongifolia</i>	Amebic dysentery, bloody diarrhea	Twig tips	14
<i>Dissotis rotundifolia</i>	Analgesic, anti-infective	Leaves, fruits	7
<i>Dissotis senegamiensis</i>	Diarrhea, stomachache	Leaves, stem	7
<i>Memecylon flavovirens</i>	Pneumonia, venereal infections, stomach spasm	Roots, leaves	6, 7
<i>Memecylon polyanthemum</i>	Venereal diseases, toothache, general body pains	Leaves, bark	7
<i>Osbeckia congolensis</i>	Analgesic lotion for knee sprain, cough	Whole plant	6, 11
<i>Tristemma coronatum</i>	Lumbago, fevers, wound healing	Leaves	7

Meliaceae

<i>Carapa pocera</i>	Tonic, skin diseases, purgative, ophthalmia, impotence, rheumatism, bacterial infection, hydrocephalus in children, chest ailments, vaginal prolapse, anthelmintic, fatigue, fevers, coughs, insanity, stomachache	Stem, nuts, exudate	6, 7
<i>Cedrelopsis grevei</i>	Antifungal, anti-inflammatory, antiviral	Stem bark	16
<i>Ekebergia benguelensis</i>	Tonic, aphrodisiac pains	Fruits, roots	6, 7
<i>Ekebergia senegalensis</i>	Bronchitis, fevers, urinary tract infections, epilepsy, fish poison	Roots, leaves	6, 7
<i>Entandrophragma angolense</i>	Fevers, headache, stomachache, kidney pains	Bark sap	
<i>Entandrophragma cylindricum</i>	Bronchitis, fevers, urinary tract infections, colds, furuncle, wounds	Stem bark	6, 7
<i>Entandrophragma utile</i>	Diabetes, chronic sores, otitis, severe headache, kidney	Stem bark	6, 7
<i>Guarea cedrata</i>	Fevers, hemorrhoids	Stem bark	
<i>Khaya grandiflora</i>	Urogenital disorders, skin infections, hyperacidity, gonorrhea	Stem bark, roots	
<i>Khaya senegalensis</i>	Malaria, vermifuge	Leaves, stem bark	6, 7
<i>Lovoa trichilioides</i>	Dental caries, pulmonary diseases, anti-infective	Aerial parts	
<i>Melia azedarach</i>	Fevers, purgative, venereal diseases, malaria	Stem, leaves	7
<i>Melia volkensii</i>	Headache, cutaneous leishmania	Leaves, stem bark	7
<i>Pseudobersama mossambicensis</i>	Diarrhea, cytotoxic	Stem, leaves	4
<i>Pseudocedrela kotschy</i>	Stomachache, diarrhea, dysentery, diuretic, aphrodisiac, asthma, fever, edema, facilitate childbirth, rheumatism, externally for ulcers, mastitis, hemorrhoids, fractures, caries and gingivitis, liver cirrhosis, trypanosomiasis	Leaves, stem, roots	17
<i>Toona ciliata</i>	Fevers, jaundice, local embrocation	Stem bark	6
<i>Trichilia emetica</i>	Topically as antiparasitic diseases, tonic, antiepileptic	Stem bark, roots	6, 7
<i>Trichilia heudelotii</i>	Febrifuge, diuretic, aphrodisiac, cardiac	Stems, roots, leaves	6, 7
<i>Trichilia prieureana</i>	Gonorrhea, fevers, enema	Stem bark	7
<i>Turraea rotusta</i>	Fevers, diarrhea	Stem	7
<i>Turraea sericea</i>	Toothache, neuralgia, conjunctivitis, sleeping sickness, malaria	Leaves, roots	7
<i>Turraeanthus africanus</i>	Cough, fever, headache, epilepsy, filariasis, abortifacient, hernia	Stem bark	4, 17
<i>Turraea vogelii</i>	Filariasis, tonic, rituals	Leaves, stem, fruits	7

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
Melianthaceae			
<i>Bersama abyssinica</i>	Fevers, general body pain, headache, aphrodisiac, hemorrhoids, anthelmintic, rheumatism, cancer, lumbago, epilepsy, poisons, dysentery, gonorrhea	Stem bark, twigs, roots	11, 14
<i>Bersama paulinioides</i>	Vermifuge, purgative, weak infusion used for stomachache, ritual in bone fracture healing	Stem bark, roots	6, 11
<i>Melianthus dregeanus</i>	Snakebite, slow-healing sores, skin infections	Roots, leaves	11
Menispermaceae			
<i>Antizoma angustifolia</i>	Acute intestinal pains, anthelmintic, bladder ailments, glandular swellings	Roots	16
<i>Antizoma capensis</i>	Blood purifier for boils and syphilis, inflammation, diarrhea, catarrh	Roots	11
<i>Chasmanthera dependens</i>	Venereal diseases, anti-inflammatory, tonic	Roots, stem, leaves	6, 7
<i>Cissampelos owariensis</i>	Diarrhea, dysentery, colic, intestinal worms, pregnancy aid, digestive complaints, tonic for amnesia and psychosis	Aerial parts	
<i>Cissampelos parreira</i>	Bladder inflammation, diarrhea, dysentery, ulcers, colic, intestinal worms, digestive complaints, menstrual problems, urinary tract infection, diuretic, libido, kidney stone, arthritis	Aerial parts, rhizome	
<i>Cocculus hirsutus</i>	Fever, female sterility, nervous illness	Leaves	14
<i>Cocculus pendulus</i>	Venereal diseases, anti-inflammatory, yellow fever, hepatitis, jaundice, diuretic, tonic, anthelmintic	Leaves, roots	4
<i>Dioscoreophyllum cumminsii</i>	Tonic, febrifuge	Fruits, leaves	6, 7
<i>Epineurum cordifolium</i>	Circulation problems, anti-inflammatory, anemia, edema of the legs	Leaves, stem	16
<i>Jateorhiza macrantha</i>	Bleeding in pregnancy, snakebite	Stem, roots	
<i>Jateorhiza palmata</i>	General bitter tonic, aphrodisiac, fevers, stomachache, bronchitis, hypertension, dysentery, diarrhea	Roots, stem	6, 7
<i>Kolobopetalum auriculatum</i>	Analgesic, antispasmodic, antiparasitic	Stem bark, roots	7
<i>Limacopsis loangensis</i>	Convulsions, venereal diseases, stomachache	Roots, tuber	4, 14
<i>Penianthus longifolius</i>	Aphrodisiac, cough, wound healing, anthelmintic, otitis	Roots	4, 17
<i>Penianthus zenkeri</i>	Constipation, stomach pains, coughs	Roots, stem	6, 7
<i>Sphenocentrum jollyanum</i>	Aphrodisiac, cough, wound healing	Stem, fruits, roots	6, 7
<i>Stephania abyssinica</i>	Labor pains, fevers, tonic	Stem, root bark	6, 7
<i>Stephania dinklagei</i>	Vermifuge, dysentery, postpartum medication	Roots, leaves	6, 7
<i>Tiliacora chrysobotrya</i>	Analgesic, anthelmintic, fevers	Roots	16

<i>Tinospora bakis</i>	Tonic, fevers, diarrhea	Roots, leaves	7
<i>Tinospora cordifolia</i>	Fevers, parasitic infections, urethritis	Stem, root bark	7
<i>Tinospora fragosa</i>	Boils, snake repellant, preventive for animal anthrax, respiratory system disorders, rheumatism, body pains	Leaves, stem	17
Mimosaceae (see Leguminosae)			
Molluginaceae			
<i>Glinus lotoides</i>	Tapeworm	Seeds	14
<i>Glinus oppositifolius</i>	Headache, colds, swelling of toes and fingers, indigestion	Leaves	14, 17
<i>Mollugo nudicaulis</i>	Whooping cough, ritual anthelmintic	Whole herb, leaves	11
Monimiaceae			
<i>Xymalos monospora</i>	Intestinal worms, fevers	Leaves	4
Montiniaceae			
<i>Grevea madagascariensis</i>	Topical application for pains, stomachache	Aerial parts	4
<i>Kaliphora madagascariensis</i>	Skin diseases, fever	Leaves, fruits	4
<i>Montinia caryophyllacea</i>	Colds, dental caries, aphthous oral infections, expel placenta, body tremor, fevers, wounds	Roots, leaves	14
Moraceae			
<i>Antiaris toxicaria</i>	Latex as arrow poison ingredient, vermifuge, hepatitis, anodyne, in low doses as mild circulatory and cardiac stimulant, fevers, leprosy, expel placenta, rheumatism, toothache, burns	Leaves, seeds, stem bark	14, 17
<i>Broussonetia papyrifera</i>	Dysentery, hemorrhage, hemostatic, stomachic, astringent, diaphoretic, diuretic, galactagogue, hemostatic, laxative, ophthalmic, skin, stimulant, tonic, vulnerary, astringent, diuretic, tonic	Leaves, stem bark	17
<i>Chlorophora excelsa</i>	Tonic, inflammation	Roots, leaves, fruits	7
<i>Dorstenia holstii</i>	Antifungal, antiviral	Leaves	9
<i>Dorstenia multiradiata</i>	Venereal diseases, external anti-infective	Leaves	6, 16
<i>Ficus asperifolia</i>	Coughs, hemorrhoids, urethral antiseptic, fever	Leaves, fruits	6, 7
<i>Ficus exasperata</i>	Coughs, venereal diseases	Leaves	6, 7
<i>Ficus glumosa</i>	Mouthwash, toothache, carious tooth, cough, headache	Leaves, stem bark	

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Ficus lepreurii</i>	Cough, viral infection, inflammation, cold	Fruits, leaves	7
<i>Ficus natalensis</i>	Pains, venereal diseases, lumbago, arthritis, headache, induction of labor, cataract, toothache, malaria	Fruits, leaves	6
<i>Ficus ovatifolia</i>	Breast cancer, painful menstruation	Stem bark	
<i>Ficus platyphila</i>	Physical fitness tonic, arrow poison antidote	Twigs, fruits, stem bark	
<i>Ficus sur</i>	Cough, sore throat, diarrhea, stomach pain in babies, chest pain, infertility, uterine pain, gonorrhea, edema, pain, rheumatism, diarrhea, stomach problems, tonsillitis	Leaves, stem, shoots, sap	
<i>Ficus sycomorus</i>	Tuberculosis	Roots	
<i>Ficus thonningii</i>	Bronchitis, urinary tract infection, respiratory infections, cough, uterine hemorrhage, gonorrhea, tonic	Leaves, fruits	6
<i>Milicia excelsa</i>	Aphrodisiac, hypertension, spleen pain, lumbago, cough, asthma, heart trouble, stomach pain, abdominal pain, edema, ascites, dysmenorrhea, gonorrhea, filariasis, general fatigue, rheumatism, sprains, female infertility, galactagogue, aphrodisiac, tonic, purgative, rituals	Leaves, stem bark	
<i>Morus alba</i>	Diabetes, skin infection, wound healing, hypertension, analgesic, antihelmintic, antiasthmatic, antibacterial, antirheumatic, antitussive, astringent, diaphoretic, diuretic, emollient, expectorant	Leaves, fruits, all parts	7, 17
<i>Morus mesozygia</i>	Dysentery, rheumatism, lumbago, intercostal pain, neuralgia, colic, stiffness, debility, diarrhea	All plant parts	17
<i>Morus nigra</i>	Diabetes, diaphoretic, analgesic, laxative, anthelmintic, astringent, odontologic, purgative	Leaves, fruits, all parts	17
<i>Musanga cecropioides</i>	Facilitates childbirth, emmenagogue, fevers, abortifacient	Leaves, stem	6, 7
<i>Neosleotopsis kamerunensis</i>	Conjunctivitis, skin eruptions	Leaves	11
<i>Sleotopsis kamerunensis</i>	Fevers, skin infections, yellow fever	Leaves	7
<i>Treculia africana</i>	Laxative, chronic cough, skin infections, high-protein source, anthelmintic, carious teeth, whooping cough, leprosy, laxative	Fruits, leaves, stem	6, 7
<i>Trilepisium madagascariense</i>	Amenorrhea, neuralgia, rheumatism, conjunctivitis, anemia, dysentery, diarrhea, lumbar pains, circumcision wounds	Stem bark, leaves	14
Moringaceae			
<i>Moringa oleifera</i>	In children as dietary supplement, for rickets, kwashiorkor, fevers, bronchitis, headache, scurvy, abscesses, and digestant; in adults as digestant, antioxidant, scurvy, fevers, splenomegaly, gingival ulcers, pulmonary diseases, rheumatism, dystocia	Leaves, seeds, roots	6, 11

Musaceae			
<i>Musa errans</i>	Diarrhea, fevers	Fruits, leaves	6
<i>Musa paradisiaca</i>	Potent astringent, hemostatic, indolent ulcers, roasted for antidiarrhea effect, provides good pharmaceutical starch	Fruits, leaves	11
<i>Musa sapientum</i>	Anthelmintic, high blood pressure diet, aphrodisiac	Fruits, peel, leaves	6
Myricaceae			
<i>Morella spathulata</i>	Coughs, painkiller	Aerial parts	4
<i>Myrica kandiana</i>	Abdominal pain, diarrhea, smallpox, anthrax, impetigo, vaginal prolapse	Leaves, whole plant, roots	14
<i>Myrica kilimandscharica</i>	Abdominal pain, nerve stimulant, strengthening tonic, emetic, ankylostomiasis	Roots	14
<i>Myrica salicifolia</i>	General pain, toothache, bloody diarrhea, amebic dysentery, coughs, chest pain, dyspnea, convulsions	Stem bark, leaves	4, 14
<i>Myrica serrata</i>	Coughs, headache, dysmenorrhea, colds	Roots, fruits	4, 11
Myristicaceae			
<i>Brochoneura rarabe</i>	Antiviral, antifungal, analeptic	Leaves	11
<i>Coelocaryon preussii</i>	Blood in urine, dysmenorrhea, dysentery, anodyne, expectorant, cough, lung complaints, tachycardia, rheumatism, edema	Stem bark	17
<i>Coelocaryon sphaerocarpum</i>	Coughs, carminative, body pains	Fruits, leaves	4
<i>Myristica fragrans</i>	Carminative, postpartum medication, anti-inflammatory, depression, migraine	Whole plant, leaves, seeds	4, 11
<i>Pycnanthus angolensis</i>	Skin diseases, mouth sores, fevers	Seed fat, stem bark	6
<i>Pycnanthus kombo</i>	Skin infections, rheumatic pains	Leaves, flowers	6, 7
<i>Scyphocephalum mannii</i>	Gonorrhea, sterility in women, cough, excessive lactation	Stem bark	14
<i>Staudtia kamerunensis</i>	Gonorrhea, rheumatism, snakebite, skin diseases, edema, menstrual problems, dysentery, lung complaints, cough, wounds, aphrodisiac, yaws, scabies	Leaves, stem bark, seeds	4, 14
Myrothamnaceae			
<i>Myrothamnus flabellifolius</i>	Tonic, restorative, inflammation of the gum, injuries, circulatory system disorders, digestive problems, kidney, genitourinary disorders, infections/Infestations, analgesics, muscular-skeletal disorders, nervous disorders, colds	Leaves, aerial parts	4, 17
<i>Myrothamnus moschatus</i>	Inflammation, colds, analgesic	Leaves	4

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
Myrsinaceae (see Primulaceae)			
Myrtaceae			
<i>Coelocaryon klainei</i>	Anodyne, coughs, diarrhea	Stem bark	
<i>Coelocaryon preussii</i>	Blood in the urine, dysmenorrhea, dysentery, hemorrhoids, cough, lung complaints, tachycardia, rheumatism, edema, diarrhea, colic, expectorant, emetic, anodyne	Stem bark, sap	
<i>Eucalyptus citriodora</i>	Fevers, cold, toothache	Leaves	7
<i>Eucalyptus globulus</i>	Colds, fevers	Leaves, exudate	7, 16
<i>Eugenia caryophyllata</i>	Pneumonia, toothache, carminative	Fruits, leaves	6, 7
<i>Psidium guajava</i>	Dysentery, fever teas, stomachic	Leaves, stem, roots	7
<i>Syzygium aromaticum</i>	Carminative, tonics given after childbirth, asthma, abdominal pains, headache, hypertension	Buds, fruits, leaves	4, 6, 7
<i>Syzygium cordatum</i>	Coughs, depressed fontanel, rheumatism, diarrhea, tuberculosis, respiratory diseases, wounds, stomachache, amenorrhea, indigestion, emetic	Stem bark, leaves, roots	
<i>Syzygium guineense</i>	Stomachache, diarrhea, malaria, coughs, asthma, antispasmodic, purgative, anthelmintic, insanity, amenorrhea, rheumatism, venereal diseases	Leaves, stem bark	4, 17
Nelumbonaceae			
<i>Nelumbo nucifera</i>	Astringent, cardiotonic, febrifuge, hypertension, stomachic, styptic, tonic, vasodilator, indigestion, enteritis, chronic diarrhea, spermatorrhea, leukorrhea, insomnia, palpitations, premature ejaculation, bleeding gastric ulcers, excessive menstruation, postpartum hemorrhage, hypercholesterol	Aerial parts, flowers, rhizome	4, 17
Nyctaginaceae			
<i>Commicarpus (Boehavia) plumbagineus</i>	Leprosy, expectorant, emetic (high doses), jaundice, skin diseases, glandular swelling	Whole plant, leaves	4, 17
<i>Boehavia diffusa</i>	Dysmenorrhea, jaundice, asthma, diuretic, oxytocic, smallpox, venereal diseases, premature labor, hemorrhoids	Roots, leaves	6, 7
<i>Boehavia erecta</i>	Rheumatism, scabies, conjunctivitis, dyspepsia, abscesses, aphrodisiac, convulsions, hypertension	Roots, leaves	14
<i>Bougainvillea spectabilis</i>	Laxative, expectorant, and febrifuge	Leaves, fruits	7
<i>Mirabilis jalapa</i>	Swellings, spleen enlargement, dropsy	Fruits, roots	6, 7
<i>Pisonia aculeata</i>	Venereal diseases, muscular-skeletal disorders, rheumatism	Leaves	17

Nymphaeaceae

<i>Nymphaea lotus</i>	Pain relief, anxiety states	Leaves	6, 11
<i>Nymphaea nouchali</i>	Astringent, diarrhea, endocrine system disorders	Rhizome	4, 17

Ochnaceae

<i>Brackenridgea zanguebarica</i>	Dysmenorrhea, aphrodisiac, jaundice, snakebite, wounds, rectal prolapse, conjunctivitis, amenorrhea	Stem bark, roots	4
<i>Campylospermum deltoideum</i>	Fevers, body swelling	Stem bark, leaves	
<i>Campylospermum elongatum</i>	Diarrhea, venereal diseases, whitlow, stomachache	Leaves, roots	
<i>Campylospermum laeve</i>	Headache, toothache, stimulant (smoked)	Leaves, stem	
<i>Campylospermum schoenleinianum</i>	Purgative, stomachic	Root bark	
<i>Campylospermum sulcatum</i>	Aphrodisiac, impotence, headache	Stem bark	
<i>Lophira alata</i>	Fevers, rheumatism, anti-inflammatory, venereal infections, pains, dysmenorrhea, stomachache, cardiac pain, jaundice, leprosy	Stem bark, roots	6, 11
<i>Lophira lanceolata</i>	Fevers, anti-inflammatory, headache, hypertension, syphilis	Leaves, stem bark, roots	
<i>Ochna pulchra</i>	Malaria, indigestion, burns, nutritive for elderly	Leaves, fruits, roots	
<i>Ochna schweinfurthiana</i>	Laxative, stomachic, febrifuge, vermifuge, eye inflammation	Stem bark, leaves	4, 17
<i>Ouratea affinis</i>	Fevers, aphrodisiac, bronchitis	Leaves, root bark	
<i>Ouratea calantha</i>	Diabetes, laxative	Leaves	
<i>Ouratea flava</i>	Laxative, stomachic	Leaves	6, 7
<i>Rhabdophyllum affine</i>	Diabetes, aphrodisiac, sexual asthenia, respiratory diseases	Root bark	

Olacaceae

<i>Coula edulis</i>	Tonic, stomachache, skin diseases, dysentery, wounds, female sterility	Stem, fruit	6, 7
<i>Diogo zenkeri</i>	Skin infections, diarrhea, fevers	Fruits, leaves	4
<i>Heisteria parvifolia</i>	Convulsions, asthma, costal pain, stomach pain, migraine, menstrual problems, toothache	Leaves	17
<i>Heisteria zimmereri</i>	Digestive system disorders, dysmenorrhea, asthma, convulsions	Leaves	4
<i>Octoknema borealis</i>	Fevers, coughs	Stem	
<i>Olax dissitiflora</i>	Fevers, venereal infections, skin diseases	Roots, leaves	6, 7
<i>Olax manni</i>	Venereal diseases, snakebite, yellow fever, jaundice	Roots, leaves	6, 7
<i>Ongokea gore</i>	Laxatives for babies, splenomegaly	Stem	14

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Strombosia pustulata</i>	Cough, skin rehydration	Stem, roots	7
<i>Strombosiosis tetrandra</i>	Elephantitis, bronchitis, rabies, epilepsy, menstrual problems, induction of labor, wound healing, dysentery, syphilis	Stem bark	4, 17
<i>Ximenia americana</i>	Ulcer, ringworm, "crawl-crawl," febrifuge, astringent, skin diseases	Leaves, stem, roots	
<i>Ximenia caffra</i>	Conjunctivitis, syphilis, toothache, headache, malaria, sleeping sickness, purgative, abscess	Root, stem, leaves	6, 7
Oleaceae			
<i>Chionanthus battiscombei</i>	Scrotal swelling, venereal diseases	Aerial parts	4
<i>Chionanthus niloticus</i>	Constipation, scrotal swelling, stomachache, splenomegaly	Roots, twigs	14
<i>Chionanthus welwitschii</i>	Gonorrhea	Stem bark	14
<i>Jasminum dichotomum</i>	Wound dressing, parasitic skin infection, fevers	Leaves, berries	7
<i>Jasminum sambac</i>	Local application as anti-inflammatory agent, skin diseases	Leaves	16
<i>Olea capensis</i>	Respiratory tract infections, pains, emetic, anthelmintic, fevers, malaria	Leaves, stem bark	4, 17
<i>Olea europaea</i>	Laxative, inflammation, emollient	Leaves, unripe fruits	6
<i>Olea guineensis</i>	Measles, urinary tract infections, skin diseases	Leaves, fruits	6
<i>Schrebera trichoclada</i>	Hydrocele, leprosy, toothache, antidiysenteric, antienetic, anxiety states	Leaves, fruits, roots	6
<i>Scirpus articulatus</i>	Pain, fevers	Fruits, leaves	6, 11
Oliniaceae			
<i>Olinia rochetiana</i>	Cough in infants, fevers, coughs, dysmenorrhea, rheumatism, general pains, stimulants, tapeworm, bronchitis	Stem bark, roots	14
<i>Opilia celitidifolia</i>	Fever, flu, analgesic, anthelmintic, sleeping sickness, diuretic, purgative, in psychiatry	Roots, leaves	6, 7
Onagraceae			
<i>Ludwigia abyssinica</i>	Threatened abortion, abdominal pain, wounds, liver diseases and intestinal worm infestations in children	Leaves	17
<i>Ludwigia erecta</i>	Fevers, malaria	Leaves	4
<i>Ludwigia octovalvis</i>	Rheumatic pains, diarrhea, dysentery, laxatives, painkillers, vermifuges		
<i>Epilobium hirsutum</i>	Disinfectant, wounds, ulcers, skin infections	Leaves	17
<i>Fuchsia magellanica</i>	Skin inflammation/eruptions	Aerial parts	4

Orchidaceae			
<i>Aerangis thomsoni</i>	Anti-inflammatory, topical treatment of hernia, abscesses	Bark	11
<i>Bonatea steudneri</i>	Anthelmintic, carminative, colds	Roots	11
<i>Habenaria macrandra</i>	Purgative	Roots	4
<i>Podangis dactyloceras</i>	General body pain, anodyne	Whole plant	14
Orobanchaceae			
<i>Asepalum eriantherum</i>	Female infertility, snakebite, fevers	Roots	14
<i>Buchnera hispida</i>	Antiparasitic, scabies, eczema	Whole plant	17
<i>Cistanche phelypaea</i>	Digestive system disorders, diarrhea, genitourinary system disorders, menstruation	Tubers, whole plant	17
<i>Orobanche minor</i>	Fevers, spleen disorders	Leaves	
<i>Striga asiatica</i>	Leprosy, general healing, analgesic, contraceptive, stomachic, vermifuge, intestinal obstructions, gout	Whole plant	4, 17
<i>Striga gesnerioides</i>	Analgesic, stomachache, wounds, anodyne	Whole plant	17
<i>Striga senegalensis</i>	Headache, application to ulcers and intact skin in leprosy	Whole plant	11
Osmundaceae			
<i>Osmunda regalis</i>	Jaundice, diuretic, skin diseases, convulsions	Fronds, stem bark	
Oxalidaceae			
<i>Biophytum aphrodiscias</i>	Fevers, epilepsy, stomachache, used in magic rituals (believed to cause deep sleep and change victim's sex)	Leaves, whole herb	6
<i>Oxalis barrelieri</i>	Hemorrhoids, wound dressing, insect bites	Whole herb	
<i>Oxalis corniculata</i>	Wound dressing, diarrhea, cough, fever, dysentery, antidote	Leaves, whole herb	11
<i>Lepidobotrys staudtii</i>	Stomachache	Stem bark	
Palmae (see Arecaceae)			
Pandaceae			
<i>Microdesmis haumaniana</i>	Rheumatism, otitis, venereal diseases, hemorrhoids, diarrhea	Leaves	
<i>Microdesmis keayana</i>	Diarrhea, palpitation, abortifacients, ebolics, convulsions, antidote for venomous stings, bites, etc.; heart diseases, spasm, menstrual cycle; painkillers; paralysis, epilepsy, migraine	Stem bark, leaves, roots	

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Microdesmis pentandra</i>	Gastrointestinal disorders, aphrodisiac	Roots	
<i>Microdermis puberula</i>	Emmenagogue, threatened abortion, rheumatism, migraine, aphrodisiac, skin eruptions, venereal diseases, diarrhea, ulcers	Leaves, whole plant	6, 7
<i>Panda oleosa</i>	Skin diseases, seed fat applied to ulcers, hemorrhoids, rheumatism, wounds, yaws, sores, whitlow, swellings, abdominal troubles, threatened abortion, intestinal parasites, blennorrhea, anti-inflammatory, analgesic, aphrodisiac, bronchitis, dysmenorrhea	Fruits	6, 7, 17
Papaveraceae			
<i>Argemone mexicana</i>	Pains, sedative, catarrh, insecticide	Fruits, roots, latex	6, 11
<i>Papaver somniferum</i>	Anodyne, diarrhea, diaphoretic, expectorant, hypnotic, sedative, antispasmodic, antitussive, astringent, emmenagogue, narcotic	Fruits, roots, latex	17
Papilionaceae (see Leguminaceae)			
Passifloraceae			
<i>Adenia cissampeloides</i>	Diuretic, fevers, abortifacient, gall bladder problems, colic, dysentery, cholera, diaphoretic, gonorrhea, infertility, threatened abortion, dysmenorrhea, chest problems	Leaves, roots	14
<i>Adenia lobata</i>	Venereal diseases, fevers, coughs, bronchitis, malaria, oxytocic, gastrointestinal problems, headache, tachycardia, ease childbirth	Leaves, flowers, roots	4, 6, 7
<i>Androsiphonia adenostegia</i>	Head lice, antiparasitic	Leaves	6, 7
<i>Barteria fistulosa</i>	Aphrodisiac, male tonic, coughs, tuberculosis, body pains, fevers, headache, lumbar pain, rheumatism, insanity, venereal diseases, uterine hemorrhage, toothache, sores	Stem bark, roots, leaves	14
<i>Barteria nigrifolia</i>	Fevers, aches, stomach disorders, snakebite, gonorrhea	Leaves, fruits	6, 11
<i>Basananthe hanningtoniana</i>	Bronchitis, headache, coughs	Roots, stem	4
<i>Basananthe heterophylla</i>	Coughs	Root	14
<i>Basananthe longifolia</i>	Wound dressing, snakebite	Leaves, roots	11
<i>Crossostemma laurifolium</i>	Diabetes, tonic	Fruits	
<i>Deidamia commersoniana</i>	Splenomegaly, fevers	Leaves, roots	
<i>Efulensia clematoides</i>	Liver inflammation, spleen enlargement, jaundice, arrow poison	Leaves, roots	
<i>Passiflora edulis</i>	Febrifuge, purgative, jaundice	Leaves, fruits	6, 7
<i>Passiflora foetida</i>	Anxiety states, sleeplessness	Leaves	6, 7

<i>Schlechterina mitostemmatoides</i>	Malaria, aphrodisiac, excessive menstruation	Roots, leaves	4
<i>Smeathmannia laevigata</i>	Dysentery, toothache, skin diseases	Stem bark, leaves	6, 7
Pedaliaceae			
<i>Ceratotheca triloba</i>	Anti-infective, antitussive	Fruits, leaves	6
<i>Dicerocaryum zanguebarium</i>	Antiviral, anti-inflammatory	Leaves, roots	11
<i>Harpagophytum procumbens</i>	General tonic, analgesic, anti-inflammatory, allergies, sedative, facilitates childbirth, arteriosclerosis, sores, boils, migraine	Tubers, roots	16
<i>Josephinia africana</i>	Open wounds	Root pit	14
<i>Sesamum angustifolium</i>	Diarrhea, skin diseases, fevers	Leaves	6
<i>Sesamum indicum</i>	Purgative, bronchial complaints	Fruits, leaves	6
Penaeaceae			
<i>Olinia usambarensis</i>	Headache, diarrhea	Leaves	11
Phyllanthaceae			
<i>Antidesma madagascariense</i>	Decoction, dysentery, albuminaria, diuretic, astringent, diabetes, boils, muscle pains, jaundice	Leaves, bark	18
<i>Antidesma membranaceum</i>	Fevers, treatment of threatened abortion, stomachache	Leaves	6
<i>Bridelia atroviridis</i>	Purgative and diuretic, urethral discharges, fever, coughs, abdominal pain, dysentery, diarrhea, rheumatic pain, thrush, pain, asthma, venereal diseases	Leaves, stems	17
<i>Bridelia cathartica</i>	Fevers, viral infections, male infertility, malaria, anemia, cough	Stem, root bark	7
<i>Bridelia ferruginea</i>	Impotence, diuretic, dysentery, thrush in children, toothache, external applications, cough, diabetes	Leaves, roots	7
<i>Bridelia micrantha</i>	Cough, laxative, diabetes, dysentery, stomachache, emetic, throat inflammation, tapeworm, dysmenorrhea, gastritis, muscular skeletal disorders, conjunctivitis, gonorrhea, fevers	Leaves, stem bark	6
<i>Bridelia soleroneura</i>	Headache, mental disorders, syphilis, pain, peritonitis, anemia	Leaves, roots, twigs	6
<i>Keayodendron bridelioides</i>	Cough, bronchitis, kidney problems (external application)	Stem bark	17
<i>Meineckia ovata</i>	Fevers, parasitic skin diseases, stomachache	Aerial parts	4
<i>Phyllanthus amarus</i>	Stomachache, skin diseases, colds	Leaves	16
<i>Phyllanthus beillei</i>	Stomachache, aphrodisiac	Roots	1, 19
<i>Phyllanthus engleri</i>	Venereal diseases, pain relief, premenstrual cramps	Roots	16

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Uapacca guineensis</i>	Bronchitis, coughs, parasitic skin diseases, male impotence, rheumatism, female sterility, migraine, fevers, aphrodisiac, headache	Stem, roots	
<i>Uapaca heudelotii</i>	Jaundice, swellings, constipation	Stem bark, roots	
<i>Uapaca kirkiana</i>	Indigestion, malaria, worms, dysentery, insect repellent, fruits as tonic	Fruits, leaves	
<i>Uapaca nitida</i>	Malaria, wound dressing, coughs, aphrodisiac	Roots	
<i>Uapaca paludosa</i>	Female sterility, painful menstruation, dysentery, food poisoning	Stem bark	
<i>Uapaca sansibarica</i>	Expectorant, influenza, headache, rheumatism, fevers	Leaves, stem	
<i>Uapaca togoensis</i>	Fevers, impotence, malnutrition, general fatigue, jaundice	Stem bark	
<i>Zimmermannia capillipes</i>	Anthelmintic, stomachache	Aerial parts	
Phytolaccaceae			
<i>Hilleria latifolia</i>	Rheumatism, asthma, gonorrhea, skin infections, scabies, smallpox, jaundice, hemostatic, headache	Aerial parts	17
<i>Phytolacca dodecandra</i>	Sponges, fish poison, purge teniafuge, conjunctivitis, venereal diseases, bilharzia, rabies, malaria, sore throat, respiratory problems, rheumatic pain, jaundice, epilepsy	Fruits, leaves	6, 7, 17
Piperaceae			
<i>Piper capense</i>	Coughs, anthelmintic, fevers, insecticide	Leaves, fruits	6, 7
<i>Piper guineense</i>	Carminative, restorative soup after childbirth, embrocation for sprains	Leaves, fruits	7
<i>Piper nigrum</i>	Embrocation for sprains, colds, asthma remedy	Leaves, fruits	6, 7
<i>Piper umbellatum</i>	Hypertension, hypermenorrhea, dysmenorrhea, kidney pains, ascites, conjunctivitis, nephropathy, threatened abortion, fevers, gonorrhea, rheumatism, migraine, headache, earache, otitis, skin diseases, cough, abscess, abdominal pain	Leaves, fruits	4, 14
Pittosporaceae			
<i>Pittosporum viridiflorum</i>	Emetic, chest complaints, malaria, aphrodisiac, analgesic, digestive system disorders, sedative	Stem bark	17
Plantaginaceae			
<i>Bacopa crenata</i>	Conjunctivitis, wound healing, headache	Leaves	11
<i>Bacopa monnieri</i>	Diuretic, antispasmodic, kidney tonic, beriberi, hoarseness, brain tonic, rheumatism, epilepsy, hysteria, insanity, cardiac tonic, diarrhea	Whole plant, leaves	

<i>Plantago lanceolata</i>	Expectorant, laxative, colds, asthma, antibacterial, kidney stones, emphysema, bronchitis, fevers, gastritis, ulcers, bladder problems, female fertility, irregular menstrual flow, hypertension, general tonic, rheumatism, hay fever, general detoxifier, laryngitis, inflammation	Whole plant, seeds, roots	16
<i>Plantago major</i>	Diuretic and astringent, earache, wounds, insect stings, sunburn, skin diseases, eye irritation, inflammation of mouth and throat, conjunctivitis, toothache, gingivitis, nausea, asthma, constipation, rheumatism, intestinal pains, gout, wounds, eczema, skin infections	Leaves, roots	
<i>Plantago palmata</i>	Conjunctivitis, hemorrhoids, diarrhea, vaginal prolapse, hepatitis, gastrointestinal disorders, respiratory disorders, female fertility	Leaves, roots,	
<i>Scoparia dulcis</i>	Toothache, fevers, pimples, impetigo, ulcers, eczema, diuretic, gastric disorders, diarrhea, dysentery, coughs, bronchitis, hypertension, hemorrhoids, insect bites	Leaves, roots	6, 11, 17
Plumbaginaceae			
<i>Plumbago indica</i>	Vesicant, abortifacient, remedy for leprosy	Roots, stem bark	7, 16
<i>Plumbago zeylanica</i>	Parasitic skin diseases, piles, fevers, anthelmintic, vesicant, abortifacient, general anti-inflammatory	Roots, leaves, stem	6, 7
Poaceae			
<i>Andropogon gayanus</i>	Malaria, hiccups, fevers, skin diseases	Aerial parts	
<i>Bambusa vulgaris</i>	Aphrodisiac, sexual asthenia, arthritis	Young stem corms	14
<i>Chloris virgata</i>	Wound dressing, antiseptic, embrocation	Leaves	16
<i>Cymbopogon citratus</i>	Fever, jaundice, insect repellent, malaria tea, coughs, hypertension, stomachic, diarrhea	Leaves, aerial parts, roots	4, 7, 11
<i>Cymbopogon densiflorus</i>	Tonic, fever, styptic, carminative, coughs, bronchitis, epilepsy	Leaves, rhizome	4, 14
<i>Cymbopogon giganteus</i>	Fevers, gastritis, antimicrobial, poisoning, migraine, cerebrospinal meningitis, malaria, gonorrhea, tuberculosis, syphilis, stiffness of limbs, insanity, insect bites, yellow fever, epilepsy	Leaves	4, 14
<i>Cymbopogon martinii</i>	Febrifuge, digestive system disorders, respiratory disorders	Leaves, bulbs	4, 17
<i>Cymbopogon nardus</i>	Insect repellent, febrifuge, cosmetics, rheumatism, carminative	Leaves, essential oils	4
<i>Cymbopogon schoenanthus</i>	Diuretic, genitourinary diseases, tonic, muscle spasm, toothache, insanity, threatened abortion, convulsion, aphrodisiacs	Aerial parts	4, 14
<i>Digitaria sanguinalis</i>	Gonorrhea, emetic, ophthalmic (cataract)	Seeds, leaves	
<i>Echinochloa crus-galli</i>	Carbuncles, hemorrhages, sores, spleen trouble, cancer, wounds	Aerial parts, roots	
<i>Eragrostis curvula</i>	Famine food, appetite suppressant, diuretic tea	Leaves, seeds	

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Eragrostis tef</i>	Preparation of teff bread, digestive disorders, diabetes	Grains, leaves	
<i>Hordeum vulgare</i>	Jaundice, catarrh, diabetes, abortifacient, cancer, carminative, demulcent, digestive, diuretic, emollient, expectorant, febrifuge, galactofuge, hypoglycemic, lenitive, nutritive, poultice, stomachic	Caryopsis, shoots, seeds	
<i>Imperata cylindrica</i>	Sore throat, neuralgia, intestinal worms, diarrhea, dysentery, fevers, nausea, dropsy, jaundice, asthma, hematuria, influenza, antibacterial, emphysema, internal bleeding, nosebleed, cough, kidney diseases, blood purification, malaria, antitumor, diuretic, cosmetics, asthma	Various plant parts	
<i>Leersia drepanolox</i>	Wound dressing	Aerial parts	
<i>Leersia hexandra</i>	Severe cough, bronchitis, tuberculosis, tonic, dislocation, sprains	Whole plant, twigs	
<i>Lolium perenne</i>	Diarrhea, regulation of menstrual cycle, antitangrene	Leaves	11
<i>Oryza glaberrima</i>	Diarrhea, in soup for digestive problems, ulcer dressing	Seeds	
<i>Oryza longistaminata</i>	Famine food, diarrhea, diuretic	Seeds, leaves	
<i>Oryza sativa</i>	Ulcers, diarrhea	Seeds, seed husk	
<i>Oxytenanthera abyssinica</i>	Diabetes, colic, rheumatism, dysentery, edema, albuminuria, skin infections, genitourinary disorders, endocrine disorders	Aerial parts, roots	
<i>Panicum turgidum</i>	Antidiabetic, wound dressing, famine food	Seeds, shoots, leaves	
<i>Paspalum conjugatum</i>	Anorexia, hypermenorrhea, sore eyes, headache	Leaves, twigs	4
<i>Paspalum vaginatum</i>	Coughs, dysentery	Leaves	17
<i>Pennisetum purpureum</i>	Mild laxative, abdominal pains, deafness, vaginal wash, cataract, otitis, mouth diseases, toothache, wound dressing, gonorrhea	Leaves, roots	
<i>Phragmites australis</i>	Arthritis, bronchitis, cancer, cholera, cough, diabetes, diarrhea, dropsy, fever, gout, hiccups, jaundice, leukemia, nausea, pneumonia, rheumatism, sores, stomach pains, typhoid fever, rhinitis, bacterial meningitis, urinary tract infections	Leaves, seeds, twigs	
<i>Phragmites mauritanus</i>	Chest infections, pneumonia, bacterial infections	Stem	6, 11
<i>Pogonarthra squarrosa</i>	Bilharzia, skin infections	Root	11
<i>Saccharum officinarum</i>	Laxative, poultice, respiratory diseases, diarrhea	Stem, leaves	6
<i>Setaria barbata</i>	Epilepsy, muscle pains, convulsion in children	Sap, whole plant	14
<i>Setaria megaphylla</i>	Diarrhea, venereal diseases, ease childbirth, neuralgia, catarrh, stomachache, drowsiness, migraine, cough, convulsions, gonorrhea, antispasmodic, epilepsy	Leaves, shoots, stem	4, 14
<i>Setaria pumila</i>	Muscle pains, body bath, fumigant for convulsion in children	Leaves	
<i>Setaria verticillata</i>	Diarrhea, gonorrhea, scorpion bite	Aerial parts	6
<i>Sinaurindinaria alpina</i>	Aphthous oral infections, stomatitis, caries	Leaves	

<i>Sorghum bicolor</i>	Anemia, abortifacient, hepatitis, jaundice	Roots, red twigs, leaves	
<i>Themeda triandra</i>	Dysmenorrhea, nutritive	Roots	4, 14
<i>Urochloa mosambicensis</i>	Famine grain, diarrhea, skin diseases	Seeds, aerial parts	
<i>Urochloa reptans</i>	Snakebite remedy	Whole plant	
<i>Vetiveria nigriflora</i>	Diarrhea, antiseptic, digestive problems, ulcer dressing, insanity	Leaves, roots	
<i>Vetiveria zizanioides</i>	Carminative, diaphoretic, diuretic, emmenagogue, refrigerant, stomachic, tonic, antispasmodic, sudorific, insect repellent	Leaves, volatile oil, rhizome, seeds	
<i>Zea mays</i>	Jaundice, liver enlargement, gonorrhea, genitourinary diseases, cancer, cholagogue, demulcent, diuretic, hypoglycemic, lithontripic, stimulant, vasodilator, hypotensive	Style, leaves, cob	
Podocarpaceae			
<i>Afrocarpus falcatus</i>	Tuberculosis, meningitis, painkiller, gonorrhea, skin diseases	Aerial parts	
<i>Podocarpus elongatus</i>	Anti-infective	Aerial parts	
<i>Podocarpus madagascariensis</i>	Skin diseases	Leaves, seeds	
Polygalaceae			
<i>Atroxima afzeliana</i>	Female sterility, jaundice, bloody urine, gonorrheal orchitis	Roots, leaves	
<i>Carpolobia alba</i>	Genital stimulant/depressant, threatened miscarriage, fevers, arthritis, rheumatism, poison antidote	Leaves, stem, roots	4
<i>Carpolobia lutea</i>	General tonic, cough, indigestion, externally for pains	Roots, fruits	6, 7
<i>Muraltia heisteria</i>	Aphrodisiac, inflammation	Aerial parts	4
<i>Nylandtia spinosa</i>	Diarrhea, skin diseases	Aerial parts	4
<i>Polygala arenaria</i>	Skin diseases, flu, wound dressing	Leaves	6, 11
<i>Polygala stenopetala</i>	Sore throat, purgative, syphilis	Leaves	6, 11
<i>Securidaca longipedunculata</i>	Cough, indigestion, tape worm, syphilis, purgative	Leaves, stem bark	6
Polygonaceae			
<i>Oxygonum sinuatum</i>	Skin infections, amebiasis, fevers	Roots, leaves	11
<i>Polygonum barbatum</i>	Astringent, carminative, parasiticide, colic, scabies	Roots (rhizome)	
<i>Polygonum nepalense</i>	Fevers, aromatherapy for malaria, tonic	Aerial parts	
<i>Polygonum senegalense</i>	Rheumatic pains, syphilitic sores, inflammation	Leaves, whole plant	6, 11
<i>Rumex abyssinicus</i>	Bilharzia, purgative	Roots, leaves	6, 11

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Rumex crispus</i>	Alterative, antiscorbutic, astringent, cancer, cholagogue, depurative, laxative, poultice for skin diseases, salve, tonic, diarrhea, piles, bleeding of the lungs	Roots, whole plant	17
<i>Rumex lanceolatus</i>	Headache, colds, anthelmintic, abscess, wounds, tumors	Roots, leaves	11, 14
<i>Rumex nepalensis</i>	Rheumatism, colic, stomachache, abdominal pains, cough, headache, laxative, depurative, pneumonia, dysentery, venereal diseases, uterine bleeding, malaria, schistosomiasis, abortifacient, anthelmintic	Rhizome, leaves	4, 11, 17
<i>Rumex usambarensis</i>	Diabetes, gonorrhea, conjunctivitis, chest pain, dyspnea, polydipsia in pregnancy, threatened abortion, asthma, insanity, general pain, anthelmintic	Leaves, aerial parts	4, 14, 17
<i>Rumex vesicarius</i>	Dysentery, snakebites, scorpion stings, toothache	Leaves, seeds	17
Pontederiaceae			
<i>Eichhornia crassipes</i>	Skin infections	Aerial parts	4
Portulacaceae			
<i>Calyptrothea somalensis</i>	Digestive system disorders, stomachic	Leaves	17
<i>Portulaca oleracea</i>	Gastric sedative, earache, abscesses, boils, syphilis, hematuria, vermifuge	Leaves, seeds	11
<i>Portulacaria afra</i>	Ease childbirth, promote lactation	Leaves, aerial parts	17
Primulaceae			
<i>Embelia kraussii</i>	Teniacide, carminative	Leaves, stem, fruits	11
<i>Embelia schimperi</i>	Antispasmodic, anthelmintic, stomach disorders, marasmus, oxytocic, syphilis, antifertility, tachycardia, liver inflammation	Leaves, stem bark	11
<i>Maesa lanceolata</i>	Rituals, pimples, ringworm in children, stimulant	Fruits, stem	4, 17
<i>Myrsine africana</i>	Chest pains, anthelmintic, arthritis	Fruits	7
<i>Rapanea melanophloeos</i>	Anthelmintic, respiratory problems, stomach, muscular and heart complaints, spirit possession	Stem bark, fruits	4, 17
Proteaceae			
<i>Faurea rochetiana</i>	Diarrhea, ear infections	Roots	17
<i>Faurea saligna</i>	Fevers, diarrhea, indigestion, colic, cough, venereal diseases, schistosomiasis, dysmenorrhea, rheumatism, headache, skin complaints, pneumonia, lumbago, colic, intestinal parasites	Leaves, stem, roots	6, 7, 17
<i>Grevillea robusta</i>	Topical antifungal, leaves may cause contact dermatitis	Seeds	17

<i>Macadamia integrifolia</i>	Psoriasis	Kernel oil	4
<i>Mimetes cucullatus</i>	Skin diseases	Whole plant	4
<i>Protea caffra</i>	Gastric ulcers, bloody diarrhea, dizziness	Stem, roots	14
<i>Protea madiensis</i>	Amenorrhea, aphrodisiac, epilepsy, coughs, colic, fever, malaria, schistosomiasis	Stem, leaves, roots	4
<i>Protea repens</i>	Cough, chest and pulmonary complaints, diabetes	Flowers	14
<i>Protea welwitschii</i>	Diarrhea, dysentery	Roots	11
Ptaeroxylaceae (see Meliaceae)			
Quillajaceae			
<i>Quillaja saponaria</i>	Tonic, antiparasitic	Stem, root, leaves	16
Ranunculaceae			
<i>Clematis grandiflora</i>	Vesicant, headaches, skin diseases, rituals	Juice, leaves	6
<i>Clematis hirsuta</i>	Leprosy, skin diseases, fevers	Juice, leaves	7
<i>Ranunculus pubescens</i>	Scabies, purge, cough, sore throat, mumps	Leaves	6, 7
<i>Thalictrum rhyncho carpum</i>	Fevers, hypertension, diarrhea	Roots	11
Resedaceae			
<i>Cayusea abyssinica</i>	Abdominal pain, anthelmintic	Leaves, roots	17
<i>Ochradenus baccatus</i>	Anthelmintic	Aerial parts, stem	4
<i>Reseda odorata</i>	Diaphoretic, diuretic, laxative, essential oils	Roots, whole plant	17
Rhamnaceae			
<i>Berchemia discolor</i>	Menorrhagia, infertility, vomiting, general body pain	Root, white stem pith	14
<i>Berchemia zeyheri</i>	Dysentery, back pain, rectal inflammation in children	Stem bark	4
<i>Gouania longipetala</i>	<i>Taenia</i> infections, tonic, fever bath, venereal diseases	Leaves	4, 17
<i>Helinus integrifolius</i>	Skin diseases, venereal diseases, insanity, cellular tissue disorders	Roots, leaves	4, 17
<i>Helinus mystacinus</i>	Headache, stomachache in children, cracked nipples	Roots, leaves	14
<i>Lasiodiscus mildbraedii</i>	Stomachache, purgative for children	Stem bark	4
<i>Maesopsis eminii</i>	Bronchitis, mouth sores, venereal diseases	Leaves, stem bark	6, 7
<i>Noltea africana</i>	Fevers, anthelmintic	Aerial parts	4
<i>Sageretia thea</i>	Diuretic, substitute for tea, tonic	Leaves	4

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Scutia myrtina</i>	Stimulant, stomachache, gonorrhea, ringworm	Roots	17
<i>Ziziphus abyssinica</i>	Abortifacient, pneumonia, purgative, emetic, fevers, asthma, upper abdominal pain, tonsillitis, sore throat	Roots, stem, leaves	14
<i>Ziziphus mucronata</i>	Carminative, colds, diarrhea, anthelmintic, dysentery, fever, chest pain, epilepsy, rheumatism, gonorrhea	Leaves, fruits, stem	4, 7
<i>Ziziphus mauritiana</i>	Tonic, colds, antipyretic, anthelmintic, malaria, diarrhea, dysentery, tapeworm, rheumatism, glandular swellings, asthma, urinary incontinence, schistosomiasis, skin diseases, hypermenorrhea	Fruits, leaves	4, 7, 14
Rhizophoraceae			
<i>Anopyxis ealaensis</i>	Local application for sores and skin infections, fevers, external analgesic	Leaves	4, 6, 11
<i>Anopyxis klaineana</i>	Gonorrhea, skin diseases, bronchitis, lung complaints, kidney pain	Stem bark	17
<i>Bruguiera gymnorhiza</i>	Malaria, astringent, hemostatic, diabetes, hypertension	Roots, leaves	4, 17
<i>Carallia brachiata</i>	Septic poisoning and itch, venereal diseases	Stem bark, leaves	4, 17
<i>Cassipourea malosana</i>	Expel placenta, skin lightener, skin ailments, sunburn	Inner stem bark, leaves	17
<i>Cerlops tagal</i>	Malaria, astringent, hemostatic, ulcers, abdominal pains	Stem bark	4, 17
<i>Rhizophora racemosa</i>	Dysentery, fevers, coughs	Leaves, stem bark	11
Rosaceae			
<i>Alchemilla ellenbeckii</i>	Insanity, spirit possession, migraine	Leafy twigs	4, 14
<i>Alchemilla kivuensis</i>	Oxytocic, emetic, insanity, possession, tonic	Leafy twigs	14
<i>Alchemilla woodii</i>	Headache	Roasted whole plant	14
<i>Eriobotrya japonica</i>	Astringent, antidiarrhea, wounds, expectorant	Fruits, leaves	4, 17
<i>Hagenia abyssinica</i>	Diarrhea, fever, wound dressing	Leaves	11
<i>Leukosidea sericea</i>	Diarrhea, gastrointestinal disorders, ophthalmia	Whole plant, leaves	11, 14
<i>Prunus (Pygeum) africanum</i>	Inflammation, prostate gland disease, kidney disease	Roots, stem	6, 16
<i>Rubus pinnatus</i>	Gum bleeding, diarrhea	Roots	6, 11
Rubiaceae			
<i>Agathisanthemum bojeri</i>	Asthma, diarrhea, coughs, syphilis, worms, toothache, pain in the side, expel placenta, pharyngitis, snakebite	Roots, leaves, flowers	4, 14
<i>Aldia micrantha</i>	Skin diseases, fevers, parasitic infections	Stem bark, roots	7

<i>Amaralia bignoniiflora</i>	External applications for pains, coughs, indigestion	Roots, stem bark	6, 7
<i>Aoranthie cladantha</i>	Ovarian problems, galactagogue, diarrhea, backache, aphrodisiac, spleen pain	Stem bark	14
<i>Aulacocalyx jasminiflora</i>	Chew sticks, tooth cleaning	Twigs	4
<i>Borreria verticillata</i>	Liver problems	Aerial parts	
<i>Brenania brieyi</i>	Aphrodisiac, purgative, colic, cardiac problems, fevers, worms, expectorant	Fruits, stem bark	
<i>Breonadia salicina</i>	Tachycardia, pneumonia, purgative, yellow fever, malaria, wounds, colic, trypanosomiasis	Roots, leaves, stem	4, 14, 17
<i>Burchellia bubalina</i>	Fevers, malaria, rituals, love charm	Aerial parts	4, 17
<i>Canthium keniense</i>	Inflammation, stomachic, indigestion	Leaves, roots	7
<i>Canthium rubrocostatum</i>	General tonic, coughs, influenza, vermifuge	Roots, fruits	6
<i>Caphalea glaucescens</i>	Body swelling, anti-inflammatory	Twigs, flowers	4, 17
<i>Catunaregam nilotica</i>	Digestive system disorders, emetics, genital stimulants/depressants, venereal diseases	Fruits, stem bark	17
<i>Catunaregam spinosa</i>	Bronchitis, asthma, leukoderma, diseases of the brain, sores, diarrhea, dysentery, fever, nausea, general coughs, toothache, pains during pregnancy, dizziness, menorrhagia, depressed fontanel, snakebites, gonorrhea	Fruits, stem, roots	17
<i>Chassalia albiflora</i>	Wound dressing, liver diseases, inflammation	Fruits, leaves	6
<i>Cinchona succirubra</i>	Tonic, headache, with xylophia as remedy for sleeping sickness, used elsewhere as malaria remedy	Roots, stem bark	7
<i>Corynanthe mayumbensis</i>	Fevers, sexual asthenia (with roots of johimbe in severe cases)	Roots	14
<i>Corynanthe pachyceras</i>	Malaria, fevers, astringent, diarrhea, tonic, cardiac and kidney problems, aphrodisiac	Stem, roots	6, 7, 14
<i>Craterispermum cerinanthum</i>	Colic, coughs, ulcers	Leaves, stem bark, roots	
<i>Craterispermum laurinum</i>	High blood pressure, cough, toothache, fever, venereal diseases, wounds and sores, cosmetics, malaria, insecticide	Leaves, stem, roots	
<i>Craterispermum schweinfurthii</i>	Coughs, whooping cough, stomach ailments, fever, diarrhea, rheumatism, edema, sting pain; sores and wounds, venereal diseases, aphrodisiac	Stem bark	
<i>Crossopteryx febrifuga</i>	Antipyretic, antiviral, infertility, digestive system disorders, pregnancy/birth/ puerperium disorders, lactation stimulant, respiratory system disorders, coughs	Roots, stem bark	6, 17
<i>Danais fragrans</i>	Malaria, skin infections, wound healing, abscess, fevers	Bark, fruit juice	18
<i>Didymosalpinx abbeokutae</i>	Toothache, skin diseases, fevers, antiparasitic	All plant parts	
<i>Diodia rubricosa</i>	Smallpox, leprosy, amenorrhea, headache, ophthalmia, oral diseases, caries, mouthwash	Whole plant, sap	

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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Diodia sarmentosa</i>	Migraine, gastric pains, venereal diseases, rheumatism, tuberculosis, dislocations, sprains, analgesic	Leaves, whole plant	
<i>Diodia scandens</i>	Stomachache, earache, coughs, venereal diseases, snakebite	Leaves, roots, stem	7
<i>Fadogia agrestis</i>	Aphrodisiac, general tonic	Root stock	6, 7
<i>Fadogia erythrophloea</i>	Fevers, poison antidote	Leaves, berry	6, 7
<i>Feretia apodanthera</i>	Sedative, pain, antipyretic, snakebite, sexual asthenia, stomachic, kidney pains, constipation, urinary tract infection, inflammation	Roots, stem bark	6, 14
<i>Gardenia erubescens</i>	Venereal diseases, cosmetic applications, tonic, aphrodisiac	Fruit	6, 7
<i>Heinsia crinita</i>	Digestive system disorders, emetics, headache, tetanus in horses, malaria, skin rashes, amebic dysentery, gonorrhea, aphrodisiac, convulsions, abdominal pain, respiratory ailments, hernia, rheumatism, head lice, kidney problems	Leaves, roots	4, 14, 17
<i>Hymenodictyon flribundum</i>	Eclampsia, aphrodisiac, female infertility, dysmenorrhea, wounds	Roots, stem	14
<i>Hymenodictyon parvifolium</i>	Kidney pain, malaria, eclampsia, snakebite, eye inflammation	Roots, stem	4
<i>Ixora congesta</i>	Fevers, toothache, measles, bronchial infections, anti-inflammatory	Leaves, stem	6, 7
<i>Ixora rhodesiaca</i>	Measles, colds, antimicrobial, skin diseases	Fruits, leaves	6
<i>Keetia gueinzii</i>	Epilepsy, hydrocele, colic, abdominal pain, anthelmintic	Leaves	14
<i>Keetia leukantha</i>	Hemorrhoids, swellings, astringent, scorpion bite	Leaves, roots	14
<i>Keetia tenuifolia</i>	Malaria, headache, abscesses, stomachache	Leaves, roots	4, 14
<i>Keetia venosa</i>	Rheumatism, anthelmintic, vaginal prolapse	Leaves, roots	
<i>Keetia zanzibarica</i>	Convulsions, ankylostomiasis, abdominal pain, antispasmodic, malaria	Roots	4, 14
<i>Lagynias lasiantha</i>	Diarrhea, dysentery	Leaves	14
<i>Lagynias pallidiflora</i>	Paralytic stroke	Roots, leaves (external)	14
<i>Lasianthus kilimandscharicus</i>	Inflammation, stomachic	Stem bark	4
<i>Lasianthus pedunculatus</i>	Female infertility	Root	14
<i>Leptactina densiflora</i>	Antileishmanial, stomachache, fevers	Leaves, stem bark	7
<i>Massularia acuminata</i>	Arthritis, rheumatism, dropsy, swellings, edema, gout, kidneys, diuretic, liver, irregular menstrual cycle, diarrhea, pregnancy, antiabortifacients, venereal disease, dysentery	Stem bark	
<i>Meyna tetraphylla</i>	Rheumatism, skin diseases	Aerial parts	4
<i>Mitracarpus villosus</i>	Eczema	Aerial parts	
<i>Mitragyna ciliata</i>	Venereal diseases, malaria, African sleeping sickness, dysentery, ingredient in antisterility medicine	Stem, leaves, roots	6, 7

<i>Mitragyna inermis</i>	Malaria, mental illness, general body pain, fever, asthenia, ulcers, to ease childbirth, jaundice, gonorrhea, convulsions, diabetes	Leaves, stem bark, roots
<i>Mitragyna ledermannii</i>	Fever, vomiting, general weakness, hypertension, dysentery, colds, gonorrhea, amenorrhea, leprosy, chest pain, food poisoning, male sterility, childbirth, anthelmintic, diuretic, skin diseases	Leaves, stem bark
<i>Mitragyna rubrostipulata</i>	Dysmenorrhea, epigastric pain, migraine, liver inflammation, colic	Twigs, root bark
<i>Mitragyna stipulosa</i>	Malaria, fevers, skin diseases, venereal infections	Root, stem bark
<i>Morinda longiflora</i>	Colic, constipation, fevers, anthelmintic	Leaves, fruits
<i>Morinda lucida</i>	Antimalarial, fevers, pains	Roots, leaves
<i>Morinda morindoides</i>	Malaria, jaundice, constipation	Roots, stem bark
<i>Multidentia crassa</i>	Anthelmintic, otitis, throat inflammation, lesions	Roots, leaves
<i>Mussaenda atzeli</i>	Anti-inflammatory, conjunctivitis	Roots
<i>Mussaenda elegans</i>	Colds, antipyretic, gonorrhea	6, 7
<i>Nauclaea diderrichii</i>	Malaria, febrile, anemia, stomachache, indigestion	7
<i>Nauclaea vanderghuchtii</i>	Malaria, jaundice, liver diseases	Roots, stem bark
<i>Nauclaea xanthoxylon</i>	Gonorrhea, fever teas, malaria, inflammation, small pox	7
<i>Oldenlandia macrophylla</i>	Rheumatic pains, laxative, chronic conjunctivitis	Leaves
<i>Oncocalyx schimperi</i>	Bronchitis, liver diseases, skin eruptions, fevers	6, 7
<i>Oxyanthus speciosus</i>	Fevers, teeth cleaning	Roots
<i>Paederia bojeriana</i>	Stomachache, diarrhea, ankylostomiasis	Stem, flowers
<i>Pauridiantha callicarpoides</i>	Headache, intercostal pain, ulcers, wounds, migraine, scabies, dysmenorrhea, irregular menstruation, circumcision wounds	11
<i>Pauridiantha dewevrei</i>	Hernia, colic, convulsion in children	14
<i>Pauridiantha paucinervis</i>	Splenomegaly, wounds, malaria	Roots
<i>Pausinystalia johimbe</i>	Aphrodisiac, general tonic, diabetes-related male impotence, sexual asthenia, hypotension, insanity, malnutrition, debility, menstrual cycle, painkillers, mild stimulant	14
<i>Pausinystalia macroceras</i>	Aphrodisiac, tonic, anthelmintic, sexual weakness	Stem bark, fruits
<i>Pausinystalia talbotii</i>	Dysentery, sexual asthenia, tumors, fevers	Stem bark, fruits
<i>Pavetta corymbosa</i>	Jaundice, fracture, goiter, coughs	Twigs, leaves
<i>Pavetta crassipes</i>	Coughs, malaria, asthma, inflammation, urinary tract infections, worms, asthenia, tachycardia, snakebite, syphilitic sores, diarrhea, colds, swellings, mental illness, splenomegaly	14

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Pavetta schumanniana</i>	Headache, fevers, coughs, diarrhea, sore throat, infertility	Leaves	6, 14, 19
<i>Pentanisia schweinfurthii</i>	Fevers, diarrhea	Stem, leaves, roots	6, 7
<i>Pentas bussei</i>	Diarrhea, dysentery, fevers	Stem bark, leaves	7
<i>Pentas purpurea</i>	Dysmenorrhea	Roots	11
<i>Polysphaeria schweinfurthii</i>	Purgative, colds	Roots	11
<i>Porterandia spp</i>	Wound dressing, eczema, local pain relief	Leaves	6, 7
<i>Pseudocinchona africana</i>	Malaria, fevers, aphrodisiac	Roots, leaves	6, 7
<i>Psychotria warneckei</i>	Diarrhea, infantile fevers, assist women in labor	Leaves, stem	7
<i>Randia acuminata</i>	Insect bites, hemorrhage	Fruit pod, leaves	7
<i>Richardia brasiliensis</i>	Cataract (local application as eyedrops)	Leaves	14
<i>Rothmania longiflora</i>	Cosmetic paint, measles, jaundice	Fruit, leaves	6, 7
<i>Rothmania maculata</i>	Cosmetic paint for rituals, measles	Fruits, leaves	6, 7
<i>Rothmania whitfieldii</i>	Dysmenorrhea, check perspiration, dye	Fruits, roots	6, 7
<i>Rubia cordifolia</i>	Fevers, diarrhea, skin diseases	Stem, leaves	7
<i>Rutidea parviflora</i>	Conjunctivitis, wounds, dizziness	Roots, leaves, fruits	14
<i>Rytigynia beniensis</i>	Ascariasis, sciatic pain syndrome	Stem, leaves	14
<i>Rytigynia canthioides</i>	Anesthetic, palpitation, ulcers	Leaves	4
<i>Sabicea calycina</i>	Wound dressing, rheumatism, panacea	Roots	6, 7
<i>Sarcocephalus esculentus</i>	Febrifuge, tonic, hemorrhoids	Roots, stem, fruits	7
<i>Sarcocephalus latifolius</i>	Jaundice, hernia, venereal diseases, malaria, digestive system, kidneys, diuretics, painkillers, stomach troubles, vermifuges, arthritis, rheumatism, menstrual cycle, pulmonary infection	Stem bark, roots, leaves	
<i>Sarcocephalus pobeguinii</i>	Fevers, urinary tract infections, scabies, fungal infections, abortifacients, ecbolics; liver, painkillers, venereal diseases	Stem bark, roots, leaves	
<i>Schumanniohyton magnificum</i>	Dysentery, wound dressing, snakebite, aphrodisiac, ulcers	Leaves, stem bark	4, 7
<i>Spermacoce dibrachiata</i>	Dizziness, coughs, aphrodisiac, hepatitis, dysmenorrhea	Roots	14
<i>Spermacoce natalensis</i>	Dysentery, diarrhea, cardiac and chest complaints, vomiting	Roots, leaves	14
<i>Spermacoce princeae</i>	Swellings, conjunctivitis, coughs, wounds, skin diseases, dislocation, tonic for pregnant women, gastric ulcers	Leaves, whole plant	4, 14
<i>Spermacoce ruelliae</i>	Diarrhea, venereal diseases, dysmenorrhea, diuretic, hemorrhoids	Aerial parts	4

<i>Spermacoe verticillata</i>	Leprosy, fever in children, paralysis, skin diseases, wounds, whitlow, abortifacient, anemia, venereal diseases	Whole plant, leaves	14
<i>Tarenna gracilis</i>	Anthelmintic, repellent	Roots	4, 14
<i>Tarenna graveolens</i>	Malaria, articular rheumatism, ulcers, smallpox	Roots	14
<i>Tarenna littoralis</i>	Menopausal syndrome, amenorrhea, chest pain, coughs	Roots, leaves	4
<i>Tarenna pavettoides</i>	Cough, poison, nasopharyngeal affections	Roots, whole plant	14, 17
<i>Tennantia semii</i>	Fevers, diarrhea	Fruits	4
<i>Tricalysia ovalifolia</i>	Inflammation, snakebite	Roots	11
<i>Uncaria africana</i>	Cough, aphrodisiac	Stem bark, roots	7
<i>Uncaria gambier</i>	Wound dressing, mouthwash, astringent lotion	Stem bark, leaves	7
<i>Vangueria infausta</i>	Fevers, parasitic diseases	Stem, leaves, roots	11
<i>Xeromphis nilotica</i>	Poultice for muscular pains, emetic poison antidote	Fruit, root	11
Rutaceae			
<i>Adenandra villosa</i>	Stomachache, venereal diseases	Aerial parts	4
<i>Aeglopsis chevalieri</i>	Stomachache, antiparasitic	Fruit rind, leaves	16
<i>Afraegle paniculata</i>	Carminative, febrifuge, convulsions, rheumatism, mental illness, dysmenorrhea, postpartum pain, bronchitis, anthelmintic	Fruit rind, leaves	4, 16
<i>Agathosma betulina</i>	Inflammation, kidney and urinary tract infections, appetite stimulant, cystitis, prostatitis, digestive, carminative, cough, influenza, colds, hangover, rheumatism, gout, antispasmodic	Leaves	18
<i>Agathosma gnidioides</i>	Convulsions, fever, coughs, diaphoretic, sleep aid, rheumatism	Leaves	4, 11
<i>Arallopsis tabouensis</i>	Venereal diseases, stomachache, pulmonary diseases, subcutaneous parasitic infections, febrifuge	Roots, stem	7, 17
<i>Calodendrum capense</i>	Diarrhea, to dye the skin whitish, emollient	Stem bark, leaves, oil	4, 17
<i>Citrus aurantifolia</i>	Tonic, stomachache	Fruits (unripe)	7
<i>Citrus aurantium</i>	Carminative, tonic, stomachic	Fruits, leaves	6, 7
<i>Citrus paradisi</i>	Tonic, skin infections	Fruits	6, 7
<i>Citrus sinensis</i>	Laxative, leaves for fever, malaria steam therapy	Fruits, leaves	6, 7
<i>Clausena anisata</i>	Fever, headache	Roots, leaves	7
<i>Diosma thyrsoiflora</i>	Diarrhea, pulmonary diseases	Aerial parts	4
<i>Fagaropsis angolensis</i>	Malaria, expectorant, male sterility	Stem bark	17
<i>Fagaropsis hildebrandtii</i>	Fevers, bronchitis	Aerial parts	4

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Harrisonia abyssinica</i>	Fevers, general pain relief, dyspnea	Leaves, roots	11
<i>Harrisonia occidentalis</i>	Skin diseases, laxative	Root bark	6, 7
<i>Oricia saueolens</i>	Toothache, fevers, antiparasitic	Stem bark, leaves	16
<i>Ruta graveolens</i>	Colds, fevers, typhoid and scarlet fever, infant convulsion	Leaves, juice	6, 7
<i>Teclea (Vepris) nobilis</i>	Pneumonia, fevers, diaphoretic, rheumatism, syphilis, expectorant	Leaves, roots	14
<i>Teclea (Vepris) simplicifolia</i>	Chest problems, leprosy, gonorrhea, stomachache, toothache	Stem bark, roots	14
<i>Thamnosma africana</i>	Genitourinary system disorders, anodyne, insect repellent, coughs, respiratory disorders, menstruation regulation, female fertility, influenza	Leaves, whole plant	17
<i>Thamnosma rhodesicum</i>	Influenza, colds, infections, mosquito repellent, sinusitis, menstrual problems, expel placenta, headache	Aerial parts, roots	14
<i>Toddalia asiatica</i>	Fevers, inflammation, cough, insect bites	Leaves, roots	11
<i>Vepris heterophylla</i>	Diuretic, antipyretic, conjunctivitis, high blood pressure	Leaves	17
<i>Vepris (Araliopsis) soyauxii</i>	Skin infections, gonorrhea	Stem bark, roots	4
<i>Vepris verdoorniana</i>	Hypertension, coughs, anthelmintic, conjunctivitis	Leaves, twigs, roots	4, 14
<i>Zanthoxylum amaniense</i>	Toothache, fevers, anodyne	Stem bark	
<i>Zanthoxylum capense</i>	Colds, fever, influenza, cough, pleurisy, bronchitis, syphilis, gastrointestinal disorders, internal parasites, toothache, gall sickness	Stem bark, twigs	
<i>Zanthoxylum chalybeum</i>	Stomach pains, edemas, malaria, colds, asthma, ankylostomiasis, diarrhea, venereal diseases, toothache, pneumonia, rheumatism, fevers	Stem bark	7
<i>Zanthoxylum davyi</i>	Chest pain, mouth ulcers, cough, cold, boils, pleurisy, toothache	Stem bark	
<i>Zanthoxylum gilletii</i>	Fevers, bacterial infections, cough, gonorrhea, schistosomiasis, severe diarrhea, aphrodisiac, enlarged spleen, pain after childbirth, burns, rheumatism, headache, stomachache, toothache, dysmenorrhea	Stem bark	11
<i>Zanthoxylum lepreurii</i>	Gingivitis, diuretic, purgative, venereal diseases, toothache, wounds, leprosy, aphrodisiac, kidney pain, postpartum pain, rheumatism	Stem, twigs	
<i>Zanthoxylum usambarense</i>	Venereal diseases, fevers, malignant catarrhal fever, toothache, respiratory tract infections, sore throat, tonsillitis, chest pains, cough	Stem bark	
<i>Zanthoxylum viride</i>	Aphrodisiac, toothache, male impotence, rheumatism, gonorrhea	Leaves, stem bark	
<i>Zanthoxylum zanthoxyloides</i>	Toothache, sickle cell anemia, venereal diseases, malaria, syphilis, oral hygiene, general tonic, antiseptic, analgesic, diaphoretic, tuberculosis, paralysis, edema, general body weakness, chew sticks, hemorrhoids, abscesses, snakebites, yaws, conjunctivitis, sore gums	Roots, stem	6, 7

Salicaceae

<i>Salix babylonica</i>	Pain relief, fevers, embrocation, rheumatism, wound dressing	Leaves, bark	11
<i>Salix capensis</i>	Analgesic, fever remedy	Leaves, bark	11
<i>Salix subserata</i>	Body pains, anti-infective	Leaves, bark	6, 7

Salvadoraceae

<i>Azima tetraacantha</i>	Snakebite, wound dressing, body pains, toothache, dropsy, diuretic, dyspepsia, chronic diarrhea, stimulant tonic	Roots	4, 16
<i>Dobera glabra</i>	Mineral and vitamin source, sensory system disorders	Stem bark, fruits	4
<i>Salvadora persica</i>	Tooth cleaning, venereal diseases, catarrh	Stem, root bark	6, 11

Santalaceae

<i>Korthalsella japonica</i>	Jaundice, diarrhea	Stem bark	4
<i>Okoubaka aubrevillei</i>	Dermatological diseases from syphilis and leprosy, edema, poison antidote, tiredness, depression, allergies, infections, rituals, immunostimulant, hematomas, tachycardia	Stem bark	4, 17
<i>Osyridicarpos schimperianus</i>	Malaria, fevers, swelling of the breasts	Stem bark	4, 17
<i>Osyris abyssinica</i>	Wound dressing, galactagogue, amenorrhea, infertility, venereal disease	Leaves, root	11
<i>Santalum album</i>	Cosmetics, perfumery, vomiting, stomachache, gonorrhea	Exudates	17
<i>Thesium lacinulatum</i>	Genitourinary system disorders, uterine tonic	Roots, leaves	17
<i>Thesium viride</i>	Jaundice, liver enlargement, splenomegaly	Aerial parts	4
<i>Viscum capense</i>	Diarrhea, bronchitis, asthma, irregular menstruation, hypermenorrhea, hemostatic, nosebleed, epilepsy	Aerial parts	4, 11, 14
<i>Viscum rotundifolium</i>	Fevers, remove warts, heart ailments, tonic	Aerial parts	4, 11
<i>Viscum tuberculatum</i>	Pneumonia	Twigs	14

Sapindaceae

<i>Allophylus africanus</i>	Diarrhea, arthritis, headache, anthelmintic, colic, infertile fevers, nasal congestion, hemorrhoids, lactation induction	Fruits, leaves, roots	6, 7
<i>Aporrhiza nitida</i>	Malaria, epilepsy, bronchitis	Roots, leaves	4, 14
<i>Aporrhiza paniculata</i>	Tuberculosis, gonorrhea	Stem bark, roots	14
<i>Blighia sapida</i>	Externally as a body stimulant, considered poisonous, weak decoction used in wasting disease	Stem bark, leaves	6, 7

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Blighia uniugata</i>	Hemostatic, especially in childbirth, antihelmintic, tonic, fish poison	Roots, pods, leaves	6, 7
<i>Cardiospermum grandiflorum</i>	Antifungal, analgesic	Leaves, stem	11
<i>Cardiospermum halicacabum</i>	Antifungal, antipyretic	Leaves, fruits	11
<i>Chytranthus atroviolaceus</i>	Coughs, migraine, stimulant, fracture, cardiac problems	Stem, fruits, root	14
<i>Chytranthus priuriatus</i>	Oxytocic, ease childbirth, dysmenorrhea	Roots	4, 14
<i>Deinbollia grandiflora</i>	Jaundice, mental illness, tachycardia, headache, postpartum, hemorrhagic fevers, hemorrhage, antihelmintic, stomachache, nervous disorders, ache, constipation	Roots, leaves	6, 7
<i>Dialiopsis africana</i>	Scabies, sores, diarrhea, colds	Leaves, stem	7
<i>Dodonaea viscosa</i>	Febrifuge, cough, dysmenorrhea, irregular menstruation, sprains, bruises, burns, wounds, digestive system disorders	Fruits, leaves	11, 17
<i>Ganophyllum giganteum</i>	Respiratory tract diseases, dysmenorrhea, epilepsy, convulsions, sterility and impotence, rheumatism, stomachache, trypanosomiasis	Fruits, stem bark	17
<i>Haplocoelopsis africana</i>	Diabetes, jaundice, inflammation	Aerial parts	4
<i>Haplocoelum foliosum</i>	Eye lotion, toothbrush	Stem	17
<i>Lecaniodiscus cupanioides</i>	Fevers, hepatomegaly, dressing for burns, sores, measles	Leaves, root, stem	9, 16
<i>Lecaniodiscus cupanioides</i>	Wounds, dressing for sores, abdominal swelling caused by liver abscess, fevers	Stem bark, leaves	8
<i>Majidea forsteri</i>	Skin diseases, liver enlargement	Leaves	
<i>Pancovia laurentii</i>	Coughs, gonorrhea	Fruit sap, roots	14
<i>Pappea capensis</i>	Ankylostomiasis, fermented alcoholic beverage as tonic, stomachache, eye diseases, aphrodisiac, ringworm, venereal diseases, chest pain	Leaves, stem bark, seeds	4, 14
<i>Paullinia pinnata</i>	Fever, bronchitis, jaundice	Leaves	6, 7
<i>Zanha africanus</i>	Galactagogue, constipation, labor induction, epilepsy	Roots	7
Sapotaceae			
<i>Afrosersalisia kassneri</i>	Anti-inflammatory, prolapse of the uterus	Leaves, roots	7
<i>Baillonella toxisperma</i>	Kidney problems, toothache, rachitis, vaginal infections, respiratory and digestive system disorders	Stem bark	
<i>Bequaertiodendron natalense</i>	Abdominal pains, tonic	Roots, fruits, exudate	6
<i>Chrysophyllum africanum</i>	Diarrhea, nausea, stomachic, promotes lactation, sores, carminative	Fruits, stem bark	6
<i>Chrysophyllum albidum</i>	Antiemetic, antimalarial, antidiarrheal	Fruits	7
<i>Chrysophyllum perpulchrum</i>	Tonic, anodyne, galactagogue, aphrodisiac, jaundice, asthma, madness	Stem bark, leaves, fruits	

<i>Englerophyllum magalismontanum</i>	Arthritis, muscular-skeletal disorders, nervous disorders, convulsion, headache, rheumatism, epilepsy, paralysis	Stem bark, fruits, roots
<i>Englerophyllum natalense</i>	Rheumatism, impotence, sterility in men, stomachache	Roots
<i>Lecomtedoxa klaineana</i>	Tonic to mothers after childbirth, anti-inflammatory	Leaves
<i>Mimusops andongensis</i>	Malaria, penile stimulant, diarrhea	Latex from stem
<i>Mimusops caffra</i>	Astringent, wounds, sores	Stem bark
<i>Mimusops elengi</i>	Diarrhea, inflammation of the gums, toothache, headache, wounds, sore eyes, gonorrhea, fevers, diarrhea, skin diseases	Leaves, stem bark, flowers
<i>Mimusops kummel</i>	Wound healing, skin diseases, ascariasis, laxative, galactagogue	Roots, seeds
<i>Mimusops maxima</i>	Diarrhea, dysentery, hemorrhage	Leaves, fruits
<i>Mimusops obtusifolia</i>	Gonorrhea, stomach pain, emetic	Stem bark
<i>Mimusops zeyheri</i>	Candidiasis, wounds and ulcers, tonic	Leaves, stem bark
<i>Manilkara lacera</i>	Wound healing, skin diseases	Stem bark, latex
<i>Manilkara sulcata</i>	Skin diseases, measles, venereal infections	7
<i>Omphalocarpum elatum</i>	Constipation, wound dressing, syphilitic sores, malaria, scrotal elephantiasis, yaws, purgative, coughs	6, 7
<i>Omphalocarpum procerum</i>	Emetic, genital stimulants/depressants; lactation stimulants, painkillers, pulmonary problems, stomach problem, vermifuges	6, 7
<i>Pouteria adolfi-friedericii</i>	Stomachache, taenicide	Roots
<i>Sideroxylon inerme</i>	Hernia, diaphoretic, coughs, conjunctivitis, paralysis	Fruits, stem bark
<i>Synsepalum brevipes</i>	Jaundice, nausea, malaria, intestinal hookworm, coughs, nausea, dropsy, swellings, edema, gout, stomachache	17
<i>Synsepalum dulcificum</i>	Parasitic skin infections, sweetener, rituals	14
<i>Tieghemella africana</i>	Rheumatism (externally)	6, 7
<i>Tridesmostemon omphalocarpoides</i>	Rheumatism, wounds, syphilis, stomachache, cardiac problems	Fruits, leaves
<i>Vitellaria paradoxa</i>	Emollient, rheumatic aches, facilitates childbirth, headache, eye bath, amebic dysentery, diarrhea, oxytocic, ascites, mouth infections, nasal congestion, insanity	7, 11
Scrophulariaceae		
<i>Buddleja acuminata</i>	Tapeworm	Fat
<i>Buddleja asiatica</i>	Expectorant, tonic, fevers	Stem bark
<i>Buddleja axillaris</i>	Insecticide, anthelmintic	Seed fat, leaves
<i>Buddleja polystacha</i>	Antifertility, uterotonic, anti-implantation, ophthalmia	4, 17
		4, 7
		14
		Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Buddleia saligna</i>	Coughs, colds, purgative	Leaves, roots	11, 14
<i>Buddleia salviifolia</i>	Stomachache, diarrhea, flatulence, coughs, ophthalmia	Leaves, roots	4, 11, 14
<i>Camptoloma rotundifolium</i>	Anodyne, orally and externally for body pains, burns, injuries	Roots,	4
<i>Cynium camporum</i>	Snakebite, wounds	Leaves, whole plant	14
<i>Cynium herzfeldianum</i>	Hemostatic, exhaustion, marasmus	Aerial parts, leaf sap	14
<i>Cynium racemosum</i>	General body pain, emetic, ease childbirth	Roots	14
<i>Sutera atropurpurea</i>	Headache, anxiety states, coughs	Leaves	6, 11
<i>Sutera burkeana</i>	Conjunctivitis, cataract, insanity, abdominal pain, ease childbirth	Leaves, whole plant	4, 11
Scytopetalaceae (Lecythidaceae)			
Selaginellaceae			
<i>Selaginella cafrorum</i>	Headache, venereal sores	Rhizome	14
<i>Selaginella cathedrifolia</i>	Dizziness, analgesic	Leaves	4
<i>Selaginella imbricata</i>	Toothache	Frond	6, 11
<i>Selaginella myosurus</i>	Oxytotic, splenomegaly, headache, bronchitis, fevers, gonorrhea, ringworm, eye diseases	Leaves, whole plant	14
<i>Selaginella rupestris</i>	Smoke with <i>Lycopodium</i> species for headache, dressing for syphilitic sores	Rhizome	11
Simaroubaceae			
<i>Brucea antidysenterica</i>	Diarrhea, dysentery, parasitic skin diseases	Leaves	11
<i>Brucea ferruginea</i>	Fevers, stomachache, constipation	Leaves	11
<i>Hannoa klaineana</i>	Fevers, colic venereal diseases, embrocation for pains	Stem bark, leaves	7
<i>Mannia africana</i>	Fruit rind and leaves as tonic, seed lotion for lice	Fruits, leaves, seeds	6, 7
<i>Odyndyea gabonensis</i>	Stomachache, bronchitis, lung complaints, head lice, psoriasis	Stem bark, leaves	
<i>Quassia africana</i>	Febrifuge, tonic, anthelmintic	Stem, leaves	6, 7
Siparunaceae			
<i>Glossocalyx longicuspis</i>	Fevers, abdominal pains	Leaves	4
Smilacaceae			
<i>Smilax kraussiana</i>	Venereal diseases, tonic, fevers	Roots	7

Solanaceae

<i>Capsicum annuum</i>	Carminative, rubefacient, appetite stimulant	Fruits	11
<i>Capsicum frutescens</i>	Cough, carminative, embrocation for fractures	Fruits	6, 11
<i>Cestrum nocturnum</i>	Sedative, antimicrobial	Stem bark, leaves	6, 11
<i>Cyphomandra betacea</i>	Digestive system disorders, anemia, respiratory diseases, male prostate inflammation, tonsillitis, vitamin C	Fruits, roots	4, 17
<i>Datura metel</i>	Additive to palm wine for its narcotic effect, remedy for nervous disorders, eye diseases	Leaves	6, 11
<i>Datura stramonium</i>	Asthma, coughs, external applications	Leaves	6, 11
<i>Discopodium eremanthum</i>	Respiratory diseases, pains	Leaves	4
<i>Discopodium penninervium</i>	Rectal prolapse, coughs, tonic for pregnant women	Leaves	14
<i>Lycium cinereum</i>	Anodyne, kidney disease, perfume	Roots	4
<i>Lycium shawii</i>	Tapeworm, mouth sores, constipation, stomachache	Leaves	17
<i>Lycopersicum esculentum</i>	Urinary antiseptic, local embrocation, coughs, prostate inflammation	Unripe fruits, roots	6, 11
<i>Nicandra physalodes</i>	Digestive system disorders, flatulence, insecticide	Leaves	4
<i>Physalis angulata</i>	Bacterial infection, fevers, childbirth, anthelmintic, diarrhea, diabetes, whitlow, dystocia, scabies, pneumonia	Leaves, fruits	4, 6, 11
<i>Physalis peruviana</i>	Angina, diuretic, cough, chest problems, fevers, inflammation	Leaves, roots	14
<i>Schwenkia americana</i>	Mouth infection, teeth cleaning, rheumatic pains, chest pains, mouth infection, fevers, ingredients in Yoruba Agbo medicine	Stem, leaves	6, 11
<i>Solanum aethiopicum</i>	Digestive disorders, urethritis	Leaves, fruits	6
<i>Solanum duplosinuatum</i>	Skin diseases, poison antidotes, expulsion of placenta	Leaves, fruits	6
<i>Solanum incanum</i>	Skin diseases, fevers, stomachache, expulsion of placenta	Fruits, leaves, roots	11
<i>Solanum macrocarpon</i>	Cardiac diseases, bulk laxative	Leaves, fruits	11
<i>Solanum nigrum</i>	Stomach, laxative, psoriasis	Leaves, fruits	6, 11
<i>Solanum torvum</i>	Tonic, hemopoietic agent, pains	Leaves	6
<i>Withania somnifera</i>	Fever, convulsions, rheumatic pains	Leaves	6

Sphenocleaceae

<i>Sphenoclea zeylanica</i>	Venereal diseases, dysentery	Aerial parts	4
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Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
Sterculiaceae (Malvaceae)			
<i>Abroma angulata</i>	Dysentery, skin diseases, menstruation disorders, fertility, male tonic	Roots, stem bark, leaves	7
<i>Chlamydocola chlamydyantba</i>	Intestinal pain, coughs, eye inflammation	Stem, inner pod	
<i>Cola acuminata</i>	Stimulant, topical analgesic; ceremonies	Fruits	6, 7
<i>Cola attensis</i>	Local application for pains, headache, migraine, syphilis, fevers	Fruits	6, 7
<i>Cola cordifolia</i>	Diuretic, kidney diseases, laxatives, leprosy, ritual, pulmonary troubles, venereal diseases	Seeds, leaves	
<i>Cola gigantea</i>	Hemorrhoids, dropsy, swellings, edema, gout, leprosy; painkillers	Seeds, pods	
<i>Cola laurifolia</i>	Digestive system disorders, diarrhea, dysentery	Seeds, leaves	
<i>Cola lepidota</i>	Seed oil for coughs, fever remedy, antiviral	Fruits	6, 11
<i>Cola nitida</i>	Stimulant, healing rituals, diarrhea, dysentery, CNS stimulant, thirst suppressant, ceremonial plant	Fruits, leaves	6, 7
<i>Cola pachycarpa</i>	Coughs, internal fever	Fruits, leaves	
<i>Dombeya mupangae</i>	Venereal diseases, insanity	Roots, stem	6
<i>Dombeya rotundifolia</i>	Syphilis, ritual	Stem, root	6
<i>Melthania velutina</i>	Diarrhea, colds	Leaves, stem	11
<i>Octolobus spectabilis</i>	Sexual asthenia	Root bark	17
<i>Pterygota bequaertii</i>	Chest pain, intercostal neuralgia	Stem bark	14
<i>Pterygota macrocarpa</i>	Urinary tract infections, bladder, stomach problems	Leaves	14
<i>Sterculia africana</i>	Postnatal stomachache, eye inflammation, convulsions, back pain, hernia, dizziness, aphrodisiac, fungal infections	Leaves, stem, exudate	
<i>Sterculia quinqueloba</i>	Diarrhea, colds	Stem bark, leaves	
<i>Sterculia tragacantha</i>	Vermifuge, syphilis, inflammation, digestive disorders, externally as poultice for boils, whitlow	Shoots, bark, seeds	11
<i>Theobroma cacao</i>	Lactation, stimulant, emollient	Fruit, pod, leaves	11
<i>Waltheria americana</i>	Purgative, fevers, syphilis	Whole plant	
<i>Waltheria indica</i>	Venereal diseases, cough, diuretic, diarrhea, gingivitis, kwashiorkor, aphrodisiac, colds, influenza, anthelmintic, hemorrhoids, headache, suppurating wounds, toothache	Roots, twigs, leaves	4, 14
Stilbaceae			
<i>Halleria lucida</i>	Rituals, charms, earache	Leaves	4

<i>Ravenala madagascariensis</i>	Strelitziaceae Fever, antiseptic Skin infections, inflammation Glandular inflammation, venereal diseases	Leaves	4, 14
<i>Strelitzia juncea</i>		Leaves	4
<i>Strelitzia reginae</i>		Inflorescences	4, 14
Taccaceae (see Dioscoreaceae)			
<i>Talinum triangulare</i>	Talinaceae Tonic, in salad for convalescence, diabetes	Leaves, whole plant	
<i>Taxus baccata</i>	Taxaceae Rheumatism, malaria, epilepsy, purgative (only in South Africa)	Stem, leaves	11
<i>Cyanastrum cordifolium</i>	Tecophilaeaceae Skin infections	Aerial parts	
<i>Ampelopteris prolifera</i>	Thelypteridaceae Laxative, meningitis, encephalitis Antibacterial, bacteriostatic, fungistic, aphrodisiac, jaundice Febrifuge, dropsy, swellings, edema, gout Dropsy, swellings, edema, gout Burns, cough, malaria, general sickness, gonorrhea, sores, liver diseases, antioxidant Chest problems, anodyne Gonorrhea	Leaves	17
<i>Cyclosorus dentatus</i>		Fronds, whole plant	14, 17
<i>Cyclosorus elatus</i>		Leaves, sap	17
<i>Cyclosorus gongyloides</i>		Leaves	17
<i>Cyclosorus interruptus</i>		Leaves	17
<i>Cyclosorus oppositifolius</i>		Leaves, sap	14, 17
<i>Cyclosorus striatus</i>		Leaves	14
<i>Craterosiphon quarrei</i>	Thymelaeaceae Lumbago, sprains, tonic Venereal diseases, snakebite Laxative, stomachache Insanity, aphrodisiac Purgative Fever, skin diseases, diabetes, insect bites	Leaves, stem	7
<i>Dicranolepis buchholzii</i>		Stem, leaves, roots	
<i>Dicranolepis disticha</i>		Stem bark, leaves	
<i>Dicranolepis laciniata</i>		Roots, leaves	14
<i>Dicranolepis persei</i>		All plant parts	14
<i>Gnidia chrysantha</i>		Leaves, stem, fruit	11
<i>Continued</i>			

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Gnidia kraussiana</i>	Skin diseases, bronchitis, yellow fever, colic, abdominal pains, constipation, emetic, measles, lumbago, chest pain, tonic	Flowering parts	4, 11
<i>Gnidia microcephala</i>	Aphrodisiac, contraction of vaginal canal	Roots	14
<i>Peddiea fischeri</i>	Poisonous (roots), anti-infective, heartburn (external)	Fruits, roots	4, 17
<i>Struthiola thomsonii</i>	Coughs, insanity, stomachache, spirit possession	Roots, twigs	14
<i>Synaptolepis kirkii</i>	Epilepsy, emetic, snakebite, constipation, aphrodisiac, contains neurotrophins	Roots	4, 14
<i>Synaptolepis longiflora</i>	Tuberculosis, drastic purgative, ankylostomiasis	Roots, leaf sap	14
Tiliaceae (see Malvaceae)			
Typhaceae			
<i>Typha capensis</i>	Antidepressant, libido, circulation, diarrhea, dysentery	Rhizome, leaves	
<i>Typha domingensis</i>	Famine food, coughs, digestive disorders, anemia	Aerial parts	
<i>Typha elephantina</i>	Ulcers, dysentery, and gonorrhea	Rhizome, fruits	
<i>Typha latifolia</i>	Blood system disorders, infections, dysmenorrhea, sedative, water purification, diuretic, emmenagogue, hemostatic	Roots, aerial parts	
Ulmaceae			
<i>Cellis adolfi-friderici</i>	General malaise, severe cough, fever, headache, body pains, eye inflammation, tuberculosis	Leaves, fruits, stem bark	17
<i>Chaetachme aristata</i>	Coughs, colds, laryngitis, hemorrhoids, toothache, tuberculosis	Leaves, stem bark	
<i>Chaetacme madagascariensis</i>	Hemorrhoids, purgatives	Stem bark	
<i>Holoptelea grandis</i>	Rheumatism, antihelmintic, laxative	Roots, stem	
<i>Terna orientalis</i>	Coughs, sore throat, asthma, bronchitis, gonorrhea, toothache, yellow fever, dysentery, inflammation, pneumonia, muscular-skeletal system disorders	Stem bark, leaves	4, 17
Umbelliferae (see Apiaceae)			
Urticaceae			
<i>Boehmeria nivea</i>	Coughs, dysentery, tonic, wound dressing, rheumatism, skin diseases, dysuria, urogenital inflammation, diuretic, prolapse of the uterus, antipyretic, leprosy	Root	11, 17
<i>Droguetia iners</i>	Hemostatic, skin diseases	Aerial parts	4
<i>Fleurya aestuans</i>	Tonic, burns, wound dressing	Leaves	11

<i>Fleurya mitis</i>	Oral hygiene, headache	Leaves	11
<i>Laportea aestuans</i>	Constipation, postpartum tonic, rickets in children, wound dressing	Leaves	9
<i>Musanga cecropioides</i>	Cough, arterial hypertension, pain during childbirth, schizophrenia, antidiabetic, anthelmintic, wound dressing, trypanosomiasis, skin diseases, otitis, rheumatism, emmenagogue, oxytocic, gargle for toothache, constipation, gonorrhea, skin diseases	All parts of plant	4
<i>Myrianthus arboreus</i>	Dysentery, skin infections, anthelmintic, incipient hernia, fevers, heart troubles, pregnancy complications, dysmenorrhea, antitussive, antiarthritic, hematuria, blennorrhea	Leaves, stem, roots	11
<i>Pilea microphylla</i>	Diuretic, liver and urinary inflammation, diarrhea, sores	Whole plant	14
<i>Urera rigida</i>	Diarrhea, aphrodisiac, pneumonia, diuretic, poison antidote	Leaves	17
<i>Urtica dioica</i>	Hemostatic, administered for nosebleeds and for excess menstrual flow	Whole plant	6
Valerianaceae (see Caprifoliaceae)			
Velloziaceae			
<i>Xerophyta equisetoides</i>	Antibortifacient, epistaxis (nosebleeds)	Root, whole plant	11
<i>Xerophyta spekei</i>	Body aches, anti-inflammatory, postpartum hemorrhage	Stem bark	11
Verbenaceae			
<i>Chascanum hildebrandtii</i>	Rheumatism, fevers	Aerial parts	4
<i>Duranta repens</i>	Antifungal, skin diseases, insecticide	Fruit juice	6
<i>Lantana camara</i>	Cough remedies, fever teas	Leaves, fruits	6
<i>Lantana mearnsii</i>	Stomachache, sore eyes, dressing for ulcers, washing inflamed nostrils	Leaves	16
<i>Lippia javanica</i>	Headache, fevers, skin diseases	Leaves, roots	6, 11
<i>Lippia multiflora</i>	Pneumonia, recurrent fever, headache	Leaves, fruits	6, 11
<i>Priva curtisiae</i>	Conjunctivitis, skin diseases	Leaves	6
<i>Stachytarpheta jamaicensis</i>	Headache, fevers	Leaves	6
<i>Stachytarpheta mutabilis</i>	Anthelmintic, laxative, wound dressing	Leaves, fruits	6
Violaceae			
<i>Hybanthus enneaspermus</i>	Laxative, general tonic	Leaves	6
<i>Rinorea arborea</i>	Abdominal pains, fevers	Roots	16
<i>Rinorea brachypetala</i>	Headache (sniffed)	Leaves	17

Continued

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Rinorea dentata</i>	Malaria, headache	Leaves, roots	14
<i>Rinorea elliptica</i>	Pneumonia, snakebite, threatened abortion	Roots, stem bark	14
<i>Rinorea ilicifolia</i>	Coughs, aphrodisiac, epilepsy	Roots, leafy twigs	17
<i>Rinorea subintegrifolia</i>	Conjunctivitis, rheumatism, purgative, chew stick for dental care, arthritis, rheumatism, menstrual cycle, febrifuge, venereal diseases	Roots, stem bark	14, 17
Vitaceae			
<i>Ampelocissus africana</i>	Anthelmintic, bronchitis	Roots, flowers	16
<i>Cayratia gracilis</i>	Cough remedy, antipyretic	Roots	11
<i>Cissus oliveri</i>	Analgesic, antiviral, antifungal	Whole plant	6
<i>Cissus quadrangularis</i>	Antiviral, analgesic	Leaves	6, 7
<i>Cissus rotundifolia</i>	Analgesic	Volatile oil, leaves	6, 7
<i>Cissus trothae</i>	Carminative, cough	Leaves	6, 7
<i>Cyphostemma adenocaula</i>	Purgative, anti-inflammatory, syphilis, abdominal pains, abscess, analgesic, adenopathy, ascariasis, dysmenorrhea, coughs, lumbago, dizziness, hypermenorrhagia	Leaves, tubers	11
<i>Cyphostemma buchananii</i>	Analgesic, antipyretic, abdominal pain, goiter	Fruits, leaves, roots	11
<i>Cyphostemma cyphopetalum</i>	Enlarged gland, oral hygiene, angina, vaginal prolapse, colic, expulsion of placenta, gastric ulcer, bleeding in pregnancy	Leaves	11, 14
<i>Cyphostemma orondo</i>	Tonic, anti-inflammatory, boils, venereal diseases, abdominal pain in pregnancy	Leaves, tubers	11
<i>Leea guineensis</i>	Anti-infective, analgesic, antidiabetic, aphrodisiac, earache, rheumatism, epilepsy, malaria, toothache, gonorrhea	Leaves, roots	11
<i>Rhoicissus revollii</i>	Wound healing, local painkiller, diarrhea, threatened abortion	Fruits, roots	7, 14
<i>Rhoicissus tomentosa</i>	Diarrhea, dysentery, anthelmintic for calves, psoriasis, uterine pain, dysmenorrhea, burns, hypermenorrhea, burns, vomiting, gonorrhea, nerve tonic, glandular swelling, sterility	Leaves, stem, roots	14, 17
<i>Vitis cordifolia</i>	Snakebite, skin infections	Fruits, roots	4, 11

<i>Erismadelphus exsul</i>	Urinary lithiasis (in a mixture with other plants)	Stem bark	17
Vochysiaceae			
Xanthorrhoeaceae			
<i>Asphodelus fistulosus</i>	Skin embrocation, lotion for scabies	Fruits	6, 7
<i>Bulbine abyssinica</i>	Promote healing of skin tissue in wounds, burns, and the like; dysentery, bilharzia, cracked lips	Leaves, sap	17
<i>Bulbine capitata</i>	Anti-infective agent, purgative, fevers, skin diseases	Leaves, aerial parts	4
<i>Bulbine frutescens</i>	Wounds, cuts, sores, grazes, burns, bites, ringworm, herpes, rashes, cracked lips, mosquito bites, scrofula, vaginal problems	Leaf gel	18
<i>Kniphofia linearifolia</i>	Infertility in women, cough, skin diseases	Fruit	11
<i>Kniphofia thomsonii</i>	Skin diseases, tonic	Leaves	
<i>Trachyandra divaricata</i>	Pertussis (whooping cough), infections	Aerial parts	
<i>Trachyandra laxa</i>	Pertussis (whooping cough), respiratory system disorders	Roots	
Zingiberaceae			
<i>Aframomum angustifolium</i>	Inflammation, fungal infections, coughs, fevers	Fruits, rhizome	6, 11, 17
<i>Aframomum baumannii</i>	Tonic, postpartum pains	Rootstock	6, 7
<i>Aframomum daniellii</i>	Fungal infections, fevers, pain relief	Fruits, rhizome	16
<i>Aframomum melegueta</i>	Coughs, inflammation, carminative, antibacterial	Seeds, rhizome	16
<i>Aframomum sanguineum</i>	Body pains, anthelmintic, fevers, dysentery, stomachache	Roots, seeds	16
<i>Aframomum sulcatum</i>	Fevers, anthelmintic, abortifacient	Roots, fruits	6, 11
<i>Ampelocissus abyssinica</i>	Tonic, colds	Fruits	11
<i>Costus afer</i>	Cough, hypertension, arthritis, aphrodisiac, cataract, leprosy, skin diseases, gonorrhea, stomachache, diabetes, syphilis, amebic dysentery, headache, topical ulcers, malaria	Stem, rhizomes	14, 16
			<i>Continued</i>

Table 2.1 (Continued) Catalog of Major African Medicinal Plants

Plant Name	Medicinal Use	Parts Used	References
<i>Costus lucanisanus</i>	Insanity, coughs, measles, wounds, filariasis, galactagogue	Leaf sap, aerial parts	14
<i>Costus schlechteri</i>	Fevers, diabetes mellitus, chest problems, smallpox, diseases of the eyes	Stem, rhizomes	6, 11
<i>Costus spectabilis</i>	Fever, allergic dermatosis, gonorrhea, eye injuries	Leaves, stem	
<i>Curcuma longa</i>	Anti-inflammatory, vermifuge, embrocation, catarrh, lumbago, malaria, yellow fever	Rhizome	6, 11
<i>Kaempferia aethiopica</i>	Carminative, analgesic, fevers, labor complications	Root stock	6, 16
<i>Siphonochilus aethiopicus</i>	Diarrhea, dysentery; laxatives, anodyne, vermifuges	Rhizome, aerial parts	17
<i>Zingiber officinale</i>	Indigestion, coughs, stimulant, antimicrobial, abdominal pain, amnesia, bronchitis, aphrodisiac, arthritis, genitourinary system disorders, ritual, analgesic, carminative	Rhizome	6, 11
Zygophyllaceae			
<i>Augea capensis</i>	Tonic, salt substitute	Roots	11
<i>Balanites aegyptiaca</i>	Tonic, antiparasitic, fevers, fish poison, abortifacient, molluscicide	Fruits, roots, stem	6, 11
<i>Balanites maughamii</i>	Coughs, antiparasitic, insecticide	Fruits	16
<i>Balanites wilsoniana</i>	Emmenagogue, anthelmintic, fevers, anti-inflammatory	Fruits, leaves	16
<i>Kaempferia ethelae</i>	Analgesic, antispasmodic, premenstrual syndrome, malaria, fevers	Rhizome, leaves	11
<i>Tribulus maximus</i>	Diuretic, skin diseases	Fruits, leaves	16
<i>Zygophyllum album</i>	Insecticide, general massage for stroke, not for oral consumption	Aerial parts	
<i>Zygophyllum foetidum</i>	Antiseptic, dressing for chronic sores, insecticide	Leaves	16
<i>Zygophyllum morgsana</i>	Convulsions, paralytic stroke	Seeds	4

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Pharmacognostical Profile of Selected Medicinal Plants

ABELMOSCHUS ESCULENTUS — OKRA



Botanical Name — *Abelmoschus esculentus* (L.) Moench

Synonyms — *Hibiscus esculentus* L.; *Abelmoschus bammia* Webb; *Abelmoschus officinalis*; *Abelmoschus longifolius* (Willd.) Kostel.; *Abelmoschus praecox* Sickenb; *Abelmoschus tuberculatus*

Related Species — *Abelmoschus manihot* (L.) Medik

Synonyms — *A. caillei* (A.Chev.) Stevels; *A. pseudomanihot* DC. Endl; *A. platidactylus* (Bakh.) Nakai and *Hibiscus manihot*; *Hibiscus papyriferus* Salisb

Family — Malvaceae

Common Names — Common okra, Okro, Okra, lady's finger, ladies' finger, gumbo

African Names — Akan (Twi): nkruman, nkruma (okra); Bantu: ki ngombo, ngumbo, gombo; Congo, Angola: quillobo, ki ngombo; Swahili: gumbo; Igbo: okwuru.

Description — Okra is a stout annual herb typically reaching 2 m in height, but some African varieties may grow up to 5 m tall, with a base stem 10 cm in diameter. The heart-shaped, lobed leaves are attached to the thick, woody stem. They may reach 30 cm in length and are generally hairy. Flowers are borne singly in the leaf axils and are usually yellow with a dark red or purple base. Some of the African varieties bloom only in late fall in temperate zones and are photoperiod sensitive. It is largely self-pollinated, although some outcrossing is reported, and it is often visited by bees.

The pod (capsule or fruit) is 10–25 cm long (shorter in the dwarf varieties). Generally, it is ribbed or round and varies in color from yellow to red to green. It is pointed at the apex, hairy at the base, and tapered toward the tip. It contains numerous oval seeds that are about the size of peppercorns, white when immature and dark green to gray-black when mature.⁹⁷²

Habitat and Distribution — The genus *Abelmoschus* is believed to have originated in South-East Asia. The common okra, *Abelmoschus esculentus*, however, is a cultigen of uncertain origin.

The vast occurrence of primitive types and wild relatives in Africa (especially Ethiopia, Nigeria, Cameroon, and Ghana) indicates that okra is certainly African. It is, however, widespread in tropical, subtropical, and warm temperate regions but is particularly popular in West Africa, India, the Philippines, Thailand, and Brazil. The common okra, *Abelmoschus esculentus*, grows in the whole of tropical Africa, whereas West African okra, *Abelmoschus manihot* (L.) Medik [synonyms: *A. caillei* (A.Chev.) Stevels; *A. pseudomanihot* DC. Endl; *A. platidactylus* (Bakh.) Nakai; and *Hibiscus manihot*] is a cultigen occurring mainly in West and Central Africa. It has been reported from Guinea to Nigeria in West Africa; in Cameroon, Gabon, and the Democratic Republic (DR) of the Congo in Central Africa; and in Uganda in East Africa. Its distribution is restricted to humid and perhumid climates in Africa, between 12° N and 12° S, most commonly between 5° N and 10° N, whereas the common okra, *Abelmoschus esculentus* (L.) Moench, can be found worldwide throughout the tropics, subtropics, and warm temperate regions.

Ethnomedicinal Uses — The immature fruits and the leaves are eaten in various ways. Fruits, fresh or sliced and dried, are used for soups (West African draw-soup), also fried in oil. Leaves are used as a potherb. Young shoots are also eaten. The mucilage is used medicinally and technically as an industrial raw material. A decoction of the immature okra fruits is demulcent, diuretic, and emollient. It is also used in the treatment of catarrhal infections, *ardor urinae*, dysuria, and gonorrhea. It has been used as a plasma replacement or blood volume expander. The seeds usually obtained from mature and hard capsules are antispasmodic, cordial, and stimulant. An infusion of the roasted seeds has sudorific properties. Leaves are sometimes used as a basis for poultices; as an emollient, sudorific or antiscorbutic; and to treat dysuria.

Constituents — All the aerial parts of the plant are useful, although the ends of the fruits are usually trimmed, leaving about 80% of the product as the edible portion. The composition of okra fruits per 100 g edible portion is water 88.6 g (85.7–90.2), energy 144 kJ (36 kcal), protein 2.1 g (1.1–3.0), fat 0.2 g, carbohydrate 8.2 g, fiber 1.7 g, Ca 84 mg (55–142), P 90 mg, Fe 1.2 mg (1.1–1.5), β -carotene 185 μ g (180–190), thiamin 0.04 mg, riboflavin 0.08 mg, niacin 0.6 mg, ascorbic acid 47 mg (20–126). The composition of okra leaves per 100 g edible portion is water 81.5 g (75.3–92.4), energy 235 kJ (56 kcal), protein 4.4 g (2.8–5.6), fat 0.6 g, carbohydrate 11.3 g, fiber 2.1 g, Ca 532 mg (258–635), P 70 mg, Fe 0.7 mg, β -carotene 385 μ g, thiamin 0.25 mg, riboflavin 2.8 mg, niacin 0.2 mg, ascorbic acid 59 mg (9–75). Compared to other fleshy fruit-vegetables (tomato, eggplant), okra is particularly rich in Ca and ascorbic acid. Okra seed meal contains more than 20% of good-quality protein on a fat-free, dry-weight basis, whereas most of the suitable amino acids in okra seed protein are present in amounts that are equal to or exceed the amounts in eggs and casein, and the U.N. Food and Agriculture Organization (FAO) references okra as a protein source. The seed protein is similar in amino acid composition to soya bean protein. It contains 20% oil (similar in fatty acid composition to cottonseed oil). The seeds are rich in phenolic compounds, mainly composed of oligomeric catechins (2.5 mg/g of seeds) and flavonol derivatives (3.4 mg/g of seeds). The skin's polyphenolic profile is composed principally of hydroxycinnamic and quercetin derivatives (0.2 and 0.3 mg/g of skins).¹

Pharmacological Studies — Because of its high nutrient value, okra is considered a good source for food fortification strategies. Okra has also been used in the management of duodenal ulcers and diabetes. The glycosylated molecules found in the okra mucilage have been related to the inhibition of adhesion of *Helicobacter pylori* to human gastric mucosa.² Such molecules could also contribute to glucose entrapment and alpha-glucosidase inhibition, which might be advantageous in the management of diabetes.³ The fruit and the leaves have antioxidant properties. It has been observed that the distribution of phenolics in methanolic extracts of okra correlates with distribution of antioxidant activity. Studies have also shown that roasting of okra seed flour at 160°C for up to 40 min caused an increase in antioxidant activity, as determined by free-radical scavenging using the DDPH (2,2-Diphenyl-1-picrylhydrazyl) assay.⁴ A methanolic extract of okra seeds was shown to have antioxidant activity, as evidenced by several criteria, and to exert antihypoxic activity in two mouse models.⁵

Toxicity — Okra is a common and popular vegetable with no known toxicity report. Both okra tofu and the protein-rich residue left after oil extraction showed no acute toxicity and offer promise as food additives and animal feed ingredients. The seeds in the mature fruits yield oil that is similar to cottonseed oil, and some varieties are said to contain gossypol or a gossypol-like compound. In some okra seed varieties, the oil contains small quantities of cyclopropanoid fatty acids with their strong physiological properties.

Formulation and Dosage Forms — Okra is usually available in food stores and health food outlets as fresh fruits or as frozen materials. Sun-dried and horizontally or vertically sliced fruits are often sold in West African markets. Freeze-dried, microwave-dried, and controlled temperature backed fruits prepared with the aim of preserving the secondary metabolites have been packaged for the dietary supplement industry.

Commerce — Okra is grown throughout the world as an article of commerce. Countries in Asia and Africa are the major producers. World production of okra as a fresh fruit-vegetable is estimated at 6 million tons/year. Common okra makes up 95% of this amount, and the West African species accounts for about 10% of world production. In West and Central Africa, the common okra and its local variety share the market equally.

Agriculture — Farmers usually use seeds harvested from their own local cultivar or rather heterogeneous landrace. The easiest way to keep the seed is to leave it in the pods. Seed weight varies from 30 to 80 g/1000 seeds. To soften the hard seed coat, the seed is often soaked in water or chemicals prior to sowing. The seed is usually dribbled directly in the field (1–3 seeds per hole). Optimum plant densities are in the range of 50,000–150,000 plants/ha. Emergence is within 1 week. When the plants are about 10 cm tall, they are thinned to one plant per hole.

Germination and initial growth are improved greatly by cultural practices that lower soil temperature (e.g., mulching, watering before the hottest part of the day, and sowing on ridge sides least exposed to direct sunlight). The robust West African okra should be grown at 20,000–50,000 plants/ha. Emergence is also within 1 week, and the plants are then thinned to one plant per hole for optimum growth.

Commercial okra growers usually practice sole cropping and prefer the early, homogeneous, introduced cultivars of common okra (*Abelmoschus esculentus*). In traditional agriculture, farmers grow their okra landraces in home gardens or in fields with other food crops. The landraces often consist of a mixture of *Abelmoschus caillei* and *Abelmoschus esculentus*, the former being predominant in humid climates and the latter in drier climates. The uptake of minerals is rather high. Indicative figures for total nutrient uptake per hectare of a crop with fruit yield of about 10 t/ha are 100 kg N, 10 kg P, 60 kg K, 80 kg Ca, and 40 kg Mg. Under humid tropical conditions, a full-grown crop consumes about 8 mm of water per day. Some farmers practice ratoon cropping. A ratoon crop flowers soon after cutting but usually results in poor-quality fruit with a high percentage of bent fruits.¹ Organic cultivation of okra in north central Nigeria yielded good fruits comparable in both composition and biomass with plants grown with chemical fertilizer .

ABRUS PRECATORIUS

Botanical Name — *Abrus precatorius* Linn.

Synonyms — *Abrus abrus* (L.) Wright, *Abrus cyaneus* R. Vig., *Abrus maculatus* Noronha, *Abrus minor* Desv., *Abrus pauciflorus* Desv., *Abrus squamulosus* E. Mey., *Abrus tunguensis* Lima, *Glycine abrus* L.

Family — Leguminosae

Common Names — Crab's eye, love bean, lucky bean, prayer beads, wild licorice

African Names — Ewe: dedekuede, adekude; Hausa: da marzaya, idon Zakara; Chagga: mdela; Giriam: Igbo: anya nnunu; Lozi: mutiti; Luvala: mukakenjenge; Ndebele: amabope; Nyamwezi:

Kachenche; Shambala: lufyambo; Sukuma: lufiambo; Swahili: mongaluchi, mtipitipi; Tiwi: dammabo, obereku-aniwa; Yoruba: iwere-jeje; Mozambique: cessane, mini-mini, mpanamene, namecolo, tsangariorio; Swaziland: umphitsi; Zanzibar, Tanzania: matscho ya tipitipi; Afrikaans (Namibia): mini-minies, minie-minies, paternostertjies; Afrikaans (South Africa): minnie-minnies.

Description — A woody twining plant with characteristic red and black seeds. The seeds are pinnate and glabrous, with many leaflets (12 or more) arranged in pairs. The leaflets are oblong, measuring 2.5 cm long and 1.5 cm wide. The plant bears orange-pink flowers, which occur as clusters in short racemes, sometimes yellowish or reddish purple in color, and small and typically pea-like. *Abrus* produces short and stout, brownish pods, which curl back on opening to reveal pendulous red and black seeds (4–6 in each pod).

Habitat and Distribution — It is found occurring wild in thickets, farms, and secondary clearings and sometimes in hedges. The plant is widely distributed throughout the continent.

Ethnomedicinal Uses — The leaf decoction is used for treatment of coughs, constipation, colic, and general pains. The leaves are chewed to relieve hoarseness and bronchial constrictions; the vapor from crushed leaves boiled with water is used to treat eye inflammation.⁶ The aqueous extract of the seed is used for the treatment of cancer of the epithelioma and as a vermifuge and an abortifacient. A single dose of the powdered seeds acts as a long-acting contraceptive, with the effect lasting up to 13 menstrual cycles.⁷ The seed infusion has been employed to hasten labor and for treatment of conjunctivitis granulosa and trachoma.⁸ The entire plant is drunk for treatment of venereal disease, headaches, and snakebites. A poultice prepared from the seeds of *Abrus*, salt, and the unripe fruits of *Musa paradisica* is applied topically to boils and abscesses.⁹

Constituents — The seeds contains abrin (a highly toxic glycoprotein), hyapaphnorine, precatorine, and some other uncharacterized indole alkaloids.¹⁰ Abrin, being a toxalbumin, is inactivated by heat. Trigonelline and other related pyridonium derivatives have been isolated from the plant. The plant contains phytosterols β -sitosterol and stigmasterol and flavonoids abrecatorin (6,4'-dimethoxy-7,3'-dihydroxyflavone) and desmethoxycentaureidin-7-O-rutinoside.¹¹ Two anthocyanins have also been identified (xyloglucosyldelphinidin and p-coumarylgalloyl ester of glucosyldelphinidin) in the seed coat of pigment of the plant. The free sugars present in the leaves, stems, roots, and seeds of the plants have been characterized as galactose, arabinose, and xylose.¹² Sweet-tasting glycosides, the abrusosides, based on the novel cycloartane-type aglycone (abrusogenin), have been isolated from the leaves of the plant.¹³

Pharmacological Studies — The activity of the seed powder against cancer of the epithelioma of the hand, skin, and mucosa has been reported.¹⁴ The aqueous extract of the seed elicits a biphasic response on the field-stimulated guinea pig ileum, being inhibitory at low concentrations but excitatory at high concentrations. The excitatory exponent contracts most smooth muscles, including the uterus. Its actions are atropine sensitive. The inhibitory fraction also contracts the uterus but relaxes the other smooth muscles; it is resistant to common pharmacological blocking agents but is inhibited by indomethacin, a prostaglandin synthetase inhibitor.¹⁵ The antifertility activity of the root has been reported.¹⁵

Nwodo had shown that trigonellyl glycoside possesses both nicotinic and muscarinic activity at the ganglion (i.e., it produces a depressor cum pressor activity on close arterial injection). He maintained that while the activity of the isolates of *Abrus* is blocked by indomethacin, these activities were not essentially due to prostaglandin release.⁸ The sweet-tasting glycosides found in the leaves, the abrusosides, have been shown to be 30–100 times sweeter than sucrose. The glycosides were neither acutely toxic when tested on mice nor mutagenic to *Salmonella typhimurium* strain TM677.¹³

A steroidal fraction of extract of the seeds has been shown to cause dose-dependent degenerative changes in the testicular weights, sperm count, later stages of spermatogenesis, and Leydig cells in testes of rats.¹⁶ The steroidal fraction also caused a dose-dependent decrease in the enzyme activity of $3\alpha,3\beta,17\beta$ -hydroxysteroid dehydrogenase, glucose-6-phosphate dehydrogenase, sorbitol dehydrogenase, and leucine aminopeptidase. A probable mechanism of the alterations in the testes could be at the pituitary level by a feedback mechanism that may result in decrease in production and release

of testosterone.¹⁶ Oral administration of a 50% ethanol extract of *Abrus* seeds (250 mg/kg) in albino rats for 30 and 60 days induced absolute, but reversible, infertility in males, with marked suppression of sperm motility in the cauda epididymis.¹⁷ The treatment did not appear to affect the histological and histocytometric characters of the testes and parareproductive tissues, but protein, sialic acid, acid phosphatase, and succinic dehydrogenase levels were significantly depleted.¹⁷ An isolate of the seeds, BN, was shown to inhibit contractions of guinea pig ileum to field stimulation, acetylcholine, and histamine and to reduce rhythmic activity of rabbit isolated intestine.¹⁸ The seed oil was also found to cause dose-dependent contractions of both gravid and primed virgin uteri.¹⁹ The contractions were blocked by indomethacin but resistant to the effects of atropine. Furthermore, the sensitivity of the tissue to oil could be restored by subeffective doses of prostaglandin E2 following blocking with indomethacin.¹⁹ These effects appear to support the use of the seed extract as an antidiarrheal agent in traditional medicine.

The extracts of the *Abrus* have also been shown to possess trypanosocidal action,²⁰ aldose reductase inhibition,²¹ antidiabetic properties,²² milk-induced leukocytosis and eosinophilia in the management of asthma,²³ antitumor and immunomodulatory activities,²⁴ and anthelmintic activities.²⁵ A polyherbal preparation containing extract of *Abrus* leaves has demonstrated hair-growth properties in clinical studies.²⁶

Toxicity — Fatal incidents have been reported for ingestion of well-chewed seeds of *Abrus*; because of its hard seed coat, it can pass through the gastrointestinal tract undigested and remain harmless. The unripe seed has a soft and easily broken seed coat and is thus more dangerous. It has been reported that poisoning has been experienced through a finger pricked while stringing the seed. Symptoms may develop a few hours to several days after ingestion; they include severe gastroenteritis with pronounced nausea and vomiting. Mydriasis will occur as well as muscular weakness, tachycardia, cold sweating, and trembling. There is no known physiological antidote. The treatment is essentially symptomatic. Since there is a long latent period associated with abrin poisoning, little value can be placed on induction of emesis or gastric lavage; these measures are useful only if digestion has just occurred. Bismuth trisilicate may be given during poisoning with *Abrus* to reduce the degree of gastrointestinal damage. If the emesis or diarrhea become excessive, replacement fluids and electrolytes are advocated. If hemorrhage occurs, blood transfusion may be necessary.

Toxicity of *Abrus* to goats has been evaluated. Doses of 2, 1, or 0.5 g/kg/day via stomach tube caused death between days 2 and 5 for those given 2 or 1 g/kg; one goat that received 0.5 g died on day 32, and another was killed on day 33. The main signs of poisoning include inappetence, bloody diarrhea, dyspnea, dehydration, loss of condition, and recumbency.¹⁹ Abrin, the main toxic compound in *Abrus*, is antigenic, and animals can thus be immunized with small doses before being allowed to graze on pastures infested with *Abrus*. Because of the potential use of abrin and the related castor bean toxin ricin in terrorism as a chemical or biological warfare agent, human immunization against both toxins is under development.²⁷

ACACIA SENEGAL

Botanical Name — *Acacia senegal* (L.) Wild

Synonyms — *Mimosa senegal* L., *Acacia verec* Guill. et Perr., *Acacia circummarginata* Chiov., *Acacia cufodontii* Chiov., *Acacia oxyosprion* Chiov., *Acacia rupestris* Boiss., *Acacia spinosa* Marloth & Engl., *Acacia volkii* Suess., *Acacia senegal* (L.) Britton

Family — Leguminosae

Common Names — Gum Arabic tree (E), Gommier, Gommier blane (F)

African Names — Arabic: shagar; Samgh Arabic: konait; Bambara: patukill; Hausa: akovia, dakwara; Fulani: dibehi; Kanuri: kolkol; Ndebele: umhlahalinye; Nyamwezi: katatula, mgwata, kakakantunda; Peuhl: patuki, bulbi; Swahili: kikwata mgunga; Zinza: mkoto

Description — *Acacia senegal* is a small tree or shrub, up to 7 m high, with a short bole, gray-fissured stem, usually coming off as papery patches to reveal a powdery underlayer. It branches low, and its dense foliage gives it the appearance of a somewhat large thorn at the base of the branchlets, with 3 to 6 pairs of pinnae and 6 to 15 pairs of narrow leaflets, about 6–8 mm long. The cream-color, fragrant flowers are borne in axillary clusters, as densely crowded spikes, usually longer than the leaves. The fruits occur as membranous flat cloves, about 11 cm long and 2–4 cm wide, hairy and pale brown in color; containing 7 or 8 flat and circular beige seeds.^{9,28}

Habitat and Distribution — It is found in subdesert regions, the Sahelian, and dry tropical zones. It occurs in Mauritania, Sudan, Niger, Mali, Senegal, Gambia, Nigeria, Burkina Faso, Kenya, Uganda, Tanzania, and parts of southern Africa.

Ethnomedicinal Uses — In West Africa, especially in the Senegal-Gambia region, the gum is used in the preparation of a remedy for dysentery and diarrhea and applied externally for modular leprosy. In East, Central, and North Africa, the leaves have been used in remedies for ophthalmia, colds, and hemorrhage,¹⁷ and gum was used for the treatment of local inflammations. The root is used in the mainland of Tanzania as a gonorrhea remedy.

Constituents — The most important constituent of this plant is gum arabic, a colorless, odorless, nontoxic solid substance soluble in water (1:2) that forms a sticky solution used in a variety of consumer products.²⁹ The gum exudes from branches and by stripping off a patch of the bark. Gum arabic consists of a glycosidal acid of high molecular weight that has been termed arabic acid, and it is combined with potassium, magnesium, and calcium. It also contains diastases and oxidase enzyme (African Pharmacopoeia⁴³⁶). Acacia gums consist of galactose, arabinose, rhamnose, and glucuronic acids as the only sugars found in all types of the gums. The difference between *A. senegal* and *A. seyal* (and the other *Acacia* exudates) is the level of each sugar. The polysaccharide fraction is composed of a linear chain of β -1,3-linked galactose. This chain is ramified in position with chains of galactose and arabinose. Rhamnose, glucuronic acid, or methyl-glucuronic acid units are found as chain terminations.³⁰

Pharmacological Studies — Acacia gum is used in the food industry and pharmacy as a suspending and emulsifying agent, emollient, and adhesive in the manufacture of tablets and other oral dosage forms. Acacia gum is highly appreciated in technical applications due to its unique properties; it is used not only as a film former in the printing industry and as an adhesive agent in glues, but also as a binding agent when used as a natural substitute for chemicals. The gum's technological properties (texturing and film forming in confectionery, emulsifying, and encapsulating in flavors and colors) and, for about 20 years, nutritional properties (fiber and prebiotic) in enriched foods and nutritional complements have made it a preferred edible industry gum.³¹ Various modifications have been made to the natural gum for use in specific pharmaceutical formulations.³¹

The unique properties of *Acacia* gum have also been adapted to provide a protective coating to natural foods. For example, shiitake mushrooms coated with gum arabic plus natamycin (GANA) maintained tissue firmness and showed a reduction in microbial counts from yeasts and molds compared with the control. In addition, GANA coating delayed changes in the soluble solids concentration, total sugar, and ascorbic acid. Sensory evaluation proved the efficacy of GANA coating by maintaining the overall quality of shiitake mushrooms during the storage period. The efficiency was better than that of gum arabic or natamycin treatment alone. Our study suggested that GANA has the potential to improve the quality of shiitake mushrooms and extend their shelf life up to 16 days.³²

ACHYRANTHES ASPERA

Botanical Name — *Achyranthes aspera* L.

Synonyms — *A. canescens* R. Br., *A. argentea* Decne., *A. grandifolia* Moq., *A. obovata* Peter, *A. repens* L.

Family — Amaranthaceae

Common Names — Chichiri (Indian); chirchita or onga (English)

African Names — Hausa: hakooin-macijii, kaimin-kadangaree; Igbo: odu-ngwere; Kibende: buhulula; Kiluguru: nara; Kisafwa: ndadaulo; Kiswahili: purura, purule; Kihehe: nugulukauna; Kirangi: kyululankanga; Kinyaturu: munyori, mnyoli; Kinyamwezi: lukululankanga; Yoruba: abora

Description — It is an erect or suberect, annual or perennial herb 0.5–1.5 m high. The leaves (1.5–1.6 cm long and 0.7 cm wide) are simple, opposite, with stipules absent, the blade ovate to ovate-lanceolate or ovate-oblong with rounded apex. The base is cuneate, and the margins are entire, pubescent above and below, with a petiole 0.5–3 cm long. It produces solitary hermaphrodite flowers in the axil of the bract, 3.5–5.5 mm long, pinkish or greenish sepals, ovate-lanceolate. The flowers enlarge with age, hardening and becoming pungent. The fruits are small, 2–5.3 mm long, and detach from the plant with the perianth and bracteoles. Both the flowers and fruits are borne concurrently throughout the year. It has a characteristic woody rootstock.^{9,28,33}

Habitat and Distribution — The plant occurs widely throughout the continent in different vegetation zones. It grows well in semiarid areas receiving about 250 mm rainfall and also high-rainfall savannas with over 2000 mm annual rainfall and can be located in secondary clearings. The species grows in open areas; it does not tolerate shade and therefore cannot be found as undercrops in dense tropical canopies. It grows well in Nigeria, Ghana, Zaire, and Cameroon and has been located in Mali, Kenya, Ethiopia, and Tanzania.

Ethnomedicinal Uses — The root is used as a hemostatic agent to stop wound bleeding. A decoction of the roots or stem bark is administered to children for constipation. The leaves, when fire cured like tobacco, are used as an embrocation for sprains and headache. When boiled, the steam is inhaled for the treatment of severe catarrh and colds. The decoction of the root bark is taken as a remedy for venereal diseases. A poultice made from the ash of the burned leaves is applied on boils and as an ointment for scabies; the ash mixed with honey is administered for coughs. The root infusion is used as an emetic and mixed with lime as a remedy for bronchitis, malaria, and helminthic infestation. The root has also been dispensed as a gargle for toothache, as a snakebite topical remedy, for the treatment of heartburn, to prevent miscarriage in pregnancy, and as a poison antidote to control vomiting.³³ In India, the plant extract is used for the treatment of infectious diseases and in the management of leprosy.³⁴

Constituents — The plant yields saponins and steroids, and the fruit has been shown to contain a large percentage of alkaline potash. Betaine and ecdysterone may be present in the plant.³³ A betaine, achyranthine, based on N-methylpyrrolidine 3-carboxylic acid, has been isolated from the plant.³⁵ Two fully characterized saponins, *Achyranthes* saponins A and B, have been shown to be constituents of the seeds.³⁶

Pharmacological Studies — The saponins are cardiotoxic. The benzene extract has been found to be abortifacient. The plant also possesses fungicidal activity. Oral administration of the crude extract at a dose of 5 mg/kg exerts diuretic, purgative, and hypoglycemic action in rats.^{37–39} It has been suggested that the diuretic action may be due to its high potassium content.³⁹ The saponin fraction of the extract significantly increased the tone and contractility of the isolated hearts of frog, guinea pig, and rabbits, with the observed activity quicker in onset but of a shorter duration than that induced by digitoxin.^{40–42} The biological activity of achyranthine has been investigated.³⁸ The compound has hypotensive, cardiac depressant, and vasodilatory activities, as well as analeptic action on the respiratory system and spasmogenic effect on smooth muscles. Achyranthine is also diuretic, purgative, and mildly antipyretic. The cardiac contractility caused by the saponin has been attributed to its phosphorylase activity.³⁸

Studies have shown that *Achyranthes* possesses antiviral,⁴³ immunostimulant,⁴⁴ anti-inflammatory,⁴⁵ wound-healing⁴⁶ and antidiabetic properties.⁴⁷ The activity of the polysaccharides found to be associated with the antiviral and antidiabetic activities of *Achyranthes* species appears to be significantly enhanced in the sulfated derivatives.

ACOKANTHERA SCHIMPERI

Botanical Name — *Acokanthera schimperi* Benth. & Hok

Synonyms — *A. oubaio*, *A. abyssinica* K. Schum., *A. deflersii* Schweinf. ex Lewin., *A. friesiorum* Markgr., *A. scabra* Schweinf. ex Markgr., *Arduina schimperi* (A. DC.) Baill., *Carissa deflersii* (Schweinf. Ex Lewin) Pichon., *Carissa friesiorum* (Markgr.) Cufod., *Carissa inepta* Perrot & Vogt., *Carissa schimperi* A.DC.

Family — Apocynaceae

Common Name — Acokanthera

Description — This is an evergreen tree or shrub, growing up to 6 m in height. The leaves are elliptic, with sharply cuspidate apex and acute base; they are ceraceous, shiny, and smooth above. The leaves, 11 by 4.5 cm, display 7–13 lateral nerves on each side, with prominent venation showing on both surfaces. The flowers are pink colored, up to 1.5 cm long in short, dense, axillary cymes.

Habitat and Distribution — The plant occurs in both savanna and rainforest vegetation. It grows in Ghana, Nigeria, Zaire, and parts of East Africa.

Ethnomedicinal Uses — *Acokanthera* is the primary source of the dreaded African arrow poisons, which are considered so dangerous that even minute quantities transmitted through small injuries by the arrow prick could lead to fatal cardiac arrest within a few minutes of reaching the bloodstream. *Strophanthus* species are employed as adjuncts or alternative ingredients in the preparation of the arrow poisons. *Acokanthera* species are generally unavailable, and they are not considered an economical source of the pharmacologically important cardiotonic ouabain. In traditional African medicinal practice, the most important species are *A. schimperi*, *A. venanta* G. Don, and *A. longiflora*. Githens⁴⁸ listed the species for the treatment of snakebite and tapeworm infestation.

Constituents — The wood of African *Acokanthera* species yields very potent cardiotonics, of which the principal compound is ouabain. Other constituents of *Acokanthera* species include G strophanthin, acokantherin, and acovenoside A, B, and C. The seeds of the closely related species *Carissa acokanthera* yield similar glycosides. Pichon has suggested that the plant should be treated as a section of the genus *Carissa*.⁴⁹

ADANSONIA DIGITATA



Botanical Name — *Adansonia digitata* Linn.

Synonyms — *Adansonia bahobab* Gaertn., *Adansonia integrifolia* Raf., *Adansonia scutula* Steud., *Adansonia situla* (Lour.) Spreng., *Adansonia somalensis* Chiov., *Adansonia sphaerocarpa* A.Chev., *Adansonia sulcata* A.Chev., *Baobabus digitata* (L.) Kuntze, *Ophelus sitularius* Lour

Related Species — *Adansonia fony* Baill., *Adansonia grandidieri* Baill., *Adansonia gregorii* F. Muell., *Adansonia madagascariensis* Baill., *Adansonia perrieri* Capuron, *Adansonia suarezensis* H. Perrier, *Adansonia za* Baill.

Family — Malvaceae

Common Names — Baobab, monkey-bread tree, dead-rat tree, cream-of-tartar tree, magic tree, chemist tree, symbol of the earth, upside-down

African Names — Ashanti: odade; Hausa: kuka, bumbu, murna; Bambara: sira; Bisa: hor-go, poh-go; Gourounsi-Lele: koukoulou, ekoulou; Peul: boki, olohi; Igbo: Oyili-akpu; Wolof: gui, bui, gif; Yoruba: ose, oske; Baoule: frondo; Malinke: sira; Senoufo: ngigue; Swahili: mbuyu, mkuu hap-ingwa, mkuu hafungwa, muuyu

Description — This is a huge and dominant species in the savanna and Sahel regions of Africa. Its massive structure with its bottle shape makes it easy to identify. The tree is rather remarkable for its enormous trunk in comparison with the small crown of foliage. The trunk is comparatively short, 13–17 m high but 10–14 m or more in girth, with short, thick branches. A specimen with a girth of 37 m has been recorded. The bark is unarmed. The leaves are palmate with 5 sessile leaflets. The flowers are large, 12.5–15 cm in diameter, white, with numerous monadelphous purple stamens. The flowers are oblong, 15–20 cm long, pendulous on long stalks, woody, indehiscent, with large seeds embedded in dry acid pulp.

Habitat and Distribution — Baobab occurs naturally throughout the drier parts of the continent, and it is available all year round. Outside Africa, it has been widely introduced in tropical and subtropical regions as a commercial crop. Although it was introduced late in many Central African countries, it is now a valued crop in many countries in that region. It is still not common in Rwanda, Burundi, Djibouti, and Uganda. It has been introduced in Madagascar and many other Indian Ocean islands. In West Africa, it often occurs in northern parts of the subregion from Nigeria to Senegal in savanna forests and in baobab orchards around villages.

Ethnomedicinal Uses — This majestic tree is revered in Africa for its medicinal and nutritional value. Many parts of the plant are used to treat various ailments, such as diarrhea, malaria, and microbial infections. Other activities include use for urinary tract disorders; as a diaphoretic for fevers; as an anti-inflammatory; for mild asthma, fatigue, dysentery, kidney and bladder diseases; and as an expectorant, astringent, and tonic. It is reported that it is an excellent antioxidant due to the vitamin C content. It has a widely held reputation as an antiviral and anti-inflammatory medicine. The leaves are most valuable for medicinal uses, but the fruits and stem bark are also used in the preparation of remedies.

Constituents — Baobab fruit pulp has 10 times the vitamin C content of orange (w/w). It also contains the following, per 100 g: water 8.7 g, energy 1290 kJ (308 kcal), protein 2.7 g, fat 0.2 g, carbohydrate 73.7 g, fiber 8.9 g, Ca 335 mg, Mg 167 mg, P 76.2 mg, Fe 2.7 mg, Zn 1.0 mg, thiamin 0.62 mg, riboflavin 0.14 mg, niacin 2.7 mg, ascorbic acid 209 mg. The seed, which is about 55% seed coat and 45% kernel, contains the following, per 100 g of kernel: water 8.1 g, energy 1805 kJ (431 kcal), protein 33.7 g, fat 30.6 g, carbohydrate 4.8 g, fiber 16.9 g, Ca 273 mg, Mg 640 mg, P 5.1 mg, Fe 6.6 mg, Zn 6.7 mg, thiamin 0.25 mg, riboflavin 0.14 mg, niacin 1.0 mg. The fatty acid composition is linoleic acid 34.9%, oleic acid 32.3%, palmitic acid 26.5%, and stearic acid 4.4%. Phytochemical investigation has also revealed the presence of flavonoids, amino acids, fatty acids, vitamins, and minerals. Phytosterols such as campesterol, stigmasterol, isoflucasterol, and avenasterol are present in the seeds. An alkaloid, adansonin, has been identified from the bark of the baobab tree, and it is believed to be the active agent that is responsible for the antimalarial properties of baobab tree bark. The seed protein contains a large amount of lysine, but its use as a protein source is limited by the

presence of antinutritional factors such as trypsin, tannins, oxalic acid, protease inhibitors, phytate, and amylase inhibitors (African Herbal Pharmacopoeia¹¹⁴¹).

Pharmacology — The plethora of biological activities attributed to baobab are traceable to the constituents found in the plant. The analgesic effect of the hot aqueous fruit of *A. digitata in vivo* (mice) has been established. It was noted that the extract exhibited analgesic activity 2 h after administration. At 800 mg/kg, the reaction time was 15.4 min in comparison to the negative control (10.2 min). The petroleum ether extract containing seed oil of baobab also showed analgesic activity. The extract exhibited analgesic activity with the tail flick response in 6.1 s, which was not statistically different from aspirin used as a positive control. The antipyretic activity of baobab extract has been established by laboratory studies in rats.

The hot water extract of the fruits showed *in vivo* anti-inflammatory activity in the rat paw formalin-induced edema test. The extract tested at a dose of 400 and 800 mg/kg inhibited formalin-induced edema. After 24-h administration of the aqueous extract, the mean swelling of the foot was 1.81 and 1.75 mm for 400 mg/kg and 800 mg/kg, respectively, in comparison to the negative control (6.35 mm).¹¹³¹ The DMSO (dimethylsulfoxide) of fruit pulp extract and aqueous leaf extract showed significant inhibition against cytokine interleukin 8 (IL-8).¹¹³²

The capacity of baobab extracts to reduce the mobility of *Trypanosoma brucei*, which causes sleeping sickness, was evaluated using four different extracts (petroleum ether, chloroform, water, and methanol) obtained from the leaves and the bark. The time at which mobility stopped ranged between 10 and 45 min for the root bark, while with the leaves, the mobility ceased between 25 and 45 min when various extracts were tested at 2 mg/ml.¹¹³³ The extracts also possess only modest activity against the malaria-causing parasite *Plasmodium falciparum*.

Because of the widespread use of baobab extract in the treatment of viral infections in West African traditional medicine, several *in vitro* and *in vivo* studies have been carried out to determine the antiviral activity of various baobab plant parts. In comparative studies by Ananil et al.,¹¹³⁴ baobab extract was found more active than several herbal extracts tested against the herpes simplex virus (HSV) and sindbis and polio viruses. A later investigation was made by Vimalanathan and Hudson¹¹³² on the antiviral activity of the leaves, fruit pulp, and seed extracted with water, DMSO, and methanol. The study was conducted using the minimum inhibitory concentration (MIC) method against influenza virus, HSV, and the respiratory syncytial virus. It was shown that the influenza virus was very susceptible, while the respiratory syncytial virus was resistant. The leaf extract exhibited the most promising activity against the influenza virus, with the MIC value ranging from 0.12 µg/ml (DMSO) to 2.8 µg/ml (water). The activity of the leaf extract was promising against the HSV (MIC value 1.0 to 11.7 µg/ml), while the pulp and the seed exhibited much lower activity (MIC value 72.5 µg/ml). The study clearly demonstrated variation in biological activity when different plant parts are investigated. Furthermore, the anti-HSV activity was considerably enhanced by light, especially long-wavelength ultraviolet (UV) light, although they all showed “dark” antiviral activity as well. Thus, all the extracts contained antiviral photosensitizers.^{1132,1135}

Baobab extracts have also been proved effective in laboratory studies to possess insecticidal and insect repellent activity; antioxidant, drug permeation enhancement; and hepatoprotective, hypoglycemic, and hypolipidemic activities.¹¹³⁶

Formulation and Dosage Forms — All parts of the plant are used for either food or medicine. Several proprietary products are available with baobab as a major ingredient. In most parts of Africa, the leaves of baobab are used either fresh as a cooked vegetable or dried and powdered as an ingredient of soups and sauces. The shoots and roots of seedlings are eaten as well. The roots are boiled and eaten in West Africa in times of famine. The flowers are eaten raw. The fruit contains soft, white, edible, and nutritious flesh (“monkey bread”). In northern Nigeria, it is used to curdle milk; it is eaten as a sweet and is used in making gruel and refreshing drinks and ice cream. In Sudan, it is made into a milk-like drink called “gubdi.” The powdered fruit flesh is added to cold

liquid, thus preserving vitamins. An emulsion of the fruit pulp may be used to adulterate milk. The dried pulp is used as a substitute for cream of tartar in baking.¹¹⁴⁰

The seeds are eaten raw or roasted and are used to thicken and flavor soup. Fermentation of the seed kernels improves the nutritional value. In coastal Kenya and Tanzania, the pulp-coated seeds are colored and sugar coated and sold as sweets. The seeds are used to adulterate groundnuts and sometimes as a coffee substitute. The oil extracted from the seed kernels by boiling and distillation is semifluid, golden yellow, gently scented, and nondrying and has a long shelf life. It is used for cooking and in the cosmetics industry. The most prominent commercial product is the sun-dried fruit pulp. Roasting and fermentation of both the fruit pulp and the seeds improve their chemical composition, and it is believed that the fermented product with decreased tannin content provides a better ingredient in traditional medicine.

Commerce — Baobab is a major nontimber forest product (NTFP) that plays a significant role in the lives of communities in the savanna, and its many products (seeds, oil, leaves, and fruits) constitute a source of income for many rural people in Africa. Baobab products are used in pharmaceutical and cosmetic industries. According to a United Nations Conference on Trade and Development (UNCTAD) report (p. 7),¹¹⁴⁵ baobab is highly sought after in several market segments, such as for food and beverages (Germany, France, and the Netherlands); botanical remedies (Germany, France, and the Netherlands); and nutraceuticals as well as natural cosmetics (European Union, United States, and Japan). Baobab fruit is an ideal candidate in the functional food market as it is very high in vitamin C and other vitamins and minerals; the powder may be used as a thickener due to its high pectin and fiber contents. The import value of the product class of rare edible dried fruit, which includes baobab fruit pulp, grew by 13% in 2003.

The U.S. Food and Drug Administration (FDA) approved on 25 July 2009 the designation of baobab dried fruit pulp (BDFP) as GRAS, indicating it is a substance that is generally recognized as safe, which was based on a submission by PhytoTrade in 2008 to that agency. According to the Federal Food, Drug, and Cosmetic Act, Sections 201² and 409, any substance that is intentionally added to food as an additive is subject to premarket review and approval by the FDA. This makes baobab a major article of international commerce. The designation of BDFP as GRAS, through scientific procedures, allows for its use as an ingredient in blended fruit drinks and fruit cereal bars at levels of up to 10% and 15%, respectively. Similar classification of baobab as a safe food ingredient exists in the European Union.

ADENIA CISSAMPELOIDES

Botanical Name — *Adenia cissampeloides*

Synonyms — *Adenia gracilis* Harms (1897), *Adenia gummiifera* (Harv.) Harms (1897), *Adenia guineensis* W.J. de Wilde (1971)

Related Species — *Adenia lobata*

Family — Passifloraceae

Common Names — Monkey rope, snake climber, wild granadilla

African Names — Swahili: mandali, mkengeti; Ashante-Twi (Ghana): homakyem; Ga: akpeka, peteha (*A. lobata*); Luguru (Tanzania): gale; Digo (Kenya): mgore, mugore, munua nyoka; Shambaa: ghoye; Zigua: zokambago

Description — *A. cissampeloides* is a dioecious liana, growing up to 30 m long, with a stem up to 10 cm in diameter, striped bluish-green and older stems often with whitish powder; stems have simple or 3-fid tendrils 10–20 cm long. Leaves are alternate, simple; stipules 0.5(–1) mm long, broadly rounded to triangular, irregularly cleft; petiole (1–)1.5–11 cm long; blade entire or more or less deeply 3(–5) lobed, orbicular to ovate or rhomboid in outline, (1–)3–14 cm long, base cordate to truncate or cuneate, apex obtuse or retuse, rarely acute, with a single gland at the base,

up to 4 glands on the lower leaf surface and 3–7 glands on the margins. Inflorescence an axillary cyme, often with up to 2 (–4) cm long tendrils between the branches, up to 35 flowered in male, 2–6 flowered in female inflorescence; peduncle (0.5–)1–12(–16) cm long; bracts and bracteoles narrowly triangular, 0.5–1 mm long, acute, minutely toothed. Flowers unisexual, regular, 5-merous, pale greenish; pedicel 2–10(–15) mm long in male flowers, slightly shorter in female ones; sepals and petals free; male flowers with sepals up to 8 mm long and petals 8–11 mm long, filaments of stamens fused at base, ovary rudimentary; female flowers with sepals up to 6.5 mm long and petals up to 4.5 mm long, ovary superior, ovoid, 3–6 mm long, 3(–6) ribbed, stigmas almost sessile, kidney shaped, stamens rudimentary. Fruit an ovoid capsule 2.5–4.5 × 1.5–3 cm, leathery to woody, pale green, 30–50 seeded. Seeds ovoid, 3.5–5.5 × 3–4 × 2 mm, pitted.¹¹⁴⁰

Habitat and Distribution — The genus *Adenia* consists of about 95 species, about 60 of them occurring on the African continent, 20 in Madagascar, and 15 in Asia. The genus is subdivided into six sections. *Adenia cissampeloides* belongs to section *Ophiocaulon*, while *Adenia lobata* belongs to section *Blepharantes*. *A. cissampeloides* occurs from Senegal east to Somalia and south throughout Central and East Africa to southern Africa, including South Africa. It is also found in the Seychelles. *A. lobata* occurs from Senegal east to Ethiopia and has been found south to Angola and Mozambique.

Ethnomedicinal Uses — *Adenia* species are used as fish poisons. The dried leaves have been employed as diuretics, febrifuges, and abortifacients. Various parts of the plant have been used as a diaphoretic and for the treatment of gallbladder problems, colic, dysentery, cholera, gonorrhea, infertility, threatened abortion, and dysmenorrheal and chest problems. The stem and roots are used in a limited extent for the same purpose. The exudate or sap from the plant is highly toxic and should not be used.

Constituents — The plant contains cacogenic glycosides barterin (tetraphyllin B) and volkenin (epitetraphyllin B) in the leaves, fruits, stem, and roots. The leaves also yield gummiferol, a cytotoxic polyacetylenic diepoxide with *in vitro* anticancer activity. Leaves and root bark are rich in iron; the average iron content of the leaves per 100 g dry matter is 32.5 mg, of stem bark 9.9 mg, and of root bark 32.1 mg.

Pharmacology — *Adenia cissampeloides* extract has been shown to contain hepatotoxic compounds with *in vivo* liver-damaging activity, and the excessive use of the plant has been associated with liver complaints among the Zulu people in South Africa. Stem pulp showed a significant parricidal effect on the beet armyworm *Spodoptera exigua*. In a laboratory test, aqueous extracts of the plant had a dose-dependant depressing effect on the blood pressure of cats. The effect was neutralized by small doses of atropine. Possible sympathomimetic and vasoconstrictive activity were also shown. An extract of the plant showed poor *in vitro* activity when tested against *Plasmodium falciparum*. A diethyl-ether extract from the bark, formulated as an emulsifiable concentrate, was found to be an effective anesthetic for the African honeybee (*Apis mellifera adansonii*).¹ An extract of *A. gummifera* exhibited antioxidant and acetylcholinesterase inhibition (AChEI) activity.⁵⁰

AFRAMOMUM MELEGUETA

Botanical Name — *Aframomum melegueta* K. Schum

Synonyms — *Aframomum grana-paradisi* (L.) K. Schum; *Aframomum meleguetella* K. Schum; *Alexis grandiflora* (Sm.) Salisb.; *Alpinia grana-paradisi* (L.) Moon; *Amomum grandiflorum* Sm.; *Amomum grana-paradisi* L.; *Amomum melegueta* Roscoe; *Cardamomum grana-paradisi* (L.) Kuntze; *Cardamomum grandiflorum* (Sm.) Kuntze; *Torymenes officinalis* Salisb.

Family — Zingiberaceae

Related Species — *A. daniellii*, *A. strobilaceum*, *A. exscapum*, *A. korarim*

Common Names — Grains of paradise, guinea grain, alligator pepper, melegueta pepper

Description — *A. melegueta* is an aromatic plant cultivated for its edible spicy fruit. It is a perennial herb growing up to 4 m high. The stem is short, marked with the encircling scars of fallen aerial leaves, and it is highly branched. The lower surface bears the roots, which are adventitious and slender. It yields an aromatic rhizome, which is horizontal and tuberous and bears scaly leaves with occasional buds in axils. The leaves are large, about 30 cm long and 12 cm wide, with close nerves below. They occur in two rows with an open or closed sheath sessile or stalked on the sheath; the blades are usually large, with numerous closely parallel pinnate nerves diverging obliquely from the midrib. The bracts are few and about half overlapping. The plant yields beautiful aromatic flowers with orange-colored lip and a rich pinkish-orange part. They are solitary, borne separately from the leafy stem. The fruits are fleshy and indehiscent and contain numerous small seeds embedded in pleasant-tasting aril. The seeds are golden or red-brown when fresh but darken on drying; they are angular and granular, strongly aromatic, and pungent.⁹

Geographical Distribution — *Aframomum* occurs throughout tropical Africa, but it is cultivated mainly in West and Central Africa.

Ethnomedicinal Uses — The genus is employed extensively in traditional medicine in West and Central Africa. In Ewe (Ghana), the common name for the plant, *megbe-dogboe*, means “never lacking for the sick.” In Southern Nigeria, it is typically chewed with kola nut as a masticatory agent. The fresh fruit is used as an aphrodisiac. The leaf is dispensed for measles and applied externally for the treatment of leprosy. The root decoction is taken by nursing mothers to check excessive lactation and to control postpartum hemorrhage. The rhizome is used as an ingredient for the preparation of a remedy for infertility to promote conception, and the fruit is used as a tonic for sexual stimulation. The plant is also used as a purgative, galactagogue, anthelmintic, and homeostatic (hemostatic) agent. The seeds are used with the leaves of *Urera oblongifolia* as an external treatment for tumors. In Senegal, the seeds are mixed with salt and rubbed on the interior of the mouth as a treatment for sleeping sickness.

Constituents — The members of the genus yield essential oil in most parts of the plants. The seeds of *A. melegueta* have been shown to contain the benzenoids gingerol, shagaol, and paradol.⁵¹ The seeds of *A. danielli* obtained from Cameroon have been shown to contain labdane diterpenoids.⁵² Other constituents of the genus include flavonoids,⁵³ monoterpenes,^{54,55} and quinoids.⁵⁶ The chloroform extract of the seeds contains antiestrogenic diarylheptanoids, named gingerenone D, dihydrogingerenone A, dihydrogingerenone B, and dihydrogingerenone C.⁵⁷

Pharmacological Studies — The essential oil obtained from the seeds and the benzenoid components paradol, gingerol, and shagaol have been shown to possess antimicrobial and antifungal activity.⁵⁸ The alcoholic extract was lethal to snail hosts of schistosomes.⁵⁹ Extracts of the plant showed positive activity in a cytotoxicity assay.⁶⁰ Studies of sexual behavior in rats have shown that *A. melegueta* modified the sexual behavior of male rats by increasing sexual arousal. The aqueous extract of the seeds of this plant was shown to significantly increase the penile erection index, as well as the frequencies of intromission and ejaculation. The plant extract was also found to enhance the orientation of males toward females by increasing mounting and anogenital investigatory behavior.⁶¹ A review of *Aframomum* indicated its potential as a dietary supplement or spice for foods and as a potential source of new medicines for a variety of diseases, including inflammation, infections, and central nervous system (CNS) disorders.⁶² It has been suggested that the selective inhibition of cyclooxygenase 2 (COX-2) enzyme by *Aframomum* constituents may be indicative of more tolerable anti-inflammatory and analgesic compounds than most conventional nonsteroidal anti-inflammatory drugs (NSAIDs).⁶³ The phenolic component has been shown to possess a significant antiglycation and antioxidant effect,⁶³ which may be useful in its application as a dietary supplement.⁶⁴

The potential benefit of grains of paradise in weight management has been demonstrated by the effect of an extract of *Aframomum* and 6-paradol on the activation of thermogenesis in brown adipose tissue.⁶⁵ Intragastric injection of an extract of 6-paradol enhanced the efferent discharges of

the sympathetic nerves in a dose-dependent manner. The enhanced nerve discharges were sustained for as long as 3 h. The rats did not become desensitized to the stimulatory effects of these compounds on sympathetic nerve activity. The temperature of brown adipose tissue showed a significant increase in rats injected with 6-paradol. These results demonstrated that *Aframomum* may be useful for the regulation of weight loss and weight maintenance.⁶⁶

Toxicity — *Aframomum* is considered a safe herbal supplement, and no human toxicity or allergic reaction has been reported. A 28-day subchronic toxicity study in male and female Sprague-Dawley (SD) rats to evaluate the safety of a grains-of-paradise extract showed a dose-related increase in absolute and relative liver weights in males and females dosed with 450 and 1500 mg/kg, respectively. There was a corresponding increase in alkaline phosphatase (ALP) with no signs of steatosis or cirrhosis. At the same doses, there was a significant decrease in blood glucose in male rats.⁶⁶

AGATHOSMA BETULINA

Botanical Name — *Agathosma betulina* (P.J. Bergius) Pillans

Synonyms — *Barosma betulina* (P.J. Bergius) Bartl. & H.L. Wendl.; *Barosma orbicularis* Sweet; *Bucco betulina* Schult; *Hartogia betulina* P.J. Bergius

Related Species — *Agathosma crenulata* (L.) Pillans

Family — Rutaceae

Common Names — Buchu, diosma

African Names — Khoi: buchu; Afrikans: boegoe, rondebelaarboegoe; South Africa: Bucco, Bookoo; Xhosa: ibuchu

Description — *Agathosma betulina* is a resprouting, broad-leaved aromatic shrub with erect woody stems reaching 2 m tall, but low-growing and prostrate varieties also occur. The leaves are of pale green color, leathery and glossy, with a blunt, strongly curved tip and a fine-tooth margin; round pellucid oil glands are conspicuously scattered throughout the leaf, along the margins and lower surfaces. They are strongly aromatic, usually opposite, ericoid, often crowded, simple, entire, from 0.5 to 3.5 cm long. The star-shaped flowers are produced in terminal clusters, 0.7–2 cm diameter, with five white, pink, red, or purple petals. The brownish fruits are five chambered. The two related buchu plants can be differentiated by the shape of the leaves: *A. betulina* is described as “round-leaf buchu,” whereas *A. crenulata* is known as “oval-leaf buchu.” The latter species has been described as a pungently aromatic, woody, single-stem shrub that reaches a height of 2.5 m. The glossy, dark green leaves are more than twice as long as they are broad, with many oil glands throughout. The delicate stems bear one to three, relatively large, white or mauve flowers in the leaf axils.⁶⁷

Habitat and Distribution — Buchu is a southern African plant that appears to be naturally restricted to the Cederberg Mountain range of the Western Cape Province of South Africa. *Agathosma betulina* is particularly adapted to dry conditions and can be found on sunny hillsides where other crops will not succeed. It can be found on the rocky sandstone slopes of the northwestern Cape region. *A. crenulata* grows on the damp lower and middle slopes and valleys, from Ceres to Swellendam (South Africa).

Ethnomedicinal Uses — Buchu is a highly valued traditional medicine for the treatment of inflammatory conditions and kidney and urinary tract infections. It has also been used as an appetite stimulant, digestive, antispasmodic, and carminative and for the treatment of coughs, cystitis, prostatitis, influenza, colds, hangover, rheumatism, and gout. Buchu is a general restorative tonic in African ethnomedicine. It is also an effective insect repellent. In the pharmacopoeias, buchu is categorized as a diuretic and urinary tract antiseptic. Herbal medicine shops include the plant in formulations to treat arthritis, cellulite, cystitis, diarrhea, flatulence, kidney infections, nausea, rheumatism, and wounds.

Constituents — Both commercially important species of *Agathosma* yield essential oils (1–2% w/w). *A. betulina* is characterized by the dominant presence of diosphenol in the oil (ca. 40% of total oil) with limonene, menthone, l-pulegone (<5%), and (ψ)-diosphenol (anisomer of diosphenol), whereas *A. crenulata* elaborates a high pulegone content of about 50% with near total absence of the diosphenol found in *A. betulina*. Buchu also contains flavonoids, diosmin, diosmetin, quercetin-3, 7-diglucosides, and rutin. It has been reported that the characteristic black currant smell and flavor of buchu oil is due to the presence of sulfur-containing minor compounds (8-mercapto-p-menthan-3-one).¹¹⁴¹ The two species can be standardized and qualitatively differentiated easily by liquid and gas chromatographic (GC) techniques with or without coupling to mass spectroscopy (MS) based on the analysis of the composition of the oils. The use of vibrational spectroscopy has also been reported for the quality assessment of the two commercially important species.⁶⁸

Pharmacological Studies — The essential oil obtained from *A. betulina* has been shown to inhibit 5-lipoxygenase (5-LOX) enzyme, which is involved in the inflammatory process ($IC_{50} = 35.2 \mu\text{g/ml}$).⁶⁹ The data clearly indicate that the *Agathosma* essential oil blocks the synthesis of 5-LOX products *in vitro*. Since leukotrienes, for which 5-LOX is the key enzyme, are considered to be involved in the initiation and maintenance of a variety of inflammatory diseases, it may be reasonable to state that the inhibition of leukotriene synthesis may, at least in part, be responsible for the anti-inflammatory action of these species. The spasmolytic activity on guinea pig ileum by the same species has been demonstrated, which is indicative of apparent blockage of calcium channels.¹¹⁴¹ Although buchu contains flavonoids, studies have shown that the plant has only weak antioxidant activity in the DPPH (2,2-diphenyl- β -picrylhydrazyl) assay, both species having IC_{50} values greater than 100 $\mu\text{g/ml}$. Neither was found to exhibit radical scavenging activity equivalent to that of the standard, ascorbic acid (IC_{50} value of $2.47 \pm 0.178 \mu\text{g/ml}$).

The antimicrobial activity of various extracts of buchu has been investigated by several scholars who showed that buchu possesses moderate antimicrobial properties. *In vitro* antimicrobial studies of *A. betulina* extracts (water, dichloromethane: methanol, and methanol) of seven pathogenic microorganisms (*Listeria monocytogenes*, *Pseudomonas aeruginosa*, *Candida albicans*, *Escherichia coli*, *Proteus vulgaris*, *Staphylococcus aureus*, and *Enterococcus faecalis*) using the MIC microplate assay showed that the dichloromethane:methanol extracts had the greatest activity, with MIC values ranging between 3 and 6 mg/ml.⁷⁰ The study also evaluated the effect of buchu extracts on the growth and development of biofilms using the crystal violet (CV) assay. The dichloromethane:methanol extracts prevented attachment of bacteria to the polyvinyl chloride surface; however, exposure of *Candida albicans* to the extracts enhanced attachment and subsequent biofilm formation. The growth and development of a preformed biofilm was also inhibited, but to a lesser extent.⁷⁰

An evaluation of the efficacy of buchu oil applied topically to treat pain resulting from muscle damage has been conducted by the Research Unit of Exercise and Sports Medicine, University of Cape Town (South Africa). In the study, 30 male participants did a bout of exercise using their nondominant arm with the intention of causing exercise-induced muscle damage. The results from the double-blind, placebo-controlled trial indicated that the group treated three times daily with buchu gel showed a reduction in swelling that may be ascribed to the anti-inflammatory properties of buchu.⁷¹

Toxicity — The extracts of *A. betulina* and *A. crenulata* were shown to be nontoxic at the concentrations tested (IC_{50} values > 100 $\mu\text{g/ml}$) using the MTT (3-[4, 5-dimethyl-2-thiazol-yl]-2, 5-diphenyl-2H-tetrazoliumbromide) cellular viability assay. In the same assay, the essential oils exhibited higher toxicity at the concentration tested, both having IC_{50} values less than 0.0001 $\mu\text{g/ml}$ when compared to the control.⁷¹ The compound cis-isopulegone present in both species may contribute to the observed toxicity. R-(+)-Pulegone is known to be a hepatotoxic compound; large oral doses have been shown to deplete glutathione (GSH), which is needed in one of several biological

detoxification steps. This depletion along with excess pulegone leads to centrilobar hepatocellular necrosis.⁷¹

Formulation and Dosage Forms — The leaves are usually air dried and may be steam distilled to obtain the oil. Apart from its use in the dietary supplement industry, it is a major ingredient in the flavor and fragrance industry, where buchu is used to enhance fruit flavors. It is particularly used to boost black currant-like flavors. Its fragrance has a minty camphoraceous, sweet berry, catty, tropical guava, apricot and peach, green herbal taste. The oil is also used in perfumes and colognes. Several proprietary products exist in which buchu is used either alone or in combination with ginger, *Garcinia kola*, *Curcuma longa* for arthritis and with *G. kola* and *Cola nitida* (InterCEDD Health Products) as a “hangover” tonic.

Commerce — The two species of *Agathosma* are articles of international trade. The crude drug as well as the volatile oils are traded extensively. Herbalists and trade associations in South Africa export buchu to Europe, especially Germany and France. Although producer prices have fluctuated wildly in recent years, the demand for this crop has been stable since 2002. According to the Market News Service (MNS) *Bulletin on Medicinal Plants and Extracts—2011*,¹¹⁴⁶ the wholesale price for dried leaves of buchu was US\$38.36/kg on cost insurance freight (CIF) terms.

Agriculture — Buchu is restricted to South Africa and is a typical component of fynbos vegetation of the Cape region. Although some cultivation has been embarked on since the 1970s to raise improved varieties with more desirable properties, most of the commercial products are still wild crafted. Recent efforts in crop development have resulted in buchu now being a viable option for small-scale farming. Recently, growers experienced severe losses, ascribed to a soil-borne disease. The bioequivalence of some of the hybrids and cultivars is yet to be determined.

AGAVE SISALANA

Botanical Name — *Agave sisalana* Perrine

Synonym — *Agave rigida* Mill

Family — Asparagaceae

Common Name — Sisal

African Names — Arabic: sisal, bambara, tangeka; Hausa: axomyis; Swahili: katani, mkonge

Description — This is a perennial plant with a short stem, numerous leaves (in a rosette) that are thick, fleshy, and thorny and can reach 2 m in height and 15 cm in width. The inflorescence occurs in panicles at the apex of a hardy and long central stem of 3 to 8 m; greenish-yellow flowers that are rare develop into capsular fruits and into seed but produce a lot of plantlets that ensure fast propagation.

Habitat and Distribution — The plant is widely distributed throughout East and Central Africa. It is, however, cultivated in most tropical parts of the continent, requiring much sunlight and preferring areas such as highlands with two rainy seasons. Sisal is a major crop in Tanzania, Uganda, Angola, Mozambique, and Kenya.

Ethnomedicinal Uses — Sisal is used primarily as a source of commercial fiber. In traditional medicine in East Africa, the sludge obtained from the sap is used in the preparation of a lotion for the treatment of local inflammatory conditions.

Constituents — The fibers contain about 78% polysaccharide, of which about 84% consists of cellulose and the remainder pentosan. The juice of the leaves contains hecogenin as the major component and other steroidal sapogenins, such as sisalagenin, tigogenin, and neotigenin. Other constituents include mucilage, pectins, mannitol, and reducing sugars. *Agave* contains phenolic compounds, including flavonoids. The use of high-temperature and high-pressure reactors (PARR model 4560) for phenolic extraction of *Agave* proved to be more efficient compared to the conventional solid-liquid extraction at room temperature. It has been observed that an increase in both

temperature and extraction time led to a corresponding increase in the amount of phenolic compounds extracted and suggested that, after process optimization, *Agave* could be used as an interesting source of polyphenols.

Pharmacological Studies — Extracts of the plant have been found to be devoid of antibacterial activity.⁷² The inflorescence and leaf, as well as the juice, showed a positive hemolysis test,⁷³ probably due to the saponin content of the plant. The d-mannitol present in the *A. sisalana* biomass waste may add economic value to the natural sisal fiber production chain since the compound is widely used in the pharmaceutical industry and is also used as a raw material for producing several types of polymers.⁷⁴ Hecogenin found in *Agave* has been shown to possess anti-inflammatory, antioxidant, and gastroprotective activities.⁷⁵ *Agave sisalana* constituents showed antiparasitic action against gastrointestinal nematodes (GINs) in livestock, and the extracts could therefore be employed in parasite management methods in the livestock sector.⁷⁶

AGERATUM CONYZOIDES



Botanical Name — *Ageratum conyzoides*

Synonyms — *Eupatorium paleaceum* Sesse & Moc., *Chrysocoma maculata* Vell., *Carelia conyzoides* (L.) Kuntze., *Caelestina microcarpa* Benth. ex Oerst., *Caelestina latifolia* (Cav.) Benth. ex Oerst., *Cacalia menstrasto* Vell., *Alomia pinetorum* L.O. Williams., *Alomia microcarpa* (Benth. ex Benth.) B.L.Rob.

Family — Compositae

African Names — Chagga: ifuna; Efik: ikongifoien; Igbo: akwukwo-nwosinaka; Masai: ol crowil el ajok; Ndoga: tongolla; Yoruba: imi-eshu

Description — *Ageratum* is an erect herb with many branches. It is up to 1 m tall, with characteristic hairy stalks. The leaves are simple, oval shaped, 7.5 cm long and 5 cm broad, and oppositely

arranged on the stem; they are roughly heart shaped, pointed at the apex and rounded at the base. They have toothed margins, with two main veins arising from the midrib. The plant bears fruits having angular achenes with five narrow and pointed bristles.⁷⁷

Habitat and Distribution — It is a deciduous forest plant that occurs in western and eastern regions of the continent.

Ethnomedicinal Uses — *Ageratum* is used in folk medicine for the treatment of various diseases,⁷⁷ especially for the treatment of wounds and burns.⁷⁸ It has been dispensed as an emetic, for treatment of fevers, and externally in lotions for scabies and in eyedrops for inflammations.⁷⁷ For wound healing, the juice of the bruised leaves is squeezed into the wound and covered by a bruised but intact leaf.⁷⁸ The root decoction or weak infusion of the whole herb is used by the Chagga as a general remedy for abdominal discomfort and pain. The plant is used in East Africa for the treatment of syphilitic sores; for this purpose, it has been reported that the root is placed in a small shell, and an adolescent boy, who must be wearing a copper armlet, urinates into it; then, the fluid is rubbed over a stone, and the slimy mess is applied to the sore with a cock's feather.⁷⁹

Constituents — The plant yields essential oil (about 0.16%), of which ageratochromone is the principal constituent.⁸⁰ The oil from the leaves also contains 6-dimethoxyageratochromone, phenols, phenolic esters, coumarin, and traces of eugenol.^{80,81} Other constituents of the plant include the flavonoid conyzorigun, dotriacanthene, 7-methoxy-22-dimethylchromene, and 5,6,7,8,3',4',5'-heptamethoxyflavone.^{80,82} An isoflavone glycoside, 5,7,2',4'-tetrahydroxy-6, 3'-di-(3,3-dimethylallyl)-isoflavone 5-O- α -L-rhamnopyranosyl-(1 \rightarrow 4)- α -L-rhamnopyranoside 1, has been isolated from the stems of *Ageratum conyzoides*.⁸³

Pharmacological Studies — The plant has broad-spectrum antimicrobial activity.⁸⁴ *Ageratum* extract has been found effective against *Helicobacter pylori*, a Gram-negative microaerophilic bacterium that is a major etiological agent in duodenal, peptic, and gastric ulcers.⁸⁵ It has proved useful in treating wounds, but the activity does not appear to be due to direct antibacterial activity as the extract has been shown not to be active against microbes isolated from wounds.⁸⁶ The incorporation of *Ageratum* extract in the preparation of traditional West African black soap did not show any significant effect on the antimicrobial activities exhibited by the various soaps against the bacterial and fungal organisms tested.⁸⁷ The extract also showed *in vitro* anthelmintic activity.⁸⁰ The extract has been evaluated against human lung cancer cell lines (SK-LU 1 and SK-MES1) and the human skin fibroblast cell line (FS5 cells), with encouraging results.⁸⁸

Ageratum has been used in the management of Alzheimer's disease (AD), a neurodegenerative disease of the CNS that leads to dementia and behavioral and cognitive impairments. To evaluate the herb as a possible treatment for the preliminary symptoms of AD, the effect of *Ageratum conyzoides* on learning and memory has been investigated in mice. *Ageratum conyzoides* (250, 500, and 750 mg/kg p.o.) produced a dose-dependent improvement in the memory of young and aged mice. Furthermore, it also reversed the amnesia induced by scopolamine (0.4 mg/kg i.p.) and natural aging. It also produced a profound reduction in the whole-brain acetylcholinesterase activity.⁸⁹ The dichloromethane extract from the aerial parts of *Ageratum conyzoides* was found to exhibit broad-spectrum antiprotozoan activity, with pronounced activity (IC_{50} = 0.78 μ g/mL) against bloodstream forms of *Trypanosoma brucei rhodesiense*, the etiologic agent of East African human trypanosomiasis (East African sleeping sickness). The extract also exhibited noticeable activities against *Leishmania donovani* (kala azar, IC_{50} = 3.4 μ g/mL) as well as *Plasmodium falciparum* (malaria tropica, IC_{50} = 8.0 μ g/mL). Five highly methoxylated flavonoids along with the chromene derivative encecacol methyl ether were isolated. All the isolated compounds did not give the antiprotozoan activity found in the dichloromethane extract, which is indicative of the fact that none of the known isolates from *Ageratum* is responsible for its activity.⁹⁰ Of immense therapeutic importance is the finding that an aqueous extract of *A. conyzoides* has the ability to potentiate the antimalarial activity of chloroquine and artesunate against induced plasmodiasis in mice.⁹¹ If clinical evalua-

tion in humans replicates the animal studies, then *A. conyzoides* could be used with antimalarial compounds in the treatment of malaria.

The essential oil of *Ageratum conyzoides* inhibited the mycelial growth and aflatoxin B1 (AFB1) production by *Aspergillus flavus*.⁹² AFB1 is a highly toxic and carcinogenic metabolite produced by *Aspergillus* species on food and agricultural commodities. The essential oil inhibited fungal growth to different extents depending on the concentration and completely inhibited aflatoxin production at concentrations above 0.10 µg/ml. The analysis of the oil by GC/MS showed that its main components are precocene II (46.35%), precocene I (42.78%), coumarin (5.01%) and trans-caryophyllene (3.02%). Comparison by transmission electron microscopy of the fungal cells, a control, and those incubated with different concentrations of essential oil showed ultrastructural changes that were concentration dependent of the essential oil of *A. conyzoides*. Such ultrastructural changes were more evident in the endomembrane system, affecting mainly the mitochondria. Degradation was also observed in both surrounding fibrils.⁹³ The ability to inhibit aflatoxin production by *A. conyzoides* may prove useful in the preservation of agricultural products.

Ageratum has also been shown to possess anti-inflammatory,⁹³ anticoccidial,⁹⁴ antioxidant, and gastroprotective activities.⁹⁵

ALCHORNEA CORDIFOLIA



Botanical Name — *Alchornea cordifolia* (Schum et Thonn.) Muell. Arg.

Synonyms — *Alchornea cordata* Benth., *Cacoucia caudifolia* (Schumach. & Thonn.) Walp., *Schousboea cordifolia* Schumach. & Thonn.

Family — Euphorbiaceae

Common Names — Christmas bush

African Names — Hausa: bambami; Igbo: ububo; Efik: mbom; Yoruba: ewe-epa; Bwari: tahi; Ijaw: epai; Bini: uwonowen; Igara: oje, ose

Description — *Alchornea cordifolia* is a multistemmed shrub or small tree, sometimes climbing but most times an erect spreading plant, up to 5 m high and 30 cm girth. The leaves are simple, broadly ovate, and cordate, with a drawn-out apex and heart-shaped base, 15–28 cm long and 8–16 cm broad. The margins are entire, wavy, or slightly dentate. They are sparsely hairy on the lower surface with glands in axils of basal nerves. The stalks are from 5 to 14 cm long. The plant produces

small, greenish-white flowers, often dioecious, borne on common stalks in the axils of the leaves, with the individual flowers sometimes having no stalk. The fruits are greenish-gray in color, two celled, and usually split to expose red seeds when they are ripe.⁹

Habitat and Distribution — It is found in secondary forests and is widespread in tropical Africa. It has been located in Ghana, Nigeria, Senegal, Angola, Zimbabwe, Cameroon, and Tanzania.

Ethnomedicinal Uses — The leaves and stem bark are used in the preparation of remedies for urinary, respiratory, and gastrointestinal disorders. A slurry of the fruits is administered for cough. A complex laxative is prepared with the fresh leaves, the fruits of *Xylopia aethiopica*, and leaves of *Psidium quajava*. A decoction of the leaves alone is used as an eye lotion. The leaves and bark, when powdered, are drunk in water or eaten in food for piles. The juice of the leaves and fruits is rubbed on ringworm and other skin infections. An extract of the roots of *A. floribunda* (Nianndo) prepared by macerating the plant material for several days in palm wine is used in Zaire as a stimulating intoxicant and aphrodisiac.⁹⁶

Constituents — An indole alkaloid resembling yohimbine and related indole alkaloids has been detected in several *Alchornea* species.⁹⁶ In a later investigation, the presence of yohimbine in the stem bark of *Alchornea* could not be confirmed; however, four unidentified alkaloidal compounds were detected with terpenes, sterols, and their glycosides.⁹⁷ The root bark has been found to contain about 0.03–0.26% total alkaloids.⁹⁸ The plant also contains the hexahydroimidazopyrimidine alkaloids alchorine and alchornidine.⁹⁹ Other constituents of the species include gentistic and anthranilic acids, as well as tannins.

Pharmacological Studies — Extracts of the leaves have been shown to inhibit the growth of both Gram-positive and Gram-negative bacteria.¹⁰⁰ It has also been found active against methicillin-resistant *Staphylococcus aureus* (MRSA).¹⁰¹ Its antistress activity has been positively assessed by the ability of the extract to alter the duration of immobility; in the forced swim endurance test, a picrotoxin-treated animal was employed as the model to assess its activity against convulsive seizures.¹⁰² The root extract has sympatholytic and hypotensive activity. Positive results were obtained in clinical experiments with root and stem extracts in the treatment of icterus.¹⁰³

The leaf and root bark extracts showed significant topical anti-inflammatory activity in the mouse ear edema model using croton oil at a dose of 90 µg/cm. Six compounds isolated from the active extracts also exhibited significant topical anti-inflammatory activity. Of these, daucosterol, acetyl aleuritic acid, N1,N2-diisopentenyl guanidine, and N1,N2,N3-triisopentenyl guanidine were found to be more active than indomethacin, while β-sitosterol and di(2-ethylhexyl) phthalate were less effective.¹⁰⁴ In egg-albumen-induced rat hind paw edema model, the leaf extract showed impressive anti-inflammatory activity.¹⁰⁵ *Alchornea* extracts have been shown also to possess immunomodulatory,¹⁰⁶ analgesic, and antiprotozoal activities.¹⁰⁷

ALLIUM SATIVUM

Botanical Name — *Allium sativum* L.

Synonyms — *Porrum sativum* (L.) Rchb., *Porrum ophioscorodon* (Link) Rchb., *Allium pekinense* Prokh., *Porrum ophioscorodon* Link., *Allium longicuspis* Regel, *Allium controversum* Schrad. Ex Willd.

Family — Amaryllidaceae

Common Names — Garlic, ail commun (French)

African Names — Hausa: tafanuwa; Igbo: ayo-ishi; Swahili: kitunguu-sumu; Yoruba: ayu

Description — Garlic is a herbaceous plant. It occurs as a bulb of fleshy scale leaves on the lower part of the stem; each bulb consists of a number of bulbets or “cloves” that rest on a common bulb base and are covered with membranous bracts. It has a very strong and disagreeable odor that is noticeable in the breath and a strongly pungent and persistent taste; both the odor and taste linger

for several days following the ingestion of the plant. Garlic includes two basic varieties: hardneck and softneck. Hardneck garlics, which include *A. sativum* var. *ophioscorodon* and *A. sativum* var. *pekinense*, are characterized by hard, woody central stalks that extend down to the basal plate at the bottom of the bulb.

Habitat and Distribution — It is indigenous to Asia but has been introduced to Africa, where it is cultivated in many parts of the continent.

Ethnomedicinal Uses — It is used for the treatment of respiratory infections and as an anthelmintic. It is applied externally in northern Nigeria for the treatment of skin diseases. In parts of Chad, the fresh bulbs are used in the preparation of tonics for diabetes and hypertension.

Constituents — Garlic yields 0.1% to 0.3% of a volatile oil consisting of sulfur-containing compounds, including S-allyl-2-propenthiosulfinate (allicin), methylallyltrisulfide (MATS), diallyldisulfide, diallyltrisulfide, diallyltetrasulfide, allylpropyldisulfide, ajoene (4,5,9-trithiododeca-1,6,11-triene 9-oxide), 2-vinyl-4*H*-1, 3-dithiin, and allin, which yields allicin on enzymatic hydrolysis.^{108,109} The oil also contains the terpenes citral, geraniol, linalool, and α - and β -phellandrene and various enzymes, including allinase, vitamins of the B group, flavonoids, and several minerals.⁸² Studies have shown that aged garlic has a chemical profile that is distinct from the fresh materials, and whenever possible, aged garlic should be used.

Pharmacological Studies — It has been established that extracts of garlic possess demonstrable antiatheromatous properties. In feeding experiments with rabbits, the animals given garlic had a much less marked increase in blood cholesterol than those given the same diet but without garlic.¹¹⁰ The oil extracted from garlic prevents fat-induced hypercholesterolemia¹¹¹ and sucrose-induced hyperlipidemia¹¹² and enhances fibrinolytic activity.¹¹³ *In vitro* studies showed that garlic inhibits platelet aggregation.¹¹⁴ It has also been observed that conversion of labeled arachidonate (AA) in garlic oil-treated platelets was impaired compared to a control in the elaboration of platelet COX and LOX products.¹¹⁵ Aqueous extract of garlic inhibited aggregation induced by adenosine diphosphate (ADP), collagen, AA, epinephrine, and calcium ionophore A23187 in a dose-dependent manner.¹¹⁶ It has demonstrable antioxidant properties.¹¹⁷ These effects have an indirect relationship to the use of garlic in the treatment of hypertension. The drug has been shown in five consecutive cases of hypertension to reduce the blood pressure to satisfactory levels.¹¹⁸

Other pharmacological activities include pronounced hypoglycemic activity in animals and humans;¹¹⁹ the drug also contains substances with hyperglycemic activity.¹²⁰ In rabbits, the maximum fall in blood sugar level given a glucose loading dose with garlic juice was 12% compared with 20% for those treated with tolbutamide and 2% for those given a water control.¹²¹ It has also been observed that in a group of mice injected with cancer cells incubated with garlic extract, no deaths occurred for up to 6 months while mice injected with untreated cancer cells died within 16 days.¹²² Garlic extracts and more specifically allicin have been shown to be active *in vitro* against *Candida albicans*, *Trichomonas* spp., *Staphylococcus aureus*, *Salmonella typhi*, and *paratyphi*, *Shigella dysenterica*, *Vibrio cholerae*, and *Escherichia coli*.^{123,124} It was active against some multi-drug-resistant bacteria *in vitro*.¹²⁵ One of the active metabolites of garlic, allicin, possessed significant antifungal activity *in vitro* against *Candida*, *Cryptococcus*, *Trichophyton*, *Epidermophyton*, and *Microsporum* species.¹²⁴

Garlic shows a general tonic effect even at very low doses due to the stimulation of hypophyseal function, and this property has been exploited in relation to Seyle's stress syndrome.¹²⁸ The beneficial effects of garlic extract injections on lindane-induced damages in testes, brain, and thyroid function have been evaluated experimentally, and it was found that 300 mg fresh garlic/kg/day counteracted the damage to these organs caused by lindane.¹²⁶

Clinical Applications — The lower incidence of heart disease in Italy and Spain when compared to that in the United States has been attributed, at least in part, to the greater consumption of garlic by the general population of these Mediterranean countries. The effect is believed to be related to the herb's hypolipidemic and antiplatelet aggregating effects.¹²⁷

In clinical practice, garlic is used for long-term treatment of hypertension,¹²⁸ degenerative heart disease, and atherosclerosis.¹²⁹ The medication should be given for an extended period, at least 3 months, to achieve the desired results. A social problem with garlic medication is the persistent smell. Attempts to present garlic in dosage forms that mask the odor have not been successful since the disagreeable odor comes about when constituents containing sulfur are eliminated via the skin and respiratory passages. It has also been observed that reduction of the smell by encapsulation and adsorption to charcoal invariably leads to reduced activity.¹²⁷ The dosage is determined relative to the severity of the condition being treated and lies between 10 and 25 g of the whole drug or 2 and 8 ml of the syrup. Garlic is available in health food shops in the following forms: garlic bulbs, tincture, capsules, and garlic juice.

Garlic is also used as an expectorant, diaphoretic, disinfectant, and diuretic. Extracts of the plant, as well as the constituents diallyl- and trisulfides, are active against the *Culex* mosquito. The isolates were larvicidal at 5 ppm.¹³⁰ According to some Chinese doctors, application of thin slices of garlic bulb aided healing during repair of perforations of the eardrum in 17 of 18 patients.¹³¹

Although garlic and onion are frequently recommended for degenerative heart disease, an analysis of the relationship of garlic and onion consumption to mortality from ischemic heart disease in 27 countries raised doubts about the protective effect of garlic.¹³² Several clinical trials, however, have demonstrated the beneficial effects of garlic as a dietary supplement.

Toxicity — Garlic is not known to cause any serious toxicity when consumed in moderate quantities. Allicin yields a degradation product that often causes severe halitosis following the ingestion of large quantities of garlic.¹³³ Contact dermatitis to garlic has been reported.¹³⁴ There is a case report of prolonged inhalation of garlic dust by a food industry worker that resulted in the development of a severe asthmatic reaction with subsequent cross-allergenicity to other plants of the families Liliaceae or Amaryllidaceae.¹³⁵ Garlic medication is contraindicated in ambulatory patients taking anticoagulant drugs due to possible prolongation of bleeding time. According to *Martindale's Extra Pharmacopoeia*,²⁰⁵ the administration of preparations of garlic to children is dangerous, and fatalities have been recorded.

ALOE BARBADENSIS



Botanical Name — *Aloe barbadensis* Miller

Synonyms — *A. vera.*, *A. vulgaris* Lamk., *A. indica* Royle

Family — Liliaceae

Common Names — Aloe vera, curacao aloe, aloe vera gel (AVG)

Description — *Aloe barbadensis* is a perennial herb with rosettes of long pointed leaves from a shortly branched creeping rhizome. The leaves are brittle and exude a clear yellowish viscous sap when broken. They have soft marginal prickles. The flowers are yellow and borne in an elongated compact raceme from the center of the rosette. Propagation is by means of the rhizome branches since it does not produce fruit.³²

Habitat and Distribution — It grows in subtropical regions of the continent. The plant is probably a native of South and East Africa and the Mediterranean regions, although it is widespread throughout the continent. It is not very discriminatory to soil types and climatic conditions, but as a member of the Liliaceae family, it will prefer a well-drained clayey loam, with rainfall of at least 80 in. per annum.

Ethnomedicinal Uses — The fresh leaf is used for wound dressing and for the treatment of vertigo. In Nigeria, the exudate from freshly cut leaf is used in the treatment of guinea worm infestation. In Trinidad and Tobago, the exudate is mixed with egg white and taken for colds and asthma and to heal bruises; it is taken with seawater for stomach ulcers.¹³⁶ The dried exudate is used in the treatment of severe constipation. Aloe vera possesses healing, moisturizing, and emollient properties useful in a wide range of cosmetic formulations. It is employed as a humectant in skin preparations such as moisturizers, suntan lotions, and aftershave creams. It has been found useful for application to severely chapped skin.

Constituents — Aloes contain C-glycosides and resins. The crystalline glycoside known as aloin is used in pharmacy as a cathartic. It is, however, the gel, said to contain several organic acids and the so-called biostimulators, that the plant secretes as a repair agent on physical injury that has the topical healing properties. The plant also contains polysaccharides, glycoproteins, sterols, organic acids, and saponins.^{123,137}

Preparation of Aloe vera — AVG is prepared in various ways depending on the manufacturing house. A common practice is to drain the free-flowing aloes first and then allow the leaves to be soaked in 15% ethanol solution in the dark for up to 14 days; then, the finely chopped material is subjected to a mill press. There is no scientific report on the differences (if any) between the pharmaceutical aloes and those processed for cosmetic use. The methods of preparation are highly customized and are the subjects of several patents, with each manufacturing house claiming the superiority of its own method and product.

Pharmacological Studies — *Aloe vera* is one of the most effective wound- and burn-healing agents in current use. Several publications are available in the literature substantiating the healing properties of AVG, and only recent reports are reviewed here. Animal studies have shown that it possesses both oral and topical wound-healing activity.¹³⁸ In the oral experiment, animals were administered 25% aloe vera in their drinking water for 2 months. The animals in the topical experiment were given 25% of the drug in a cream. The results showed that a 62.5% reduction in wound diameter was noted in mice that received a 100 mg/kg/day oral dose of the substance; for the topically treated animals, a 50.8% reduction was recorded. In both groups, the wounds were induced on both sides of the vertebral column of ICR mice with a biopsy punch.¹³⁸

In another study, full-face dermabrasion was used to evaluate the wound-healing activity of AVG in comparison with the standard polyethylene oxide gel dressing.¹³⁹ It was found that by 24–48 h, there was dramatic vasoconstriction and accompanying reduction in edema on the side treated with aloe vera; by the third to fourth day, there was less exudate and crusting at the site treated with the drug; the fifth to sixth day witnessed the complete reepithelialization of the aloe site. It was estimated that there was a 72-h acceleration of wound healing in the aloe-vera-treated sites against the side of the face dressed with standard polyethylene oxide gel. It was observed that the acceleration of wound healing is significant in the reduction of bacterial contamination, possible keloid formation, and pigmentary changes.¹³⁹ A suggestion has been made that the cicatrizant activity of aloe vera is due, at least in part, to the gibberellin content of the plant.¹⁴⁰ Both aloe and gibberellins

were shown to inhibit polymorphonuclear (PMN) leukocyte infiltration to a site of gelatin-induced inflammation in diabetic animals.^{141,144}

In the management of burn wounds, it was found that Hartley guinea pigs that received full-thickness burns covering 3% of their body surface area by direct contact with a hot plate were completely healed in 30 days versus 50 days for the control group dressed with gauze occlusive dressing.¹⁴² One comparative study of the burn wound-healing activity of aloe vera and that of 1% silver sulfadiazine cream concluded that AVG hindered the healing process in second-degree burns in the guinea pig.¹⁴³ The aloe juice has been found effective in the treatment of third-degree X-ray burns; more recently, it has been advocated in treating atomic radiation burns.^{144,145}

At a dose of 60 mg/kg, aloe vera powder was found to increase both the fertility rate and the litter size of female rabbits.¹⁴⁶ The plant was also useful in menstrual irregularities and functional sterility.^{147,148} Aloe vera is incorporated in several dietary supplements for its beneficial effects as an antioxidant and in the prevention of premature tissue aging. Interestingly, AVG does not include the sap of *Aloe vera*, which contains anthraquinones. AVG is widely used in cosmetics and toiletries for its moisturizing and revitalizing action. The organic whole leaf of *Aloe vera* is reported to aid in cellular repair and in digestion and assimilation of foods, vitamins, minerals, and other vital nutrients.¹⁴⁹ The rheological characteristics of native *Aloe* gel and juice under dynamic and steady shear have been evaluated for its use in topical formulations. The damping of the elastic moduli and viscous moduli at various temperatures for the *Aloe* gel under oscillatory shear tests have been reported and were observed due to the presence of the weak, fibrous, and random structure of polysaccharides in it. The moduli for gel increased with increasing temperature and that for juice decreased with temperature. Prior to attaining the plateau region after a certain shear rate, AVG and juice exhibited shear thinning behavior, with a flow behavior index for *Aloe* gel samples of 0.1 in the shear thinning region.¹⁵⁰

Aloe vera has been found useful for the treatment of various diseases, including diabetes, and studies have established that it possesses antifungal,¹⁵¹ antihyperlipidemia, antiatherosclerosis, and anti-inflammatory¹⁵² properties and is used in management of gastrointestinal disorders.¹⁵³

Toxicity — *Aloe vera* is generally regarded as safe and no serious adverse effects or toxicity have been reported. However, a caution was raised by the U.S. National Toxicology Program, which has found that rats grew tumors after drinking water spiked with an extract of the plant. The rodents were given relatively high doses of a whole-leaf extract of *Aloe vera* over 2 years.¹⁵⁴ In rats that had drunk water containing 1.5% by weight of the extract, 39% of females and 74% of males had malignant or benign tumors in their large intestines. The report indicated that none of these growths was seen in rats given pure drinking water. It is believed that the tumors were probably caused by aloin A. In 2002, products containing aloin A or aloe extracts were removed from laxatives sold over the counter in U.S. pharmacies because manufacturers did not provide sufficient safety information to the U.S. FDA.¹⁵⁵

ALOE FEROX

Over 80 species of *Aloe* (family Liliaceae) occur in various parts of the world. The main species found growing in Africa is *Aloe ferox*, which yields the so-called Cape aloe. Another common species is *Aloe barbadensis* (discussed in the preceding section), which is the source of Curacao aloe. Socotrine and Zanzibar varieties originate from *Aloe perryi*.

Botanical Name — *Aloe ferox* Miller

Synonyms — *Pachidendron ferox* (Mill.) Haw., *Pachidendron supralaeva* (Haw.) Haw., *Pachidendron pseudo ferox* (Salm-Dyck) Haw., *Aloe galpini* Baker., *Aloe horrida* Haw., *Aloe muricata* Haw.

Family — Asparagaceae

Common Names — Aloe, Cape aloe

African Names — Arabic; Swahili: shubiri

Description — The genus *Aloe* includes herbs, shrubs, and trees, bearing spikes of white, yellow, or red flowers. The leaves are fleshy, strongly cuticularized, and prickly at the margins. *A. ferox* is a shrub, 3–4 m in height and about 12 cm in diameter, with a large rosette of leaves. The leaves are oval-lanceolate, 40–60 cm long and 10–12 cm wide, with a thorny ridge and edges. Flowers have a perianth 2.5 cm in diameter, tinged with yellow and purplish-blue, striped with red and green.²⁸

Habitat and Distribution — It is a subtropical plant but widely cultivated in dry forest areas of the continent.

Constituents — Aloe contains anthraquinone glycosides, the principal one being a yellow, crystalline substance called barboloin. It also contains resin and aloe-emodin. The pharmaceutical “aloe” is the solid residue obtained by evaporating the liquid that drains from the parenchyma tissue in the center of the leaves of various species of *Aloe*. The aloe mostly used in cosmetics formulations is the Curacao aloe from *A. barbadensis* Miller (see *Aloe vera* Linne). The major aglycone found in *A. ferox* is aloe-emodin and is associated with decomposition product aloe-emodin-9-anthrone.

Production of Aloes — Aloes for pharmaceutical uses are prepared from the wild species of *A. ferox* or are cultivated species of *A. barbadensis* by making transverse cuts near the base of the leaves and collecting the ensuing juice for about 6 h. It is concentrated by boiling for about 4 h in an open flame. *Aloe ferox* gel can be differentiated from AVG by the analysis of their monosaccharide content; *A. ferox* yields a mixture of glucose and galactose, whereas *A. vera* contains mainly mannose.¹⁵⁶

Pharmacological Studies — The main pharmaceutical use of the aloes is as a laxative, the activity being due to anthraquinone glycosides. An anaerobic bacterium, *Eubacterium* sp., has been isolated from human feces, which is capable of transforming barboloin to aloin-emodin anthrone, and the bacterium is believed to be one of the bacteria responsible for metabolizing barboloin in the intestine.¹⁵⁷ The mechanism of cathartic action of aloe-emodin-9-anthrone causes a significant increase in water content of the rat large intestine, which has been attributed to its inhibition of rat colonic Na⁺, K⁺-adenosine triphosphatase (ATPase) *in vitro* and an increase in the pericellular permeability across the rat colonic mucosa *in vivo*.¹⁵⁸ Aloes have also been found effective as anti-hyperglycemics and hypoglycemics in experimental animals.¹⁵⁹ Aloe has been identified as one of the most commonly used herbal proprietary products.¹⁶⁰

In a comparative analysis of the gels from various *Aloe* species for wound healing and antifungal properties, *A. ferox* was found to have the highest antifungal activity, measured as absence of or low percentage of infected wounds.¹⁶¹ The antifungal activity was positively correlated with gel aloin content. The use of Cape aloe in traditional medicine in Africa as a general tonic and restorative medicine seems to be validated by the scientific evidence of its anti-inflammatory, anticholinesterase, and antioxidant activities,¹⁶² as well as its antimicrobial and wound-healing properties.¹⁶³

ALSTONIA BOONEI

Botanical Name — *Alstonia boonei* de Wild.

Family — Apocynaceae

Common Names — Boone's, Alstonia, stool wood, pattern wood

African Names — Igbo: egbu; Bini: ukhu; Efik: ukpo; Yoruba: awun

Description — The plant is a large tree commonly found in the drier areas of the lowland and rain forest. It often grows to significant heights (33 m high and 3 m in girth) with a straight and fluted stem and without buttress roots. The bark occurs in commerce as brownish-gray, deeply fissured pieces, with irregular fragments, up to about 1 cm thick. The dark brown bark is fairly rough and flakes off in small patches. A cut through the bark exudes copious white latex, a characteristic of most members of the family Apocynaceae. The latex can be used as a rubber adulterant. The plant is often confused with *A. congesta*, even in the scientific literature; both plants differ substantially in their appearance and habitat.¹⁶⁴

The leaves of *A. boonei* are simple, about 20–20 cm long and 5–8 cm broad, appearing in whorls of 5–8 leaves at each node. The individual leaf is glossy, dark green on the upper surface with some bluish tint on the lower surface; it is leathery and smooth to the touch. Leaves are very shortly pointed at the apex and gradually wedge-shaped common stalks at the base. The individual flower is shortly stalked. Flowering occurs between October and March. The fruits (December–March) are borne in folicles of up to 50 cm long, hanging down in pairs from the branches. They are finely hairy and contain numerous elongated seeds about 5 cm long, which bear a tuft of long, silky hairs at each end. When ripe, they split lengthwise.^{9,28,33}

Habitat and Distribution — It is found in forest fringes, deciduous forest, swampy land. It occurs in Ghana, Nigeria, Angola, Kenya, and southern Sudan.

Ethnomedicinal Uses — The plant is highly prized in African ethnomedicine for the treatment of malaria, especially when the allopathic antimalarial drugs are found ineffective either because of the presence of the drug-resistant malaria infection strains or because of acquired tolerance from repeated dosing with synthetic antimalarials. For this purpose, *Alstonia* stem bark or leaves are administered as a strong decoction or “teas” and sometimes as an ingredient in malaria “stem therapy.” *Alstonia* was listed in the British pharmacopoeia of 1914 as an antimalarial drug. The infusion of the bark alone is dispensed as a remedy for snakebite and sometimes for the treatment of arrow poison.

The latex of the plant is smeared on swellings caused by filarial worms and then bandaged with the crushed bark of the ordeal tree (*Erythrophleum guineense*) for cure.⁸¹ The plant has also been reported to be an astringent, an alterative tonic, and a febrifuge for relapsing fevers; it has been claimed to be useful in muscle tone after debilitating fevers.¹⁶⁵ The leaves and latex are used topically to reduce swellings and for the treatment of rheumatic pains. The latex has also been used to stimulate lactation. A decoction of the bark is taken after childbirth to facilitate the expulsion of the placenta.¹²³ Extracts of *Alstonia boonei* have been employed in folk medicine for the treatment of muscular pains, spasms, and hypertension. The plant has also been dispensed as an emmenagogue, astringent, galactagogue, and anthelmintic.¹⁶⁶

Constituents — The plants contain several indole alkaloids, including echitamine, echitamine, akuammidine, picraline, quebrachidine and its esters, vincamajine, alstonine, and akuammiline.¹⁶⁷ The triterpenes β -amyryne and lupeol have been reported as occurring in the bark and ursolic acid in the leaves.¹⁶⁸

Pharmacological Studies — The extracts of *Alstonia* have been shown to have antipyretic, analgesic, and anti-inflammatory activity. Echitamine, one of the major constituents of *A. boonei*, has been reported as being able to lower carotid pressure and increase renal output.¹⁶⁹ This finding was corroborated by later using hypertensive cats; it was observed that the compound caused a significant fall in blood pressure.¹⁷⁰ In a later investigation, however, it was observed that the hypotensive effect of the compound occurred only occasionally after a first intravenous injection of 6 mg/kg, and it was suggested that the diuretic action on saline-loaded dogs and cats may explain the hypotensive action.¹⁷¹ The same investigators reported the effect of the triterpene ursolic acid, hitherto considered an inert compound, on the electrolytic balance. They established that a dose of 3 mg produced sodium retention in suprarenalectomized rats equivalent to that of 3 g DOCA (deoxycortisone acetate) and considerably higher potassium retention. They also reported that echitamine in particular potentiated the barbiturate sleeping time of mice and rats and enhanced the lethality of strychnine; on an isolated toad rectus abdominis preparation, increased concentrations of acetylcholine enhanced its action, whereas in isolated rat hemidiaphragm, its action was reversed by physostigmine. Echitamine also regressed methylcholanthrene-induced fibrosarcoma by 80% and 53% in Wistar rats at doses of 7.5 and 5 mg/kg, respectively, when given subcutaneously. The compound also showed activity against p-388 lymphocytic leukemia at a dose of 16 mg/kg.¹⁷²

The antipyretic and antihypertensive activity of the drug has been experimentally shown to be due (at least partly) to echitamine.^{173,174} Although *Alstonia* has enjoyed a folk reputation in three

continents as a remedy for malaria, there is apparently no laboratory evidence to confirm its efficacy. An alkaloid-rich extract obtained from the New Guinea species was found to significantly inhibit (*in vitro*) the growth of W-2 and D-6 clones of *Plasmodium falciparum*.¹⁷⁵ An *in vivo* antimalarial evaluation of extracts of *A. scholariss* showed no significant activity.¹⁷⁶ An evaluation of *A. congensis* in Nigeria showed that the methanol of the species suppressed early infection chloroquine- sensitive *Plasmodium berghei* in mice but had no effect when infection was already established.¹⁷⁷ A combination therapy with *Khaya ivorensis* has been found to be effective in malaria prophylaxis.¹⁷⁸ The herbal mixture, when given to mice subjected to the 14-day repeated-dose toxicity test (subacute toxicity test), did not cause any serious toxicity, such as weight loss, liver or kidney morphological modifications, significant alterations in locomotor activity, or any other sign of illness.

A major component of *Alstonia*, the indole alkaloid alstonine, has been evaluated for its possible use in the treatment or management of negative symptoms in schizophrenia. Negative symptoms of schizophrenia are particularly problematic due to their deleterious impact on a patient's social life. The indole alkaloid exhibited an antipsychotic-like profile in mice, as well as anxiolytic properties. Subchronic (but not acute) treatment with alstonine at 0.5 mg/kg (but not 1.0 mg/kg) significantly increased social interaction in mice. Moreover, MK801-induced social withdrawal was completely prevented by sulpiride (10 mg/kg) and alstonine 1.0 mg/kg and was partially prevented by alstonine 0.5 mg/kg. The study indicated that alstonine not only increased social interaction in normal mice but also averted social deficits attributable to negative symptoms of schizophrenia.¹⁷⁹

ANACARDIUM OCCIDENTALE (CASHEW)



Botanical Name — *Anacardium occidentale* L.

Synonyms — *Acajuba occidentalis* Gaertn., *Cassuvium pomiferum* Lam., *Anacardium microcarpum* Ducke

Family — Anacardiaceae

Common Name — Cashew

African Names — Krio: kushu; Mende: kusui; Temme: e-lil-e-potho; Yoruba: kaju; Hausa: kadinnia; Kanuri (Hausa): kanju; Igbo: kashu

Description — Cashew is a small tree, with leaves that are alternate, simple, entire, obtuse, and borne on short leafstalks. The flowers are abundant, small, and fragrant and are produced in terminal,

loose panicles. The enlarged juicy peduncle that bears the nut is known as the “cashew apple.” When ripe, it is of a golden-yellow color and obovate in shape; it has a pleasant, acid flavor and is somewhat astringent. The cashew nut hangs from the end of the cashew apple and is kidney shaped and about 2.5 cm long. It consists of an edible kernel surrounded by two shells. The outer shell is smooth and of a bright brown color. Between the two shells, there is a very caustic oily substance. The cashew kernel is considered to be of high nutritive quality and is covered with a thin reddish-brown skin or testa.¹⁸⁰

Habitat and Distribution — The cashew tree was originally native to Brazil and was later introduced by the Portuguese to Mozambique and then India in the sixteenth century as a means of controlling coastal erosion. It was not until the nineteenth century that plantations were developed, and the tree then spread to a number of other countries in Africa, Asia, and Latin America. The cashew is now distributed throughout the tropics and in parts of the warm subtropics. Cashew processing, using manual techniques, began in India in the first half of the twentieth century, when cashews were exported to the wealthy Western markets, particularly the United States.

Ethnomedicinal Uses — All parts of the tree are used in traditional medicine. Cashew leaves are used extensively in traditional medicine for the treatment of fevers, skin disease, diabetes, and hypertension. The fresh juice from the fruit is effective for the treatment of syphilis, cholera, and kidney disease and is antiscorbutic, astringent, and diuretic. Root infusion is an excellent purgative. The stem bark is astringent, counterirritating, rubefacient, and vesicant and is used for ulcers. Cashew nut shell oil is antihypertensive and purgative; it is used for blood sugar problems, kidney diseases, cholera, cracks on the soles of feet, hookworms, corns, and warts. The kernel is a demulcent and an emollient and is used for diarrhea. The resinous juice of seeds is used for mental derangement, heart palpitation, and rheumatism. A gum exudes from the trunk and repels insects. An extract of the pericarp and nut is used to treat wood to give complete protection against beetles. Cashew syrup is a good remedy for coughs and colds. Cashew apple juice is said to be effective for the treatment of syphilis.

Constituents — Cashew elaborates a complex mixture of compounds in different parts of the plant. The kernel testa (skin) is reported to contain huge amounts of tannin, and the tannin extracted from cashew kernel testa is used in the leather industry. The juice of the cashew apple is rich in riboflavin (vitamin B₂), ascorbic acid (vitamin C), and calcium. The nutrient composition of the cashew fruit apple is as follows:

Composition of Cashew Apples

Moisture	86.1 (g/100 g)
Proteins	0.8 (g/100 g)
Fat	0.2 (g/100 g)
Carbohydrate	12.6 (g/100 g)
Fiber	0.6 (g/100 g)
Ash	0.3 (g/100 g)
Ca	0.2 (mg/100 g)
P	19.0 (mg/100 g)
Fe	0.4 (mg/100 g)
Vitamin B ₁	0.2 (thiamine mg/100 g)
Vitamin B ₂	0.2 (riboflavin mg/100 g)
Niacin	0.5 (mg/100 g)
Vitamin C	200 (mg/100 g)

The seed contains 21% protein and 35–45% oil. The oil contains 60–74% oleic acid and 20–8% linoleic acid. Cashew nut shell liquid (CNSL) contains 90% anacardic acid (C₂₂H₃₂O₃) and 10% cardol (C₃₂H₂₇O₄). It also yields glycerides; linoleic, palmitic, stearic, and lignoceric acids; and sitosterol. Other constituents include anacardol, cardanol, quercetin, and kaempferol glycosides. The presence of the phenolic lipids related to anacardic acid in cashew is of immense industrial and

therapeutic importance. The testa contains α -catechin, β -sitosterol, and 1-epicatechin, as well as proanthocyanidin leucocyanidin and leucopelargonidin. The dark color of the nut is due to an iron-polyphenol complex. The oil content of the shell ranges from 16.6% to 32.9%, of the kernel from 34.5% to 46.8%. Reducing sugars range from 0.9% to 3.2%, nonreducing sugars from 1.3% to 5.8%, total sugars from 2.4% to 8.7%, and starch from 4.7% to 11.2%. Gum exudates contain arabinose, galactose, rhamnose, and xylose.

Pharmacological Studies — The pharmacological properties of cashew are usually classified according to the plant part of interest. Leaves derive their activity due to the presence of flavonoid glycosides. The leaves have been shown to be effective antimicrobial agents.¹⁸¹ The so-called cashew apple contains nutrients that play health restorative roles. The most active components of cashew are in the oils obtained from the shell. Anarcadic acid has been shown to possess broad-spectrum activity against various bacteria, fungi, and algae¹⁸² and has proved useful in treating tooth abscesses. Perhaps of greater importance is its potentiating effect on antibiotics used for the treatment of drug-resistant Gram-positive and Gram-negative bacteria.¹⁸³ It has also been shown to possess insecticidal and molluscicidal activities, as well as enzyme inhibition with potential application in certain cancers.¹⁸⁴

Toxicity — Some persons are allergic to raw cashew nuts and cardol and anarcadic acid in CNSL. Other proteins have been identified as contributing to the allergic reaction to cashew. Cooking often does not remove or change these proteins. These allergic reactions can be life threatening or even fatal; prompt medical attention is necessary. Care must be taken before cashew products are taken by sensitive individuals. Dermatitis among cashew nut workers has been reported in many countries. During processing, care should be taken to ensure that CNSL does not contaminate the kernels.

Commerce — Cashew is cultivated for the nuts. Botanically, the nut is the fruit; the cashew apple is the swollen, fleshy fruit stalk. The seed kernels are extracted by shelling the roasted nuts. In production areas, cashew serves as food. Elsewhere, it forms a delicacy. The nut contains a high-quality oil; the cake remaining after extraction serves as animal feed.

Value-Added Products from Cashew

Cashew kernels are used worldwide as a snack, but most of the exports from Africa are raw cashew kernels sent to India and Europe for processing. Various diversified products can be obtained from the raw cashew kernels with minimum product development. Value addition through minimum processing can substantially enhance the economy of cashew production as follows:

1. *Cashew Kernel Flour*: The low-grade kernels, which can neither be exported nor sold in the domestic market, are made into cashew flour, which is highly proteinaceous and is easily digested. It is an excellent supplement to usual wheat flour.
2. *Cashew Kernel Oil* (“*Caribbean Oil*”): The kernel contains 35–40% oil,¹¹³⁷ which can be used as a substitute for imported olive oil. As in the case of cashew kernel flour, lower-grade kernels are also used to extract kernel oil, which is comparable with olive oil in its healthy and nutritious properties.
3. *Cashew Kernel Butter*: The residue of the kernel after oil extraction is used to produce cashew kernel butter, which can be used as a substitute for peanut butter. The oil-expressed kernel can also be processed into cashew nut cake, which can be used as animal feed.
5. *Cashew Kernel Milk*: Sweetened and flavored cashew milk can be prepared from cashew baby bits.
6. *Cashew Spread*: Baby bits and other nonwhole seeds can be used to prepare cashew spread, which can be sweetened with various flavors. (Adapted from Prabhakaran.¹¹³⁷)

Agriculture — Nigeria was the world’s largest producer of cashew nuts with shell in 2010. Most of the cashew nuts produced in Africa are still exported as raw nuts. Propagation is generally by seeds but may be vegetative from grafting, air layering, or inarching. Cashew germinates slowly and poorly; several nuts are usually planted in the hole and thinned later. Plantings are better done in situ as cashew seedlings do not transplant easily. Recommended spacing is 10 × 10 m, thinned to 20 × 20

m after about 10 years, with maximum planting of 250 trees/ha. Once established, a field needs little care. Intercropping is common and may be done the first few years, with cotton, peanut, or yams. Fruits are produced after 3 years, during which lower branches and suckers are removed. Full production is attained by the 10th year, and a tree continues to bear until it is about 30 years old. In dry areas, such as Tanzania, flowering occurs in the dry season, and fruits mature in 2–3 months. Flowers and fruits in various degrees of development are often present in the same panicle. From the flowering stage to ripe fruit requires about 3 months. Mature fruit falls to the ground, where the “apple” dries away. In wet weather, they are gathered each day and dried for 1–3 days. Mechanical means for shelling have been unsuccessful, so hand labor is required. Cashews are usually roasted in the shell (to make it brittle and the oil less blistering), cracked, and the nuts removed and vacuum packed.¹⁸⁵

ANDROGRAPHIS PANICULATA



Botanical Name — *Andrographis paniculata* (Burm.f.) Nees

Synonym — *Andrographis paniculata* var. *glandulosa* Trimen

Family — Acanthaceae

Common Names — Andrographis, green chirayta, creat, king of bitters, India echinacea, Kalmegh or Kalamegha

Description — *Andrographis paniculata* is an erect herb that grows to a height of 30–110 cm. The slender stem is dark green, squared in cross section with longitudinal furrows and wings along the angles. The lance-shaped leaves have hairless blades measuring up to 8 cm long by 2.5 wide. The small flowers are borne in spreading racemes. The fruit is a capsule around 2 cm long and a few millimeters wide. It contains many yellow-brown seeds (Wikipedia).¹¹³⁸

Habitat and Distribution — *A. paniculata* is often found in moist, shady places in a variety of habitats, such as plains, hillsides, coastlines, and disturbed and cultivated areas such as roadsides, farms, and wastelands. Native populations of *A. paniculata* are spread throughout Asia, especially

China, India, and Sri Lanka. The herb has only been identified in Africa as occurring in Kaduna and other northern parts of Nigeria. It may be an introduced species as it is not widely known in the country.

Ethnomedicinal Uses — *Andrographis paniculata* is used in traditional medicine for the treatment of many ailments. It has been used as an antibacterial, antifungal, antidiabetic, anti-hypercholesterolemic, and antiviral agent. The leaves are used in Nigeria for the management of hypertension.¹⁸⁶ In the Indian subcontinent, it is used as an immunostimulant, for hypertension, and for cold and colic pains in children; it is a diuretic, an emmenagogue, an astringent, an emollient, a gastric and liver tonic, an antipyretic, and a “blood purifier.” It is recommended in the Indian traditional system of medicine for gonorrhea, leprosy, boils and skin eruptions, scabies, and chronic and seasonal fevers because of its supposedly blood-purifying properties.¹⁸⁷

In China, the herb known as *Chuanxinlian*, *Yijianxi*, or *Lanhelian* is described as bitter and cold and is used as an antipyretic, detoxicant, and anti-inflammatory and is thought to remove “pathogenic heat” from the blood. *A. paniculata* is used for the treatment of pharyngolaryngitis, diarrhea, dysentery, cough with thick sputum, carbuncle, sores, and snakebites. Various preparations and compound formulas of the herb have been used to treat infectious and noninfectious diseases, with significant effective rates reported for conditions such as epidemic encephalitis B, suppurative otitis media, neonatal subcutaneous annular ulcer, vaginitis, cervical erosion, pelvic inflammation, herpes zoster, chicken pox, mumps, neurodermatitis, eczema, and burns.¹⁸⁸

Constituents — *A. paniculata* contains diterpenes, diterpene-glycosides, lactones, and flavonoids. The main active chemical constituent is the diterpene lactone andrographolide, a colorless, crystalline substance with a very bitter taste. Andrographolide is considered a marker compound for the identification of this herb. Another bitter principle isolated from the leaves is a compound called kalmeghin. Flavonoids occur in the roots and leaves. The aerial parts contain alkanes, ketones, and aldehydes. Chinese investigators isolated five lactones—chuanxinlian, deoxyandrographolide, andrographolide, neoandrographolide, and 14-deoxy-11,12-didehydroandrographolide—from the aerial parts of the plant. A diterpene glucoside (deoxyandrographolide-19- β -D-glucoside) has been detected in the leaves, and six diterpenoids of the ent-labdane type, two diterpene glucosides and four diterpene dimers (bis-andrographolides A, B, C, and D), have also been isolated from aerial parts. Two flavonoids identified as 5,7,2',3'-tetramethoxyflavanone and 5-hydroxy-7,2',3'-trimethoxy flavone were isolated from the whole plant. Previous reports indicated that 12 flavonoids and 14 diterpenoids have been isolated from the aerial parts of the plant in China.^{189,190}

Pharmacological Studies — *Andrographis paniculata* extracts and isolates are known to possess a variety of pharmacological activities and have been tested against a variety of biological systems to correlate the observed traditional uses with evidence from laboratory and clinical studies. They exhibit antipyretic, antiinflammatory, antimalarial, antihepatotoxic, antityphoid, antihypertensive, and antifungal activities. Their use as a general immunostimulant agent has also been the subject of many investigations. A study conducted at Bastyr University (USA) showed a significant rise in the mean CD4 lymphocyte level of HIV subjects after administration of 10 mg/kg andrographolide, the main constituent extracted from the leaves of the plant.¹⁹¹ In another study conducted on the cellular processes and targets modulated by andrographolide treatment in human cancer and immune cells, andrographolide treatment inhibited the *in vitro* proliferation of different tumor cell lines, representing various types of cancers. The compound exerts direct anticancer activity on cancer cells by cell cycle arrest at the G0/G1 phase through induction of cell cycle inhibitory protein and decreased expression of cyclin-dependent kinase 4 (CDK4). Immunostimulatory activity of andrographolide is evidenced by increased proliferation of lymphocytes and production of interleukin 2. Andrographolide also enhanced the tumor necrosis factor alpha (TNF- α) production and CD marker expression, resulting in increased cytotoxic activity of lymphocytes against cancer cells, which may contribute to its indirect anticancer activity.

Antioxidant and anti-inflammatory activities of *A. paniculata* and its constituents have been validated in several experimental models. For example, in nicotine-induced inhibition of mitochondrial

electron chain complexes, the resultant increase in nitric oxide (NO) in different parts of rats' brains was prevented by simultaneous treatment with the water and ethanol extracts of *A. paniculata* or andrographolide; the water extract exhibited greater antioxidant activity than the ethanol extract.¹⁹² The antioxidant activity of the aqueous extract on liver defense systems in lymphoma-bearing AKR mice has also been investigated. The aqueous extract significantly increased the activities of catalase (CAT), superoxide dismutase (SOD), and glutathione-S-transferase enzymes and reduced lactate dehydrogenase activity.¹⁹³ A methanol extract inhibited formation of reactive oxygen species (ROS) *in vitro* and completely inhibited carrageenan-induced inflammation. Andrographolide pretreatment significantly attenuates accumulation of phorbol-12 myristate-13-acetate (PMA)-induced formation of ROS and N-formyl-methionyl-leucyl-phenylalanine (fMLP)-induced adhesion of rat neutrophils.¹⁹⁴ A double-blind, placebo-controlled study has shown that the king of bitters also had a reproducible effect on rheumatoid arthritis.¹⁹⁵

The antihyperglycemic and hypoglycemic properties of *A. paniculata* have been investigated in several animal models and controlled clinical studies. It appears that the water extract does not exert any hypoglycemic effect on nondiabetic animals, whereas the methanolic extract and andrographolide showed reduction in serum glucose of both diabetic and normal laboratory animals. Chronic administration of the extract for 6 weeks showed no effect on the fasting blood glucose level but significantly prevented orally administered glucose-induced hyperglycemia in nondiabetic rabbits without affecting epinephrine-induced hyperglycemia. However, in chemically induced diabetic laboratory animals, it significantly reduced the serum blood sugar levels.¹⁸⁷ It has been suggested that the hypoglycemic effect of *A. paniculata* may be due to insulin release from pancreatic β -cells through ATP (adenosine triphosphate)-sensitive potassium channels, similar to other insulinotropic antidiabetic agents. *In vitro* experiments indicated that inhibition of alpha-glucosidase and alpha-amylase enzyme could be the mechanism by which the ethanol extract of *A. paniculata* and andrographolide produce a hypoglycemic effect. It is highly possible that the hypoglycemic and antihyperglycemic activities of the extract and andrographolide may involve different mechanisms in normal and diabetic conditions. Water extract seems to be a more suitable candidate for use as a dietary supplement as it does not affect fasting blood glucose levels of nondiabetic animals.

For its use in the treatment of hypertension, *A. paniculata* aqueous extract produced a dose-dependent fall in systolic blood pressure of both spontaneously hypertensive rats (SHRs) and normotensive Wistar-Kyoto rats, with a corresponding significant decrease in plasma angiotensin-converting enzyme (ACE) activity and lipid peroxidation in kidneys in extract-treated SHRs. It was also observed that the decreases in ACE activity and lipid peroxidation were not significantly altered in normotensive Wistar-Kyoto rats, which suggests that the hypotensive effect in hypertensive and normotensive rats is not mediated through identical mechanisms.^{187,196} Other studies have supported this observation and validated the use of the aqueous extracts of *Andrographis* in the treatment of cardiac insufficiency and myocardial ischemic-reperfusion injury.

On reproductive systems, the current evidence suggests that *A. paniculata* affects the productive system in both male and female animals, but the results are too inconsistent, with some findings directly contradicting others, to reach any definitive conclusion about the reproductive effects of *A. paniculata* and its possible role in human fertility.

Toxicity — *Andrographis* is well tolerated in mild doses, and no acute toxicity has been reported in clinical studies. The LD₅₀ of the alcohol extract and andrographolide is 1.8 g/kg and 11.46 g/kg in mice, respectively. In a study of HIV-positive patients, a dose of 1500–2000 mg of andrographolides was given daily for 6 weeks. Side effects led to the early discontinuation of the study despite some improvements in CD4+ counts. Because of the inconsistency in the effect on the reproductive system, it would be advisable for both men and women to avoid this herb during desired conception and for women during pregnancy. Concurrent use of *A. paniculata* with a prescription should be carefully monitored because of reports of possible drug-herb interaction. It was found that some of the components of *A. paniculata* interact with theophylline and retard its elimination when theophylline was administered at a high dose. The study suggested that patients who want to use CYP1A2-metabolized

drugs such as caffeine and theophylline should be advised of the potential herb-drug interaction to reduce therapeutic failure or increased toxicity of conventional drug therapy.¹⁹⁷

Commerce — *Andrographis paniculata* is a global article of commerce. The whole drug and isolated compounds are used in the production of many proprietary phytomedicines.

Agriculture — The plant is not cultivated commercially in Africa. A successful trial cultivation of *A. paniculata* was done in the Bioresources Institute of Nigeria in collaboration with the Natural Remedies Company of India. It was found that the Nigerian cultivar had a good yield of andrographolide, which suggests that the crop can be grown commercially in Africa.

ANTHOCLEISTA NOBILIS



Botanical Name — *Anthocleista nobilis* G. Don

Synonyms — *A. parviflora* Baker., *A. macrophylla* G. Don

Family — Gentianaceae

Common Names — Cabbage tree, cabbage palm

African Names — Fante: hororoho; Twi (Ashanti): awudifoakete, bontodi

Description — *Anthocleista nobilis* is a tall tree, growing up to 20 m high, 50–90 cm wide. The bark is light gray and smooth, with the bole free of branches for up to 15 m nestled with a small crown with ascending hollow branches. It has a cream-yellow and granular slash. The leaf axils accommodate twigs with two divergent spines. The leaves appear to be crowded at the apices of the branchlets, opposite, subequal, sessile, or shortly petiolate. An FAO monograph of this species showed that the petioles are up to one-sixth as long as the blade; the blade is oblong elliptic, obovate-elliptic, or oblanceolate, up to 6.5–12 cm long, 4–12 cm wide, larger on young trees, discolourous, dark green above, glaucous below.³³ It produces erect hermaphrodite flowers, with branched, terminal cymes, 12–16 cm long, borne on conspicuously long peduncles with the stamens attached to the corolla tube and protruding. Fruits occur as dark brown ellipsoid berries 2–2.5 cm in diameter with persistent calyx and contain many seeds. The plant appears to produce flowers most times of the year.^{9,28,33}

Habitat and Distribution — *Anthocleista* inhabits transitional and secondary forests. It can be found dotted in semideciduous forests and semisavanna regions. It is reported as preferring well-drained soils, a rainfall of between 1100 and 2000 mm a year, and a temperature not exceeding 35°C. It generally prefers low-lying ground not exceeding 300 m above sea level but can occur up to 1200 m.³⁷ It occurs in the West Coast in Senegal, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Cameroon, and Nigeria.

Ethnomedicinal Uses — It is a common ingredient in several traditional remedies in Gabon and neighboring regions of West Africa.¹⁹⁸ The bark is dispensed in Nigeria and Ghana as an anti-microbial agent for the treatment of venereal diseases. The bark is used as a mixture with those of *Bosqueia angolensis* and *Spathodea campanulata* as a weak decoction once a week as an antifertility agent. The preparation can also be administered as an enema. In the Ivory Coast, it is prescribed as a purgative.¹⁹⁹ The genus is reputed to have antidiabetic activity. In Ghana, the bark is boiled with water and the liquid extract taken once a day for the cure of piles, intestinal and abdominal troubles, and worms.³³ The same prescription, sometimes mixed with the bark of *Morinda lucida*, is drunk as a purgative for jaundice in Akwapim. The root bark mixed with red pepper, ginger, and guinea grain (Piper) is used by the Fanti as an enema for the management of hernia. In the Central African Republic, the roots steeped and mixed with guinea grain and pepper are used for the treatment of hemorrhoids, and an infusion of the stem bark after exposure to the sun in an open bottle is used for gonorrhea. In the same region, the bark decoction is used as an enema and a sitz bath for colic and stomach troubles, and the pulped bark is applied per rectum to children as an anthelmintic. The bark decoction is drunk or used in a bath and vapor bath as an antidote to poisoning and also for leprosy, gonorrhea, or menstrual troubles or as a purgative.³³ In Sierra Leone, the plant features extensively in the treatment of gynecological problems; the leaf decoction is taken with lemon for abdominal pains of uterine origin.⁶ It is an ingredient for the preparation of a long-term contraceptive. The decoction of the leaves with lemon is also used in Ghana for the treatment of epilepsy. A related species, *A. djalensis*, is used in folk medicine for the same indications as listed in Irvine.⁹

Constituents — The bark contains indole alkaloids similar to brucine.²⁰⁰ The genus yields a bitter monoterpene heteroside swertiamaroside or swertiamarin.

Pharmacological Studies — The alcoholic extract of the root has been shown to possess anti-diabetic effects.³³ It has been suggested that the hypotensive and hypoglycemic activity of the plant may be valuable in the clinical management of obese adults with secondary hypertension.²⁰⁰

Toxicity — Cases of accidental poisonings have been reported, and the symptoms include colic, obstinate constipation, pronounced pallor, and heart weakness.¹⁹⁹

ARECA CATHECHU



Botanical Name — *Areca catechu* L.

Synonyms — *Areca faufel* Gaertn., *Areca himalayana* Griff. ex H. Wendl., *Areca hortensis* Lour., *Areca nigra* Giseke ex H. Wendl.

Family — Arecaceae

Common Names — Betel nuts, *Arecae semen*, Arekasame, noix d'arec

Description — *Areca* fruit is ovoid, bright orange in color when fully ripe, and about 3 to 5 cm in diameter and 6 to 8 cm long. The nut consists of a hard kernel, grayish brown in color with a network of paler depressed lines and a deep testa showing fawn marbling. It is slightly acidic in taste and astringent, and the odor is faint. The plant itself grows as an erect, rather graceful palm with a slender, tall stem crowned by a tuft of the large ornately ordered leaves.

Habitat and Distribution — The plant is pantropic and prefers dry deciduous forestland. It is indigenous to East and North Africa, Malaysia, the Philippines, Indonesia, Sri Lanka, and India. It is cultivated in many tropical countries for its valuable nuts. It grows in the savanna belt and in deciduous forests and secondary clearings. It is a major crop in North Africa and parts of South Africa.

Ethnomedicinal Uses — It is used as a masticatory agent and tonic in most parts of Africa. *Areca* chewing custom appears to be almost universal among traditional societies, such as in Papua New Guinea, Melanesia, and many Asian countries. It is an effective anthelmintic, laxative, and astringent. Although there is a decline in the use of the nut in human medicine, there has been a renewed interest in the drug due to the beneficial effects of arecoline in the treatment of AD.²⁰¹ In India, the nut is dispensed for infections, urinary diseases, vaginal disorders, and heartburn in pregnancy.¹⁶⁶

Constituents — The principal compound in *Areca* nuts is the alkaloid arecoline, accounting for 0.5% of the plant material. Other constituents include guvacoline, arecaine, arecaine, guvacine, and several other amino acids, as well as phlobaphene tannins, fixed oils, and procyanidins (PACs).

Pharmacological Studies — *Areca* is a taeniicide, and it is employed often in veterinary medicine, where it is used for the eradication of roundworms and the tapeworms. Chewing the nuts as a masticatory is said to act as a tonic; it refreshes the breath and removes unpleasant tastes, strengthens the gum, and checks perspiration.¹⁶⁶ *Areca* chewing promotes the flow of saliva, and this habit has been associated with the increased incidence of some types of oral leukoplakia and cancer. The quids are often composed of areca, lime, and occasionally tobacco leaf or "snuff." The carcinogenic principle in *Areca* is probably the alkaloid arecaine.²⁰² Two of the components of *Areca*, guvacine and arecaine, have been found to possess competitive inhibition of γ -aminobutyric acid *in vitro*.²⁰³ *Areca* nuts possess CNS activity, and the use of these nuts can be addictive; the development of severe pyramidal symptoms has been reported in two chronic schizophrenics after chewing betel nuts.²⁰⁴

Arecoline, methyl-1,2,5,6-tetrahydro-1-methylnicotinate, is the major anthelmintic alkaloid isolated from betel nuts. It has parasymphomimetic activity and has been employed sometimes as a substitute for pilocarpine. It is a strong taeniafuge, but lacks pronounced taeniacidal activity, and has been commonly used in veterinary medicine as a purgative and taeniafuge. It has been used extensively in many countries to control infestation of *Echinococcus granulosus* in dogs.

ARTEMISIA AFRA

Botanical Name — *Artemisia afra* Jacq. ex Wild.

Synonyms — *Absinthium ponticum* (L.) Garsault., *Absinthium tenuifolium* Gaterau., *Artemisia altaica* Desf., *Artemisia balsamita* Willd., *Artemisia grandiflora* Fisch. ex Herder., *Artemisia pallida* Salisb., *Artemisia pontica* Burm.f., *Artemisia pseudopontica* Schur., *Artemisia tenuifolia* Moench.

Family — Compositae

Common Names — Als, wild-als, wild wormwood, African wormwood

African Names — Kisambaa: fivi; Kinyakyusa: lusanje; Kisafwa: luyanga; Swati: umhlonyane; Tsawana: lengana, iliongana; Xhosa: umhlonyane; Zulu: umhlonyane

Description — The plant is a medium-size perennial herb, rarely exceeding 2 m high. It has a ribbed stem, and the aerial parts have the strong characteristic odor of wormwood; it is much branched and woody, shortly rhizomatous. The leaves are 6 cm long, gray-green, alternately arranged, and oval in shape. It produces pale yellow tubular florets, with few outer female and inner bisexual inflorescence occurring in an elongated racemose panicle. The capitula is small, the receptacle is flat and naked. (achenes cylindrical, pappus absent). The African wormwood flowers between March and July, and the seeds are produced from August to November.^{28,33}

Habitat and Distribution — According to the FAO report,³³ *Artemisia afra* is a clump-forming perennial herb of the highland areas of eastern and southern Africa at an altitude between 1500 and 2500 (3000) m. The soils range from volcanic ash, loamy sands, to sandy or calcareous clay loams of volcanic or granitic origin.³³ The plant grows in the southern and eastern regions of the continent. It has been located in Ethiopia, Kenya, Zimbabwe, Malawi, Angola, and the Republic of South Africa.

Ethnomedicinal Uses — A decoction of the leaves is used for the treatment of bronchial diseases.³⁷ It is a common ingredient for the preparation of remedies for cough, colds, dyspepsia, stomachache, gout, and constipation. In South Africa, a decoction of the leaves and lemongrass is used as an antipyretic and for the treatment of malaria. A fermentation prepared with the heated herb is given to children with a sore throat (Kokwaro). Other uses of the African wormwood include the treatment of indigestion, as an anthelmintic, and as an anti-inflammatory agent. Externally, the plant is used in the treatment of skin infections, as a hot bath in measles, and as a local application for hemorrhoids. In Tanzania, a weak infusion of the leaves is administered for the treatment of colic.²⁰⁵

Constituents — The plant yields a pleasant-smelling volatile oil, which contains cineole, thujone, umbelliferone, and some polyacetylenes. Earlier reports indicated the probable presence of ceryl cerotate, triacontane, scopoletin, and quebrachitol.³³

Pharmacological Studies — The volatile oil has been shown to be abortifacient when administered per os to rabbits. The extract is known to produce hemophagic nephritis, nonfatty degeneration of the liver, and pulmonary edema.²⁰⁶ The Asian species, *A. annua*, has been shown to possess significant activity against multidrug-resistant malaria.²⁰⁷

ASPALATHUS LINEARIS — ROOIBOS

Botanical Name — *Aspalathus linearis* (Burm. f.) R. Dahlgren

Synonyms — *Aspalathus tenuifolia* DC., Prodr.; *Aspalathus contaminatum* Druce; *Aspalathus corymbosa* C.A. Mey.; *Lebeckia linearis* (Burm. f.) DC.; *Psoralea linearis* Burm. f.

Family — Leguminosae

Common Names — Rooibos, rotbush, aspalathus, *Herba Aspalathi*, bush tea, bushman, mountain tea, red bush, red bush tea, rooibos tea

African Names — Afrikaans: rooibos; South Africa: koopmanstee, naaldtee rooibostee

Description — *Aspalathus linearis* has been described as an erect to spreading, highly variable shrub or shrublet up to 2 m high. Its young branches are often reddish. The leaves are green and needle-like, 15–60 mm long and up to about 1 mm thick. They are without stalks and stipules and may be densely clustered. The yellow flowers, which appear in spring to early summer, are solitary or arranged in dense groups at the tips of branches. The fruit is a small, lance-shaped pod, usually containing one or two hard seeds.¹¹⁴⁰

Habitat and Distribution — Rooibos is native to South Africa, where it appears to be restricted only in the Cedarberg area and around the villages of Clanwilliam and Citrusdal, which are situated to the north of Cape Town in South Africa. Apparently, rooibos needs a very specific climate and soil to grow and elaborate its characteristic compounds as efforts to cultivate rooibos in other areas or countries with similar climates have not been very successful.

Ethnomedicinal Uses — *Aspalathus linearis* is a major South African medicinal plant and has been used in the Cape region of that country for centuries. Its main uses in South African traditional medicine include alleviating infantile colic, allergies, asthma, and dermatological problems. It has also been used for its anti-inflammatory and antiallergic properties.

Constituents — Rooibos is the only known source of the chalcone aspalathin. Other phytochemicals found include nothofagin, caffeic acid, chrysoeriol, isoquercitrin, orientin, isoorientin, luteolin, vitexin, isovitexin, luteolin, rutin, flavonoids, quercetin, and polyphenols.

Pharmacological Studies — Although reports of double-blind clinical studies with rooibos are scarce in the scientific literature, animal studies suggested it has potent antioxidant, immunomodulating, and chemopreventive effects. Clinical outcome observations have shown that consumption of rooibos tea may relieve fever, asthma, insomnia, colic in infants, and skin disorders. Rooibos extracts are used in ointments against eczema. In South Africa, it is common to give rooibos tea to babies who suffer from stomach cramps (colic).

The presence of quercetin and lutein has been linked to prevention of cardiovascular diseases, some cancers, and stroke and has been supported by *in vitro* and animal studies. A trial to test the effects of rooibos on various biological markers considered to be indicative of risk for cardiovascular disease and other degenerative diseases has shown that a high intake of rooibos tea resulted in significant reductions in lipid peroxidation, low-density lipoprotein (LDL) cholesterol, and triglycerides and an increase in high-density lipoprotein (HDL) cholesterol levels compared with the control group. The investigators concluded that rooibos lowered risk factors associated with degenerative heart diseases.²⁰⁸ Rutin has been associated with the maintenance of blood vessel walls. The low level of tannins in rooibos is believed to prevent problems with iron absorption associated with some tannin-rich herbal teas. Some trade journal publications have suggested that rooibos extracts from fermented rooibos leaves could reduce cancerous transformation of mouse cells irradiated with X-rays, but extracts from unfermented green rooibos tea did not show this protective effect.

According to entries in the Internet free encyclopedia, Wikipedia, rooibos is purported to assist with nervous tension, allergies, and digestive problems. Rooibos tea has been shown to inhibit *in vitro* activity of xanthine oxidase (XO), yet an *in vivo* study has not been conducted. XO plays a role in conversion of purine to uric acid in humans, and reducing the activity of XO could limit uric acid production, which would aid in treatment of gout.

Toxicity — Rooibos is generally considered as nontoxic, but a recent report identified a possible case of hepatotoxicity due to rooibos consumption.²⁰⁹ However, it has been suggested that it was possible that the tea may have been contaminated by another hepatotoxic compound or that the person may have had a genetic predisposition to react negatively to any one of the other bioactive properties found in the tea.

Commerce — Rooibos is a major herbal tea from South Africa. A trade controversy surrounding the name *Rooibos* became a case study on the possible abuse of intellectual property rights to gain an illegal monopoly. In 1994, Burke International obtained a patent from the U.S. Patent and Trademark Office for the use of the name *Rooibos*, which gave the company a monopoly on the use of the name in America at a time when it was virtually unknown in America. When the plant later entered more widespread use, Burke demanded that companies either pay fees for use of the name or cease its use. In 2005, the American Herbal Products Association and a number of import companies succeeded in challenging the trademark through petitions and lawsuits, and after losing one of the cases, Burke surrendered the name to the public domain.²¹⁰ However, it is interesting that South Africa has a legal framework for the protection and restriction of commercial use of the name *Rooibos* in that country. It has drawn parallel inferences to similar legislation that already exists in Europe (for the protection of the names *Champagne* and *Port*, for example). This is despite Rooibos South Africa's decision to contest the Burke trademark on the grounds that rooibos is a generic term, rather than claiming it as a geographic indication.²¹¹

Agriculture — Attempts to grow *Aspalathus linearis* outside its natural home in South Africa have not been successful. PROTA4U¹¹⁴⁰ outlined the following methodology: The seeds must first be scarified and then planted in acid, sandy soils. The local rooibos tea management board supplies seeds that have been treated and germinate easily. They are planted in seedbeds in March to a depth of 5–10 cm and are ready for planting out by July. Plants are generally rainfall dependent but prefer not to be too wet. No fertilizing is required, and the plants grow quite well in nutrient-poor conditions. Seedlings are transferred to plantations. It takes 12–18 months before the shrubs are ready to be harvested. They are harvested once each year, from December through April for a period up to 5 years. They are then pulled out, and new plants are planted. The basic method of rooibos harvesting has remained largely the same as the process used centuries ago. An environmentally friendly way of harvesting tea is used that involves cutting only the young branches. Once they are cut, they are neatly bound and transported to the process yards. The older branches are left on the tree, and the bushes become slightly taller every year. The tea cuttings are chopped very fine and then bruised to ensure that the important chemical reaction that develops the characteristic color and flavor of the tea can take place. After watering and airing, the tea is left to “sweat” in heaps, and it is at this point that the tea acquires its typical reddish-brown color and develops its sweet flavor. After the sweating process has been completed, it is spread out in a large drying yard to dry in the sun. The rest of the process involves sorting and grading the tea according to length, color, and flavor. The finished rooibos is finally weighed, bagged, and sold to companies that pack the product in either teabags or in loose-leaf form under their own brand names.¹¹⁴⁰

ASPARAGUS AFRICANUS

Botanical Name — *Asparagus africanus* Lam.

Synonyms — *Protasparagus africanus* (Lam.) Oberm.

Family — Asparagaceae

African Names — Bambara: sogoba kenessi; Falor: simboul; Fulani: pelol fouru, nombo; Ga: adende, enene; Hausa: sark'a, sansarin kura; Malinke: inaniaga; Mende: ningei; Tukolor: narari; Wolof: narara; Yoruba: aluki, kadankobe

Description — The plant is a member of the plant subfamily Asparagae (Liliaceae). It is a tall, climbing undershrub, with wiry stem and small white fragrant flowers.²¹²

Habitat and Distribution — Members of the genus grow in the savanna and deciduous forest zones of West Africa and parts of East Africa. It is distributed from Guinea to Kenya.

Ethnomedicinal Uses — Several species of *Asparagus* yield edible fruits or leaves. The cladodes (leaves) are used as an external application when crushed to stimulate hair growth in women. In Sudan, the plant is administered for diuresis and as a remedy for syphilis. It has also been used as a poultice for the treatment of swellings and guinea worm sores and internally as a remedy for hematuria.

Constituents — Saponins, named A4–A8, have been isolated from the roots of *A. racemosus*. One of the saponins, A4, yields glucose and rhamnose on hydrolysis with acid sarsapogenin.²¹³

Pharmacological Uses — The root extracts of the related *Racemosus* have been shown to possess cardiogenic and antioxytotic effects.^{214,215} The plant exhibited an inhibitory effect against *Entamoeba histolytica*²¹⁸ and showed galactagogue effects, which were accompanied by an increase in weight of the mammary glands in rats²¹⁹ as well as in buffaloes.¹¹⁴ Dhar et al. reported the *in vitro* activity of extracts of the plant against human epidermal carcinoma of the nasopharynx.²¹⁶

An aqueous extract of the root has been shown by Thatte and Dhanukar to exert immunotherapeutic effects in diverse experimental infections.²¹⁷ It was found that the extract protected rats against mortality induced by intra-abdominal sepsis following cecal ligation. In the animals treated with the extract, only 27.2% mortality occurred compared to 66–100% recorded for the untreated group on the 5th day. The extract and the serum from rats treated with *A. racemosus* were devoid of any *in vitro* antimicrobial activity, which indicated that the mechanism of protection against

mortality induced by cecal ligation was not mediated through a direct antibacterial activity.²¹³ The extract also significantly reduced mortality due to *E. coli*-induced peritonitis in mice.²¹³

A. racemosus extract abolished neutropenia produced by a single dose (200 mg/kg s.c.) of cyclophosphamide (a known myelosuppressive agent) and compared favorably with the effects of lithium carbonate and glucan in checking the myelosuppressive effects of both single and multiple doses of cyclophosphamide.²¹⁸ The test substances produced leukocytosis with a predominant neutrophilia and prevented the cyclophosphamide-induced leukopenia. It has also been reported that the extract of the plant improved macrophage function and reduced stress-induced gastric vascular damage.²¹⁹ In mice with hemisplenectomy, *A. racemosus* significantly reduced the mortality,²¹⁹ (28% vs. 100% in controls) due to *E. coli*-induced sepsis.

Clinical Properties — *Asparagus racemosus* is used in Indian medicine for the treatment of dysentery, inflammation, biliousness, epilepsy, and ophthalmic diseases. Animal studies, summarized previously, showed that the drug exerts its activity at least in part due to its immunostimulant property.

ASTRAGALUS GUMMIFER

Botanical Name — *Astragalus gummifer* Lab.

Synonyms — *A. strobiliferus* Royle, *A. erianthus* Willd., *A. adpressus* Ehrenb. ex Walp, *A. noemiae* Eig. var. *brantii* Eig.

Family — Leguminosae

Common Name — Tragacanth tree

African Names — Arabic: shagal et ketira; Tuareg: adrilel.

Description — *Astragalus* species occur as thorny shrubs. *A. gummifer* is an umbellate shrub with leaves composed of thorny rachis with 4–7 pairs mucronated and smooth leaflets. The flowers are borne in clusters of two or three at the axils of the leaves.⁹

Habitat and Distribution — Plants are found in steppe pastoral land and dry highlands up to an altitude of 1800 m in the Sahel region. The species occurs in Sudan, Niger, Chad, and the Kano Emirate of Nigeria.

Ethnomedicinal Studies — The plant is employed in folk medicine as a laxative. The leaves are used in the preparation of a wound-healing lotion. Tragacanth is the source of the pharmaceutical suspending agent tragacanth gum.

Constituents — The gum consists of a water-soluble polysaccharide portion known as bassorin. Tragacanthin is made up of an arabinogalactan, tragacanthic acid, and alcohol and has a high molecular weight (<800,000). The high-quality gums contain less tragacanthin.²²⁰ Tragacanthin yields on hydrolysis D-galacturonic, D-galactopyranose, L-fucose, D-xylopyranose, and L-arabofuranose. The gum also contains trace amounts of amino acids and their derivatives.

Pharmacological Studies — The polysaccharides from *A. gummifer* have been shown to have stimulatory activity on phagocytosis and to increase the plasma cell counts of T-lymphocytes.¹²³ Tragacanth has also been found active against a variety of experimental tumors.²²¹ Mice pretreated with extracts of the plant showed a reduction in the number of positive “takes” of translated Erlich ascites cells.²²¹

A fraction of the aqueous extract of *A. membranaceus* roots, with molecular weight of 20,000–25,000, has been shown to exert complete immune restoration of local xenogeneic graft-versus-host reaction (XGVHR) in cancer patients.²²² The *in vitro* immunomodulatory activity of the fractions of *A. membranaceus* was first determined from their effects on mononuclear cells (MNCs) derived from healthy normal donors using the local XGVHR test system.²²³ The extracts of MNCs derived from 13 cancer patients induced a significant increase in local XGVHR when compared to untreated MNCs derived from normal donor controls with the relative index (ratios) of 1.60 ± 0.48 and 1.23 ± 0.17 , respectively ($p < 0.005$).²²⁶ Chu and his colleagues also found that when the active fraction

was injected intravenously into phosphamide-primed rats at various concentrations prior to grafting of MNCs from healthy donors, maximum abrogation of the local XGVHR mounted by the MNCs was observed.²²⁵

It was shown that the reversal of the cyclophosphamide-induced immunosuppression by the administration of the active fraction of the plant drug was complete since the volume of the abrogated local XGVHR ($39.78 \pm 8.3 \text{ mm}^3$) was comparable to the value of $34.79 \pm 5.69 \text{ mm}^3$ ($p > 0.1$) in the negative saline control group without cyclophosphate priming.¹²⁴

Astragalus membranaceus was also tested on a chemiluminescent oxidative burst system as an indicator of phagocytic function in a murine macrophage cell line J774.²²⁴ The J774 cells were incubated with the aqueous herbal extract for 18 h at 37°C and 5% CO₂, and chemiluminescent oxidation was triggered by adding a zymosan. A suspension containing luminol was assayed in an automated luminometer. It was observed that a significant dose-related augmentation of chemiluminescence occurred with the addition of the extract.²²⁸ The drug also potentiates the LAK cell cytotoxicity generated by low-dose recombinant interleukin-2.²²⁵ Extracts of *Astragalus* are therefore indicated in the treatment of patients suffering from iatrogenic or inherent immune deficiency.

AZADIRACHTA INDICA

Botanical Name — *Azadirachta indica* A. Juss

Synonyms — *Melia azadirachta* L., *M. indica* (A. juss) Bandis

Family — Meliaceae

Common Names — Neem, nim, margosa tree, bead tree, holy tree, Indian lilac tree

African Names — Arabic: zanzalacht; Hausa: dogon yaro; Igbo: ogwu akom; Yoruba: aforo-oyinbo

Description — *A. indica* is a shady tree with an evergreen crown; it grows up to 25 m high in some places but occurs in West Africa mostly as a medium-size tree. It has rough, dark brown bark with wide, shallow longitudinal fissures separated by flat ridges. The bole is short and stout. It is easily confused with *Melia azedarach*, an Asian tree, which has also been introduced to other tropical parts of the world; references to *A. indica* in very old literature should be viewed with caution. The leaves are compound, imparipinnate, each comprising 5–15 leaflets; they are very diagnostic and measure about 6 m long and 2 cm broad. The tree bears many flowered panicles, mostly in the leaf axils; sepals are ovate-, sub- or bicular, about 1 cm long, with sweet-scented white oblongeolate petals. It produces yellow drupes, which are ellipsoid, glabrous, and 12–20 cm long.^{9,33}

Habitat and Distribution — This is an introduced plant that is now naturalized in Africa. It is widely cultivated throughout West and Central Africa as an ornamental plant. It is a drought-resistant plant and therefore grows well in the arid parts of the continent.

Ethnomedicinal Uses — The plant is used widely in Africa, especially on the West Coast, for the treatment of malaria. It is such a favorite malaria remedy that it is uncommon near homes to see an intact tree without the stem bark scraped for medicinal use. The extracts from neem have been acclaimed as effective in malarial attacks for which the allopathic antimalarial drugs were found ineffective either because of the presence of resistant *Plasmodium* strains or because of acquired tolerance from repeated dosing with 4- or 8-hydroxyquinoline derivatives and their analogues. The dried flowers are used as a tonic and stomachic and externally for the treatment of chronic eczema and as a fly repellent. A weak infusion of the bark is drunk as an antipyretic and a bitter. There is a limited use of the aqueous decoction of the root as an anthelmintic agent. The seed, which yields an oil of undistinguishable quality with the Indian “margosa oil” (technically the oil from *Melia azedarach*), is used extensively as an ingredient in the preparation of remedies for hemorrhoids, jaundice, and peptic ulcers. In Bendel State, Nigeria, the fruit juice is said to be useful in the treatment of boils, syphilitic sores, skin diseases, glandular swellings, jaundice, and peptic ulcers. The

fruit is also favored as a laxative and for the treatment of urinary diseases, leprosy, and intestinal worm infestation. The stem and root yield bitter but effective chewing sticks.

Azadirachta is a native to India, and it is employed widely in the Indochina region for a variety of medicinal uses and nonmedicinal purposes. Perry²²⁶ indicated that a tincture of the bark is helpful for people with chronic malaria or with jaundice and generalized fatigue and for the treatment of fevers following injuries. It was also stated that the tincture of the leaves gives an aperitif but constipating tonic and a stimulating rub to treat bruises, sprains, or muscular pains (see Der Marderosian and Liberti¹²⁷ for other uses of this plant in Asia). A proprietary product, Silvose, containing extract of the bark of *Azadirachta* is claimed to reduce dental caries and inflammation of the mouth when used as an ingredient in dental preparations. Powdered plant parts and extracts of neem have been incorporated into toothpastes and tooth powders.²²⁷ Infusion or tincture of *Azadirachta* is listed as a bitter;²⁰⁵ for this purpose, the usual dose is 15 to 30 ml of 1-in-20 c. infusion, or 4 to 8 ml of a 1-in-15 c. dilutions tincture.

Methods of Preparations, Administration, and Doses — In traditional medical practice, the leaves, stem bark, and root are used for the treatment of malaria in the form of an aqueous decoction. The selected part is usually reduced to small sizes, placed in a suitable container with water, and set aside to macerate for a period ranging from 1 day to several weeks. Portions of the extract are often dispensed as soon as an acceptable brew is achieved, and the marc replenished with fresh-water. The average concentration is about 100 ml, taken 2 or 3 times a day for about 2 to 3 days. The drug can also be prepared by macerating the coarsely powdered plant part for a few hours in cold water and using the hand to press out fluid from the marc. In urban areas, the drug is prepared either as a decoction with hot water or as an alcoholic extract.

Complementary to the oral therapy is steam treatment, in which the patient is covered with a thick blanket or cloth and subjected to the vapors from a boiling pot of herbs. *Azadirachta* is a common ingredient in such hot pot herbs. Other ingredients in the steam therapy include the leaves of *Cymbopogon citratus* (lemon grass), *Psidium guajava* (guava), *Mangifera indica* (mango), and *Hyptis suaveolens*. The drug is used prophylactically once a month in the form of a weak infusion called “neem tea.”

Constituents — All plant parts have been shown to contain some bitter principles, composed of nimbin, nimbidin, nimbinin desacetylnimbin, and structurally related compounds. The seed oil contains about 45% of these bitter substances, the stem bark yields 0.04%, while the fruit pulp and leaves contain about 25%.^{228,229} Salannolide, a meliacin with a unique feature by the presence of a hydroxybutenolide side chain in place of the usual furan ring attached at C-17, has been found to be one of the bitter principles of neem seed oil.²³⁰ A number of other nortriterpenoids, meliacins, have also been isolated from the plant. Kraus and his colleagues have reported the presence of azadirone and nimbin/salannin-type compounds from the seeds of neem.²³¹ They also isolated pentanortriterpenoids (nimbadiol and 6-O-acetylnimbadiol) for the first time in nature, from the seed oil, leaves, and stem bark.²³² Perhaps the most studied constituent of the seed is azadirachtin, which was isolated together with meladanin by Connolly in 1968 and was later found to inhibit the feeding response of the desert locust.²³³ The structure of this tetranortriterpenoid was determined by Butterworth and others using modern chemical methods, including spectroscopy.²³⁴ The seeds have also been shown to contain tiglic acid (5-methyl-2-butanoic acid), which is believed to be responsible for the distinctive odor of the oil.²³⁵ The fatty acid (diethernoid) present in the seed is said to aid the ripening of seeds. The gum lavones, which is a good emulsifying agent, is a unique gum by having D-glucosamine, an amino sugar, as one of its constituents. Other constituents of the gum include other simple sugars (such as fructose, rhamnose, xylose, and mannose), uronic acid and proteinaceous materials (e.g., amino acids and dipeptides). The plant contains relatively large amounts of carotene and vitamin C.²³⁶

Flavonoids have also been found in *Azadirachta*. Simple flavonoids, such as kaempferol and quercetin, have been isolated from the flowers. The chloroform-soluble fraction of the ethanolic

extract of the leaves has been found to contain an isoprenylated flavone, nimbaflavone, which was characterized from its spectroscopic data to be 8,3'-diisoprenyl-5,7-dihydroxy-4'-methoxyflavone.²³⁷ Rutin and quercetin-3-rhamnoside are the main constituents of the polar fraction of the alcoholic extract of the leaves.

Pharmacological Studies — The extracts of *A. indica* have been shown to possess antipyretic, analgesic, and anti-inflammatory activities.²³⁸ The leaf decoction decreased the parasite count in chloroquine-sensitive strains of *Plasmodium berghei* injected in mice and inhibited the growth of *P. falciparum*.^{239,240} The antimalarial activity has been estimated to be equivalent to half the therapeutic dose of chloroquine sulfate on a dry weight basis. It had earlier been reported that the leaf extract of *A. indica* showed no antiparasitic activity when tested (*in vitro*) against *Plasmodium berghei* drawn from infected albino rats.²³⁹ Etkin, however, found that preincubation of plasmodium-carrying blood with aqueous leaf extract of the herb led to lack of infection in mice.²⁴¹ Furthermore, a field evaluation of patients using extracts of neem in self-medication for the treatment of malaria showed that the drug does indeed have antimalarial activity.²⁴²

The antimalarial activity of neem may be considered as established; what is unclear is the mechanism of its action. It does appear that the activity of this herb may not be due to a direct antiparasitic activity per se, but to a possible drug-catalyzed parasite-host interaction. Etkin and others have studied the significance of the oxidation-reduction or "redox" status of red blood cells on parasites and host cell biochemistry during malarial infection. They observed that increased levels of red cell oxidation attendant on plasmodial infection was a consistent feature of malaria. The suggestion has been put forward that while plasmodial parasites might be responsible for generating oxidants, excessive oxidation may in the long run be detrimental to continued and successful malarial infection.^{243–245} An approximate redox balance must therefore be maintained to ensure red cell integrity and proper metabolic functioning, which is also essential for the development of the *Plasmodium* parasite. In effect, under a drug-induced physiological condition where excess oxidation occurs and cannot be compensated, a variety of damaging effects will ensue, resulting in the destruction of both red blood cells (hemolysis) and the malaria parasites.

It has been shown that an aqueous extract of *A. indica* leaf significantly increased the generation of methemoglobin (by the oxidation of hemoglobin) and the conversion of compound GSH to its oxidized counterpart (GSSG) in *in vitro* studies using normal red cell hemolysates in dilute hemoglobin suspensions.²⁴⁵ Similar oxidant effects on hemoglobin and GSH have been observed *in vivo*. The antimalarial activity of *Azadirachta* is therefore believed probably due to redox perturbation in the form of the imposition of substantial oxidant stress during malaria treatment. The aqueous leaf extract inhibits NADPH-cytochrome c (P-450) reductase activity in rats with a significant increase in microsomal protein. The aniline hydroxylase activity and the phenobarbitone metabolism are also enhanced by the administration of 400 mg/kg of the extract per os.²⁴⁶ The ubiquitous flavonoids quercetin-3-rhamnoside and quercetin-3-rutinoside (rutin) have been suggested as the active constituents.

Azadirachta extract possesses modest *in vitro* antimalarial activity against drug-resistant strains of *Plasmodium falciparum*.²⁴⁷ It has been shown that two of the constituents of neem, quercetin and the limonoid gedunin, exhibited activity against *P. falciparum* *in vitro*, with IC₅₀ values of 6.4 and 0.8 µg/ml, respectively.²⁴⁸ It has also been suggested that the beneficial therapeutic effects of the neem tree claimed by patients might be due to the anti-inflammatory and immunomodulatory activities of the plant.²⁴⁹ There is extensive literature on other pharmacological properties of *Azadirachta*, and what is summarized in the following paragraph is only a random selection from the major publications.

An aqueous extract of the leaves was found to act on isolated guinea pig ileum with a histamine-like effect. It had a biphasic action on the blood pressure of a dog; following an intravenous injection, an initial increase in blood pressure was observed, followed by a prolonged decrease followed by accelerated breathing.²⁵⁰ It also exhibited hypoglycemic and antihyperglycemic effects in dogs; when administered intravenously, it prevented both adrenalin- and glucose-induced hyperglycemia,

with the activity lasting up to 4 h after the dosing.²⁵¹ One of the constituents, nimbidin, showed significant anti-inflammatory and antiarthritic properties.²⁵² The insecticidal and antifeedant properties of neem on various insects have been well documented, and the activity has been claimed to be comparable with conventional insecticides such as DDT, hexachlorocyclohexane (B-isomer) (HBC), and carbamyl. The antibacterial activity of the oil has been evaluated (for further reading on the insecticidal, antifeedant, and antimicrobial activities, see References 253–258). *Azadirachta* extracts and constituents have shown significant broad-spectrum antibacterial activity,²⁵⁹ as well as anti-inflammatory, antitumor, and antiproliferative activities.²⁶⁰

Toxicity — Neem has been associated with liver toxicity. It is likely that it is the nonpolar extractives that cause the hepatotoxicity, and the therapeutically useful aqueous dosage form may be devoid of any serious side effects. Liver biopsy of experimentally induced margosa-oil-poisoned mice demonstrated pronounced fatty infiltration of the liver and proximal renal tubules as well as cerebral edema and mitochondrial damage. Toxicity of neem has been associated with the etiology of Reyes syndrome—usually characterized by vomiting, drowsiness, metabolic acidosis, PMN leukocytosis, and encephalopathy—observed in 13 infants within a few hours of ingestion of the oil.²⁶¹ Such serious toxicity symptoms have not been reported from the leaves, stem, or root extract. Some of the constituents of *Azadirachta* have been shown to be cytotoxic.^{253,262}

Neem-based consumer products used in health care and for cosmetic purposes appear to be well tolerated, and the toxicity has been detected only in very high doses and after chronic use. Histopathological exams showed that toxicity was observed in the testicles, liver, and kidneys at a very high dose of 1600 mg/kg/day.²⁶³ Detailed investigation of the biochemical mechanism of action and toxicity of this very important medicinal plant is strongly advocated.

BALANITES AEGYPTIACA



Botanical Name — *Balanites aegyptiaca* (L) Del.

Synonyms — *Ximenia aegyptiaca* L., *Agialida senegalenses* v. Tiegh, *A. barteri* v. Tiegh., *Balanites zizyphoides* Mldbr. & Schltr.

The genus *Balanites* has hitherto been placed in the plant family Zygophyllaceae or Simaroubaceae.

Related Species — *Balanites wilsoniana* Dawe and Sprague

Family — Zygophyllaceae

Common Names — Desert date, soap berry, thron tree

African Names — Arabic: bhanitez; Hausa: aduwa; Fulani: tanni; Kanauri: kingo; Swahili: mnyara, njienja; Yoruba: adowa. For *B. wilsoniana*: Igbo: ngwu-awusa; Bini: ubogho; Yoruba: budare.

Description — This is a savanna tree that grows up to 10 m, easily recognized by the long, straight, green spines arranged spirally along the branches; each spine has a two-leaflet compound leaf below it. It has a remarkably fluted trunk and a spherical crown; the bark is grayish-brown and has ragged fissures and yellowish-green patches that are exposed by scaling of the bark.²⁶⁴ It has distinctive leaves, with two leaflets up to 5 cm long on leafstalks about 2 cm long that are broad, slightly obovate, blunt, or rounded at the apex and cuneate; young leaves have short hairs. The yellowish-green flowers are borne above the leaf axils in short clusters; the (five) greenish petals are about 5 cm long; individual flower stalks (five) are up to 1 cm long with yellow⁶ stamens and an ovary of five fused shiny, dark-green carpels (March–June). Fruits are produced between March and October. The fruit has a single hard, pointed seed, about 2.5 cm long and 1.2 cm in diameter; it is broadly oblong, ellipsoid, green, and shortly velvety when young, turning yellowish and glabrous when ripe and resembling a small date; it has a thin hard skin and a pale brown sticky edible fleshy pulp.^{28,33}

The related species *B. wilsoniana* is a lowland large forest tree found in the southern parts of West Africa and in parts of East Africa. It is distinguishable from *B. aegyptiaca*, which grows in the north, by its large leaves and by the lack of spines on the flowering branches. The leaflets have distinct stalks, and the petals are hairy inside. The uses, constituents, and other notes on *B. aegyptiaca* should apply also to *B. wilsoniana*.

Habitat and Distribution — It is found in Sahel-savanna regions and drier parts of middle-belt zones of Nigeria, Ghana, and Ivory Coast and is cultivated as a fruit tree in semisavanna parts of the continent.

Ethnomedicinal Uses — The plant features prominently in Hausa ethnomedicine and has been found most useful for other household purposes. A Bornu proverb extols *Balanites* thus: “A bito tree and a milk cow are just the same.” The fruit pulp is a mild purgative but when ripe can be used in making pleasant drinks or fermented into alcoholic beverages. The fruit and bark are lethal to small freshwater snails (mollusks), which act as intermediary hosts to bilharzia, and has been recommended for the control of schistosomiasis. The bark decoction is used as an abortifacient. The oil of the fruit kernel is employed for the dressing of wounds and as an embrocation in rheumatism.^{6,265} The roots and fruits are used as anthelmintics and as an arrow poison antidote; the fruit alone is employed for the treatment of liver and spleen disorders; the root has been indicated for the treatment of malaria, herpes zoster, and venereal diseases. For a comprehensive account of the various medicinal uses, please consult the references cited and see the work of Ainslie,²⁶⁶ Ayensu,⁷ and Irvine.⁹

Other Uses — The gelatinous substance on top of the fruits is used in making sweetmeats. Saponin occurs in the roots, bark, wood chips, and fruits; hence, they are used in washing clothes. The gum from the trunk, when fresh, is pleasant to suck. The leaves are occasionally used as a vegetable and are eaten by goats, camels, and cattle. The root is processed with charcoal and oil to produce local ink, and the hard seeds are used for rosary beads and necklaces and in the game of darra.⁹ The fine-grained wood is used for implements and furniture, and various plant parts are used for religious rituals.

Constituents — The dried seeds yield about 48% of a fixed oil, *zachunoil*, and the seedcake contains 50% protein.²⁶⁷ The seeds, leaves, fruit pulp, bark, and root contain saponin, including the tetraglycoside of diosgenin.²⁶⁸ The diosgenin content of the whole dried plant has been evaluated as 5.6%; the predominant genin (two-thirds) in the plant is, however, yamogenin, the C-25 epimer

of diosgenin.²⁶⁹ The plant holds promise as a source of steroidal sapogenins for the hemisynthesis of corticosteroids and hormones.²⁷⁰ Two furanocoumarins, bergapten and (+)-marmesin, have been isolated from *Balanites*.²⁷¹

Pharmacological Studies — The molluscicidal activity of the plant has been investigated, and because of its lethality to both the freshwater snails (which act as an intermediate host for bilharzia) and the minute free stages of the schistosomes, the plant has been recommended for planting along the banks of infested rivers.²⁷² Malcom and Sofowora reported on the antimicrobial properties of the plant.²⁷³ The anticancer principles of the plant have also been investigated.²⁷⁴

BERSAMA ABYSSINICA



Botanical Name — *Bersema abyssinica* Fresen. subsp. *Paullinioides*

Synonyms — *B. paullinioides* (Planch.) Bak., *B. cloroleuca* Brehmer., *B. coriacea* Baker f., *B. erythrocarpa* Brehmer., *B. gallensis* Brehmer., *B. giuliarellii* Chiov., *B. goetzei* Gurke

Family — Melianthaceae

Common Names — Bersema bark, bitter bark

African Names — Basa: je-ra-kpar; Baule: daunt; Chagga: maranguwe, mrandangube; Fanti: samangya; Lunda: kapachi; Mbulu: wamis; Mende: kpondeblokai; Shona: chereke, mun-yahlawa, munyohava

Description — At least two varieties of the subspecies are known: var. *paullinioides* and var. *engleriana* (Gurke) Verkourt. The two varieties are similar and occur as small- or medium-size tree 6–9 m tall, rarely exceeding 25 m in height. It branches low, with smooth gray bark and cream-colored slash, which darkens on exposure. The leaves are imparipinnate, occurring in clusters, rather clouded at the end of branchlets, about 35 cm long, with 5–10 pairs of leaflets, and displaying wings between the distal pairs of leaflets. The leaflets are variable in size and shape; the middle pairs are usually the largest, 5–15 cm long and 2–5 cm broad, lanceolate, elliptic or oblong elliptic, gradually acuminate, or tapering to a sharp ovate and unequally rounded at the base. The margin

is entire, crenate-serrate, or sharply serrate. It produces white or pinkish flowers in stout upright racemes (up to 25 cm long). The fruits are globose and tardily dehiscent with a woody capsule with four valves spreading horizontally and persisting. The pericarp is densely hairy and reddish when ripe; seeds are scarlet with yellow arils.⁷⁷

Habitat and Distribution — The plant is widespread throughout tropical Africa, preferring higher rainfall or evergreen forests. It is distributed from Senegal to Zaire and parts of southern Africa.

Ethnomedicinal Uses — Aqueous extract of the stem bark is administered as a purgative, and it is claimed to be anthelmintic, with the worms expelled during purgation. It is also used as an aphrodisiac. The root bark is added to tobacco as snuff and dispensed for the treatment of severe headache. The twigs of the plant are used as a ritual plant in Liberia during treatment of fractures, in which the plant is used as a dressing to a fowl's leg that is deliberately broken as a vicarious treatment for a man's broken limb;⁶ it is believed that the fractured limb will heal in the same manner as that of the bird. The plant is used as an ingredient in remedies for the treatment of hemorrhoids, dysentery, epilepsy, and colds.

Constituents — *Bersema* has been shown to contain a mixture of cardenolides, including abyssinol A, B, C; bersaldegenin; hellerigenin; and bufadienolide-O-acetate,^{275–278} as well as saponins,²⁷⁹ manferin,²⁸⁰ and gallic acid derivatives.²⁸¹

Pharmacological Studies — The plant extracts exhibit strong insect antifeedant activity,²⁸⁵ the activity being due to the cardenolides, with abyssinin as one of the most active isolates.²⁷⁸ The extracts also showed activity as insect sex attractants. The bufadienolides isolated from the plant exhibited antitumor activity against a variety of experimental tumor systems.^{283–285} The plant has also been found to possess antimicrobial activity.²⁸⁶

BORRERIA VERTICILLATA

Botanical Name — *Borreria verticillata* (L.) G.F.W. Mey.

Synonyms — *Spermacoce verticillata* L., *Spermacoce globosa* Schum. et Thonn.

Family — Rubiaceae

African Names — Bambara: som som; Hausa: damfark'ami, feshe; Peuhl: samtarde, gudurdel; Yoruba: irawo-ile

Description — This is a perennial bushy subshrub, 1 m high, that branches out in slightly regular stalks with oblanceolate smooth leaves 10 to 15 mm in diameter and small white flowers. The fruit is a drupe, dry and dehiscent. Seeds are mostly with endosperm and are ruminant. The embryo is either straight or curved.

Habitat and Distribution — The species grows in tropical Africa and Madagascar. In the West Coast, the plant grows only in the wet season.

Ethnomedicinal Uses — The juice obtained from the aerial parts is applied topically for the treatment of skin diseases. The plant is reputed to be very effective as an antieczematic. It is also used as a diuretic and abortifacient. A related species, *B. compacta*, is also used externally in southern Africa. Another species, *B. natalensis*, is employed by the Zulu in the form of an enema for infantile hyperprexia and in the treatment of leprosy, furuncles, and paralysis.²⁴⁷

Constituents — The plant contains indole alkaloids, of which borrerine and borreverine are the major compounds.²⁸⁷ The root bark has been shown to contain iridoids,²⁸⁸ including asperuloside, feretoside, and daphyloside. The reported presence of emetine in the earlier literature²⁸⁹ has not been confirmed by recent studies. The leaves yield a volatile oil that consists of hydrocarbon sesquiterpene, lactones, phenolic compounds, and aromatic polycarboxylic acids.

Pharmacological Studies — The essential oil inhibited the growth of the bacterial *Escherichia coli* and *Staphylococcus aureus*.²⁹⁰ It had no action on the blood pressure and respiration of the cat and had an effect on guinea pig intestine and striated frog muscle.

BOSCIA SENEGALENSIS

Botanical Name — *Boscia senegalensis* Lam.-Holl.

Synonyms — *Boscia firma* Radlk., *Boscia hypoglaucula* Gilg., *Boschia octandra* Hoschst. ex Radlk.

Family — Capparaceae

African Names — Bambara: bere; Bargami: kungassa; Fulani: anzagi; Hausa: anza, hanza, dilo; Songhai: horregna; Temajegh (Tuareg): tandeni, tandomei; Wolof: diendoun, ndiandam

Description — It occurs as a stout shrub or short tree, with a black stem, up to 5 m high. The leaves are broad, elliptical to ovate, with 5–6 pairs of prominently looped lateral nerves. The flowers are greenish and sweet scented and are borne in short, dense racemes. The fruits are spherical, sometimes warted, up to 2 cm in diameter.

Habitat and Distribution — The plants occur in the drier parts of the continent. Dalziel⁶ listed it as being present “in barren and fire-scorched soil.” It is distributed from Mauritania to northern Nigeria.

Ethnomedicinal Uses — The leaves and berries are commercially available in many parts of northern Nigeria and Sudan as food condiments for soups in times of scarcity. The leaves are used in the preparation of a malaria remedy and for the treatment of jaundice, fungal infections, and venereal diseases. It is applied externally for a wound dressing. The fruits and roots are used as an aphrodisiac, and the root decoction is used for stomachache and to facilitate labor.

Constituents — The plant contains alkyl glucosinolates²⁹¹ and the alkaloids stachydrine and hydroxystachydrine.²⁹² The genus has been shown to elaborate several flavonoids,²⁹³ sesquiterpenes and their glycosides,²⁹⁴ sulfur compounds,²⁹⁵ and lipids.²⁹⁶

Pharmacological Studies — The plant possesses antimicrobial and antifungal activities.^{297–299} It has also been shown to be an effective uterine stimulant.³⁰⁰ A related species, *B. salicifolia*, has been evaluated for its sweetening properties.

BOSWELLIA SACRA

Botanical Names — *Boswellia sacra* Flueck.

Synonyms — *Boswellia carterii* Birdw. var. *undulato-crenata* Engl.; *Boswellia bhar-dajiana* Birdw.; *Boswellia bhar-dajiana* var. *serrulata* Engl.; *Boswellia undulatocrenata* (Engl.) Engl.

Family — Burseraceae

Common Names — Arabian frankincense, bible frankincense, frankincense, incense, olibanum, olibanum tree

African Names — Somali: mohor (tree), beyo (resin); Swahili: ubani

Description — The tree may be 1.5–8 m tall, branching from the base or with a distinct trunk; bark is pale brown with some outer flaking, papery layers, and a thick reddish-brown inner resiniferous layer; young shoots are tomentose or rarely glabrous, and resin is copious and milky and dries yellowish-brown.¹¹⁴⁸ The leaves are clustered at tips of branches and are imparipinnate; leaflets are opposite, in 6–8 pairs, oblong, with a crenate margin, and tomentose. Flowers are often in axillary racemes, crowded at the end of branches; racemes are up to 10 cm. The calyx is 5-lobed. There are 5 petals, which are yellow-white and spreading. There are 10 stamens. The ovary is surrounded by a fleshy disk. Fruits are capsules, obovoid, broadly pyriform, reddish-brown, glabrous, 8–12 mm, 3–5 angled, and opening by 3–5 valves.¹¹⁴⁰

Habitat and Distribution — The trees grow in stony soil. They adhere to boulders of rock faces by means of a cushion- or disk-like swelling at the base of the trunk. This swollen base seems to be important in stabilizing the tree and is best developed in trees growing on very steep or exposed rocks but less so, or not at all, in the occasional trees that grow in gravel or in planted specimens.¹¹⁴⁰ They are found in Somalia and most parts of the Horn of Africa and up to Arabia.

Ethnomedicinal Uses — Frankincense is used in traditional medicine for treatment of skin diseases, wound healing, and general inflammation. *Boswellia* has been used for acne, amenorrhea, cancer, analgesia, diuresis, antiseptic, cystitis, cervical spondylosis, and genital infections and as a carminative, expectorant, and sedative. It is also used in religious ceremonies for spirit invocation during serious negotiations and in burial rites. Frankincense resin is eaten as a general restorative tonic and for skin care in the Horn of Africa and parts of the Sahel region. Edible frankincense must be pure for internal consumption, meaning it should be translucent, with no black or brown impurities. It is often light yellow with a (very) slight greenish tint. It is often chewed like gum, but it is stickier because of its resinous composition.

Constituents — The oleo-gum resin frankincense or olibanum is the most important component of *Boswellia* species, and the chemical composition is of immense value in differentiating members of the genus. Olibanum has been reported to be a rich source of monoterpenes, sesquiterpenes, and iridoids, as well as nonvolatile triterpenoid constituents such as ursane, oleanane, and lupine, which are in many cases responsible for some of the observed biological activities. The presence of isoincense acetate in both *B. sacra* and *B. carteri* has been used as the main diterpenic chemotaxonomic biomarker. Although the diterpene also occurs in *Boswellia serrata* olibanum, the presence of methylchavicol, methyleugenol, and an unidentified oxygenated sesquiterpene distinguishes *B. serrata* olibanum from the two other species. The characteristic chemical compounds of *Boswellia papyrifera* are the diterpenic biomarkers incense and its oxide and acetate derivatives n-octanol and n-octyl acetate. *Boswellia frereana* olibanum is devoid of diterpenes of the incense family but contains a high amount of many dimers of β -phellandrene. The chemical composition of olibanum, which is demonstrated to be different for each *Boswellia* species, allowed the determination of the taxonomic origin of frankincense samples purchased on various markets in East Africa, in the Near East, and in Yemen. Moreover, terpenic fingerprints allowed the botanical origin of olibanum used in traditional incense mixtures to be identified.³⁰¹ The volatile oil derived from the olibanum consists of 75% monoterpenes, sesquiterpenes, monoterpenols, sesquiterpenols, and ketones. It has a good balsamic and sweet fragrance, while the Indian frankincense oil has a very fresh smell. The steam- or hydrodistilled frankincense oil does not contain any boswellic acid (BA) as these components (triterpenoids) are nonvolatile and too large to come over in the steam distillation process, and such claims in proprietary products should be disregarded.

The botanical designation of *B. carterii* as a synonym of *B. sacra* has been challenged based on the detailed chemical profile of both varieties.⁴⁹ A transnational team of investigators led by Cole Woolley has evaluated the Somalian (*B. carterii*) and Omani/Yemeni (*B. sacra*) species by chemical analyses to determine if there were any minor or major differences between the two species of frankincense. Components identified with their average percentage for *B. sacra* were α -thujene (0.6%), α -pinene (68.2%), camphene (2.1%), sabinene (2.9%), β -pinene (2.0%), myrcene (0.7%), and limonene plus β -phellandrene (6.2%). Components identified with their average percentage for *B. carterii* were α -thujene (7.9%), α -pinene (37.3%), camphene (0.8%), sabinene (4.9%), β -pinene (1.8%), myrcene (7.3%), and limonene plus β -phellandrene (14.4%). Initially, GC/MS analysis did not reveal major statistical differences. However, optical rotation values for *B. sacra* (+30.1°) and *B. carterii* (−13.3°) demonstrated a greater significant difference. Enantiomeric ratio (+)/(−) values of α -pinene for *B. sacra* and *B. carterii* of 8.24 and 0.68, respectively, were also calculated, aiding the investigators to conclude that *B. sacra* and *B. carterii* are not synonymous but rather two distinct and individual frankincense species.³⁰²

Pharmacological Studies — The volatile oils from several species of *Boswellia* have been evaluated for their antimicrobial activity. The antimicrobial activity (MIC assay) of the oils ranged from 4–16 mg/ml (*Staphylococcus aureus*), to 1.5–8.3 mg/ml (*Bacillus cereus*), to 4.0–12.0 mg/ml (*Escherichia coli*), to 2.0–12.8 mg/ml (*Proteus vulgaris*), to 5.3–12.0 mg/ml (*Candida albicans*).³⁰³ The gum exudate of some *Boswellia* species contains four major triterpenic acids known as BAs, that is, β -boswellic acid (BA), 3-O- α -acetyl- β -boswellic acid (ABA), 11-keto- β -boswellic acid (KBA), and 3-O- α -acetyl-11-keto- β -boswellic acid (AKBA). The BA acylates, including their epimers, were synthesized and screened against a panel of human cancer cell lines. They exhibited a range of cytotoxicity against various human cancer cell lines, thereby leading to the development of a possible structure–activity relationship (SAR). One of the identified lead compounds was found to be an inhibitor of the NF- κ B and STAT proteins, and it is currently being investigated for development as an anticancer agent.³⁰⁴

The anti-inflammatory activity of BAs has been shown to be probably due to direct inhibition of lipopolysaccharide (LPS) functionality and LPS-induced cellular responses. In pull-down experiments, LPS could be precipitated using an immobilized BA, implying direct molecular interactions. Binding of BAs to LPS leads to an inhibition of LPS activity, which was observed *in vitro* using a modified limulus amoebocyte lysate assay. Analysis of different BAs revealed clear structure–activity relationships, with the classical β -BA the most potent derivative ($IC_{50} = 1.8 \mu M$).³⁰⁵

Boswellia has been used clinically for the management of ulcerative colitis; however, the second European evidence-based consensus on the diagnosis and management of ulcerative colitis found the clinical evidence insufficient to approve the use of *Boswellia sacra* extract (BSE) and BAs in the treatment of this serious disease.³⁰⁶ It has also been used for the treatment of asthma, depression, and osteoarthritis (OA).

Commerce — Frankincense occurs in various forms in commerce. The crude olibalum is sold in markets in Somalia, Djibuti, Yemen, and neighboring countries in the Horn of Africa and Middle East. The essential oils are exported for the perfumery industry and for use in aromatherapy. The product from Sudan is mostly *Boswellia papyrifera*, and the Indian frankincense is *Boswellia serrata*. The edible frankincense, which is translucent, often light yellow with a slight greenish tint, and with no black or brown impurities, is consumed in most parts of the Horn of Africa. It is often chewed like gum, but it is stickier because it is a resin. It is the frankincense produced along the northern coast of Somalia from which the Roman Catholic Church draws its supplies.

Agriculture — The propagation of *Boswellia sacra* trees is difficult, although the plant can adapt to extremely harsh environments. Their ability to grow in environments so unforgiving is considered unusual; they sometimes grow directly out of solid rock. The trees start producing resin when they are about 8 to 10 years old. Tapping is done two to three times a year, with the final taps producing the best tears due to their higher aromatic terpene, sesquiterpene, and diterpene content. In commerce, the more opaque resins are considered to be the best quality. According to recent surveys, frankincense tree populations are declining, partly due to overexploitation. Heavily tapped

trees have been found to produce seeds that germinated at only 16%, while seeds of trees that had not been tapped germinated at more than 80%. It has been further observed that bush burning, grazing, and attacks by the longhorn beetle have reduced the tree population.¹¹³⁸

BRIDELIA

Botanical Name — *Bridelia* spp. Willd.

Family — Euphorbiaceae

The genus is characterized by the presence of easily recognized stalkless and markedly persistent flower clusters in the leaf axils along the branchlets. Four species—*B. atroviridis*, *B. speciosa*, *B. micrantha*, and *B. ferruginea*—are employed in the preparation of traditional remedies. The last-named species, however, is the most common of these savanna plants. They bear flowers with greenish-yellow sepals and very small and narrow petals; the males have 5 stamens in a central column surrounded by a conspicuously yellowish disk, and the females usually have two branched styles. Both male and female flowers are found in each flower cluster. The distinctive leaves are marked with lateral nerves that continue to the margin to form a marginal nerve.¹⁶⁸ They bear persistent fruits that are egg shaped and smooth; the ripe ones are usually black with a hard seed.

According to Keay et al.,¹⁶⁴ the species can be differentiated by the following characteristics:

1. *B. atroviridis*: lateral nerves looped close to the margin, but not forming a marginal nerve like other *Bridelias*
2. *B. speciosa*: midrib projecting a short spine beyond the acuminate leaf tip; leaves almost glabrous on both surfaces
3. *B. micrantha*: midrib not projecting; branchlets and undersurfaces of leaves shortly hairy; hairs lying flat, particularly along the nerves and veins beneath
4. *B. ferruginea*: hairs spreading; leaves with 6–10 pairs of lateral nerves and very characteristic down-curved acuminate tip forming a short, rigid hook

All members of the genus *Bridelia* have been used in the preparation of folk remedies. Decoction of the plants has been recommended for the treatment of a variety of illnesses, such as fevers, diabetes, rheumatism, gonorrhea, and diarrhea.

BRIDELIA FERRUGINEA



Botanical Name — *Bridelia ferruginea* Benth

Synonyms — *Gentillia chevalieri* Beille

Family — Phyllanthaceae

African Names — Hausa: kirni; Igbo: orha (ola); Yoruba: ira

Description — It is a shrub, sometimes growing up to 18 m high and about 1.5 m in width. The stem is often crooked, with branches occurring at lower regions; the bark is gray, rough, and often scaly. It has thin and red slash. The thin branches often grow spines. The twigs are usually densely covered with short, rust-colored hairs. The plant has characteristic broadly elliptic leaves, 4–10 cm long and about 3–5 cm in breadth. The margins are slightly wavy, with the apex drawn out, rigid, and curved downward. It has a thick, short, and very hairy leafstalk. *B. ferruginea* produces creamy-yellow, sweet-scented flowers that appear between February and August. The fruits occur in July–September and are small and nearly round.¹³

Ethnomedicinal Uses — The stem bark was used in the western states of Nigeria as an antidote for arrow poison. The roots, bark, and leaves are ingredients in some varieties of the Yoruba “agbo pot” used for pediatric illness. Dalziel⁶ listed the whole plant for the treatment of intestinal and bladder disorders and externally for skin infections and eruptions and the leaves and stem bark are indicated for arthritis. A popular mouthwash called *epo-ira* in Yoruba is prepared from the stem bark of this plant.²⁶⁹ The leaves are cooked as a vegetable and eaten in times of famine.

Perhaps the most important use of *B. ferruginea* is in the treatment of diabetes in certain parts of West Africa. Ampofo made the first report on the clinical use of this herb for the treatment of diabetes.³⁰⁷ He documented the positive results of a pilot clinical trial of the antidiabetic properties of *Bridelia* on 12 patients. An evaluation of 10 patients who received treatment at another herbal home in Nigeria confirmed the value of *B. ferruginea* in the treatment of diabetes. In Yoruba (Nigeria) ethnomedicine, the plant is used in the preparation of a traditional gargle called “Ogun Efu,” which is employed in the treatment of “Efu,” a pathological disorder characterized by a furred tongue caused by overgrowth of papillae that produces a creamy curd-like coating on the tongue.³⁰⁸ It is also used as a diuretic, antihypertensive, antifungal, and antidepressant. Other uses of the plant include the preparation of an embrocation for the treatment of bruises, boils, dislocation, and burns and as an oral decoction for the treatment of ulcers and persistent coughs.

Constituents — The first chemical screening of the genus *Bridelia* was carried out by Treub in 1907, who reported the presence of hydrocyanic acid in *B. ovate* and *B. tomentosa*.³⁰⁹ The pulverized stem bark contains tannins and reducing sugar but no alkaloid.³¹⁰ A chemical examination of the leaf of *Bridelia ferruginea* resulted in the isolation and characterization of two coumestan-flavonoids, bridelilactone and bridelilactoside, as the main constituents of ethyl acetate extract. The diethyl ether-soluble extractive yielded two coumarins, aesculetin and scopoletin, and six flavonoids, including quercetin, galangin, and naringenin. Lupeol, β -amyrin, and β -sitosterol were isolated from the petroleum spirit extract.³¹¹ It has been shown that the petrol extract yielded mainly flavonoid glycosides, of which quercetin-3-neohesperidoside (rutin) was the major constituent.³¹²

Pharmacological Studies — The hypoglycemic properties and the antihyperglycemic activity of *Bridellia* in experimentally induced diabetes have been investigated. The fasting blood levels of maturity onset diabetic patients are lowered to normal values by daily doses of aqueous extracts of *B. ferruginea* leaves. Glycosuria was eliminated after 2 weeks of therapy even when ketosis had been established. In experimental animals, alcoholic and aqueous extracts of this plant significantly lowered fasting blood sugar but failed to protect the animals against alloxan-induced diabetes.^{313,314} Rutin, isolated from the plant, has been proposed as the active constituent of *Bridelia*.³¹⁵ The milk-coagulating activity of the ethanol extract of the bark of *Bridelia ferruginea* and lime juice has been evaluated as an index to determine the usefulness of the gargle prepared from these plants in the treatment of papillary hypertrophy.³⁰⁸ Both plants appear to act synergistically as astringents in milk coagulation which by extrapolation may explain their use in the preparation of Ogun efu.³⁰⁸ Aqueous extract of the leaves of *B. atroviridis* administered in a concentration-dependent manner

induced contractions on rat uterus that were antagonized by various calcium entry blockers.³¹⁶ The cellular basis for the uterotonic activity of the plant extract appeared to be complex and probably involves mechanisms including calcium mobilization from both intra- and extracellular compartments and activation of phospholipase C through a G-protein.³¹⁶

The β -amyrin-rich extracts of *B. ferruginea* leaves possess antioxidant and cytotoxic activities.³¹⁷ Intraperitoneal administration of aqueous extract of *B. ferruginea* at the dose of 10 mg/kg produced a significant increase in urinary excretion of creatinine ($p < 0.01$ compared to a control) and creatinine clearance in rats. The urinary urea and plasma urea were not affected by the extract, whereas urinary urea and urea clearance were affected by furosemide used as an active control.³¹⁸ Its wound-healing property has been established by laboratory studies, as evidenced by its antibacterial,^{319–321} antioxidant, and fibroblast growth stimulation activity of the crude extracts.³²²

B. ferruginea has been evaluated for its anti-inflammatory activity,³²³ and its anti-inflammatory activity has been linked to possible involvement of the suppression of TNF- α upregulation based on results from tests in models that are mediated by TNF- α . The effect of the extract on LPS-induced septic shock was determined by measuring the number of deaths and the levels of serum alanine and aspartate aminotransferases following intraperitoneal injection of LPS (1 μ g/kg) into d-galactosamine-primed mice. LPS-induced vascular permeability on the back skin of mice was measured by the local accumulation of Evan's blue after subcutaneous injection of LPS. Pretreatment with *Bridelia ferruginea* extract (10–80 mg/kg) produced a dose-dependent inhibition of the septic shock syndrome in mice, with 80 mg/kg of the extract exhibiting comparable activity as pentoxifylline (100 mg/kg). LPS-induced dye leakage in the skin of mice was also suppressed by the extract (10–80 mg/kg).³¹⁸

BRYOPHYLUM PINNATUM



Botanical Name — *Bryophyllum pinnatum* (Lam.) Oken

Synonyms — *B. calycinum* Salisb., *Cotyledon pinnata* Lam., *Kalanchoe pinnata* (Lam.) Pers., *Vereia pinnata* (Lam.), *Sedum madagasariense* Clus., *Kalanchoe floripendula* Steud., *Kalanchoe calycinum* Salisb., *Crassuvia floripendula* Comm., *Cotyledon rhizophylla* Roxb.

Family — Crassulaceae

Common Names — Never die, wonder of the world, leaf of life

African Names — Yoruba: abamodo; Igbo: nkwonkwu; Efik: afia-ayo

Description — This is a glabrous, laxly erect, fleshy herb 60–120 cm tall that branches from the base. The leaves are opposite and usually in pairs; the lower leaves are simple; the upper ones are pinnate, almost rounded but larger toward the apex, and about 10 cm long and 5–6 cm broad. The margins have curved crenations (notches) with regular, blunt, or rounded teeth, which sometimes bear small plantlets or bulbils. The flowers nodding in terminal panicles are greenish-yellow but purplish at the base. The calyx is tubular and inflated, 4-lobed (the lobes triangular and shortly pointed), and about 3 cm long. The corolla is united, tubular, concentrated above the base, a little longer than the calyx, and also 4-lobed. The upper part of the lobes is ovally pointed and reddish-purple in color. The stamens are attached to the constriction of the corolla tube.^{9,77}

Habitat and Distribution — The plant is widely distributed throughout the continent but is more abundant in warm and dry areas; it thrives in rocky terrain with little water.

Ethnomedicinal Uses — The crushed leaves or the juice expressed from them are warmed as a poultice with shea butter or palm oil and rubbed on abscesses or other inflammatory conditions²⁶⁶ (see also Agoha⁷⁷). The topical application is also used for the treatment of external ulcers and burns and on the bodies of young children to prevent fits during high fevers. It is used with “sterilized” palm oil as a dressing after circumcision of male children. It has also been reported that a decoction of the leaves is taken in the West Indies for the treatment of arthritis and to clean the bladder.¹⁴⁰ The plant is listed by the Wong for the treatment of earache and in ophthalmia, and the poultice is used for sprains, dysmenorrhea, and colds in the head.³²⁴

Constituents — Preliminary chemical work on this plant revealed the presence of xanthenes, flavonoids, anthraquinones, and traces of alkaloids. Potent cytotoxic bufadienolides bryophyllin A and B have been isolated from the species.^{325, 326} Cardiac glycosides, known as bryotoxins, are also present in the plant.³²⁷ An extract of the leaves with activity against chemically induced wounds has been shown to contain bryophyllol, bryophollone and bryophollenone, bryophynol, and two phenanthrene derivatives, as well as 18 α -oleanane, ψ -taraxasterol, and α - and β -amyrin and their acetates.³²⁸

Pharmacological Studies — The pressed juice as well as the organic and aqueous extracts of the leaves has been shown to possess moderate antibacterial microbial activity.³²⁹ The plant has been shown to have antihypertensive activity. Both the aqueous and methanolic leaf extracts of *B. pinnatum* produced dose-related, significant ($p < 0.05$ – 0.001) decreases in arterial blood pressures and heart rates of anesthetized normotensive and hypertensive rats. The hypotensive effects of the leaf extracts were more pronounced in hypertensive than in normotensive rats.³³⁰

Bryophyllum has been used in clinical medicine in Europe (mainly Germany) since the 1970s as a sedative and for the treatment of premature labor.³³¹ The preparation was usually administered parenterally at a dose of 580 mg/h until contractions ceased, after which it was administered as a 50% slurry at a dose of 200 mg/h, supplemented by fenoterol at 120 mg/h if insufficiently effective alone. Clinical outcome and inhibition of labor were similar to those for fenoterol.³³² However, in contrast to the well-documented side effects of conventional labor inhibitors, especially of the cardiovascular system, which can be serious for both for mother and baby, no adverse signs or symptoms are known to date. *B. pinnatum* 5% is also used as a 10 ml i.v. bolus during delivery if contractions are too strong, frequent, or painful; the effect, which is rapidly visible on the cardiogram, is much less a matter of direct inhibition than of inducing more rhythmic contractions.³¹⁹ The tocolytic activity of *B. pinnatum* observed in alternative medicine centers in Europe has been validated by laboratory studies.^{333–335}

B. pinnatum has also been shown to possess the following pharmacological properties: analgesic, anti-inflammatory,¹⁵⁵ and antinociceptive and hypoglycemic activities.³³⁶ It has shown promise as a possible treatment for overactive bladder³³⁷ and ulcers³³⁸ and as a neurosedative and muscle relaxant.³³⁹

Toxicity — The bufadienolides found in *Bryophyllum* species are toxic to cattle and other farm stocks.³³¹ *Bryophyllum* poisoning causes anorexia, depression, ruminal atony, diarrhea, heart

rate and rhythm abnormalities, dyspnea, and death. Myocardial degeneration and necrosis with hemorrhages of the heart and alimentary tract have been observed.³⁴⁰ The median lethal doses for the Australian species, *B. tubiflorum*, flowers, roots, and leaf plus stem were found to be 0.7, 2.3, and 5.0 g dry matter/kg liver weight, respectively (7, 7, and 40 g wet weight/kg, respectively).²¹⁵ A treatment regime consisting of the administration of activated carbon, electrolyte replacement solution, and antiarrhythmic drugs has been used to abort the lethality of bryotoxin intoxication in farm animals.²¹⁶

BULBINE FRUTESCENS

Botanical Name — *Bulbine frutescens* (L.) Willd.

Synonyms — *Anthericum frutescens* L., *Anthericum incurvum* Thunb., *Anthericum multiceps* Poelln., *Anthericum rostratum* Jacq., *Bulbine caulescens* L., *Bulbine incurva* (Thunb.) Spreng., *Phalangium frutescens* (L.) Kuntze, *Phalangium rostratum* (Jacq.) Kuntze

Related Species — *Bulbine asphodeloides*, *B. abyssinica*, *B. natalensis*

Family — Xanthorrhoeaceae (formerly Asphodelaceae)

Common Names — Bulbine, bulbinella, burn jelly plant, cat's tail, snake flower

African Names — Afrikaans: geelkatstert, wildekopieva; Zulu: ibhucu; Xhosa: intelezi; Sotho: moetsa-mollo

Description — According to the *African Herbal Pharmacopeia*,¹¹⁴¹ *Bulbine frutescens* is a perennial herb up to 0.5 m high but occasionally growing up to 1.2 m. It has woody stems that bear succulent leaves. The leaves are linear, cerate or somewhat flattened, 30–250 mm long, 4–10 mm in diameter, bright green or yellowish green, and glaucous glabrous. Flowers are small, mostly yellow, sometimes partly orange, in multiflowered racemes on slender peduncles; the pedicel is thin, usually curved, petals are six, yellow, sometimes orange, erect to recurved, and somewhat persistent. Stamens are six; filaments are densely hairy. Fruit occurs as a small capsule. The plant can be distinguished from related members of the genus by its woody stem and details of the floral bracts.¹¹⁴¹

Habitat and Distribution — *Bulbine frutescens* is widespread throughout Southern Africa.

Ethnomedicinal Uses — In most parts of South Africa and Lesotho, fresh leaf sap of *Bulbine frutescens* is used externally for the treatment of skin infections, especially ringworm and eczema. The sap is applied to wounds as a disinfectant and to promote healing. In Lesotho, crushed leaves are used as a dressing for burns, and leaf sap is applied to cracked lips. It has also been reported as used for the treatment of scrofula, a form of tuberculosis that affects the lymph nodes. The root decoction is used for the treatment of diabetes, venereal diseases, rheumatism, convulsion, and diarrhea. The related species *B. abyssinica* is used as a tea for the treatment of gynecological disorders.

Constituents — The gel of *B. frutescens* yields a complex mixture of polysaccharides. The plant is also known to have knipholone-type compounds. The roots contain phenylanthraquinones, gaboroquinones A and B, and 4'-O-demethylknipholone-4'-O-beta-D-glucopyranoside.³⁴¹ Also isolated from the roots are sulfated phenylanthraquinones co-occurring with their known sulfate-free analogs. Their structures were elucidated by spectroscopic and chiroptical methods, by acid hydrolysis, or by partial synthesis.³⁴²

Pharmacological Studies — The *in vivo* wound-healing property of *Bulbine* species has been confirmed by many investigators, thereby validating the traditional use of the leaf gel extracts of *B. frutescens* and related species in the treatment of wounds. In animal studies, the wound contraction following treatment with *Bulbine natalensis* on days 2, 4, and 10 ($p = 0.004$, 0.007, and 0.03, respectively) and *Bulbine frutescens* on day 4 ($p = 0.004$) increased significantly when compared to the corresponding untreated wounds. The tensile strength of the wounds treated with the leaf gels was significantly stronger than that of the untreated wounds. There was also a significant increase in the collagen, protein, and DNA content of the *Bulbine natalensis*- and *Bulbine frutescens*-treated

wounds compared with that of the untreated wounds (respectively, collagen content: $p = 0.014$ and 0.018 ; protein content: $p = 0.03$ and 0.04 ; DNA content: $p = 0.04$ and 0.04) over the 16-day experimental period. Treatment with both leaf gels followed the same pattern in hexosamine content, with a maximum hexosamine content on day 4 followed by a steady decrease to day 16. The authors found no significant difference between the hexosamine content of the wounds of animals treated with either *Bulbine frutescens* or *Bulbine natalensis*.³⁴³ In related studies, the leaf extracts increased tensile strength by increasing fibroplasia, differentiation of fibroblasts into myofibroblasts, and increased collagen deposition and maturation in pigs. Knipholone, a major constituent of *Bulbine* species, showed strong antispasmodic activity but was devoid of antibacterial activity.¹¹⁴⁸

Clinical outcome studies conducted in about 300 patients clearly showed that *Bulbine* gel improved postoperative scar management and scar maturation.³⁴⁴ These results suggest that *Bulbine* species can be formulated as a low-cost effective topical treatment for wounds. In an antiviral assay using CEM.NK^R-CCR5 cells, ethanolic extract of *Bulbine alooides* showed HIV-1 inhibition with an IC₅₀ of 94 µg/ml.³⁴⁵ Several isofuranonaphthoquinones isolated from the roots of the related *B. capitata* showed antioxidant activity in a human lipoprotein oxidation assay, some of them with activity comparable to that of quercetin, a flavonoid with established antioxidant activity. These compounds also demonstrated weak antiparasmodial activities *in vitro*.¹¹⁴¹

Toxicity — No serious toxicity has been reported from the use of *Bulbine*. A temporary sensitivity to the topical application of *Bulbine* gel was observed in 2 of the total of about 300 patients during a clinical study.¹¹⁴¹

Commerce — The *Bulbine* species are articles of trade in the local South African *Muti* market and in some medicinal plant markets in parts of eastern and southern Africa. No significant international trade has been recorded.

Agriculture — The plant is mostly collected from the wild. *Bulbine* is easy to cultivate and there are small plantations in South Africa for the production of the gel.

Formulation and Dosage Form — The only known formulations are gels for external use. The herb is used alone or in a mixture with other wound-healing agents.

CAJANUS CAJAN



Botanical Name — *Cajanus cajan* Millsp.

Synonyms — *Cyticus cajan* L., *Cajanus indicus* Spreng.

Family — Leguminosae

Common Names — Pigeon pea, field pea, pois d'Angol, ambrebdade (Comores), pois de pigeon (F).

African Names — Arabic: bisellat el-Haman; Hausa: waken-masar, waken-turawa; Igbo: fio-fio; Swahili: mbaazi; Yoruba: otili, otinli

Description — This is an annual or biennial shrub 2 m high with ribbed, silky pubescent stems. The stalks and leaves are covered with white down. It has 3 leaflets that are oblong lanceolate in short stalks. The flowers are brownish-yellow, borne on corymbiform racemes. The fruits occur as oblong linear pods (over 5 cm long), obliquely constricted between the seeds, which vary from 3 to 4.²⁸

Habitat and Distribution — It is pantropic and is cultivated in most parts of the continent. The plant prefers savanna vegetation and dry forestlands.

Ethnomedicinal Uses — The leaves are used as a weak decoction for the treatment of measles, catarrh, and hepatitis. An aqueous infusion of the seeds sometimes mixed with the leaves is dispensed for the management of sickle-cell anemia.

Constituents — *Cajanus* contains amino acids, proteins, fats, carbohydrates, saponins, stilbenes, flavonoids, and isoflavones.³⁴⁶ It also yields minerals, such as calcium, phosphorus, and iron. The leaves contain the phytoalexins pinostrobin and cajanin stilbene acid and the coumarin cajanus lactone (7-hydroxy-5-O-methyl-8-(3-methyl-2-butylene)-4-phenyl-9,10-dihydro-benzopyran-2-one).³⁴⁷ Urease has been isolated from pigeon pea. The enzyme is used in diagnostics to determine the urea present in the blood serum.

Pharmacological Studies — The seed extract has been shown to possess hypoglycemic and antimicrobial activities.³⁴⁸ Later studies of the hypoglycemic activity showed that the extract produced transient hypoglycemia at a dose of 300 mg/kg. Extracts of the seeds were effective in restoring normal morphology of erythrocytes from blood samples of patients affected by sickle-cell anemia.^{349,350} The aqueous alcohol extract, as well as cajaminose, an amino sugar isolated from it, prevented the sodium metabisulfite-induced sickling of red blood cells.³⁵¹ Phenylalanine has been isolated as the main constituent of the antisickling fraction of the seed extract and has been suggested as probably responsible for the hematological effect.³⁵²

Viclin, a holoprotein that occurs in seeds, exhibits an unusual stability to the denaturation by 8 M and 6 M guanidine-HCl.³⁵³ The presence of urease in the plant may play some role in its use as an antisickling agent.

A *Cajanus* flavanone, pinostrobin, inhibits voltage-gated sodium channels of mammalian brain (IC₅₀ = 23 μ M) based on the ability of this substance to suppress the depolarizing effects of the sodium channel selective activator veratridine in a synaptoneurosomal preparation from mouse brain. The resting membrane potential of synaptoneurosomes was unaffected by pinostrobin. The pharmacological profile of pinostrobin therefore resembles that of depressant drugs that block sodium channels.³⁵⁴ *Cajanus* has demonstrated antifungal, antioxidant, and hypercholesterolemia effects in laboratory experiments. Genistein and apigenin from the roots showed remarkable antioxidant properties using the DPPH scavenging activity model.³⁵⁵ The antidyslipidemic activity of pigeon pea was evaluated by a high-fat diet (HFD) hamster model, in which the levels of high-density lipoprotein-cholesterol (HDL-C), low-density lipoprotein-cholesterol (LDL-C), total cholesterol (TC), and total triglycerides (TG) were examined. Pigeon pea administration was found to promote cholesterol converting to bile acid in HFD-induced hamsters, thereby exerting hypolipidemic activity. It significantly increased hepatic carnitine palmitoyltransferase 1 (CPT-1), LDL receptor, and cholesterol 7 α -hydroxylase (also known as cytochrome P450 7A1, CYP7A1) expression to attenuate dyslipidemia in HFD-fed hamsters and markedly elevated antioxidant enzymes in the liver of HFD-induced hamsters, further alleviating lipid peroxidation. This activity was attributed to a possible role of the large quantity of unsaturated fatty acids (UFAs; C18:2) and phytosterol (β -sitosterol, campesterol, and stigmasterol) present in pigeon pea.³⁵⁶

CALONCOBA ECHINATA

Botanical Name — *Caloncoba echinata* (Oliv.) Gilg.

Synonym — *Oncoba echinata* Oliv.

Family — Achariaceae

Common Names — Gorli

African Names — Igbo: udara-nwewe; Bini: otiemme; Yoruba: Kakandika

Description — *Caloncoba echinata* is a shrub or small tree about 7 m high, 1 m or less in girth, with a hard, grayish bark, which appears somewhat corrugated. The leaves are yellowish-green in color, oblong elliptic, and about 10–30 cm long and 5–10 cm broad. It is narrowly acuminate, entire, with a long and tapering apex, and rounded base. Leaves have a thin and slightly leathery texture. The lateral veins (5–6 pairs) are prominent and run wide angles to the midrib, looping well away from the margins. The stalks are about 2.5 mm long. The plant produces small whitish flowers, borne in the axils of the leaves and in clusters on common stalks, which are a few millimeters long. The sepals are about 2.5 mm long, and the petals are 3–4 mm. It flowers from May to November, and the fruiting begins in August and lasts to May. The fruits are round and yellow or orange-red in color, bear numerous prickles (echinate), are about 4 cm in diameter, and contain many black or brown seeds, which are embedded in a white, pithy pulp.

Habitat and Distribution — This is a forest tree found mainly in undergrowth and secondary clearings; it occurs in western, central, and parts of southeastern regions of the continent.

Ethnomedicinal Uses — The fruit pulp is used by the Mendes of Sierra Leone to prepare a sweet refreshing drink. The seeds, when chewed, are sweet and oily and leave a peculiar aromatic aftertaste. The seed oil has been used for making soaps and candles. The plant has a reputation as a drug for the treatment of leprosy and was cultivated in the past for this purpose. The seeds of *Hydnocarpus wightiana* are, however, preferred for the treatment of leprosy. A lotion made from the plant has been used in parts of West Africa for pustular eruptions of the skin.

Constituents — The seeds contain oil whose fatty acids have the cyclopentane nucleus of chaulmoogric acid. The acid is used in a mixture with hydnocarpic acid for treating leprosy. The stem bark contains friedelane triterpenes kokoonol, kokoonal, and 3 β ,21 β -dihydroxy-30-nor-(D:A)-friedo-olean-27-oic acid,³⁵⁷ as well as cycloartane-type triterpenoids glaucartanoic acids A and B isolated from the fruits.

Pharmacological Studies — *Caloncoba echinata* has not been investigated much pharmacologically. The cycloartanes isolated from the fruits of the related *C. glauca* have been found to possess cytotoxic activity.³⁵⁸

CAPSICUM ANNUUM

Botanical Name — *Capsicum annuum* L.

Synonyms — *Capsicum cerasiforme* Lank.m, *Capsicum chamaecerasus* Nees., *Capsicum longum* DC. Over 30 synonyms and varieties are known to exist.

Related Species — *Capsicum annuum* var. *glabriusculum* (Dunal) Heiser & Pickersgill

Family — Solanaceae

Common Names — Red pepper (English), piment doux, piment des jardins, gros piment, poivron (French)

African Names — Arabic: filfil romi; Bambara: forotu, kilikili; Hausa: barkono, barkhannu; Igbo: totoishi; Swahili: pilipili-hoho; Yoruba: ata wewe

Description — *Capsicum annuum* L. is an annual or biennial suffrutescent plant that can reach over 1 m in height. The leaves are ovate lanceolate, 6 × 3.5 cm. The flowers are greenish-white and

borne on axillary bunches. It produces polymorphic berries 18 cm long; usually globular, ovoid, or oblong in shape; green colored and yellow to red when ripe.²⁸

Habitat and Distribution — The species is cultivated throughout tropical Africa; several hybrids and strains are known.

Ethnomedicinal Uses — The fruits are used as a carminative, tonic, spasmolytic, antiseptic, rubefacient, and stimulant. In traditional medicine, they are employed mainly as a flavoring agent in compound formulations. A poultice prepared with the ground fruits, kaolin, and bark of *Newbouldia laevis* is used in postpartum medication as a general tonic. An ointment prepared with the fruit extract is used topically for skin infections.

Constituents — The fruit contains capsaicin, dihydrocapsaicin, nordihydrocapsaicin, and related alkaloids. The capsaicin content increases with maturation of the fruit. The color of the fruits is due to the presence of carotene, capsanthin, and capsorubin, as well as steroidal saponins. Vitamins A and C also occur in the plant. The common carotenoids with provitamin A activity, β -carotene and β -cryptoxanthin, occur in the plant.³⁵⁹

Pharmacological Studies — The alkaloid capsaicin has been studied extensively and has been shown to possess antimicrobial, spasmolytic, vasodilatory, rubefacient, counterirritant, and stimulatory activity on the digestive system.¹²³ It has a somewhat ambiguous effect in the stomach mucosa. It has shown the ability to excite and later defunctionalize a subset of primary afferent neurons and has been extensively used as a probe to elucidate the function of these sensory neurons in a number of physiological processes. In the rat stomach, experimental data provided clear evidence that capsaicin-sensitive (CS) sensory nerves are involved in a local defense mechanism against gastric ulcer. Stimulation of CS sensory nerves with low intragastric concentrations of capsaicin protected the rat gastric mucosa against injury produced by different ulcerogenic agents. High local desensitizing concentrations of capsaicin or systemic neurotoxic doses of the agent markedly enhanced the susceptibility of the rat gastric mucosa to later noxious challenge.³⁶⁰

One of the steroidal saponins found in the fruits exhibited antibacterial activity.³⁶¹ The fruit extract has been employed in various formulations: a gargle for laryngitis, improvement of peripheral circulation, alleviation of flatulence and colic, and externally as an ointment for lumbago, unbroken chilblains, muscle pains, and stiffness.¹²⁴ Hot pepper has an antioxidant activity that is due to its phenolic content. Both ripe and unripe hot peppers prevented Fe^{2+} -induced lipid peroxidation in the rat brain. The unripe pepper had a significantly ($p < 0.05$) higher total phenol, Fe^{2+} chelating ability and inhibitory effect on the basal and Fe^{2+} -induced lipid peroxidation in the brain tissues than the ripe pepper.³⁶²

Most pharmaceutical applications of *Capsicum* is done with *Capsicum oleoresin*, a thick, dark reddish-brown liquid concentrate produced by the extraction of fruits with volatile solvents or by supercritical fluid extraction. The capsaicin content of *Capsicum oleoresin* is highly variable, and the oleoresin exhibits differences in its ability to mediate substance P release, the neuropeptide which causes vasodilation due to the release of NO from the endothelium. The quality of the oleoresin has to be tightly controlled for uniform pharmacological outcome since the liquid contains over 100 chemicals, alcohols, carbonyls, carboxylic acids, esters, pyrazine compounds, and terpenes in the volatile component of the resin.

CAPSICUM FRUTESCENS

Botanical Name — *Capsicum frutescens* L. (= Variety: *Capsicum annuum* APG)

Synonyms — *C. frutescens* var. *minimum*, *C. baccatum* L., *C. fastigiatum* BI.

Family — Solanaceae

Common Names — Fructus capsici, African *Capsicum*, Japanese chilies, piment de cayenne, piment enrage (F), pilipili (francophone Africa), cayenne pepper

Description — This is a perennial branchy shrub, about 1 m in height. It produces yellowish-white flowers. The fruits are smaller than those of *C. annuum* and are oblong, conical, obtuse, and binocular, rarely exceeding 4 cm. They are more pungent than those of *C. annuum*, with color ranging from red, yellowish red, to brownish red; they have a characteristic odor that can be modified by selective breeding.

Constituents — The plant contains up to 14% capsaicin, the pungent principles in the genus. It yields in varied concentrations the compounds reported for *C. annuum*. The pungent properties of *Capsicum* can be distinguished from those of gingerol and paradol (found in Zingiberaceae) by the ability of the pungent substance in *Capsicum* to be resistant to destruction by solutions of caustic alkalis (1 in 50) but destroyed by potassium permanganate.

Pharmacological Studies — The biological activities are similar to those reported for *C. annuum*. The dietary hot short pepper showed antioxidant activity and prevented cyclophosphamide-induced oxidative stress in the brain. Although the flesh is a better protectant, the possible contributory role of the seeds cannot be ruled out.³⁶³

CARAPA PROCERA



Botanical Name — *Carapa procera* DC.

Synonyms — *Carapa guineensis* Sweet et A. Juss., *C. touloucouna* Guill. et Perr., *C. gummi-flua* DC, *C. velutina* DC, *C. microcarpa* Chev., *Trichilia procera* Forsyth., *Granatum surinamensis* (Miq.) Kuntze

Family — Meliaceae

Common Names — Monkey cola, crabwood

Description — It is a tall tree, often attaining a height of up to 17 m, with wide spreading branches and large leaves that are clustered at the end of the twigs. The bark is pale brown, thin, and smooth with pinkish or red slash. The leaves are large, up to 2 m long, with 8–20 pairs of opposite or alternate leaflets. Leaflets vary enormously in size and shape, usually from 12 to 24 cm long and 1.8 to 9 cm broad. They are elliptic to elongate-oblong in shape, rounded or wedge shaped. The leaf surface displays about 10 pairs of lateral veins, widely spaced. The flowers appear from August to October and January to February. They are creamy white with reddish or pinkish centers, are sweet scented and about 6 mm long, and are borne on long common stalks. The fruits are almost globular in shape with long or short beaks. They open by means of valves (five), which may have ridges

running through the entire length. The seeds are 15–20 per fruit, somehow resembling cola nuts. Each seed is about 2.5 cm in diameter, obliquely ovoid with flattened surfaces, reddish-brown, and have a thick, woody, oily kernel.

Habitat and Distribution — This is a lowland rainforest plant; it occurs in Ghana, Ivory Coast, Nigeria, Cameroon, Zaire, and Tanzania.

Ethnomedicinal Uses — The seeds yield fat that is used for skin and hair and for treating sores, burns, rheumatic pains, insect bites, jiggers, eruptions, ringworm, and yaws. It is also used as a vermifuge for both tapeworms and roundworms.

Constituents — The plant contains fatty acids, triterpenes, and a bitter principle, tulukinin.⁸²

Pharmacological Studies — The extract was shown to be apparently devoid of any activity against malaria. The LD₅₀ of the root bark extract in mice was determined as 1.2 g/kg.

CARICA PAPAYA L.



Botanical Name — *Carica papaya* L.

Synonyms — *C. hermaphrodita* Bianco, *C. mamaya* Vellon., *Vasconcellea peltata* (Hook. & Arn.) A. DC.

Family — Caricaceae

Common Names — Pawpaw, papaya

African Names — Arabic: anbah hindi, babaya, babog fruta bomba; Hausa: gwandu; Igbo: okworo-beke; Efik: etighi-mbakara; Swahili: papaya; Yoruba: ibepe, sayinbo

Description — This is a small tree with a weak soft-wooded stem and palm-like appearance. The stem is usually unbranched and hollow; the bark is gray and visibly marked by the numerous large orbicular leaf scars. The leaves are dark green, very large, and crowded on the upper part of the tree, each borne in a long, hollow, and cylindrical petiole. They are suborbicular, 20–60 cm wide, usually palmately lobed, with each lobe pinnatilobulate, obtuse or acute. It is usually dioecious, with male and female inflorescences borne on different plants, although rarely some plants bear bisexual flowers. The male inflorescences are carried in the axils of the upper leaves, a long pendulous raceme carrying the numerous sessile male flowers on the branches. The male flowers are usually very fragrant. The female flowers are remarkably much larger than the male and more or less without stalks (sessile) and are borne on the main axils.

The plant produces fruits that vary enormously in shape and size; most are oblong, globular, or round, often five angled and narrowed to the stigma tip, although flask-shaped fruits narrow at the base are not uncommon. The ripe fruit is yellow or bright orange in color. The pulp is thick and yellow-orange in color. The seeds are small, dark green or brown, enclosed in a mucilaginous mass. The whole plant yields copious white latex when cut.^{9,28,33}

Habitat and Distribution — This is cultivated and grows wide in most parts of the continent. It is native of tropical Africa.

Ethnomedicinal Uses — Pawpaw is used in traditional medicine for a variety of purposes. The green fruit is applied on ringworm and is claimed to effect a cure if rubbed hard until the skin bleeds. The ripe fruit is edible and rich in vitamin A and has some vitamin C. A weak decoction of the leaves is taken for malaria, and the mixture with lemongrass and guava leaves is used in the treatment of hypertension. The three plants are also used with leaves of neem, *Azadirachta indica*, in steam therapy for malaria,³¹⁸ in which the patients are covered with a thick blanket and made to bathe in and inhale the vapor from the cook pot.

The leaves and seeds are used for the treatment of amebiasis and as an anthelmintic. The fresh fruits are carminative and administered for digestive conditions and used as a diuretic, stomachic, and antiseptic. The sap of the plant contains a ferment, which has the property of coagulating milk and of softening or digesting the fibrous tissues of flesh; hence, it is used to make meat tender, either by adding a piece of unripe fruit to the water when cooking, by wrapping the meat in the leaves to roast or bake, or as a preliminary treatment for some hours before cooking.⁸¹ The seeds are used as an oxytocic and externally as an antifungal agent.

Constituents — The principal constituents of papaya are the proteolytic enzymes found in the latex, which abounds in all parts of the plant but is obtained mainly from the fruit, seeds, and leaf. The two major enzymes in the mixture are papain and chymopapain, with less papain occurring but with twice the proteolytic activity of chymopapain. Commercially available “purified papain” usually consists of a mixture of the two enzymes and small amounts of other enzymes. An alkaloid carpaine occurs in the seeds and leaf, with traces in the unripe fruit. The air-dried seeds yield 660 to 760 mg/100 g of the aglycone of glucotropaeolin, benzyl isothiocyanate (BITC). The fruit is rich in vitamins B and C and traces of vitamin A and has a high content of potassium and other minerals. The leaves and the root yield the alkaloids carpaine, isocarpaine, and dihydrocarpaine I and II.³⁶⁴ In the young leaves, the alkaloid content is about 0.28%.³⁶⁵ The seeds also contain fixed oils, carbohydrates, glycosides, carpasemine, and benzene senevol.³⁶⁶ The bark contains a pentanol, xylitol, and saponins.

Pharmacological Studies — The proteolytic activity of the enzymes has been exploited as an aid in digestive disorders and malabsorption syndrome. The crude enzyme preparation is used in wounds and surgical incisions to promote healing and prevent sloughing in infected wounds.³⁶⁷ A related enzyme, leucopaine, has been shown to aid the regenerative processes of the injured tissue of rabbits and in treatment of purulent wounds in 303 patients under clinical conditions.³⁶⁸ The papaya enzymes are used as a topical debriding agent, sometimes in conjunction with urea, in wound healing to facilitate wound cleaning from necrotic tissues, and to arrest local inflammation and purulent exudation. They are also applied in eye and spinal disorders.

The fruit is edible and rich in vitamin A and has some vitamin C; it is used in a variety of ways as a food and as a meat tenderizer. Chymopapain has been employed, with remarkable success, as an intervertebral disk injection in the lumbar spine (chemonucleolysis). For this purpose, it is recommended that the drug should be administered under local anesthesia rather than under general anesthesia.³⁶⁹ The leaves have been shown to possess antiplasmodial activity against both chloroquine-sensitive and chloroquine-resistant *P. falciparum*.³⁷⁰

Aqueous extract of *Carica papaya* (CP) leaves exhibited antitumor activity and immunomodulatory effects.³⁷¹ In human peripheral blood mononuclear cells (PBMCs), the production of IL-2 and IL-4 was reduced following the addition of CP extract, whereas that of IL-12p40, IL-12p70,

interferon gamma (IFN- γ), and TNF- α was enhanced without growth inhibition. In addition, cytotoxicity of activated PBMCs against K562 was enhanced by the addition of CP extract. Moreover, microarray analyses showed that the expression of 23 immunomodulatory genes, classified by gene ontology analysis, was enhanced by the addition of CP extract. In this regard, CCL2, CCL7, CCL8, and SERPIN B2 were representative of these upregulated genes and thus may serve as index markers of the immunomodulatory effects of CP extract. It is interesting to note that the identified active components of CP extract, which inhibited tumor cell growth and stimulated antitumor effects, have a molecular weight of less than 1000. It has been suggested that the CP leaf extract may potentially provide the means for the treatment and prevention of selected human diseases, such as cancer and various allergic disorders, and may also serve as an immunoadjuvant for vaccine therapy.³⁷²

The methanolic extract of the seeds showed male contraceptive activity in laboratory animals.³⁷² Treatment at various dose regimens daily for 52 weeks did not show significant changes in body weight, organ weight, food and water intake, or preterminal deaths compared to those of control animals. Sperm count and viability in animals treated with 50 mg/kg body weight and the weight of epididymis, seminal vesicle, and prostate of all the treated animals showed significant reduction compared to a control. Cauda epididymal spermatozoa of animals treated with 50 mg/kg body weight were immotile. Azoospermia was observed at various doses in the treated animals. Serum clinical parameters, serum testosterone, and histopathology of vital organs were comparable to those of control animals. It was also reported that the histology of testes revealed adverse effects on the process of spermatogenesis, while the histology of the epididymis, seminal vesicles, and ventral prostate showed no changes compared to the control.³⁷³

Clinical Applications — The proteolytic enzymes are listed in most pharmacopoeia and are incorporated into proprietary products for digestive disorders. Papain has been given as enteric-coated tablets in a dose of 1.98 g with every meal to reverse a malabsorption syndrome that was incompletely controlled by gluten-free diet and considered to be due to transient gluten intolerance.³⁷⁴ The enzyme is dispensed as an antitoxic agent for diphtheria and tetanus and is used externally for the healing of wound sores. A 4% w/v solution of the homogenized fruit pulp and 1% boric acid has been found effective in the healing of tropical sores.^{313,314} Chymopapain is employed in the treatment of herniated disks by chymonucleolysis. Reviews of the use of chymopapain in the repair of disk disorders are available.^{375,376}

The alkaloids have broad-spectrum antimicrobial activity. Carpaine inhibits the tuberculosis bacteria, *Mycobacterium tuberculosis*, but in high doses possesses a digitalis-like action that may cause cardiac paralysis and depression. In small doses (0.01–0.02 mg/day p.o. or 0.006–0.01 mg/day s.c.), carpaine hydrochloride was found useful in hypertension.³⁷⁷ Tropaoline is bactericidal and has been indicated for intestinal and injury infections.³⁶⁸ Xylitol possesses antihemolytic activity and has been reported to lower bilirubin levels in rats intoxicated with parenteral administration of saponins.³⁷⁸ A paste made from the leaves of pawpaw, mixed with opium and sodium chloride, applied for 3 days was helpful in the relief of symptoms and easy extraction of guinea worm from the body.³⁷⁹ The leaf extract is also effective against dengue fever.³⁷³

Toxicity — Allergic reactions to papaya appear to be common.³⁸⁰ Rhinitis, asthma, and other allergic reactions are sometimes experienced by health professionals handling papain-containing powders.³⁶⁷ A major adverse reaction associated with chymopapain is anaphylaxis, which can occur in up to 1% of patients.³⁸¹ Papaya, in addition to glucosinolates, contains low levels of cyanogenic glycosides (CNGs), an unusual occurrence because it was assumed that the two classes of metabolites were mutually exclusive. It is suggested that CNGs may be responsible for the antibiotic effects of the seeds and the laxative effect of the immature fruit. The accumulation of CNGs in the latex and leaves of papaya, although currently detected in edible parts at very low levels, may have potential human health implications.³⁸²

CASSIA SPECIES (CESALPINIACEAE, APG = LEGUMINOSAE)

Many members of the genus *Cassia* are indigenous to Africa, and several more have been introduced as ornamental plants. The major African species include *Cassia abbreviata*, *C. fistula*, and *C. sieberiana*. A recent revision of the genera *Cassia* and *Senna* has placed *C. alata*, *C. acutifolia*, *C. angustifolia*, and *C. occidentalis* as belonging to the genus *Senna*. They are mostly small shrubs with attractive flowers. They are used interchangeably with some *Senna* species.

CASSIA ACUTIFOLIA

Botanical Name — *Cassia acutifolia* Del.

Synonyms — *Cassia senna* L., *C. lanceolata*, *C. lentiva* Brisch.

Family — Leguminosae

African Names — Arabic: sana, senamiki, sena; Hausa: illesko, rinji, filaskon maka; Peul: falajin, sanjerehi; Swahili: msahala

Description — It is a shrub or small tree up to 10 m tall and deciduous; young twigs are glabrous or hairy. Leaves are arranged spirally, paripinnately compound with 5–12 pairs of leaflets; stipules are linear, about 1.5 mm long and caducous; leaflets are ovate-elliptical to oblong-elliptical, 3–6 × 1–3 cm, with the base rounded to obtuse and apex obtuse to subacute. Inflorescence is a terminal, lax raceme, 0.5–9 cm long, and many flowered; bracts are persistent during flowering. Flowers are bisexual, slightly zygomorphic, 5-merous, and fragrant; sepals are obtuse; petals are oblanceolate to obovate, 15–35 × 7–18 mm, and yellow; stamens are 10, 3 with filaments about 3 cm long, 4 with shorter ones, and 3 with rudimentary ones; the ovary is superior, stipitate, with the style very short and stigma small. Fruit is a pendulous cylindrical pod 30–90 × 1.5–2.5 cm, transversely partitioned, dehiscent by 2 valves, woody, black, and many seeded with seeds embedded in pulp. Seeds are ellipsoid, 9–12 mm long, and brown to black.¹¹⁴⁰

Habitat and Distribution — *Cassia abbreviata* is indigenous from Gabon east to Somalia and throughout southern Africa to South Africa. It has been introduced into Mauritius. The plant occurs in secondary forests and savannas.

Ethnomedicinal Uses — The plant is employed as a general tonic and laxative and mixed with other herbs for the treatment of various diseases. The leaves are smoked as a treatment for hematuria, whereas the smoke of smoldering twigs is inhaled to cure headache. A root infusion is kept in the mouth or roots are chewed and swallowed to relieve toothache. A root decoction or the dried powdered roots in water are drunk to treat gastrointestinal disorders, stomachache, bilharzia, venereal diseases, pneumonia, uterus complaints, heavy menstruation, and snakebites and used as a purgative, stomachic, aphrodisiac, abortifacient, and vermifuge. Malaria (including blackwater fever) is also treated with extracts from the roots. A water extract of the roots is used as an eyewash to cure eye inflammation. The powdered stem bark is applied to abscesses and added to food to cure diarrhea. A decoction of the stem bark is used as a purgative and to cure malaria and diarrhea. The seed is used as a tonic.^{1140,1147}

Constituents — The major constituents of *Cassia* species are anthrones and anthraquinones, amino acids, and proteins. The pods yield 2–5% anthraquinone glycosides, known as sennosides. They also contain kaempferol, chrysophanol, isorhamnetin, rhein, sennacrol, and cathartic acid. The leaves contain free anthraquinones, and the seeds do not contain anthraquinones. Triterpenes and organic acids have also been isolated from the leaves.

Pharmacological Studies — The fruits, leaves, and extracts of these parts of the plant, as well as the purified sennosides, are used in clinical medicine as a laxative, in various dosage forms. In laboratory studies, the extracts of the roots and leaves showed remarkable *in vitro* antiplasmodial

activity, and the crude stem bark extracts caused a drop in blood pressure in rats, which was dose dependent. The stem extracts also exhibited no abortifacient activity in pregnant mice and no apparent toxicity to the animals. Methanol, acetone, and water extracts of the stem bark showed significant inhibition against a number of Gram-positive and Gram-negative bacteria. Tests of a root extract showed only modest levels of cytotoxicity.¹¹⁴⁰

CATHA EDULIS



Botanical Name — *Catha edulis* Forsk

Synonyms — *C. forskalii* A. Richard, *Celasterus edulis* Vahl., *Methyscophyllum glaucum* E. & Z., *Dillonia abyssinica* Sacleux

Family — Celastraceae

Common Names — Khat, kat, Abyssinia kat, African tea, Arabian tea, Boesmans tea, bushman's tea, cafta, ciat, chrinda redwood

African Names — Kikuyu: Kambo; mira, miraa; Rungwe: Msuruti, msuvuti; Shambala: mandama, mfeike, m'mke; Shona: muysawhare, muzaramashawa; Somali: mulungi; Swahili: mlonge

Description — *Catha edulis* is a small tree in its cultivated form, but in the wild state the plant can grow to a height of 25 m. The plant is polymorphic, with the branches having either opposite or alternate leaves. Khat leaves are brownish green and leathery, with a glossy upper surface. They have a faintly aromatic odor and an astringent and slightly sweet taste. The mature leaves are usually 1–4 cm wide and 5–10 cm long with a serrated edge and are elliptical or lanceolate in shape. Anatomical differentiation of the species is often unreliable, and the use of chromatographic identification has been advocated.³⁸³

Habitat and Distribution — It is a native to Somalia, Ethiopia, and Djibuti. It is a savanna crop and prefers dry elevated regions.

Ethnomedicinal Uses — Khat chewing has been common in some countries of East Africa and the Arabian Peninsula for many centuries. Khat chewing has a stimulating effect on the CNS and was an effective inhibitor of the sensations of hunger and fatigue. The use of khat for the treatment of depressive states was known as early as AD 1237 by the Arabian physician Naguib Ad Din, who reported its use for that purpose.³⁸⁴ The plant is usually chewed when fresh, and the younger leaves are preferred because they are more potent and are also more tender to chew. It takes 3 to 5 years for a newly planted khat tree to produce mature harvestable leaves. The shoots at the tips of the branches are cut in the early hour of the morning, bundled, and then usually wrapped in banana leaves to preserve their freshness; the material is speedily transported to the market to be sold by late morning.³⁸⁵ Since khat leaf rapidly loses its effect on wilting, the khat habit remained endemic mainly at the areas where the plant is grown. The major countries where khat is grown include Ethiopia, Kenya, Saudi Arabia, Sudan, Malagasy, Somalia, and Yemen Arab Republic, where many houses have a room called *muffraj* that is set aside and specially arranged for regular sessions of khat chewing. With improved transportation and communication, the habit has spread to other parts of Africa and Arabia. It has been reported that shipment of khat has been observed by customs departments in Europe and the United States.³⁸⁵

Khat chewing has taken deep roots in the social and cultural tradition of the natives of the region where the plant is grown. The leaves are frequently chewed by craftspeople, laborers, and farmers to reduce physical fatigue, and the masticated plant material can be observed as a bulge in the cheek of consumers. The juice from the bolus stored in the cheek is swallowed; the residue is ejected and replenished with fresh plant materials as desired. In the traditional social setting, khat is employed during weddings and burials and as a beverage during important family events.

In the United Kingdom, there has been a growing khat trade in immigrants from the Horn of Africa, and it is fast becoming a major social problem. Although the World Health Organization in 1980 classified khat as a drug of abuse that can produce mild-to-moderate psychological dependence, it is not illegal in the United Kingdom to import, sell, buy, transport, or consume khat. It is legal, in the unprepared plant form, in the United Kingdom and the Netherlands but is a controlled substance and illegal in the United States, Canada, Australia, New Zealand, Denmark, Finland, Germany, Norway, and France.³⁸⁶

Constituents — There is no agreement on the actual constituents of khat and those that are artifacts produced during extraction of the plant material. The khatamines (–)-cathinone, (+)-norpseudoephedrine and the related phenylalkylamines are the major components found in fresh leaves of *Catha edulis*. Another group of alkaloids found in khat leaves is the cathedulins, with molecular weight ranging from 600 to 1200.^{387,388} The cathedulins are polyesters or lactones of sesquiterpene polyols. A representative structure for the members of this group is that reported for cathadine D.³⁸⁹

The plant also contains volatile oils,³⁹⁰ flavonoids,³⁹¹ sterols, and triterpenes,³⁹² as well as proteins, vitamins, and minerals. The phenylalkylamines are, however, responsible for the observed CNS stimulant activity, and (–)-cathinone accounts for more than two-thirds of the total phenylalkylamines present. The market value of the drug is usually determined by the (–)-cathinone content of the plant.

Pharmacological Studies — The structure of the active constituents of khat, (–)-cathinone and norpseudoephedrine, closely resembles that of amphetamine, and this similarity is further evident by the amphetamine-like properties of the khatamines. (–)-Cathinone exhibited a positive inotropic and chronotropic effect on isolated guinea pig atria. The compound at a bath concentration of 10 µg/ml had twice the activity of either (+)-norpseudoephedrine or (+)-amphetamine. The three compounds were equipotent in increasing the heart rate when injected intravenously (1 mg/kg) in anesthetized rats. In anesthetized cats, intravenous injection of (–)-cathinone caused a transient rise in the blood pressure by 30 to 35 mm Hg. The pressor effects of (–)-cathinone were, however, inferior to those of (+)-norpseudoephedrine and (+)-amphetamine, and with the khatamines, the pressor effects were characterized by the rapid development of tachyphylaxis.³⁹³

Other amphetamine-like activities of the khatamines include the enhancement of electrically induced constriction of rat and guinea pig vas deferens, potentiation of noradrenergic transmission, increased lipolysis, and sympathomimetic effects usually associated with amphetamine. The phenylpentenylamine alkaloids also found occurring in khat leaves showed only weak effects on dopamine release and therefore are considered unlikely to contribute to the stimulating properties of khat leaves.³⁹⁴ The flavonoid fraction of khat, when administered at a dose of 200 mg/kg orally, produced significant anti-inflammatory activity against the carrageenan-induced paw edema and cotton pellet granuloma.³⁹⁵ An aqueous solution of the methanol extract of khat has been shown to possess a likely mutagenicity on male germ cells following chronic oral administration to albino mice.³⁹⁶ The chloroform extract has been shown to exert cytotoxicity against a variety of cultured mammalian cell lines, including KB, 1BR.3, and XP2bi, and the effect may be due to inhibition of de novo RNA synthesis.³⁹⁷ (–)-Cathinone has also shown a mitodepressive effect on the dividing cells of *Allium cepa* root tips.³⁹⁸

Another form of khat use is via a semisynthetic methyl derivative of cathinone called methcathinone, an illicit drug also known as ephedrone. Its intoxication is difficult to diagnose and cure properly for two reasons: (1) Target consumers are usually “well-educated people” aware of the risks and precautionary measures, and (2) intoxication by cathinone derivatives of synthetic or natural (derived from the khat) origin induce misleading symptoms.³⁹⁹

Clinical Properties — The effects of chewing khat are contained in recent reviews on the subject.^{385,400–402} The effects of the drug, which closely resemble those of amphetamine, include sympathetic activation, anorexia, euphoria, increased intellectual efficiency, and alertness.⁴⁰² The subjective effects reported by users of khat also include relief from fatigue, enhanced creativity, hyperactivity, and mild analgesic activity. Khat chewing by pregnant women appears to be deleterious to the fetus. It has been reported that healthy full-term singletons, born after uneventful pregnancies and deliveries, had a significantly lower birth weight when the mothers were khat chewers.⁴⁰³ Norpseudophedrine was found to be excreted in breast milk in several lactating women who chewed khat leaves, and the compound was also detected in the urine of the breast-fed infants.⁴⁰⁴

The effects of the “flower of paradise,” as khat was once called, are short lasting, and like coca, the leaves have to be replenished several times in the day to maintain the state of euphoria. It has been observed that after 2 h of consumption of khat, the initial gaiety and the loquacity brought about by the reduction of social inhibition soon give way to tension, depressive tendencies and sluggishness, and logorrhea, which brings the khat-chewing session to an end, usually with the discussions becoming animated with loud talk often unrelated to the subject under discussion.

Toxicity — Khat chewing causes gastrointestinal disturbances. The high concentration of polyphenolic tannins in khat causes constipation, periodontal diseases, mucosal lesions, and increased risk of esophageal cancer. The drug induces cardiac arrhythmias, and the cardiovascular response to physical effort is exaggerated. Habitual use of the drug may change to a transient hypotensive state on abstinence.³⁹⁵

The mutagenicity of khat has been evaluated in animal studies, and it has been established that the intravenous administration of khat induced nucleic acid synthesis in brain and liver and produced abnormalities in bone marrow.⁴⁰⁵ The drug therefore has possible carcinogenic and teratogenic properties. Habitual khat use causes spermatorrhea, which is sometimes accompanied by testicular pain, and impairment of male sexual function, which may lead to impotence. Khat consumption causes several adverse sympathomimetic effects, including mydriasis, dryness of the mouth, and increases in respiratory and pulse rate. Chronic consumption has led to liver failure.⁴⁰⁶

The habitual consumption of khat has been implicated in many socioeconomic problems of the endemic regions. In Djibouti, where khat is used by 90% of the men and about 10% of the women, the drug consumed up to a third of the earned wages. Within the family, the drug affects family interaction, with the father becoming more irritable and quarrelsome while high on the drug or silent and withdrawn when the effect has worn off. The drug has been identified as the causative

factor in one of two divorces in Djibouti, attributed to its effect on the male reproductive system and the subsequent estrangement between husband and wife.⁴⁰⁷ The importation of the drug also causes a severe strain on the country's balance of payment, while a special khat sales tax accounts for 10% of the government's revenue. In the communities where khat is consumed, there is a general agreement among observers that there is high incidence of absenteeism and decreased productivity, which leads to unemployment and poverty.

It has been reported that there is a Somali saying that, "Children play, women work, and the men chew khat."

CATHARANTHUS ROSEUS



Botanical Name — *Catharanthus roseus* (L.) G.Don

Synonyms — *Lochnera rosea* Reichenb. F., *Vinca rosea* L., *Pervinca rosea* (L.) Moench., *Lachnea rosea* (L.) Rchb., *Hittonia littoralis* Lour., *Ammocallis rosea* (L.) Small

Family — Apocynaceae

Common Names — Madagascar periwinkle, periwinkle (English), pervenche de Madagascar (French)

Description — *Catharanthus roseus* is a small, erect perennial subshrub reaching 80 cm in height; it is profusely branched and produces milk latex. The leaves are oblong elliptic, 2 to 7 cm long and 1.5 to 3 cm wide, opposite, smooth and rounded at the apex, with a short petiole. They are slightly bitter, the epidermis is glabrous with some fibers, and they turn slightly green with iodine. The flowers are solitary or twin, axillary, white or pink, and are borne all year in upper leaf axils. The color of the flowers is used to characterize the varieties: variety *album* is white with a grayish-yellow eye; variety *roseus*, or forma *violacea*, is lavender-pink with a purple-red eye; and white with a purple-red eye is characteristic of variety *ocellatus*, or forma *oculata*. The fruits are follicular with two subulated mericaps and numerous black small seeds.^{9,28,353}

Habitat and Distribution — The plants grow in most parts of tropical and subtropical Africa. They are used as ornamental herbs throughout the continent.

Ethnomedicinal Uses — Aqueous extract of the leaves has been used as a laxative. The plant is reputed to be used in southern Africa as an antidiabetic. In eastern Transvaal, the plant is taken as a remedy for ingestion dyspepsia. *Catharanthus* has been used also in other continents as a medicinal

plant. In Britain, a patent medicine, called Vinculin, was sold for many years as a cure for diabetes. In South and Central America, the infusion of the plant is employed, among other things, for the treatment of laryngitis and sore throat and as an eye bath.

Constituents — The plant contains at least 63 indole alkaloids, of which 2 of them, vincal leukoblastine (vinblastine) and vincristine (leurocristine), are dimeric compounds used in clinical medicine for the treatment of certain forms of cancer. Other alkaloids found in the plant include reserpine, ajmalicine, alstonine, and their congeners. The leaf volatile oil contains loganin and sulfurous compounds.⁴⁰⁸ Organic acids have been shown to be major constituents, including proto-cathechuic, caffeic-*p*-hydroxybenzoic acid, and ursolic.

Pharmacological Studies — The dimeric alkaloid vincal leukoblastine is used in the treatment of Hodgkin's disease and choriocarcinoma. Vincristine is administered in the treatment of childhood leukemia and breast cancer. The two drugs are combined in chemotherapy and sometimes with steroids for different types of carcinoma with good results. A concentrated aqueous extract, when given parenterally, lowered the blood sugar level in cats and abated the symptoms in human diabetes.³⁶⁷

The alcoholic extracts demonstrated *in vitro* antibacterial activity, and the ethanolic extract gave a maximum zone of inhibition (21.15 ± 1.64 mm) against *Salmonella typhi* (*S. typhi*) and a minimum zone of inhibition (06.24 ± 0.69 mm) with ethanolic extract against *Staphylococcus aureus*. The methanolic extract gave a maximum (15.61 ± 1.35 mm) against *S. typhi* and a minimum (05.20 ± 0.86 mm) zone of inhibition against *Escherichia coli*.⁴⁰⁹ The phenolic and organic acids found in the roots have been evaluated as potential antioxidants.⁴¹⁰

CENTELLA CORIACEA



Botanical Name — *Centella coriacea* Nannf.

Related Species — *C. asiatica* (L.) Urban.

Family — Apiaceae

Common Names — Pennywort, pepperwort

African Names — Arabic: herba, centella; Sotho: bodila-ba-dinku

Description — *Centella* is a small tropical plant with kidney-shaped leaves up to 2 cm wide and 1 cm long. The margin is crenate, and the apex is rounded. It is native to Asia, and most of the available supplies are obtained mainly from Asia.²⁸

Habitat and Distribution — It is distributed in savanna and secondary forest clearings. The plant grows in North Africa, Senegal, Ivory Coast, northern Nigeria, Kenya, and southern Africa.

Ethnomedicinal Uses — The drug is used in both Africa and Asia as a remedy for leprosy and lupus. In East Africa, it has been dispensed for fevers, abdominal distress, and venereal diseases. The Xhosa and the Mfengu of southern Africa use the leaves as a food vegetable.⁷⁹ The plant is used in West Africa as a fever remedy and as an ingredient in steam treatment of malaria.

Constituents — *Hydrocotyle* yields a volatile oil, the principal components of which are β -caryophyllene, β -farnesene, germacrene D, β -elemene, and bicycloelemene.⁴¹¹ The plant contains several saponins, including centelloside, madecassoside, asiaticoside, oxyasiaticoside, brahmoside, thankuniside, and brahminoside and the related terpenoid aglycones, such as centellinic, brahmic, madecassic, betulic, and Asiatic acids.^{412,413}

Pharmacological Studies — The plant has been employed in folk medicine for a long time in the treatment of various skin diseases. Several proprietary products available in Europe containing *Centella* are indicated for the treatment of indolent ulcers, wounds, and keloid and hypertrophic scars. The drug has been found useful in the management of postoperative wounds and in the prevention and treatment of scarring from burns.⁴¹⁴ The wound-healing properties of a tincture of *Hydrocotyle* have been confirmed by a controlled clinical trial.³⁶⁹ The drug inhibits the growth of human fibroblasts *in vitro*⁴¹⁵ and was found effective in patients with venous disorders of the lower limbs.⁴¹⁶

CHASMANTHERA DEPENDENS

Botanical Name — *Chasmanthera dependens* Hochst

Family — Menispermaceae

African Names — Igbo: ogbo; Yoruba: ato oloriraun

Description — The plant is a woody climber with a rough stem. The young stem is hairy. The leaves are oval or rounded, 3–10 cm long and about the same size in width. The leaf surface is papery and sparsely hairy on both sides. It has a heart-shaped base, and the apex is very shortly drawn out; the stalks are leafy and up to 30 cm long. The plant produces many flowers in the axils of the leaves; they are tiny and hairy and borne on long, slender common stalks covered with soft hairs.

Habitat and Distribution — It grows in wild forest margins and savanna, especially in rocky terrains. It is cultivated as a medicinal plant in West and Central Africa. The plant is distributed from Sudan in the north to Ghana in the West Coast and spreads down to Ethiopia and South Africa.^{9,77}

Ethnomedicinal Uses — The root is used as a decoction for the treatment of venereal diseases. Fresh leaves are rubbed on sprained joints and bruises, used as a dressing for fractured limbs, or mixed with shea butter and used as an embrocation for pains and stiffness. A general tonic for physical and nervous debilities and for inflammatory and exhausting diseases is produced by boiling the stem bark.

Constituents — *Chasmanthera* and the other members of the plant family Menispermaceae contain nonnitrogenous bitter principles such as chasmanthin, columbin, and palmatine. Berberine-type alkaloids, palmatine, colombamine, and jateorhizine also occur in the plant.

Pharmacological Studies — Berberine sulfate inhibits *Leishmania tropica* in very low concentrations. The compound also possesses uterine stimulant activity.⁴¹⁷ A methanol extract of the dried leaves of *Chasmanthera dependens* exhibited anti-inflammatory and analgesic activities. The extract (100–400 mg/kg p.o.) produced dose-related inhibition of carrageenan-induced paw edema and cotton pellet-induced granuloma in rats. The extract also inhibited the leakage of Evan's blue induced by acetic acid in mice. The analgesic property was determined by its effect on writhing response induced by acetic acid as well as on the early and late phase of formalin-induced paw licking in mice.⁴¹⁸

CHLOROPHORA EXCELSA

Botanical Name — *Chlorophora excelsa* (Welw.) Benth. & Hook.

Synonyms — *Maclura excelsa* (Welw.) Bur., *Chlorophora tenuifolia* Engl., *Chlorophora alba* Chev.

Family — Moraceae

Common Names — Iroko, African oak

African Names — Bini: iroko; Hausa: ioko; Igbo: orjih; Kisi: kemo; Lunda: sanga; Runqwa: mwala; Yoruba: rook; Zinza: msule.

Description — The iroko tree is a large, tall tree, growing to more than 60 m high and exceeding 2.5 m in diameter; the bole is straight and cylindrical with about 25 m clear of branches. The trunk is gray to dark brown or blackish, smooth at first, later rough and flaking, seldom fissured, with slash cream with brown spots exuding a copious white latex. It is sometimes deciduous, dioecious (rarely monoecious) with short buttresses, blunt, and sometimes with rootspurs and large exposed reddish-brown lateral roots with horizontal lenticels. The branches are ascending, forming a flat crown that graces the forest canopy it occupies. The foliage is dark green and dense. The leaves are simple, with alternate petiole 2.5–6 cm long, stipules 0.5–5 cm long; the blade is broadly elliptic, 10–25 cm long, 5–15 cm wide, with an apex rounded with a very short acuminate tip, a base unequally cordate or sometimes rounded, margins entire, and thick glabrous above and below except for minute hairs between the network of veins; lateral veins are 10–22 pairs, up-curving near the margin, prominent, and looped below. The leaves of the seedlings and saplings are slightly different in shape, appearing oblong-elliptic, with serrate margins and densely hirsute below.³³ It produces greenish flowers with protruding styles. The fruits are borne on subcylindrical, wrinkled syncarp, 4–7.5 cm in diameter and fleshy.⁹

Habitat and Distribution — The plant is a prized inhabitant of the rainforest belt, and sometimes in deciduous, semi-deciduous, or evergreen forests, often in gallery forests, and sometimes in isolated relic forests. The plant grows better in well-drained soils and is intolerant of impeded drainage. Its very tall size is partly due to its high light demand, and it must grow above the dense forest setting to survive. The plant is widespread in tropical Africa, occurring in Senegal, Sierra Leone, Ghana, Ivory Coast, Benin, Kenya, Tanzania, Zaire, Mozambique, Malawi, and Zimbabwe.

Ethnomedicinal Uses — The leaf extract and the embrocation prepared with it are used in West Africa as fungicides and as a tropical antibacterial agent. In Ghana, parts of the plant are used for the preparation of cough remedies, especially for bronchitis. The stem bark is an ingredient in a mixture used in a hip bath for venereal sores and as a wash for chancre.⁶ The ashes from the bark with palm oil are rubbed on swelling in Liberia. In southern Zaire, the latex is used to reduce tumors and obstructions of the throat and for stomach diseases,²⁷³ and the bark infusion is used as a purgative. The latex, infusion of the bark, and soups prepared with the leaves have been administered to aid lactation.¹⁹⁸ The leaf decoction has been used in Sierra Leone as a wash for fevers.⁶ It is also applied as an enema for the cure of piles, diarrhea, and dysentery. The pounded bark mixed with the kernel of *Okoubaka aubrevillei* fruit is dispensed as an alcoholic extract for the treatment of hemorrhoids.

The species has been listed as an ingredient for the preparation of a remedy for leprosy, cardiac diseases, lumbago, and general fatigue and is taken orally or in a sitz bath for the treatment of elephantiasis of the scrotum.³³ The roots are employed in northern Nigeria as a remedy for rheumatism.⁴¹⁹ Among the Igbo of southern Nigeria, the plant is considered sacred and is featured in rituals and ceremonies.

Constituents — The plant is believed to contain a high quantity of calcium salts in the wood, of which calcium carbonate is the dominant compound.⁴²⁰ A phenolic substance called chlorophorin has been shown to be present in the plant.¹⁹⁹

Pharmacological Studies — The plant extract has been found active against the wood termite *Reticuli terminis*.⁴²¹ The phenolic compounds found in the plant are fungicidal. The latex has been used as an oral application to aid in the extraction of carious teeth.⁴²² Chlorophorin and Iroko

exhibited remarkable broad-spectrum antimicrobial activity and have shown the potential to be exploited as natural multifunctional safe control agents in the treatment of bacterial, fungal, and protozoal infections.⁴²³

CHROMOLAENA ODORATA — EUPATORIUM



Botanical Name — *Chromolaena odorata* (L.) R.M. King & H. Rob.

Synonyms — *Osmia odorata* (L.) Schultz.; *Eupatorium odoratum* Willd.

Family — Compositae

Common Names — Baby bush

African Names — Igbo: obialofulu, obiarachu, akwukwo-Eliza, etc.; Yoruba: akintola-ta-ku

Description — It is an erect or scrambling, much-branched shrub, growing up to about 3 m high. The leaves are alternate or opposite in pairs; usually, they are simple ovate-lanceolate, abruptly narrowed at the base, and acute or acuminate at the tip; they are 5–15 cm long, toothed and three nerved; rarely, they are whorled and without stipule; they are odorous, with a gland dotted beneath. It produces numerous small individual flowers called florets, usually white to light mauve in color; achenes are 5 angled, 4 mm long with many spreading bristles. The florets are of one or two kinds in each capitulum: hermaphrodite, unisexual or neutral, rarely dioecious. The fruits are one seeded, indehiscent, nearly always dry; the seed has no endosperm, but the embryo is straight with planoconvex cotyledons.

Habitat and Distribution — It is a native of the North and South American subtropics and tropics but is almost pantropic having been introduced to tropical regions of Asia, Africa, and the Pacific. It is a common weed found in waste places, along roadsides, and in neglected farmlands.

Ethnomedicinal Uses — A decoction of the leaf is valued in traditional medicine as a cough remedy and as an ingredient with lemongrass and guava leaves for the treatment of malaria. The juice pressed out of the crushed leaves is applied to cuts to stop bleeding. The fresh leaves in limited quantities have been used to enrich the fodder for domestic animals. Other medicinal uses include as an antidiarrheal, astringent, antispasmodic, antihypertensive, anti-inflammatory, and diuretic.⁴²⁴

Constituents — Odoratin (2'-hydroxy-4,4',5',6'-tetramethoxychalcone), the rarely occurring flavone salvingenin, the triterpene alcohol lupeol, and β -amyrin have been isolated from this shrub.⁴³⁹ Also found occurring in the leaves are the flavonoids isosakuranetin

(5,7-dihydroxy-4'-methoxyflavone) sakuranetin, and quercetin.⁴²⁵ Differential solvent extraction of the leaves showed lupeol, β -amyrin, and isosakuranetin in the light petrol extract; the chloroform extract yielded kaempferide and betuletol, while the polar alcohol extract gave sakuranetin, 3,5,7,3'-tetra-G-methylquercetazetin, and quercetin. The aqueous extracts were chromatographed on polyamide plates to yield sakuranetin-7-O-arabinoside and isosakuranetin-rhamnoglucoside.⁴²⁶ The roots have been shown to contain a diterpenoid, 15-angeloyloxy-16,17-epoxy-19-kauronic acid, along with five known metabolites (16-kaurin-19-oic acid, 6'-hydroxy-2',3',4,4'-tetramethoxychalcone, isosakuranetin, acacetin, and kaempferide).⁴²⁷

Pharmacological Studies — The chloroform and acetone extracts of the plant exhibited significant *in vitro* antimicrobial activity against *Bacillus subtilis*, *Escherichia coli*, *Staphylococcus aureus*, and *Aspergillus niger*, while the alcoholic and aqueous extracts were inactive.⁴³⁰ The chloroform extract, which contained mainly isosakuranetin and kaempferide, displayed the maximum inhibitory activity on all the microorganisms tested. The aqueous extract of the leaves showed hepatotropic activity *in vitro*.³⁶⁴ The aqueous alcoholic extract of the plant has been found to possess *in vitro* antispasmodic activity in the guinea pig ileum and blocked the histamine-induced spasms.⁴²⁸ The chloroform-soluble extractive has been shown to be cytotoxic to cell line CA-9KB, with an IC_{50} of 20 μ g/ml.⁴²⁹ The isolated flavonoids, however, did not show any significant activity. Kaurenoic acid found in the roots has significant α -glucosidase inhibitory and antibacterial activities against *Escherichia coli* and *Bacillus subtilis*.

CHRYSOPHYLLUM ALBIDUM



Botanical Name — *Chrysophyllum albidum* A. DC.

Synonyms — *Gambeya albida* (G.Don) Aubrev. & Pellegr., *Planchonella albida* (G.Don) Baehni.

Family — Sapotaceae

Common Name — White star apple

African Names — Ashanti: adesawa, adesaa; Bini: otien; Ewe: adansawa; Igbo: udara, udala; Twi: adios, asamfona-fufu; Yoruba: osan

Description — *Chrysophyllum albidum* is a tree up to 30 m high and about 2.5 m in girth, with small buttresses at the base. The bole is long and often straight, occasionally branched low down. The bark is grayish brown, with crisscross depressions and a pale brown slash, and exudes copious,

gummy white latex. The leaves are oblanceolate, acuminate at the apex and wedge shaped at the base, about 30 cm long and 8 cm wide. The lower surface is densely covered with silvery white or faintly yellowish silky hairs. It has a channeled midrib, with 10–15 pairs of lateral nerves; venation on the lower surface is not very distinct. The flowers are borne in clusters in the leaf axils and are shortly stalked, small and yellow; sepals are about 2.5 mm long and covered with minute yellowish hairs. The fruits occur in January–February; they are edible, glabrous when mature, ovoid to subglobose, pointed at the apex, up to 6 cm long, and pale orange when ripe. A cross section of the fruit, like that of *C. africanum*, reveals seeds arranged as a star. The seeds are 2.5×1 cm, with one sharp edge and the other blunt.⁹

Habitat and Distribution — Often cultivated, the wild species occur in closed forests and in the lowland rainforest regions. It is distributed from Gambia, Sudan, and Uganda to parts of South Africa.

Ethnomedicinal Uses — The bark is used in southern Nigeria as a remedy for malaria, sleeping sickness, and yellow fever. The Igbo regard the plant as a symbolic tree for the creative spirits, and it is featured in healing rituals for female infertility. The leaves are used as emollients and for the treatment of skin eruptions. The leaf decoction is administered for diarrhea and for stomachache. The fruit pulp is taken by pregnant women to prevent nausea.

Constituents — The leaves and stems have been shown to contain β -amyirin acetate,⁴³⁰ gentisic acid,²⁸ and alkaloids.^{431,432} The isoprene content of the latex has been characterized and was found to consist of polyisoprene, 1–4.⁴³³ The fruits are rich in ascorbic acid.

Pharmacological Studies — The methanol extract of the seeds and roots exhibited antihistaminic activity and potentiated the effects of antihistamine agents. The extracts also produced hypotension with simultaneous depression in respiration when administered to cats.⁴³⁴ At a concentration of 100 ppm, the methanol extract of the seeds was found to possess strong molluscicidal activity against schistosomiasis-transmitting snails.⁴³⁵

CINCHONA SUCCIRUBRA

Botanical Name — *Cinchona succirubra* Pav. ex Klotzsch

Synonym — *C. pubescens* Vahl.

Family — Rubiaceae

Related Species — *C. ledgeriana*, *C. calisaya* (calisaya bark or yellow cinchona), *Cinchona officinalis* Linne (pale cinchona or Quinquina). Each species consists of several hybrids; the pharmacognostic specification is that the crude drug must yield not less than 5% of *Cinchona* alkaloids, of which at least 50% consists of quinine and cinchonine.

Common Names — Peruvian bark, Jesuit bark, fever tree

African Names — Arabic: kina; Swahili: mkwin

Historic Notes — *Cinchona* has enjoyed a rich history and very colorful legend for many centuries. Legend has it that the plant derived its name from the wife of the viceroy of Peru, Countess Anna del Chinchon, who was allegedly treated with the drug in 1638, and that her miraculous cure resulted in the introduction of *Cinchona* into Spain in 1639 for the treatment of ague. Although the drug has been known for many years as “*los polvos de la Condesa*,” there is no evidence that the countess ever used the drug. The name of the plant may have been derived from the Incan word *Kinia*, which means “bark.” The drug’s other names, “Jesuit bark” and “cardinal’s bark,” are due to the fact that the Jesuit fathers controlled the trade in *Cinchona* bark for a long time, and its introduction into Rome and other parts of Europe is credited to the eminent philosopher Cardinal de Lugo.

Description — *Cinchona* stem bark occurs in quills or flat pieces up to 30 cm long, 1–4 cm wide, and 3–8 mm thick, with the outer surface gray or grayish brown to reddish brown, usually

fissured with an exfoliating cork, and bearing whitish, green, or gray lichens or mosses, more or less rough, with or without reddish warts. It has a pale yellowish-brown to brown inner surface with fine-to-coarse longitudinal striations. The fracture is fibrous, the taste is bitter and astringent, and the odor is very characteristic but faint. The microscopic characteristics of *Cinchona* are described in *African Pharmacopoeia*.⁴³⁶

The genus *Cinchona* consists of about 40 species, occurring as shrubs or medium-size trees, growing up to 30 m in height. The leaves of *C. succirubra* (ca. 20–25 cm long) are hairy below, elliptic to obovate-lanceolate, simple, entire, and evergreen with prominent midrib and lateral veins. The flowers are borne in terminal panicles, are pinkish or whitish and fragrant; they are tubular with a 5-flaring capsule, which splits open at the base when ripe to reveal 40 to 50 flat, slender, winged seeds.

Habitat and Distribution — *Cinchona* is native to the mountainous regions of tropical America from where it has been introduced to Africa. The plant is cultivated in Cameroon, Congo, Rwanda, and Tanzania.

Ethnomedicinal Uses — *Cinchona* yields up to 16% of quinolone alkaloids, consisting mainly of quinine, quinidine, cinchonine, and cinchonidine and their epimers and hydroxyderivatives. The plant also contains other alkaloids, such as cinchonamine, quinamine, and the tannin conjugates of these alkaloids known as cinchotannic acids. Tannins, resins, and waxes co-occur with these alkaloids.

Pharmacological Studies — The Peruvian bark *Cinchona* has been recognized as a potent antimalarial agent since the seventeenth century. The drug is antiplasmodial, febrifuge, orexigenic, spasmolytic, astringent, and tonic. Quinine and quinidine are the most clinically important of the *Cinchona* alkaloids; quinine is the most potent of the alkaloids as an antimalarial, whereas quinidine has stronger cardiac depressant activity. Quinine is used clinically for the treatment of malaria, especially in infections by parasites that are resistant to the newer synthetic drugs.

Quinine — Quinine, $C_{20}H_{24}N_2O_2$, (8S, 9R)-6'-methoxycinchonana-9-ol; (α R)- α -(6-methoxy-4-quinoyl)- α -[(2S, 4S, 5R)-(5-vinylquinuclidin-20yl)] methanol, is the most important alkaloid occurring in *Cinchona*. The compound was first isolated in 1820 by Pelletier and Caventou. It is available as the bisulfate, dihydrochloride, and sulfate. Quinine sulfate is a colorless or white, odorless, fine acicular crystal or a white or almost white crystalline powder that darkens on exposure to light; the hydrochloric occurs as colorless, fine, silky, acicular crystals, and the dihydrochloride is a white or almost white odorless or almost odorless powder. Quinine salts have differential solubility; the hydrochloric is soluble in a ratio of 1:23 in water, freely soluble in alcohol and chloroform, and very slightly soluble in ether. The dihydrochloride is soluble in a ratio of 1:0.5 in water and 1:14 in alcohol; the sulfate is soluble in a ratio of 1:500 in water and 1:20 in alcohol.

Pharmacological and Clinical Properties — Quinine is a rapidly acting blood schizonticide used orally for the treatment of malaria. It has activity against the blood schizonts of *Plasmodium falciparum*, *P. malariae*, *P. vivax*, and *P. ovale* and the gametocytes of *P. malariae* and *P. vivax*, but is not active against *P. falciparum* gametocytes. The compound has no activity against the exo-erythrocytic forms of the infection and therefore does not produce a radical cure in malaria due to *P. vivax* or *P. ovale*.

Quinine, its congeners, and salts are readily absorbed when given orally or intramuscularly. In the treatment of uncomplicated attacks of falciparum malaria due to chloroquine- or multidrug-resistant strains, quinine is given by mouth at dose of 1.8 to 2 g in three divided doses for at least 7 days. Following oral administration, over 80% of the drug is absorbed mainly from the upper small intestine, and peak plasma concentrations are achieved within 1 to 3 h. The dosage is adjusted according to the salt used, and corresponding lower doses are indicated for children. In complicated or severe cases of malaria for which it may not be suitable to give the drug orally, quinine is administered by the parenteral route, usually as a slow intravenous infusion. About 90% of plasma quinine

is bound to proteins; the concentration of the alkaloid in the cerebrospinal fluid is only about 2% to 5% of that in the plasma, and the drug readily crosses the placenta.⁴³⁷

Quinine has been used with clindamycin in the treatment of babesiosis and cryptosporidiosis infections. The drug has also been useful in the treatment of nocturnal leg cramps, and the incidence of cramps among patients during hemodialysis was found to be less among those given quinine. The drug possesses mild analgesic and antipyretic activity. Quinine is used in low doses as a bitter tonic and flavoring agent; a concentration of 0.03% is employed in carbonated tonics and “bitter lemon” drinks.

Toxicity — In therapeutic doses, when quinine is repeatedly administered, a cluster of characteristic symptoms called cinchonism may develop. These include ringing in the ears, headache, nausea, and visual disturbance. Increased doses intensify these symptoms as well as cause gastrointestinal, cardiovascular, and dermal effects. Visual dysfunction and functional impairment of the eighth nerve, which result in tinnitus, decreased auditory acuity, and vertigo, are common manifestations of quinine toxicity. It has also been observed that therapeutic doses of quinine and its congeners may lower blood glucose concentrations by stimulating insulin secretion.^{438,439} Recurrent hyperinsulinemic hypoglycemia should be considered very seriously when these alkaloids are used during pregnancy or when there are severe infections with the attendant malaise and anemia. The lethal dose of quinine in adults is about 8 g, although death has resulted in doses as low as 2 g in hypersensitive individuals.

CLUTIA ABYSSINICA

Botanical Name — *Clutia abyssinica* Jaub. & Spach.

Synonyms — Nil

Family — Peraceae

African Names — Chagga: indundu; Hehe: nyakirunbi; Masai: engemarna; Shambala: mhende, muhende; Xhosa: umbezo

Description — *Clutia abyssinica* is a shrub, up to 2 m high, sparsely branched with glabrous twigs. The leaves are lanceolate or elliptic-lanceolate, tapering to an obtuse apex and narrowed at the base.

Habitat and Distribution — It is found at high elevations and in dry grassland. The plant is distributed in Tanzania, Kenya, Zimbabwe, Ethiopia, and South Africa.

Ethnomedicinal Uses — *Clutia* species are used for the preparation of a malaria remedy. The leaves are used as an oral decoction for the treatment of hepatitis and externally as a local anti-inflammatory and as a medication for sores. The root extract is employed in the treatment of threatened abortion, convulsions, influenza, and enlarged spleen and for the management of habitual miscarriage. A weak infusion of the roots is administered for stomachache and chest pains.

Constituents — Methylcoumarins, including coumarin, 4-methoxy-3,5-dimethylcoumarin, 5-methyl-4-thiomethyl, perefloirin, and 8-hydroxyperifloirin, have been isolated from the roots.⁴⁴⁰ The roots also yield flavonoids and diterpenes,^{441,442} as well as the sesquiterpenes bergamotene, cadiene, α - and β -cubebene caryophyllene, santalol, and selinene, which occur in the volatile oil.⁴⁴³ The leaf also yields volatile oil, which consists of farnesyl acetate, α -farnesene, kaurane, 16- β -17-dihydroxy, β -ionone, methyl palmitate, and alkanes and several other trace compounds.⁴⁴³

Pharmacological Studies — The methanol extract has been shown to exert a weak relaxant activity on guinea pig smooth muscle, a uterine stimulant effect, and no effect on skeletal muscle.⁴⁴⁴ The alcohol extract of *C. richardiana* exhibited inhibitory activity against both Gram-positive and Gram-negative bacteria.⁴⁴⁵ Extracts of *Clutia* species have been found to be devoid of *in vitro* anti-malarial⁴⁴⁶ or cytotoxic activity.²⁹⁶

COCCULUS PENDULUS

Botanical Name — *Cocculus pendulus* (J.R & G. Forst.) Diels

Synonym — *C. leaba* (Del.) DC.

Family — Menispermaceae

African Names — Falor: tiati; Songhai: lilgui; Wolof: tiahat, mboum sehel; Tukolor: safatou

Description — This is a slender climbing shrub, but it is prostrate in open forests. It has thin, glabrous branches. The leaves are glabrous, variable, entire (sometimes obscurely lobed), and ovate-lanceolate. Male and female flowers are borne, with the male in axillary fascicles and the female single or paired. It produces red subglobose fruits.

Habitat and Distribution — It is a semitropical plant, occurring mainly in savanna vegetation. It is distributed from northern Nigeria to Angola and the Arabian peninsula and from Senegal to Cameroon.

Ethnomedicinal Uses — Many of the species *Cocculus* have been used in folk medicine in India and Africa for the treatment of hypertension and symptoms related to the disease. The fruits are used by the Arabs to make an intoxicating drink. The roots are used as an antipyretic, diuretic, and cholagogue. The leaves are used as an ingredient in the preparation of fertility medicine for women and to regulate the menstrual cycle.

Constituents — The plant contains the bitter principle colombin and the alkaloids palmatine, sangaline, and pelosine.²⁹⁷ Chromatographic analysis of the plant yielded the bisbenzylisoquinoline alkaloids penduline, pendulin, cocsulinin, and *N*-methylpendin.

Pharmacological Studies — Hypotensive activity on laboratory animals has been observed in the 50% alcoholic extract of the leaves and stems.⁸¹ One of the isolated alkaloids, pendulin, has been shown to possess hypotensive activity.⁸¹

A related species, *Cocculus laurifolius*, has also been shown to be hypotensive.²⁹⁸ Several alkaloids belonging to the *Erythrina* group have been isolated from the plant, together with dibenz[*df*] azonine, proaporphine, quaternary aporphine, morphinandienone, and 1-benzyl-tetrahydroisoquinone alkaloids.²²⁹ Isococculidine, which is the major alkaloid found in the leaves, has been shown to have neuroblocking and hypotensive activities.¹⁰⁸ Cocculudine and cocculine were also found to be hypotensive. It has been suggested that the activities of these bases could be due to a ganglionic blocking action.⁷¹ The quaternary aporphine alkaloids isolated from the plant, magnoflorine laurifoline chlorides, O-methyl isocorydine, and boldine methochlorides, exhibited *d*-tubercurarine-like curarizing action on sciatic skeletal muscles, as well as a hypotensive effect in dogs, cats, and rabbits.⁸¹ Isocorydine methochloride has been shown to exert its neuromuscular activity by the induction of a nondepolarizing effect, as observed in the rat phrenic nerve diaphragm and cat anterior tibialis peroneal nerve preparations.³⁰⁰ The antihypertensive activity of the drug has been related to its effect on histamine release. It was found that, at the dose at which complete blockage of neuromuscular transmission was observed and blood pressure was lowered, ganglionic transmission was not affected.³⁰¹

COCOS NUCIFERA



Botanical Name — *Cocos nucifera* L.

Synonyms — *Coccus mammillaris* Blanco., *Calappa nucifera* (L.) Kuntze., *Cocos indica* Royle., *Cocos nana* Griff., *Palma cocos* Mill

Family — Arecaceae

Common Names — Coconut

African Names — Arab: gos el-hind; Bambara: coco; Hausa: kwarkwar-attagara; Igbo: aki-beke; Swahili: nazi (mbata = copra); Yoruba: igi agbon

Description — The coconut is a monoecious palm tree 200 m in height. Its trunk is striated or curved but unbranched, with marked foliar scars, and topped by a crown of pinnet leaves, ranging from 3 to 5 m in length and about 30 in number. There is a central bud, which if cut off leads to the death of the whole tree. The inflorescence is surrounded by spathes; the male and female flowers are produced separately in the leaf axils, usually succeeding each other on a long stalk. It produces many

fruits, but only a few reach maturity, about 70% being shed during the year-long development. The fruit encloses a seed, the coconut, which is spherical in shape with a hard shell that encloses an oil-rich albumen and the coconut milk. A ripe fruit can be recognized by shaking the milk inside the nut.

Habitat and Distribution — Coconut palms grow best in pure sand, usually in coastal regions. They tolerate the high-salt concentration of ocean beaches, but need a humid climate and plenty of sunlight. The plant is a major crop in Ghana, Ivory Coast, Kenya, Nigeria, Mozambique, Togo, Somalia, Seychelles, Malagasy Republic, and Tanzania.

Ethnomedicinal Uses — All parts of the plants are useful in Africa. The oil obtained from the dried endocarp is used in cosmetics and for food, coir fiber is obtained by soaking the outside husk in salt for 6–12 months, the midribs of the leaves are made into brooms, and the leaves and trunks are used in erecting and roofing temporary buildings. The palm fronds are used for making mats, baskets, and artworks. The coconut (water) milk is a refreshing drink, and it is mainly used as a poison antidote. It is not usually recommended for those with cardiac problems. The oil from the nuts is valued as an emollient and used as an ingredient in remedies for skin infections. Perhaps of greatest therapeutic application is the oil from the fresh endocarp, called virgin coconut oil (VCO)

Constituents — The *African Pharmacopoeia*⁴³⁶ indicates that dry copra (coconut meat) contains 6.3% protein, 57.3% fat (oil), 38% carbohydrate, and 2% minerals. It also contains 14.33% sucrose, 2.42% raffinose, 2.42% galactose, 2.40% pentose, 1.20% fructose, 1.19% glucose, 0.58% dextrin, and 0.87% starch. The fatty acid profile of coconut oil is as follows (percentages in parentheses): capric acid (0.2–0.5), acrylic acid (4–9.5), capric acid (4.5–9.7), lauric acid (44.1–51), myristic acid (13.1–18.5), palmitic acid (7.5–10.5), stearic acid (1.0–3.2), arachidic acid (0.2–1.5), oleic acid (5.0–8.2), and linoleic acid (1.0–2.6).

Pharmacological Studies — Phenols obtained from the nutshell possess significant antifungal activity at 100 µg/ml against three *Microsporum* and four *Trichophyton* species, as well as anti-tubercular activity.^{302,303} The fresh coconut milk has been found to interfere with the absorption of some orally administered drugs and to exhibit a moderate antihistaminic effect.³⁰⁴ The most abundant fatty acid in coconut, lauric acid, possesses several biological activities. Lauric acid is known to have antiviral, antibacterial, and antiprotozoal qualities. It is converted to the monoglyceride monolaurin in the human or animal body. Monolaurin itself is antiviral, antibacterial, and antiprotozoal.

Available publications indicated that monolaurin is capable of destroying lipid-coated viruses such as HIV, herpes, cytomegalovirus, and influenza; various pathological bacteria, including *Listeria monocytogenes* and *Helicobacter pylori*; and protozoa such as *Giardia lamblia* and *Plasmodium falciparum*. It is believed that the compound is synthesized in babies from the lauric acid of mother's milk.⁴⁴⁷ Capric acid, another fatty acid found in coconut, also has antimicrobial activities. Reports also suggest that coconut oil is useful as an antioxidant, antihypertensive, and antidiabetic functional food. The fatty acids can be used for the production of biodiesel through an enzymatic conversion process.⁴⁴⁸

There is no unanimity regarding the health benefits of coconut oil.⁴⁴⁹ It has been suggested that the initial negative recommendation on the nutritional value of coconut oil was based on faulty scientific evidence and propaganda to promote the use of nontropical oils from industrialized countries, such as corn oil and cottonseed oil. The nutritional experts in the United States and Canada still caution against the use of coconut oil because of the abundance of saturated fatty acids in the oil and the potential risk of high cholesterol and its health risks.⁴⁵⁰

Virgin Coconut Oil

Virgin coconut oil (VCO) is unprocessed oil obtained from fresh coconut endocarp. It contains medium-chain fatty acids, which are assimilated more easily by the body than the long-chain fatty

acids found in many other cooking oils. It has become a major dietary supplement with many beneficial properties. VCO has the following constituents:

- Lauric acid, medium-chain triglycerides, and other saturated fatty acids, including capric, caprylic, myristic, and palmitic acids
- Monounsaturated fatty acids: oleic acid
- Polyunsaturated fatty acids: linoleic acid
- Polyphenols, gallic acid, and phenolic acids
- Derivatives of fatty acid: betaines, ethanolamide, ethoxylates, fatty esters, fatty polysorbates, mono-glycerides, and polyol esters
- Fatty chlorides, fatty alcohol sulfate, and fatty alcohol ether sulfate, all of which are derivatives of fatty alcohols
- Vitamin and minerals: vitamins E and K, iron

Advocates of VCO as a dietary supplement claim health benefits on the following: immunomodulation, diabetes, high blood pressure, cancer, hair care, skin care, stress relief, cholesterol levels, weight loss, bone strength, proper digestion and metabolism, heart diseases, dental care, HIV, and relief from kidney problems. It is believed that these health benefits of VCO can be attributed to the presence of the medium-chain fatty acids and phenolic compounds, with their known antimicrobial, antioxidant, antifungal, antibacterial, and anti-inflammatory properties, for example.

Tender Coconut Water

Tender coconut water (TCW), the liquid endosperm, is an excellent natural refreshing drink, with a caloric value of 17.4/100 g. Coconut water contains vitamin B, namely, nicotinic acid B₃ (0.64 µg/ml), pantothenic acid B₅ (0.52 µg/ml), biotin (0.02 µg/ml), riboflavin B₂ (<0.01 µg/ml), folic acid (0.003 µg/ml), and trace amounts of thiamine B₁ and pyridoxine B₆. Coconut water also contains sugars; sugar alcohols; vitamin C; folic acid; free amino acids; phytohormones (auxin, 1,3-diphenylurea, cytokinin); enzymes (acid phosphatase, CAT, dehydrogenase, diastase, peroxidase, RNA polymerases); and growth-promoting factors.⁴⁵¹

COLA ACUMINATA

Botanical Name — *Cola acuminata* (P. Beauv.) Schott & Endl.

Synonyms — *Cola pseudo-acuminata* Engl., *Sterculia acuminata* P. Beauv., *Cola grandiflora* Schott & Endl., *Cola ledermannii* Engl. & K. Krause., *Cola macrocarpa* Schott & Endl., *Bichea acuminata* (P.Beauv.) Farw., *Bichea solitaria* Stokes., *Bichea sulcata* Pierreex A.Chev., *Braxipis grandiflora* Raf., *Braxipis nitida* Raf., *Clompanus longifolia* Kuntze., *Colaria acuminata* Raf., *Edwardia acuminata* (P.Beauv.) Kuntze., *Edwardia lurida* Raf., *Sterculia laxiflora* Rusby

Family — Malvaceae

Common Names and African Names are similar in most cases: Bini: evbe; Efik: ibong; Igbo: oji-awusa; Yoruba: obi abata

Description — Resembles *C. nitida*, but the leaves are usually smaller. The fruits are composed of up to 5 carpels borne at right angles to the stalk or slightly drooping; they are narrowed to the straight apex, 20 cm long and 7 cm wide, and produce up to 14 seeds covered with white skin, usually bearing 3–5 cotyledons (rarely 2 or 6).

Uses, Constituents, and Pharmacology are as in *C. nitida*.

COLA NITIDA

Botanical Name — *Cola nitida* (Vent.) Schott & Endl.

Synonyms — *Cola vera* K. Schum., *Cola acuminata* (P. Beauv.) Schott & Endl. var. *latifolia* K. Schum., *Sterculia nitida* Vent., *Bichea nitida* (Vent.) Farw.

Family — Malvaceae

Common Names — Kola nut, bitter kola nut

African Names — Aowin (Sefwi): awase; Arabic: guro, woro; Fanti: bose; Hausa: goro; Igbo: oji; Nupe: chigban'bi; Nzima: esele; Twi (Ashanti, Wasaw): bese, bese-pa; Yoruba: obi gbanja

Description — *Cola nitida* is an evergreen tree, usually 9–12 m high, but sometimes growing up to 20 m, and 1.5 m in diameter. It has narrow buttresses, extending for 1 m in old trees, or absent; the bole is not always straight and cylindrical. The bark is gray or grayish brown, rough with longitudinal fissures, and there is pinkish-red slash, which darkens to brown on exposure. The leaves are simple, alternate, petiolate; the petiole is 1.2–10 cm long; the blade is broadly oblong to broadly elliptic or elliptic-oblongate, 10–33 cm long, 5–13 cm wide, apex abruptly and shortly acuminate, base obtuse or rounded, margins wavy, glabrous, or nearly so; there are leathery, dark-green lateral nerves (6–10), the lowest arising close to the base and running parallel to the margin, obscure above, prominent below. Inflorescence is axillary, on irregularly branched panicles 5–10 cm long, shorter than the leaves; flowers are unisexual, appearing May to July and fruiting October to December; they are 5-merous, apetalous. Male flowers have the calyx cup shaped, about 2 cm in diameter, deeply lobed, and stamens are numerous, in two whorls. Female flowers have a calyx about 5 cm in diameter, with 5 carpels and numerous rudimentary anthers at the base. The various kola species can easily be differentiated by their fruits. *C. nitida* fruits are oblong-ellipsoid follicles 13 cm long, 7 cm in diameter, and green with a shiny surface, smooth to the touch but knobby with large tubercles. They contain 4–6 (sometimes up to 10) seeds per carpel. The seeds are ovoid or subglobose, 3–3.5 cm long, 2–2.5 cm in diameter, covered with a white skin, and having only 2 cotyledons, very rarely 3.^{9,28,33}

Habitat and Distribution — The plant is native to the lowland forests of Sierra Leone, Liberia, Ivory Coast, and Ghana. It has been introduced and is cultivated in Nigeria, Mali, and Guinea. Although it tolerates shade, it thrives better in the open and prefers well-drained soils and an annual rainfall between 1300 and 1800 mm with temperature of 26°C and 35°C.

Ethnomedicinal Uses — The main use of *kola* nuts is as a stimulant to the nervous system when chewed and as a restorative. It is an effective appetite suppressant. The kola nuts are used mainly as a masticatory agent and as a ritual plant. An infusion of the bark mixed with ginger is

administered as a treatment for stomach ulcer. In Ghana, the nuts are boiled with leaves of *Morinda lucida* and dispensed as an oral treatment for hemorrhoids. The nuts ground to a fine paste together with the leaves of *Scoparia dulcis* are dissolved in a little water, and a few drops are administered orally to babies for headache. The FAO monograph³³ indicates that the nuts, preferably the white variety, ground to a fine paste together with white clay, a little pepper, ginger, or *Piper guineense* fruits, are applied as an enema for the cure of diarrhea and dysentery.

Constituents — The plant contains purines, caffeine (about 2.5%), and small quantities of theobromine (usually about 0.025%). The plant also contains two phenolic substances, kolatin and kolatein, as well as catechols (-)-epicatechol and kolanin. An anthocyanin pigment called kola red, a phlobaphen, occurs as an oxidation product of the catechols.^{452,453} The plant also contains proteins (1.5%), fat (0.5%), calcium (3.1%), iron (1.4%), vitamin A (31%), thiamin (11%), riboflavin (47%), nicotinic acid (0.7%), and ascorbic acid (9.8%);³⁷ the kernel contains about 1.6% tannin.⁴⁵⁴ It has been shown that there is a significant variation in the yield of caffeine among the different varieties and genotypes of the plant.⁴⁵⁵

Pharmacological Studies — Kola extracts exhibit the activities observed with caffeine, but unlike coffee, the activity is milder but persistent due to the presence of catechols and other constituents. It is a smooth muscle relaxant but produces overexcitement of the CNS, followed by depression at very high doses.⁷⁸ It has a tonic action on the heart by an indirect effect through the nervous system and by direct effect on the heart muscles and the walls of the blood vessels. The sense of fatigue is prevented, and a longer and more sustained muscular effort is encouraged. The extract is used in the preparation of several nonalcoholic beverages and has also been incorporated into tonic wines and health foods. Kola nuts chewed at night tend to prevent sleep.

Kola extracts and the dried whole nut are ingredients in several weight loss products and dietary supplements used as instant energy boosts and antioxidants. The proanthocyanidin isolated from the related *C. acuminata* showed activity against the sleeping sickness vector, *Trypanosoma brucei*, and low cytotoxicity against mammalian cells.⁴⁵⁶

COMBRETUM MICRANTHUM — KINKELIBA



Botanical Name — *Combretum micranthum* G. Don

Synonyms — *C. altum* Lerr., *C. floribundum* Engl. & Diels, *C. raimbaultii* Heck

Family — Combretaceae

Common Name — Kinkeliba bark

African Names — Hausa: geza; Igbo: obi-agwu; Swahili: mlama muepe; Yoruba: okan

Description — It is a bushy shrub or creeper and grows up to 20 m in length. The leaves are opposite and oval acuminate with the lamina covered with reddish scales on the inner side with downy tufts at the axis of lateral ribs. The flowers are borne as short axillary clusters on scaly stalks, with a whitish corolla and ferruginous scales covering the calyx. The fruits are small, 1.5 m in diameter, scaly and ferruginous, and four winged.

Habitat and Distribution — The genus is found all over the continent, but the subject species appears to be dominant in the savanna belt. It is found from Sudan to Nigeria and from Gambia to Congo. Several related species are used medicinally in southern African.

Ethnomedicinal Uses — Decoction of the root of *Combretum micranthum* (also *C. mucronatum*, Fam. Combretaceae) is used in West Africa for the treatment of guinea worm infestation.⁴⁵⁷ An oral dose (0.03 g/kg) of the decoction caused a complete extrusion of the worms in 43 of the 44 patients treated. There was a marked reduction in the inflammation around the lesions. Ampofo also found that application of sterilized palm oil aided in the healing of the wounds.⁴⁵⁷ *Combretum* has been used as an antidiuretic, anticholagogue, and antibacterial.¹³⁸ The leaves of this plant yield a drug called “kinkeliba,” which has been listed in the French, Spanish, and British *Extra Pharmacopoeia* under supplementary drugs and indicated for blackwater and other fevers.²⁰⁵ A decoction of the leaf and root is applied as a vapor bath, as a wash for febrile conditions, and as a remedy for lumbago.¹³⁸ An ointment prepared with the pulverized dry fruits has been used as an application to suppurating wounds and abscesses. Various members of the genus are also employed as an anthelmintic in many parts of Africa and Asia. Kinkeliba “tea” is used in West Africa as a general tonic or morning hot beverage as a substitute for tea. It enjoys a reputation in Guinea, Mali, and Senegal as a supplement for the management of diabetes, obesity, and high cholesterol.

Constituents — *Combretum* species yield catechins, glycosides, choline, organic acids, tannins, and resin. The isomeric flavonoids vitexin and saponaretin have been shown to be present in the leaves.⁴⁵⁸ The leaves also contain the alkaloids combretacins.⁴⁵⁹ The stem bark has been shown to yield similar alkaloids.⁴⁶⁰

Pharmacological Studies — Extracts of the leaves are inhibitory against strains of *Staphylococcus*, *Streptococcus*, and *Escherichia*.⁴⁶¹ The stem bark extract has also been shown to possess broad-spectrum antimicrobial activity.²⁷³ The catechins are strongly diuretic with a mild hypotensive action.⁴⁶² The young leaves of a related species, *C. racemosum*, are effective as an anthelmintic.⁴⁶³ The aqueous extract of the leaves showed dose-dependent antidiabetic activity on alloxan-induced hyperglycemic rats.⁴⁶⁴

Combretum species have demonstrated significant anti-inflammatory, antiviral, antifungal, and antioxidant activities.⁴⁶⁵ The relatively low toxicity of the decoction used as teas makes kinkeliba a potential dietary supplement for the treatment of the chronic diseases for which it is used in traditional medicine.

COMMIPHORA MOLMOL

Botanical Name — *Commiphora molmol* Engl.

Synonyms — *C. hildebrandtii*., *C. serrulata*., *C. riva*., *C. cuspidate*., *C. coriacea*., *Balsamea myrrha* (T. Nees) Oken., *Balsamea myrrha* Baill., *Balsamodendrum myrrha* T. Nees

Family — Burseraceae

Common Names — Myrrh, oleo-resine (Fr.), molmol

African Names — Arabic: morrh; Hausa: dashi, biskiti; Yoruba: turari; Swahili: mbebe, mbele

Description — Myrrh is the oleo-gum-resin obtained from several species of the genus *Commiphora*, especially *C. molmol* Engl., *C. abyssinica* (Berg.) Engl., and *C. mukul* Hook ex Stocks. The drug, also known as Somalian or Arabian myrrh, is collected from wild trees of *C. molmol* in Somali and parts of northeastern Africa and Arabia. Two varieties of myrrh are known in commerce, the “guban” myrrh, which is rather oily, and the more powdery “Ogo.” The oleo-resin is collected as exudates from fissures or incisions in the bark, which dries in the collecting vessels as irregular masses or tears. It has a somewhat reddish-yellow color, turning slightly brownish with time. It is dotted with whitish marks and has thin translucent splinters. It has a bitter but pleasant taste and aromatic odor. Guggul resin or gum is obtained from *C. mukul* and referred to sometimes as *Guggulu*.^{9,28}

Habitat and Distribution — Various species of the genus grow in the arid and tropical regions of the continent. Somalia is the natural habitat of the plant, but it is also cultivated in Kenya, Tanzania, Ethiopia, and some North African countries.

Ethnomedicinal Uses — It is employed as a mouthwash and gargle for the treatment and prevention of oral infections. It is also used as a stimulant and emmenagogue. A decoction of the stem bark is used by the Masai as a purgative and by the Nyamwezi as a snakebite remedy. In East Africa, various species of the genus *Commiphora* are used for wound dressing and for indigestion. The stem bark of *C. Africa* is used in Niger Republic as an oral treatment for various diseases.⁴⁶⁶ In West Africa, vapor from the gum resin in boiling water is used for the treatment of eye inflammation, and the bark is applied as a remedy for scorpion bite.

Constituents — Myrrh consists of about 60% buns, which are usually composed of arabinose, galactose, 4-O-methylglucuronic acid, and xylose.⁴⁶⁷ Other constituents, eugenol, cadinene, fura-nodiene, furanosesquiterpenes, heerabolene, cuminaldehyde, and elemol, are found in the volatile components.⁴⁶⁸ The resinous fraction is about 30% of the total weight and contains commiferin; α -, β -, and γ -commiphoric acid; α - and β -heerambomyrrhols; commiphorinic acid; and heeraboresene. It also contains sterols and proteins.⁴⁶⁹

Pharmacological Studies — The petroleum ether extract of myrrh, at a dose of 500 mg/kg body weight, has been shown to produce significant inhibition of carrageenan-induced inflammation and cotton pellet granuloma.⁴⁷⁰ It also showed significant antipyretic activity in mice. Myrrh has been found to inhibit the growth of microorganisms in *in vitro* assay.⁴⁷¹

The oleoresin from *C. mukul*, Guggul gum, inhibits platelet aggregation and increases catecholamine biosynthesis and activity in cholesterol-fed rabbits.^{472,473} It is also hypolipidemic and hypocholesteremic in both humans and animals.^{474,477} Guggul resin has been found to activate the thyroid glands in chickens and rats.⁴⁷⁵ It has also been reported to have significant anti-inflammatory and antiarthritic activity.⁴⁷⁶ The anti-inflammatory activity of *C. mukul* oleoresin has been associated with the presence of steroids such as E- and Z-guggulsterone, the Z-guggulsterols.^{476,477} The volatile oil contains cembrene A in addition to the other constituents found in the volatile oil of *C. molmol*. Delaveau has reported that the extracts of *C. abyssinica* stimulate phagocytosis in mice inoculated with *E. coli*.¹¹³⁹

Clinical Applications — Myrrh is an ingredient in mouthwashes because of its antiseptic and stimulant properties. It is used in folk medicine as an expectorant, anti-inflammatory, and antispasmodic and for the treatment of orodental infections. The crude drug is sold throughout northern and eastern Africa and in Saudi Arabia as a remedy for inflammatory conditions and rheumatism.

COSTUS AFER

Botanical Name — *Costus afer* Ker

Synonyms — *Costus anomocalyx* K. Schum., *Costus littoralis* K. Schum., *Costus oblitterans* K. Schum., *Costus prodigiosus* A. Chev., *Costus pterometra* K. Schum.

Family — Costaceae

Common Names — Ginger lily, bush cane

Local Names — Hausa: kakizuwa; Igbo: okpete; Yoruba: tete-egun; Efik: mbritem

Description — *Costus afer* is a herbaceous plant that grows up to 3 m high in rich soil, with succulent unbranched stem. The leaves are smooth, velvety green, and large; they are lanceolate, up to 20 cm long and 6.5 cm broad; they are long pointed at the apex and narrowly rounded at the base. The veins are parallel with the midrib. The leaves are borne on the stem bracts. The flowers are tubular, yellowish or pink, and attached to a swollen terminal bulb. It has a tubular calyx with 3 blunt lobes. The corolla is tubular, unsymmetrical, and with three yellowish or pinkish lobes.⁹

Habitat and Distribution — It is found growing wild in secondary forest and more so in the wetter areas. The species is limited to the rain forest and deciduous forests. It is widely distributed in the West Coast, in the Nile Valley, and in parts of Zimbabwe.

Ethnomedicinal Uses — The succulent stem is chewed as a remedy for cough, and a tea made from the dry aerial parts is used for treating hypertension. The root decoction is administered for the treatment of sleeping sickness. The plant is also used for the treatment of diabetes mellitus. An infusion of the whole plant is taken as a stimulant and aphrodisiac. The root extract is used for the treatment of stomachache. The rhizome is applied as a paste for skin eruptions and inflammation. The stem, stripped of the leaves and bark, is used to suppress nausea.²⁶⁶

A related species, *C. schlechteri*, has been cited for the treatment of diabetes.⁴⁶¹ The leaves of another species, *C. spectabilis*, are chewed and swallowed for the treatment of pyrexia.⁴⁷⁸ In Tanzania, the juice from the stem of *Costus* is used as an anthelmintic alone or in combination with the juice of *Dissotis rotundifolia* or the stalk of *Aframomum* species. *Costus lucanusianus* is used in the Ivory Coast for the treatment of threatened abortion.⁴⁷⁹

Constituents — The genus *Costus* is rich in steroidal saponins and sapogenins.⁴⁸⁰ The rhizome of the subject species has been shown to contain various sapogenins, namely, diosgenin, stigmasterol, and costugenin.⁴⁸¹ The rhizome of the Asian species *C. speciosus*, in addition to

the presence of saponins and sterols, contains aliphatic hydroxyl ketones, benzoquinones, and α -tocopherolquinone.³³⁴

Pharmacological Studies — Extracts of the aerial parts and rhizome have been shown to possess anti-inflammatory activity.³³⁵ An extract of *C. lucanusianus* exhibits uterine-relaxant activity.³³¹ The root oil from *Costus* causes contact dermatitis, and sensitivity to the oil is employed as a diagnostic agent for examining delayed cell-mediated immune system reactions.³³⁶ In lung cancer patients, it was found that the incidence of positive reactions to *Costus* root oil decreased with the progress of the cancer. The percentage of lung cancer patients who survived was significantly greater for positive than negative patients.³³⁶ It has also been established that patients with localized cancer showed no impairment of sensitivity to *Costus* root oil.³³⁷ The oil has also been shown to inhibit the growth of transplanted tumors in sensitized BALB/c mice.³³⁹ The *Costus* oil sensitivity is believed to be due to several sesquiterpenes found in the plant. An analysis of cross-reactions in *Costus*-sensitive patients has revealed that the most active sesquiterpene lactones are the ones with fewer oxygenated substituents close to the α -methylene- γ -butyrolactone ring.³⁴¹

The antifungal activity of *C. speciosus* has been shown to be due to the presence of a methyl ester of p-courmaric acid.³⁴¹ The methanolic extract exhibited a biphasic activity and antihyperglycemic activity.⁴⁸² At 200 mg/kg body weight p.o., it decreased the blood glucose level by 50% in streptozotocin (STZ)-induced hyperglycemia in male rats in 60 min post dosing. However, doses above 200 mg/kg body weight p.o. caused an increase in blood glucose level, potentiating the action of STZ. At 10 g/ml, the extract induced about 98% glucose uptake in differentiated 3T3-L1 adipocytes when compared with insulin (340 nm). The extract also induced expulsion of whole fetuses still enveloped within the placental membrane at the third trimester of pregnancy in rats.⁴⁸⁶

CRESCENTIA CUJETE



Botanical Name — *Crescentia cujete* L.

Synonyms — *C. cuneifolia* Gardner, *C. fasciculata* Miers, *C. acuminata* Kunth., *C. arborea* Raf., *C. plectantha* Miers, *C. pumila* Raf., *C. spatulata* Miers

Family — Bignoniaceae

Common Names — Calabash tree, gourd tree

African Names — Igbo: oba; Yoruba: igisogba

Description — The plant is a small, low-branching tree 10 m high and up to 0.5 m in girth. The leaves are simple, about 18 cm long and wide, shaped almost like a spatula with the top occasionally pointed. They are arranged in clusters around the stem. The flowers are tubular, variegated, with green, red, purple, and yellow colors, delicately fringed with red stripes. It produces large green

fruits, or calabashes, attached to the trunk and branches. They are almost spherical, about 40 cm in diameter, and contain numerous seeds covered by cream-colored pulp.¹¹⁴⁷

Habitat and Distribution — The plant is a native of South America but grows widely in tropical Africa. It is grown as an ornamental plant in Ghana, Nigeria, Cameroon, and southeastern regions of the continent.

Ethnomedicinal Uses — The plant has rather limited medicinal use as an oral drug but is widely employed in the treatment of skin infections. The fruit, emptied of its content, is used by traditional healers as a vessel for mixing and storing oral medications. In the Caribbean, the fruit pulp is used as an analgesic, anti-inflammatory, antitumor, and purgative substance and for hematoma.²²⁸ The leaves are reported to be used in the same region as an antidiarrheal and for trauma and ganglion inflammation. In Haiti and the Dominican Republic, an instillation of the leaf juice is used for earache.²²⁸

Constituents — The fruit pulp has been shown to contain hydrocyanic acids, cinnamic acid, dihydrocinnamic acid, and related organic acids; the fruit also yields quaternary alkaloids and polyphenols; the seeds contain oleic acid, and naphthoquinone derivatives have been isolated from the stem wood.^{342–344}

Pharmacological Studies — The pulp extract and cinnamic acid derivative isolated from the plant have been found to possess broad-spectrum antifungal activity.³⁴⁴ The leaf extract exhibits antibacterial activity against *Bacillus subtilis* and *Staphylococcus aureus*.³⁴⁵ The plant has been shown to be remarkably anti-inflammatory; the leaf extract at an oral dose of 1200 mg/kg showed an anti-inflammatory activity that was found to be effective even 24 h after administration of the extract.²²⁸ The anti-inflammatory activity of the extract was comparable to that of sodium dichlofenac.

Toxicity — The fruit pulp contains hydrocyanic acid and should be considered dangerous. The pulp has also been shown to be carcinogenic in the rat by the induction of neoplasms.^{229,346}

CRYPTOLEPIS SANGUINOLENTA



Botanical Name — *Cryptolepis sanguinolenta* Lindl. Schltr.

Synonyms — *Cryptolepis triangularis* N.E. Br., *Pergularia sanguinolenta* Lindl., *Strophanthus radcliffei* S. Moore

Family — Apocynaceae

Common Names — Yellow dye root, Ghana quinine, nimbima

African Names — Bambara: ouldoukoi; Dioule: nombon; Fulani: delboi; Hausa: gangamau; Mende: kpokpo-yangolei, shona mukangaza (*C. oblongifolia*)

Description — The plant is a twining, scrambling shrub, with characteristic thin stems and tuberous rootstock. The leaves are opposite, thinly herbaceous, elliptic oblong to ovate or lanceolate in shape. The margin is entire; the apex is curved and acuminate, and the base is symmetrical and obtuse or rounded. The midrib projects prominently on the lower side and is pinnately nerved. The dried leaves have a slightly bitter taste. The roots are rather tortuous and branched with little or no rootlets, with longitudinal ridges apparent in the dried samples. The root is distinctly yellow in color and breaks with a short fracture exposing a smooth transverse surface, which is yellow in color.³⁴⁷

Habitat and Distribution — The plant grows in the rainforest and deciduous forest belt. It is distributed throughout the West Coast of Africa. Related species occur in eastern and southern regions of the continent.

Ethnomedicinal Uses — The main use of the root of *Cryptolepis* is in the treatment of fevers. Extracts of the plant have also been employed for the treatment of urogenital infections, especially *Candida* infections of nonvenereal origin.³⁴⁸ In southern Nigeria, a weak decoction of the root is administered as a tonic and for the treatment of anti-inflammatory conditions. The plant appears to be used as an ingredient in several folk remedies for a multiplicity of diseases, but the major uses are in the preparation of remedies for the treatment of malaria, hypertension, microbial infections, and anti-inflammatory conditions.

Constituents — The principal constituent is the quindoline alkaloid cryptolepine, which occurs at a yield of 0.52% w/w in the roots, 0.48% in the stem, and 1.03% in the leaves.³⁴⁷ The compound co-occurs with the related bases and their derivatives.

Pharmacological Studies — The aqueous extract and the isolate cryptolepine have been shown to possess significant inhibitory activity against some bacteria and yeasts.^{349,350} The alkaloid has also been found to inhibit carrageenan-induced edema of the rat hind paw in a dose-dependent manner. The activity was shown to be less potent than that of aspirin or indomethacin. The *in vitro* studies showed 1–20 µg/ml of cryptolepine did not inhibit prostaglandin synthesis in the isolated lizard lung, but it antagonized the effects of E2 prostaglandin and did not affect that of 5-hydroxytryptamine on a perfused isolated stomach strip of the rat. The compound also antagonized the action of histamine and of acetylcholine on the isolated guinea pig ileum.^{351,352} The biological activity of the compound may be due to its demonstrated adrenoreceptor blockage activities.^{352,353} Cryptolepine also possesses hypotensive³⁵⁴ and vasodilatory activities.^{354,355}

Clinical studies have shown that extracts of the roots produced antimalarial cures in patients with the concomitant elimination of parasitemia in the blood.³⁵⁶ The extract also showed antipyretic activity in the patients evaluated. Several modifications have been made on the structure of the naturally occurring antiparasmodial compound cryptolepine, which have resulted in remarkable improvement in the antimalarial activity. Cryptolepine derivatives containing alkyldiamine side chains also possess potent inhibitory activity against *Trypanosoma brucei brucei*. These derivatives are also potent inhibitors of the trypanosome papain-like cysteine protease cruzain, which could, at least in part, explain their antitrypanosomal activity. Such compounds with good antitrypanosomal activity and selectivity provide an encouraging starting point for the rational design of new and effective antitrypanosomal agents.⁴⁸³

Cryptolepis alkaloids and their semisynthetic derivatives are subjects of ongoing studies to evaluate their antiprotozoal, antidiabetic, analgesic, anti-inflammatory, and antituberculosis activities.

CURCUMA LONGA

Botanical Name — *Curcuma longa* L.

Synonyms — *C. domestica* Val., *Stissera curcuma* Raeusch., *Amomum curcuma* Jacq.

Family — Zingiberaceae

Common Name — Tumeric

African Names — Shambala: kitambwe: Swahili; mandano, manjano, kilunga kuku

Description — Tumeric consists of the rhizomes of *Curcuma longa*. They occur as primary and secondary rhizomes. The primary rhizomes are ovate or pear shaped, while the secondary rhizomes or “fingers” are more cylindrical and lateral. Tumeric has an inner yellowish-brown color, with a characteristic odor and slightly bitter taste.²⁷⁹

Ethnomedicinal Uses — The plant is employed in West Africa as an anthelmintic and as an ointment for skin diseases. It is used as an anti-inflammatory agent and applied as an eyewash for conjunctivitis. In West Africa, the powdered rhizome is mixed with flour into a paste applied to the head for the relief of headache.³⁷ It is also applied as an ointment on the body of smallpox patients, and the patients are made to stay out in the sun. The rhizome and the juice are used in Mauritius as an emmenagogue.

Constituents — The plant contains about 5% diaryl heptanoids called curcuminoids. The principal ones are curcumin (diferuloylmethane), monodes-methoxycurcumin, and dihydrocurcumin.³⁵⁷ The volatile oil contains sesquiterpene ketones borneol, α -phellandrene, and zingiberine.³⁵⁸

Pharmacological Studies — Curcumin has anti-inflammatory activity that was found comparable in potency to that of phenylbutazone.³⁵⁹ It inhibits carrageenan-induced inflammation in rats and blocks arachidonic acid (AA) metabolism via both the COX and the 5-lipoxygenase pathways.^{360–362} The crude drug has antimicrobial, antiprotozoal, and anti-infertility properties.⁵⁰

Srivasta has used ¹⁴C-labeled AA to establish that curcuma extract inhibited thromboxane B₂ (TxB₂) production. He showed that less TxB₂ was produced in blood samples treated with curcuma extract when they were allowed to clot. It was also observed that the extract inhibited the incorporation of [¹⁴C] AA into platelet phospholipids and deacylation of AA-labeled phospholipids on stimulation with calcium ionosphere A23187.³⁶³ Dixit et al. showed that the extract caused a significant reduction in the ratio of total cholesterol/phospholipid and elevated the HDL-cholesterol/total cholesterol ratio³⁶⁴ in triton-induced hyperlipidemic rats.

The effects of turmeric in liposomal and lipid peroxidation and peroxide-induced DNA damage have been investigated.³⁶⁵ Curcumin and the aqueous extract of curcuma were found to be an effective antioxidant. Curcumin showed activity comparable to that of butylated hydroxyanisole (BHA).

It has been shown that the inhibition obtained using aqueous extract, incorporated into the liposome itself, was 70% at 300 ng/μg and protected DNA (80%) against peroxidation injury at 100 ng/μg. Curcumin and the crude extract have also been shown to be cytotoxic to lymphocytes and Dalton's lymphoma (DL) cells at concentrations of 4 and 0.4 mg/ml, respectively, and also inhibited the cell growth in Chinese hamster ovary cells at the same concentrations.³⁶⁶ Curcumin possesses a selective phototoxic effect on bacteria.³⁶⁷ Lee and Lin have shown that curcuma extract had mild antimutagenic activities against benzo[α]pyrene-induced mutation in a salmonella/microsomal system.³⁶⁸ It also inhibited mutagenicity induced by several environmental mutagens, including bidi and cigarette condensates, tobacco, and dimethyl benzo-[α]anthracene, in a dose-dependent manner.

Curcumin has cortisone-like inhibitory activity on healing of wounds. In an experiment on the healing of superficial and penetrating corneal wounds in albino rabbits,³⁶⁹ aqueous extract (2.8%) of curcuma definitely delayed healing superficial corneal wounds when compared with the effect of placebo and preservative eyedrops and also markedly reduced the tensile strength of corneal wounds. The 1:1 w/v aqueous extract has been shown to antagonize the toxic action of cobra, *Naja naja siamensis*, neurotoxin possibly via direct inactivation of the toxin. The plant extract also possesses proteolytic activity, which was shown not to be a likely mechanism for its antagonism to the cobra neurotoxin.³⁷⁰

The antitumor properties of curcuma may be due to the presence of β-elemene, which has been found to be one of the cytotoxic constituents of the plant, showed 100% anti-infertility action in albino rats at a dose of 100 mg/kg. The petroleum ether extract showed 80% anti-infertility activity in the same assay and also caused resorption of the implants.^{50,372}

Clinical Properties — Tumeric is a spice used as food condiment in many countries. It has anti-inflammatory activity that is comparable in potency to that of phenylbutazone. A proprietary preparation known as Temoe-lawak-Singer (RVG 08637) used on various inflammatory conditions has been shown to reduce both the serum and the liver cholesterol in rats. RVG 08637 consists of a mixture of extracts of *Curcuma* species and *Rhammi purshianae* and is known to have choleric and cholagogic activity in humans.³⁷²

An ethanol extract of curcuma and the ointment of curcumin were found to produce remarkable symptomatic relief in patients with cancerous lesions. Reductions in smell were noted in 90% of the cases, and in almost all the cases there were reductions in itching.³⁷⁴ It was also observed that dry lesions occurred in 70% of the cases, and 10% of the patients had a reduction of lesion size and pain. The observed effects continued in many of the patients for several months. The rhizomes of curcuma have been investigated for antioxidant, anti-inflammatory, insect antifeedant, antiviral, cytotoxic, and trypanocidal activities and in the treatment of AD, cancer, arthritis, and other clinical disorders.⁴⁸⁴ Curcuminoids, labdane, halimane, and clerodane-type diterpenoids, considered the major biological constituents of the *Curcuma* genus, have been incorporated into many nutraceuticals or dietary supplements⁴⁸⁵ and as potential antitumor drug.⁴⁸⁶

Toxicity and Adverse Reactions — Tumeric is used in various parts of the world as a food item, and no incidence of toxicity has been recorded. In the controlled clinical studies by Kuttan et al., only one patient reported adverse effects.⁴⁸⁷ A feeding experiment with raw turmeric and the alcoholic extract at very high doses of up to 2–5 g/kg and 300 mg/kg, respectively, resulted in no apparent toxicity to rabbits, guinea pigs, and monkeys.⁴⁸⁸

CYCLOPIA SPECIES — HONEYBUSH TEA

Botanical Name — *Cyclopia intermedia* E. Mey, *Cyclopia subternata* Vog., *Cyclopia genistoides* (L.) Vent., *Cyclopia sessiliflora* Eckl. and Zeyh, *Cyclopia maculata*, and related species

Family — Leguminosae

Common Names — The various *Cyclopia* species are collectively called “honeybush tea,” but the individual species are known by a variety of names, which include the following:

- *Cyclopia intermedia*, known as “mountain tea,” found between Port Elizabeth and the edge of the Langkloof
- *Cyclopia subternata*, known as “marshland tea” or “valley tea”
- *Cyclopia genistoides*, known as “coastal tea,” found mostly in the western Cape near Yserfontein and Darling and also thriving in the South Cape if cultivated
- *Cyclopia sessiliflora*, known as “Heidelberg-tee,” named after the town Heidelberg in South Africa, where it grows in the local mountain range

African Names — Bergtea (*C. intermedia*), vleitee (*C. subternata*), Kustee (*C. genistoides*)

Description — The genus *Cyclopia* includes over 20 species of shrubs, endemic to the south-west and southeast of South Africa and mainly associated with the fynbos plant formation. They are collectively called honeybush tea, and their leaves are commonly used to make tisanes or “herbal teas.” It has many similarities with rooibos. Honeybush is so named because the flowers smell of honey. The taste of honeybush tea is similar to that of rooibos but a little sweeter. Both are devoid of caffeine and much more fragrant than any true tea prepared from *Camellia* species or even other tisanes. In some rural districts, it used to be common practice to keep a kettle of honeybush tea infusing on the stove ready for drinking while scenting the whole house—unlike tea prepared from *Camellia sinensis*, the product does not rapidly spoil as it simmers.

Most *Cyclopia* species have resisted attempts at domestication or cultivation and must be harvested in the wild, but a few can be cultivated. The major problem has been poor knowledge of the ecology of fynbos. It is not always easy to discover what the seeds need to enable them to germinate; some kinds bear elaiosomes and might be dependent on the services of particular ants or birds. *C. intermedia* is one of the teas that is harvested in the Kouga mountains, where it grows naturally. Mountain tea regenerates within 3 years after harvesting or devastation by fire; consequently, less than one-third of the mountain yield is available for harvesting each year by rotation. Mountain tea and valley tea flower in September/October, whereas coastal tea flowers in May/June.

Constituents — Honeybush does not contain caffeine and is low in tannin (0.45%) but rich in minerals. Some of the active compounds found in honeybush include isoflavones, flavones, flavonols, cinnamic acids, coumestans, xanthonoids, mangiferin, and isomangiferin.

Pharmacological Studies — The antioxidant activity and antimutagenic activity of the aqueous extracts of both the fermented and unfermented honeybush tea have been established by several studies.⁴⁸⁹ In comparative studies on the antioxidant activities of *Cyclopia intermedia*, *Aspalathus linearis* (rooibos), and *Hibiscus sabdariffa* (zobo), it was found that the anti-free-radical potential (removal of hydroxyl radicals and superoxide anions) of honeybush extract was lower than in water infusions of rooibos, which was probably due to the lower concentration of polyphenols in the honeybush tea, but higher than the antioxidant activity of *H. sabdariffa*.⁴⁹⁰ It has been shown that the degree of antimutagenic activity of honeybush varies according to the type of mutagen tested. For example, extracts demonstrated stronger protective activity against mutagens that require metabolic activation, such as 2-AAF and AFB1. Significant differences were also observed in antimutagenic activity among various honeybush species and between extracts from nonfermented and oxidized material. Research showed that nonfermented material has a higher antioxidant and antimutagenic potential, both *in vitro* and *in vivo*. Depending on the type of mutagen, research model, and honeybush species and the type of material used, extracts from *Cyclopia* plants demonstrated antimutagenic activities comparable with extracts from green, black, and rooibos teas.⁶⁵

The phytoestrogenic activity of extracts of honeybush has only been demonstrated *in vitro*. Their antimicrobial activity has also not been well established.⁴⁹¹ The chemical constituents found in honeybush tea have been linked to the activities of the extracts. Although not backed by

conclusive experiments, the inferences listed next have been drawn by promoters of honeybush as a dietary supplement.

Isoflavones and Coumestans

- Regulation of menstruation cycles
- Prevention of breast, prostate, and uterus cancer
- Reduction of the risk of osteoporosis
- Antifungal properties
- Antiviral properties
- Anticholesterolemic: lowers cholesterol levels
- Hypolipidemic: lowers fat levels
- Antimicrobial
- Antioxidant

Xanthones

- Anti-inflammatory
- Antihepatotoxic
- Antiviral
- Antidiarrheal
- Antifungal
- Antioxidant
- Antidepressant

Flavones

- Vitamin-type activity (mixture of eriodictyol and hesperidien)
- Antioxidants
- Antimicrobial
- Antiviral
- Anti-inflammatory
- Spasmolytic
- Diuretic (increases urination)
- Nonfeeding sweeteners

Commerce — *Cyclopia* species have now become established commercial teas but are not as popular as rooibos tea. The biggest hindrance to commercial growth is the fact that honeybush is not one distinct species, and trade in the tea varies according to region. Differentiation of the four major commercial species is often difficult. Microscopic pharmacognostical profiling, using the leaf and stem microstructure of the species, has proved useful in determination of ultraspecific identity of the commercially important *Cyclopia* species (*Cyclopia intermedia*, *Cyclopia subternata*, *Cyclopia maculata*, *Cyclopia genistoides*). Leaflet characters of diagnostic value include the shape; margin (flat or revolute); bundle sheath extensions; crystals (aggregates, solitary crystals, and crystal sand); relative size of the upper and lower epidermal cells; and thickness of the cuticle. Studies also revealed an abundance of phenolic compounds, not only in the leaf epidermal cells and leaf bundle sheaths, but also in the secondary phloem, xylem rays, xylem parenchyma, and pith, showing that the inclusion of older stems may be acceptable and does not necessarily lower the quality of the product.⁴⁹²

Agriculture — Like most members of the fynbos ecosystem, the honeybush tea plants are not easy to cultivate. Some of the species are nonsprouting, which means that replanting requires a lot of care, but once the plant is established, it is a hardy shrub. The life span of the nonsprouters is 7

to 8 years, while that of sprouters is estimated to be at least 10 years, based on the productive age of the oldest *C. genistoides* plantation.⁴⁹³

CYMBOPOGON CITRATUS



Botanical Name — *Cymbopogon citratus* (DC) Stapf.

Synonyms — *Andropogon citratus*, *A. ceriferus* Heckel, *A. nardus* L. var. *Ceriferus* (L.) Rendle.

Family — Poaceae

Common Names — Lemongrass, citronnelle (Fr.), fever grass

African Names — Bambara: ce kala; Igbo: nche awuta, ahihia tii; Turag (Arab): hhashellay-mum; Yoruba: koriko oyibo, koko oba

Description — *Cymbopogon citratus* is a densely tufted tall grass, usually growing up to 120 cm. Leaves are grass-like, with blades tapered at both ends up to 90 cm long and 1.25 cm wide. It seldom flowers; when the plants do, the flowers occur in panicles, with inflorescences 30 to 60 cm long. It has a slightly bulbous base. The whole plant gives a characteristic lemon odor when broken. It is a perennial, and the propagation is from the clones.^{28,33}

Habitat and Distribution — The plant requires a warm climate with plenty of sunshine. It is cultivated in Tanzania, Kenya, and the Malagasy Republic.

Ethnomedicinal Uses — Lemongrass is used primarily as a weak infusion in the form of teas used for fevers and jaundice. Extracts of the plant are also dispensed as a diuretic, emmenagogue, diaphoretic, stomachic, carminative, tonic, antirheumatic, and antidiarrheal.⁴⁴⁰ The essential oil is used extensively in perfumery.

Constituents — Lemongrass yields up to 0.7% of volatile oil, which consists mainly of citral, a terpene aldehyde. Other constituents of the oil include geraniol, nerol, furfural, citronellal, methylheptenone, and myrcene,^{425,494} as well as the triterpenes cymbopogone and cymbopogonol.^{495,496}

Pharmacological Studies — A decoction of the leaves has been shown to possess hypotensive and diuretic effects in the rat.⁴⁹⁷ The essential oil showed antibacterial activity *in vitro*, and the activity is attributed to its geraniol and neral content.⁴⁹⁸ The oil is believed to have a mild depressant effect on the CNS and analgesic and antipyretic activities. But, recent laboratory evaluation of the plant failed to observe any effects on body temperature, gastrointestinal motility, or the CNS.⁴⁹⁹ Extracts of the plant appear to be devoid of any toxicity⁵⁰⁰ and were not found to cause either hematological or cellular alterations or mutagenic or embryonic toxicity.^{501,502}

CYNARA SCOLYMUS

Botanical Name — *Cynara cardunculus* subsp. *flavescens* Wiklund.

Synonym — *C. cardunculus* spp. *scolymus* (L.) Hegi

Family — Compositae

Common Names — Globe artichoke, leaf artichoke, artichaut (Fr.)

African Names — Arabic: kharsuf.

Description — *Cynara* is a small herbaceous and thorny plant, about 1.5 m in height. The leaves are alternate, deeply dentate, with almost pinnatifid whitish capitulum of tall purple flowers that are in turn subtended by thick and imbricate bracts. The crude drug consists of the fresh, thickened lower parts of the involucre bracts and the receptacle of thistle-like flowers of the plant.⁴³⁶ They are usually greenish or purplish, with the intact bract showing involucre scales enlarged at the base with a short, sharp spine arising from the notched apex. It has a soft and enlarged receptacle that forms a cushion-like mass. The plant has a faint characteristic odor and a peculiar taste.

Habitat and Distribution — Artichoke is a Mediterranean plant. It is cultivated in North Africa and in some subtropical regions of the continent.

Ethnomedicinal Uses — The *African Pharmacopoeia*⁴³⁶ listed the plant for the treatment of liver dysfunction and as a diuretic and antiatherosclerotic. It imparts a sweet taste to food and can be used as a sugar substitute for diabetics.

Constituents — It contains chlorogenic acids, cyanarin, and sesquiterpenes.²²⁹ The plant also contains a mixture of polyphenolic compounds, proteins, and inulin.

CYPERUS ESCULENTUS

Botanical Name — *Cyperus esculentus* L.

Synonyms — *Cyperus* spp. (34 synonyms, subspecies, and varieties); *Chlorocyperu saureus* (K.Richt.) Palla ex Kneuck.; *Chlorocyperus phymatodes* (Muhl.) Palla; *Pterocyperu sesculentus* (L.) Opiz; *Pycneus esculentus* (L.) Hayek.

Related Species — *Cyperus rotundus* L.

Family — Cyperaceae

Common Names — Tiger nut, yellow nutsedge, chufa flatsedge; earth-almond, grass nut, rush-nut, souchet sultan

African Names — Igbo (Nigeria): aki-awusa; Hausa (Nigeria): ayah, haya; Afrikaans (Namibia): geeluintjie, hoenderuitjie, uintjie; Afrikaans (South Africa): geeluitjie, hoenderuintjie, patrysuitjie; Damara/Nama (Namibia): !han; Khukh (Namibia): !hanni; Otjiherero (Namibia): okatjako; Shona (southern Africa): chufa; Shona (Zimbabwe): pfende; Mozambique: chimbwe-chimbwe; Zulu (South Africa): indawo, insikane; Dioula: tchoro toro; Bambara: nton togon; Malinke: toki

Description — Tiger nut is an annual or perennial herb, cespitose or not, rhizomatous or not, stoloniferous or not. Roots are fibrous, principally adventitious. Stems (culms) usually are trigonous, occasionally serrated, rarely compressed, usually solid, rarely hollow or septate. Leaves are basal or cauline, alternate, usually 3-ranked, rarely 2-ranked or multiranked, with bases forming cylindrical sheaths enclosing the stem; margins are usually fused; the junction of sheaths and blades often is with adaxial flaps of tissue or fringes of hair (ligules); blades frequently are absent from some basal leaves, rarely from cauline leaves, and when present are divergent or ascending, flat, folded, plicate, rolled, or terete, linear, venation parallel. Primary inflorescences (spikelets) have a shortened axis; glumaceous bracts (scales) are 1-many, spirally arranged, sometimes 2-ranked, usually appressed or ascending; scales usually are all fertile, each subtending a single flower, sometimes proximal or distal scales are empty; lateral spikes often are with basal, usually empty, usually 2-keeled scale

(prophyll); occasionally, prophyll subtending and enclosing rachilla, bearing 1 pistillate, sometimes (0–) 3 staminate flowers and empty scales. Secondary inflorescences panicles are often modified to corymbs, pseudumbel, cyme (anthela), raceme, spike, or capitulum (head), rarely single spike, usually subtended by foliaceous or, less frequently, glumaceous bracts; secondary inflorescences sometimes simulating spikelets. Flowers are hypogynous, bisexual in most genera; perianth is absent or with (1–) 3–6 (–30) bristles or scales, usually falling off with fruit; stamens usually (1–) 3, rarely more, usually distinct; anthers are basifixed; pistils are 1, 2–3 (–4)-carpellate, fused, locule 1; style is undivided or branches 2–3 (–4); stigma sometimes is papillate. Fruits are achenes, usually trigonous or biconvex; pericarps are thin (except in *Scleria*).¹¹⁴⁰

Habitat and Distribution — Tiger nut is a perennial tuber or nut found in the wild and cultivated in drier parts of the continent. It has been cultivated since the fourth millennium BC in Egypt and for several centuries in other parts of North Africa and southern Europe. The plant can grow in light (sandy), medium (loamy), and heavy (clay) soils and prefers acid, neutral, and basic (alkaline) soils. It cannot grow in the shade. It requires moist or wet soil.

Ethnomedicinal Uses — The spherical underground tubers, with their sweet nutty flavor, are consumed fresh, dried, and in roasted forms. Fresh tubers are also soaked in water and processed to yield a refreshing milk-like beverage in northern Nigeria and Namibia. In Spain, the nutritional drink is called *Horchata de chufa*. It is fermented in many parts of West Africa to produce an alcoholic drink. The oil, which is rich in oleic (65.55%), palmitic (16.32%), and linoleic (12.13%) acids, is produced commercially in the Valencia region of Spain as a substitute for olive oil, a nutraceutical agent, and a major ingredient for high-quality cosmetics. According to the online encyclopedia Wikipedia,¹¹³⁸ tiger nuts have excellent nutritional qualities, with a fat composition similar to olives and a rich mineral content, especially phosphorus and potassium. Since the oil has a predominance of UFAs (82%) against only 18 saturated fatty acids, it is useful as a dietary supplement for people with high cholesterol. It can also be used to replace milk in the diet of people intolerant to lactose to a certain extent. Its ethnomedicinal use is for the treatment of stomach and bowel disorders and inflammatory diseases.

Constituents — Tiger nut contains carbohydrates, flavonoids, minerals, phytosterols, tocopherols, tocotrienols, and various nutrients. The oil is composed of 7 major TAG (triacylglycerol) classes, with C54:3 (29.00%) and C52:2 (27.82%) dominating. Oleoyl chain primarily occupies both sn-1/3 (52.68%) and sn-2 (77.62%) positions in the tiger nut oil. It has a total tocol content of 120.10 µg/g, dominated by α-tocopherol (86.73 µg/g) and β-tocopherol (33.37 µg/g). The total 4-desmethylsterol content is 986 µg/g, dominated by β-sitosterol (517.25 µg/g) and stigmasterol (225.25 µg/g).⁵⁰³

Pharmacological Studies — Most of the biological studies on tiger nut have been on its nutritional properties. The rhizomes are used for chewing; in preparing the white, jelly-like, tiger nut milk recommended as a substitute for dairy milk; and in therapeutic diets for diabetes, hypercholesterolemia, and chronic indigestion. Because of its high content of vitamin E, it helps slow the aging of body cells. In cosmetics preparations, it improves the elasticity of the skin and reduces skin wrinkles.⁵⁰⁴ The related *Cyperus rotundus* has been evaluated for its antibacterial, anti-inflammatory, antidiabetic, and antioxidant activities with positive results.⁵⁰⁵

CYTISUS SCOPARIUS

Botanical Name — *Cytisus scoparius* (L.) Link

Synonyms — *Sarothamnus scoparius* (L.) Koch., *S. vulgaris* Wim., *Spartium scorparium*

Family — Leguminosae

Common Names — Broom, Scotch broom. Irish broom, broom tops, besom, scorparium, and several other names

Description — *Cytisus* is a tall deciduous shrub with ridged stems. The leaves are yellow, with three obviate leaflets at the base and single sessile and lanceolate leaves at the top. The upper parts

of the stems bear five prominent longitudinal ridges. *Cytisus* is a perennial herb with a bitter taste. The flowering tops are the plant part used medicinally.

Habitat and Distribution — Broom is a European herb that has been introduced to the semi-tropical regions of the continent. It is cultivated in South Africa as a garden plant.

Ethnomedicinal Uses — It is employed as a diuretic and in the treatment of mild hypertension. A decoction of the leaves is used with lime for chest complaints.

Constituents — *Cytisus* contains quinolizidine alkaloids, flavonoids, phenylethylamines, lectins, and monoterpenes. The major compounds isolated from the plant include the alkaloids sparteine, lupanine, isosparteine, ammoderine, and related derivatives;^{506,507} tyramine, epinine, salsolidine, and related phenylethylamines;⁵⁰⁷ genistein, quercetin, and their glycosides;^{123,508} and caffeic and *p*-coumaric acids.⁵⁰⁹ The seeds contain lectins,⁵¹⁰ and the volatile oil yields eugenol, phenol, cresols, isovaleric acid, benzoic acid, and benzylalcohol, as well as *cis*-3-hexen-1-ol and 1-octen-3-ol.⁵⁰⁹

Pharmacological Studies — *Cytisus* exerts a plethora of pharmacological activity due to its several constituents. It has a slowing effect on pathologically accelerated stimuli arising in the atrium, reduces increased irritability in the conduction system, and regulates the heart rhythm, simultaneously improving venous return.⁵¹¹ It does not have any activity on the failing myocardium and therefore is not considered a digitaloid.

One of the active principles, sparteine, has a curare-like effect on peripheral nerves, which depresses respiration; it reduces the conductivity of cardiac muscle, and it is oxytocic.⁵¹² Oxytyramine, a phenylethylamine found in the plant, has been shown to be a vasoconstrictor.⁵¹¹

Broom is a diuretic and cathartic and has been used for the treatment of tumors.⁵⁰⁸ Other alkaloids present in *Cytisus*, especially sarothamine and genistein, also inhibit conduction. The flavonoids, which co-occur with these alkaloids, have been reported to have a beneficial effect on myocardial function and the initiation of cardiac impulses.⁵¹²

Sparteine exhibits genetic polymorphism in its *in vivo* oxidation profile, and care must be taken to determine the appropriate dose for people from differing backgrounds. Sparteine polymorphism has been observed among the various racial groups.^{513–515} The drug is effectively inhibited by quinine administration.⁵¹⁵

Clinical Properties — Oral preparations of *Cytisus* are used in the treatment of persistent arrhythmias or extrasystoles. It is indicated for long-term treatment of persistent postinfectious myocarditis with arrhythmia and to prevent a tendency for extrasystoles. The drug is also not effective for the treatment of absolute arrhythmia or paroxysmal tachycardia.⁵¹¹ The plant has also been used as an antioxidant and as a hepatoprotective agent. The extract inhibited the toxicity of CCl₄ in rats in a dose-dependent manner, and the activity of the extract at a dose of 500 mg/kg was comparable to the standard drug silymarin (25 mg/kg) in the protection of the liver from oxidative stress.⁵¹²

Toxicity and Adverse Effects — *Cytisus*, when taken in low doses, is relatively nontoxic, but at higher doses the drug causes drowsiness, visual disturbances, and congestion in the head. Sparteine intoxication produces marked bradycardia. Another member of the genus *Cytisus*, *C. laburnum* (actually belonging to the genus *Laburnum*), is very toxic and should not be used for the preparation of drugs.

DATURA

The *Datura* species *D. stramonium*, *D. metel*, and *D. fastuosa* are widely distributed in Africa. For medicinal purposes, the distinction between the three species is not considered important since they all yield the pharmacologically important tropane alkaloids hyoscyne, atropine, and hyoscamine. In some books, *D. metel* is considered synonymous with *D. fastuosa* and *D. innoxia*. As indicated in the following discussions, only the variety *alba* of *D. fastuosa* is synonymous with *D. metel*; the black variety of the former appears to be a distinct species and is often confused with *Vernonia amygdalina*.

DATURA METEL

Botanical Name — *Datura metel* Linn.

Synonyms — *D. fastuosa* L. var. *alba* (Nees) C.B.Cl., *Brugmansia waymannii* Paxton., *Stramonium datura* Noronha

Family — Solanaceae

Common Names — Hairy thorn apple, metel

African Names — Arabic: oshb daturah; Ashanti: aweawu; Hausa: zak'ani, haukata yaro; Fulani: manga jidde; Igbo: myaramuo; Malinke: kidi ganian; Swahili: mnanaa, mnawha, muranha; Twi: kwasea-dua; Wolof: homhom bug or. Hompay bu gor; Yoruba: apikan

Description — *D. metel* can be differentiated from *D. stramonium* by its somewhat brownish color, with entire margins and differences in venation and trichomes. The seeds are light brown in color and ear-shaped; they resemble *D. stramonium* in the internal structures but can be distinguished by their larger size and more flattened structure. It possesses the disagreeable odor and taste of *D. stramonium*. The morphological differentiation of the species can be established from the microscopic characteristic of the powdered flowers.⁵¹⁷

Habitat and Distribution — This is a deciduous forest shrub, also found in rich savanna. The plant is distributed throughout the continent. It is often found in wastelands in many parts of West Africa.

Ethnomedicinal Uses — Most parts of the plant are employed in traditional medicine throughout the continent. It is used as a weak decoction for fevers and as an anthelmintic, insecticide, and instillation for eye diseases. The leaves are used in Senegal and Guinea as an application for inflammatory swellings, rheumatism,⁶ and general body pains. The plant is recognized as a deliriant and is often added to locally brewed beer and palm wine to stupefy victims with the intent to rob them. The Fulani use the leaves and sometimes the seeds in the preparation of a tonic used to drug youths to enable them to withstand the ordeal of the *Sharo* contest of manhood.

The constituents and pharmacology described are as described for *D. stramonium*.

DATURA STRAMONIUM



Botanical Name — *Datura stramonium* L.

Synonyms — *D. tatula* L., *Stramonium vulgatum* Gaertn.

Family — Solanaceae

Common Names — Green thorn-apple, apple of Peru, devil's apple, devil's trumpet, jimsonweed

African Names — Ga: blofo ngme-tsho; Krobo: wasiwakwe; Malinke: kidi ganian; Serere (Senegal): ndohar; Shona: chohwa; Sotho: lethsove, lethsovi, letjoi, mphufi; Tonga: zaba-zaba; Twi: ahwenee, mmfora; Xhosa: umhlavutha; Yoruba: apikan; Zulu: iloqi, iyoli

Description — This is a herbaceous annual up to 1 m high. It has many branches, which gives it a dense appearance. The dried leaves are grayish green in color; they are brittle, twisted, and often broken. The leaves are variable, 8–25 cm long and 7–17 cm wide; they are shortly petiolate, ovate, or triangular-ovate in shape; they are acuminate at the apex and have a sinuate-dentate margin. The fresh leaf is somewhat dagger shaped. A microscopic description of the leaf is included in the work of Trease and Evans.²²⁰ The flowers are white, with streaks of purple appearing sometimes on the ribs and tips of the corolla lobes. They are solitary in the axils and point upward. The plant produces round, greenish fruits or capsules that enclose black, flat, reticulated, kidney-shaped seeds. The plant has a bitter, saline taste with a disagreeable odor when fresh, but the dried plant has a tea-like odor.²⁸

Habitat and Distribution — This plant grows wild in most parts of the continent and is often found around village homes and on abandoned farmlands and poorly maintained parks.

Ethnomedicinal Uses — The leaf extract is an ingredient in remedies for cough and chest complaints. The crushed leaves or seeds are mixed with palm oil and applied to severe cases of insect bites and stings and also on inflammations to allay the pain. The seeds are sometimes used as an insecticide.⁷⁷ The leaves are used in the form of cigarettes or pulverized and burned as an inhalant for the treatment of asthma.

Constituents — The plant is a known source of tropane alkaloids hyoscyamine, atropine, and scopolamine. The total alkaloid yield has been estimated to be between 0.06% and 0.50%. The young leaves contain mainly scopolamine, whereas hyoscyamine is the major constituent of the mature leaves. In addition to these alkaloids, the plant contains other minor tropane derivatives, as well as chlorogenic acid and lectins. The seeds contain up to 30% fixed oil and about 0.2% alkaloids.

Pharmacological Studies — The drug is valued in clinical medicine as a cholinergic agent. The alkaloids of *Datura* are used as a spasmolytic, antiasthmatic, and anticholinergic. The drug has been employed in proprietary products for the treatment of excessive salivation in Parkinson's disease.

In high doses, *Datura* induces strong hypnosis. Hyoscine, also known as scopolamine, in therapeutic doses causes CNS depression, manifesting as drowsiness, amnesia, fatigue, and dreamless sleep with a marked reduction in rapid eye movement (REM). Scopolamine is frequently misused by law enforcement agencies in the preparation of the so-called truth serum. Scopolamine is employed as an adjunct to anesthetic agents or for preanesthetic medication. *Datura* leaves are incorporated into "cigars" smoked as a euphoria-inducing substance and frequently abused. Hepatonephrotoxicity has been reported with Sudanese *D. stramonium* administered to rats.⁵¹⁸

DICHROSTACHYS CINEREA

Botanical Name — *Dichrostachys cinerea* (Linn.) Wight et Arn.

Synonyms — *D. glomerata* (Forsk.) Chiov., *Cailliea glomerata* (Forssk.) J.F. Macbr., *Desmanthus mutans* (Pers.) DC., *Mimosa bicolor* Bacleex DC.

Family — Leguminosae

African Names — Hausa: dundu; Igbo: ami ogwu; Yoruba: kara

Description — *Dichrostachys cinerea* is a thorny shrub, growing up to 8 m in some places. The bark is brown, peeling off in strips. The twigs and young leaves are densely hairy. The leaves are tripinnate, from 5 to 10 cm long and with 8–15 pairs of pinnae, with each pinna being up to 4 cm long and sharing a rod-like gland with the opposite pinna. Each pinna bears 10–25 pairs of short, narrow, crowded leaflets. The spines often bear leaves. The inflorescence consists of densely crowded, stalkless, white-pink, or mauve filaments, borne in the axils of the leaves, on stalks about

4 cm long. The sterile flowers are borne below the fertile ones, each of which has yellow stamens. Flowering occurs from February to May and then in July (Agoha). The flowers are faintly fragrant and have been used as ornamentals.

The fruits occur, November–January, as smooth, flat pods, in clusters at the ends of thick stalks. Each pod is about 2.5–7 cm long, becoming folded or twisted with age, and eventually forming a more or less compact head.⁷⁷

Habitat and Distribution — It is found in savanna and low shrublands, often in thickets. It is distributed throughout the tropical parts of the continent. In the north, it grows up to Sudan, and in the south, it extends into South Africa.

Ethnomedicinal Uses — The root bark is used in North Africa as a weak decoction for the treatment of venereal diseases and leprosy. The scraped stem bark is pounded and macerated in cold water, spices and lime juice are added, and the mixture is given both for dysentery and for worms. An infusion of the root is administered as a postpartum tonic. The fresh leaves are applied externally for the treatment of abscesses and various inflammatory conditions. A hot decoction of the leaves is inhaled to relieve sore throat.

Decoction of the roots or stem is used for stomachache and constipation and as an anthelmintic in Ivory Coast. The roots are applied after chewing to snakebites and scorpion stings.

DRIMIA ALTISSIMA

Botanical Name — *Drimia altissima* L.

Synonyms — *Urginea altissima*, *Scilla altissima*, *Idothea altissima* (L.f.) Kuntze., *Ornithogalum altissimum* L.f.

Family — Asparagaceae

Common Name — African squill

General Notes — The drug, known in commerce as the white squill, consists of the dried sliced bulbs of *D. maritime* from which the membranous outer scales have been removed.²²⁰ Squill has a long history of use in medicine: The earlier Greek and Egyptian physicians used various forms of squill as therapeutic agents. An oxymel of squills was part of an Arabic prescription, and a vinegar of squill was used by Dioscorides, the Greek physician.

Squill occurs in two varieties, the white and the red squill. The white variety is employed in medicine, and the red squill is used mainly for the preparation of rat poison. The African squills *U. indica* (Roxb.) Kunth and *U. altissima* L. Bak. are used in folk medicine in Nigeria but are not official pharmaceutical products or articles of international trade.^{437,519}

Description — Squills occur as bulbs that are pear shaped and 15–30 cm in diameter. They are yellow with white, translucent strips of varied lengths (usually 1–5 cm), with a bitter and acrid taste. The drug is very hygroscopic, and if powdered drug is not well stored, it turns into a solid moldy mass.

Constituents — The plant contains a mixture of cardiotonic glycosides based on the scillardin skeleton. A crystalline glycoside, scillaren A, and an amorphous mixture called scillaren B occur in the various squills. Scillaren A, which is the major component, is very labile and is easily hydrolyzed by acid or enzyme (scillarenase) to yield the genin and sugars. Hydrolysis with scillarenase yields proscillaridin A. Squill also contains other minor glycosides, quercetin derivatives, and kaempferol polyglycosides.²²⁴

Pharmacological Studies — Proscillaridin has cardiotonic properties resembling those of strophanthin. The glycosides are poorly absorbed from the gastrointestinal tract, and they are of short-acting duration. The drug is easily eliminated from the system and is noncumulative. In binding experiments on plasma membranes derived from several types of isolated and cultivated endothelial cells, it was observed that the order of binding of the cardiac glycosides and the genins to the cells was as low as follows: proscillaridin A > ouabain > digoxin > gastrophanthidin > digoxigenin.⁵²⁰

A study of the pharmacological activity of the reduced proscillaridins in papillary muscles isolated from guinea pig heart has shown that hydrogenated products retained the positive inotropic effect of the parent drug. The compounds bufa-4,20-dienolide, bufa-4,20(22)-dienolide, 2OR-bufo-4-enolide (Ph4-R), 2OS-bufa-4-enolide (PH4-S), and chola-4-enoate exhibited the fastest onset of action but lower potency. The concentrations at which half the maximum inotropic effect was observed were consistently lower for the reduced compounds than the parent drug at less than one-tenth the time taken by proscillaridins in some cases. A dose of 11.9 mg/kg of bufa-4,20-dienolide was administered intravenously by bolus injection into guinea pigs and did not cause arrhythmias.⁵²¹ If these effects are reproducible in animals, then the reduced proscillaridins will offer many therapeutic advantages over other cardiac glycosides.

Clinical Properties — The drug is indicated for the treatment of all forms of mild-to-medium-severe heart failure. It is administered both orally and intravenously. Many proprietary preparations containing the whole herb as tablets and “teas” are available in Europe, as well as preparations incorporating the pure compound or the processed extract. Semisynthetic derivatives, especially proscillaridin 4'-methyl ether and methylepoxyproscillaridin, are also used as therapeutic agents. In an evaluation of the hemodynamic effect of methyl-epoxyproscillaridin on six patients with latent cardiac insufficiency, it was observed that the compound caused an increase in stroke volume and the systolic blood pressures both at rest and under ergometer exercise.⁵²² During physical exercise, the heart rate decreased significantly, and the cardiac output was increased.

The drug is also used in the preparation of expectorants; in small doses, it causes mild gastric irritations that initiate a reflex secretion from the bronchioles.¹¹⁹

Toxicity — The main side effect of uргinea overdose is vomiting. Excessive high doses may cause cardiac toxicity, but death due to proscillaridin intoxication is not common. The drug is eliminated rapidly from the body and is unlikely to accumulate to toxic levels without warning symptoms. In radioimmunoassay determination of proscillaridin given orally to beagle dogs, it was rapidly absorbed, exhibiting plasma maximum concentrations of 2.06 mg/ml at 20 min. The plasma level subsequently declined biophysically with half-lives of 0.6 and 25.4 h.⁵²³

ECHINACEA PURPUREA



Botanical Name — *Echinacea purpurea* (L.) Moench.

Synonyms — *Echinacea intermedia* Lindl. ex Paxton., *Helichroa purpurea* (L.) Raf., *Rudbeckia purpurea* L.

Family — Compositae

Common Names — Purple coneflower, *E. angustifolia* (D.C) Heller = coneflower, *E. pallida* (Nutt) Britt. = black Sampson

Description — *Echinacea* is available in the market as roots or rhizomes, which are often twisted with longitudinal furrows. It is grayish green in appearance, and the transverse section reveals it is yellowish and porous with black patches. It is a slightly aromatic, has a somewhat sweet taste at first, then bitter, and leaves an aftertaste that gives the tongue a peculiar tingling sensation. Although the individual species are botanically very distinct, the drug is treated as one product since the major difference lies in the quantity and type of the minor metabolites. Moreover, much confusion exists regarding the species specificity in some of the published data.

Habitat and Distribution — The plant is indigenous to North America, from which it has been introduced as a cultivated medicinal plant in parts of northern and eastern Africa.

Constituents — Polysaccharides, mainly heteroxylans and norhamanogalactans, have been isolated from the genus.⁵²⁴ A triglycoside of a caffeic acid derivative, called echinacoside, has been found present in *E. angustifolia*, but not in *E. purpurea*; some alkanes and flavonoids were also found in the species.⁵²⁵ The essential oil contains caryophyllene, germacrene D, methyl-*p*-hydroxycinnamate, and humulene.^{526,529} The dried roots of *E. pallida* yielded polyacetylenes that were absent in the fresh plant material, and it has been suggested that these polyacetylenes could be artifacts generated during storage of the drug.^{527,528} Other constituents found in *Echinacea* include unsaturated isobutyl amides (e.g., echinacin), the alkaloids tussilagine and isotussilagine, a labdane derivative, and vanillin linolenic acid derivatives.¹²³ It has been observed that commercial samples of the drug are sometimes adulterated with American feverfew (*Parthenium intergrifolium* L.), and some of the compounds reported from commercial samples, especially the sesquiterpene esters, may be due to the adulterant.^{123,531}

The immunostimulant activity of *Echinacea* appears to have been known to earlier scientists since as early as 1831 the German scientist Dierbach was said to have indicated its use as an immunostimulant and for healing damaged skin tissues. A modern account of its immunostimulant activity was given by Wagner and his colleagues,⁵²⁹ who showed the polysaccharide fraction of the aqueous extract of the plant possessed *in vitro* and *in vivo* immunostimulant activity. In the carbon clearance test in mice, it was shown that the oral administration of the drug enhanced phagocytosis; also, in the *in vitro* granulocyte assay, it stimulated phagocytosis. The lipophilic fractions of the extract were more active than the polar fractions.⁵³⁰ It has also been shown that an acidic arabinogalactan with molecular weight of 75,000, isolated from cell cultures of *E. purpurea*, was effective in activating to produce TNF- α , interleukin 1 (IL-1), and interferon β_2 .⁵³¹ It does appear from the report that the acidic arabinogalactans were more active than neutral arabinogalactan. It was also found that although arabinogalactan possessed immunostimulant activity, it neither activated B cells nor induced the T cells to produce IL-2, interferon B₂, or interferon γ , but it did induce a slight increase in T-cell proliferation.⁵³¹ The purified polysaccharides from the cell cultures of the plant were effective in protecting mice against the lethal effects of infections with one predominantly macrophage-dependent and one predominantly granulocyte-dependent pathogen, *Listeria monocytogenes* and *Candida albicans*, respectively.⁵³²

Clinical Properties — *Echinacea* species are employed in clinical medicine as anti-inflammatory agents and as immunostimulants.^{533,534} It has been shown that a single dose of the drug per week as a therapeutic adjuvant is adequate for the production of phagocytosis, as evidenced by lymphokine production and assay using [³H]-thymidine incorporation and a skin test with antigen.⁵³⁴ The drug is marketed all over Europe as an ingredient in several proprietary anti-infective drugs. Esberotox N and Echinichin, two of the most common brands, have been shown to be most useful in phagocytosis-dependent metabolism and therapy.⁵³⁵

Extracts of the plant are known to inhibit the production of hyaluronidase and thereby help to localize the infection and stop it from spreading to other parts of the blood.⁵³⁵ *In vitro* studies showed inhibitory activity against *Trichomonas vaginalis*,⁵³⁶ which supports its use in topical preparations such as ointments, poultices, and vaginal pessaries. Other uses of *Echinacea* include those for antiviral, vulnerary, and alterative activities; for septicemia; for the treatment of upper respiratory tract infections such as tonsillitis and pharyngitis; and for boils and carbuncles.⁵⁴⁰ The drug has also been useful in combination therapy for outpatients with inoperable advanced hepatocellular carcinomas.⁵³⁷

In Nigeria, a locally cultivated *Echinacea* is used in combination with *Garcinia kola* seed extract as an immune booster and antioxidant and as a remedy for flu.

ELAEIS GUINEENSIS

Botanical Name — *Elaeis guineensis* Jacq.

Synonyms — *Elaeis nigrescens* A. Chev., *Elaeis virescens* A. Chev., *Palma oleosa* Mill.

Family — Arecaceae

Common Names — Oil palm, palm tree, king palm (*Elaeis guineensis* var. *idolatrix*) (English), palmier a huile (French)

African Names — Bambara: m'te; Bini: udin; Hausa: kauku, kwakwa; Igbo: nkwu; Nupe: zukunnu; Swahili: mawese (palm oil); Tivi: irile; Urhobo: orien; Yoruba: ope, eyin

Description — The oil palm is a straight stemmed tree up to 22 m high, with several prominent foliar scars, which increase with the age of the plant. The leaves are dark brown, about 7 m smaller than those of *Raphia* palm, spiny at the base. The leaves gather at the top to form an umbrella-like canopy. Male and female inflorescences are borne at the axils of the leaves, with the male flowers being clusters of spikes, while the female flowers are in large stalkless heads. The fruits occur as ovoid drupes, with fibrous and oily mesocarp; they are bright red when ripe, appearing in a cluster ranging from 3 to 10 kg. The seed, enclosed in a hard endocarp, contains an oily white albumen.¹³

Habitat and Distribution — It is spontaneous in secondary forests and as a derived crop in savanna and high forests. It is widely cultivated throughout the tropical forest regions. It is a major crop in Ghana, Nigeria, Togo, Ivory Coast, Uganda, Tanzania, and Kenya.

Ethnomedicinal Uses — *Elaeis guineensis* is one of the plants that is central to the lives of traditional societies in West Africa. All parts of the plant are useful: The wood is used as frames for buildings, the sap is fermented into palm wine, and the oil from the mesocarp and the seeds are used for cooking and for making soaps, creams, and other cosmetics.

The fresh sap is used as a laxative, and the partially fermented palm wine is administered to nursing mothers to improve lactation. Soap prepared with ash from the palm fruit husk is used for treating infections. A root decoction is used in Nigeria for headache; the pulverized roots are added to drinks for gonorrhea and menorrhagia and as a cure for bronchitis.⁹ The leaf extract and the juice from young petioles are applied to fresh wounds. The fruit mesocarp oil and palm kernel oil (PKO) are administered as a poison antidote and are used externally with several other herbs as a lotion for skin diseases. PKO is applied to convulsant children to regulate their body temperature.

Constituents — The mesocarp yields a yellow-to-red oil known as palm oil, which has a very balanced fatty acid composition: 51% saturated fatty acids, 38% monounsaturated fatty acids, and 11% polyunsaturated fatty acids. The major saturated fatty acid is 38–44% palmitic acid (C16:0) and 4–5% stearic acid (C18:0). Oleic acid (C18:1) represents 39–44% and linoleic acid (C18:2) 10–12% of the UFAs. It has been observed that the fatty acid composition in palm oil is quite remarkable, with the structure of the fatty acids on the triglyceride backbone in which the majority (87%) of the UFAs are situated in the sn-2 position, whereas the saturated fatty acids are mostly in the sn-1 and sn-3 positions.⁵³⁸ Normally, the sn-2 position monoacylglycerols are readily absorbed in the intestine.

This unique structure in the palm oil triglyceride backbone therefore ensures that the UFAs in the sn-2 position are mostly absorbed from the intestine and that the saturated fatty acids in the sn-1 and sn-3 positions ensure stability and protection against oxidation. In addition, it contains, among other things, glycerides of fatty acids with high molecular weights, including oleic acid (40–50%) and myristic acid (1–5%). The oil is rich in carotenoids (including vitamin A and β -carotene) and sterols. Raw unprocessed palm oil normally contains 500–700 ppm carotenoids, of which 35% is α - and 56% is β -carotene. The refined red palm olein, however, contains 513 ppm carotene, of which 44% is α - and 33.3% is β -carotene. Red palm oil contains high levels of provitamin E (600–1000 ppm), with 78–82% being tocotrienols and 18–22% tocopherols.⁵³⁹ It also elaborates the following phytonutrients: sterols (60–620 ppm), squalene (200–500 ppm), coenzyme Q10 (10–80 ppm), glycolipids (1000–3000 ppm), and triterpene alcohol (40–80 ppm). The kernel yields an oil (PKO) that is pale yellow to colorless and comprised of the following glycerides of fatty acid: lauric acid (50% of total fatty acids), myristic acid (15% of total fatty acids), oleic acid (15% of total fatty acids), and traces of linoleic acid and stearic acid.

Pharmacological Studies — Natural carotenes obtained from palm oil have been shown to suppress the promoting stage of two-stage carcinogenesis of mouse skin and also inhibit the proliferation of human malignant tumor cells, such as neuroblastoma GOTO cells, stomach cancer HGC-27 cells, and pancreatic cancer PANC-1 cells.⁵⁴⁰ The bright red nonsolid palm oil has strong antioxidant activity. Tocotrienols found in red palm oil are 40–60 times more potent than tocopherols as antioxidants. Red palm oil also has the highest content of tocotrienols of all edible oils, with rich bran oil as the only other edible oil that comes close, with just less than a third of the levels contained in red palm oil.⁵⁴¹

The extract of the leaves has been evaluated for possible antioxidant activities by 2,2-diphenyl- β -picrylhydrazyl free radical scavenging activity (DPPH), xanthine oxidase inhibition (XOI), nitric oxide scavenging activity (NOS), and hydrogen peroxide scavenging activity (HPSA) assays. It was found that the extract exhibited antioxidant activity with an IC_{50} value of 814 g/mL in the DPPH radical scavenging method, 534.04 μ g/mL in the NOS assay, 37.48 μ g/mL in XOI, and 1052.02 μ g/mL by the HPSA method based on the concentrations tested.⁵⁴²

PKO obtained from the seeds is used as a lubricant and emollient for damaged skin and as a suppository base. The soap prepared from the palm husk ash possesses antimicrobial properties.

EMBELIA SCHIMPERI

Botanical Name — *Embelia schimperi* Vatke

Synonyms — *E. abyssinica* Bak., *Pattara pellucida* Hiern

Family — Primulaceae

African Names — Kiru: gezi, Masai: os sumategi; Zulu: ibinini

Description — The plant is a climber with rough stems and conical protuberances. The fruits occur as globular, reddish-brown berries, with a small projection at the apex.⁷⁷

Ethnomedicinal Uses — The leaves are used as a food vegetable in East Africa, especially in Uganda. A decoction of the stem bark is used in Nigeria as an antispasmodic. The fruit is used by the Masai and Chagga as an anthelmintic. A related species, *E. kraussi* Harv., is used by the Zulu as a taeniicide. In East Africa, both the roots and stem bark are used for the same purpose. Watt and Breyer-Brandwijk indicated that various species of the genus are employed as an anthelmintic, and the berries are articles of commerce in markets in many parts of the region.⁷⁹ The Asian species *E. ribes* has long been used in Indian medicine as a carminative, anthelmintic, stimulant, and alterative.¹⁷⁵

Constituents — It contains about 6–7% of the active component embelin (2,5-dihydroxy-3-lauryl-*p*-benzoquinone) and also several naphthaquinones, resinoids, tannins, and an alkaloid

christembine. The plant also yields a toxalbumin. The yield of the active compound embelin is reported to be higher in this species than in the Asian species *E. ribes*.⁷⁸

Pharmacological Studies — Controlled clinical studies have showed that the alcoholic and aqueous extracts of *Embelia* were very effective against ascarides.⁵⁴³ The active constituent embelin and its derivatives (such as isobutyl-embelin and n-hexylaminoembelin) were active against the parasites *Paramphistomum cervi*, *Trichus ovis*, *Oesophagostomum columbianum*, and *Dipylidium caninum* at low concentrations within a contact period of 30 min.⁵⁴⁴ The diimines were found to be inactive.⁵⁴⁴ Embelin has also been investigated as an antifertility agent because of its remarkable properties of preventing implantation without being blastotoxic and also its estrogenic and progestogenic activity.^{545,546}

Toxicity — The plant may be toxic due to the toxalbumin content. Proper processing is essential to detoxify the extract.

EMILIA SONCHIFOLIA

Botanical Name — *Emilia sonchifolia* DC.

Synonyms — *Cacalia sonchifolia* Hort. ex L., *Crassocephalum sonchifolium* (L.) Less., *Gynura ecalyculata* DC.

Family — Compositae

African Names — Igbo: nti-ele; Swahili: mchekacheke; Yoruba: odundun-odo

Description — This is a straggling herb up to 90 cm tall, common in farmlands and open places in the forest, especially along paths and roadsides. The leaves, alternately arranged on the stem and branches, are 10 cm long and 5–7 cm broad and somewhat triangular in shape. They are deeply and irregularly lobed and clasp to the stem. The flowers are small (about 1.3 cm long and 7 mm in diameter), pinkish, and cylindrical in shape. They occur singly or sometimes in small clusters in the axils of the leaves or at the ends of the stem and branches. *Emilia* produces small, hairy achenes about 3 mm long.⁷⁷

Habitat and Distribution — It is a forest plant, distributed throughout western, central, and southeast Africa. The related species *E. sagittata* is common in the West Coast.

Ethnomedicinal Uses — In West Africa, the plant is employed as a leaf decoction for fevers. The juice from the crushed leaves is instilled in the eyes for the treatment of conjunctivitis. The leaves are used as an occasional vegetable for their laxative activity or eaten cooked in soup or fresh in salad as a health food. Infants are bathed with the decoction for the prevention of high fever and convulsions. It has also been used as an ingredient for the preparation of anti-inflammatory and wound-healing remedies.

Constituents — The flowers contain flavonoids, while alkaloids and phytosterols have been isolated from the whole plant. The major constituents include kaempherol-3-d-galactoside, quercitrin, quercetin, rutin, ursolic acid, senkirkine, doronine, β -sitosterol, and stigmasterol.

Pharmacological Studies — *Emilia* possesses antioxidant and anti-inflammatory properties. Fresh juice and methanolic extract of the leaves were found to be potent inhibitors of hydroxyl radical formation and superoxide radical generation *in vitro*.⁵⁴⁷ The methanolic extract inhibited the carrageenan-induced edema in rats.⁵⁴⁸ It has also been found to be cytotoxic to DL, Ehrlich ascites carcinoma (EAC), and mouse lung fibroblast (L-929) cells, but not toxic to normal human lymphocytes, under *in vitro* conditions. Oral administration of the extract (100 mg/kg body weight) to mice reduced the development of both solid and ascites tumors and increased the life span of these tumor-bearing mice. The same methanol extract inhibited DNA synthesis, as shown from a reduction in tritiated thymidine incorporation into DL cells *in vitro*.⁵⁴⁹

Emilia sonchifolia exhibited pronounced opioid-mediated antinociceptive activity action in mice. At test doses of 100 and 300 mg/kg p.o., *Emilia* extract clearly demonstrated antinociceptive

activity in all tests. The extract had a stronger antinociceptive effect than morphine. Administration of the opioid receptor antagonist naloxone completely inhibited the antinociceptive effect induced by the extract (100 mg/kg).⁵⁵⁰ This effect is indicative of the biochemical rationale for the probable use of *Emilia* in the treatment of inflammatory hyperalgesic disorders.

ENTADA ABYSSINICA



Botanical Name — *Entada abyssinica* Steud. ex A. Rich

Synonyms — *Pusaetha abyssinica* (Steud. ex. A. Rich.) Kuntze, *Entadopsis abyssinica* (Steud. ex A. Rich.) Gilb. & Bout.

Family — Leguminosae

African Names — Ashanti: ekur, sankwituri; Bron: sankasaa, kuboya; Dagbani: chienchienga, zuguli-kukui; Igbo: angara-miri; Rwanda: umusange, umusangasange; Kinyamawezi: mfutambula; Kirangi: ijwekwe; Kizinza: musangisangi; Kibende: mubunda; Kirangi: mwulamvula; Kiluguru: mvulamvula; Kihene: mugelagela; Kinyaturu: mumbu; Musagaruzi Nandi: katutet; Sebei: mus-iembu, masiembet; Kakamega: musamba; Bemba: mulalatanga, mulalatete; Kaonde: mukumb-wangombe; Lozi: fumbwamusowo; Lunda: muzenze; Nyanja: chisekele, chongololo; Tonga: musenzenze, mumnye; Yoruba: gbengbe

Description — *Entada abyssinica* is a deciduous tree, 3–10 m high with flat, spreading crown. The bark is slightly fissured and flakes off in irregular patches; the bark is gray to reddish in color, with a pink slash with streaks of red; branchlets are pendulous, glabrous, or sometimes pubescent. The leaves are alternate, bipinnate, with stipules absent; pinnae are 1–22 pairs, leaflets are 15–55 pairs, mostly linear-oblong, 3–14 mm long, 1–4 mm wide, with apex rounded to slightly obtuse and slightly mucronate, appressed pubescent above and below or sometimes glabrous above, rarely entirely glabrous; petiole is glandular. Inflorescence is 1–4 axillary racemes 7–16 cm long (including the 0.4- to 1.5-cm peduncle). It produces cream-white, sweet-scented flowers; the fruits are large flat legumes, 15–39 cm long, 3–9 cm wide, subcoraceous, straight or nearly so, with no apparent

seed segments. The seeds are oval, flat, 10–13 mm long, and 8–10 mm wide with splitting between each seed, leaving the pod-rim and forming a wing to the seeds.^{9,33}

Habitat and Distribution — The plant occurs widely throughout the savanna belt of tropical Africa. It adapts to a variety of soils, from loams to clay loams and sometimes friable clays over laterite at altitudes from 60 to 2290 m. The mean annual rainfall is between 500 and 1270 mm. It has been located in Ghana, Benin, Mali, Guinea, Sierra Leone, Ivory Coast, Burkina Faso, Togo, Nigeria, Cameroon, Central African Republic, Zaire, Rwanda, Burundi, Sudan, Ethiopia, Angola, Uganda, Tanzania, Mozambique, Malawi, Zambia, and Zimbabwe.

Ethnomedicinal Uses — *Entada* has been used in southern Africa for the treatment of severe bronchitis and persistent coughs. A decoction of the roots is administered to alleviate arthritic pains.⁴⁸² According to Matt and Breyer-Brandjwik,⁷⁹ the plant is used in the treatment of miscarriage; the leaf is used against fever and abdominal pain. The juice of the bark and of the cambium has been used as an ordeal poison instilled under the eyelid. A weak solution prepared with roasted seeds has been applied for eye inflammation. It is used in East Africa for sleeping sickness and malaria. In Burundi, *Entada* (*Umusange*) is burned, and the smoke is inhaled for the treatment of severe headache.

Constituents — The root contains saponins and an alkaloid. Rotenone has been reported from the species.⁵⁵¹

Pharmacological Studies — The leaf infusion at a 1:1000 concentration has been shown to be lethal to the goldfish *Carrasius auratus* after a 12-h exposure but not toxic to guinea pig at doses of up to 5 g/kg.⁵⁵¹ The defatted methanolic extract has been evaluated for anti-inflammatory activity in acute and chronic models of inflammation. The extract (50–200 mg/kg p.o.) exhibited dose-dependent and significant inhibition of both the carrageenan-induced rat paw edema and granuloma tissue formation in rats. The extract (50–200 mg/kg p.o.) was also found to inhibit the acetic acid-induced vascular permeability in a dose-dependent fashion in mice.⁵⁵²

Bioassay-guided fractionation of the dichloromethane root bark extract of the plant led to the isolation of a diastereoisomer of the clerodane-type diterpene kolavenol with a trypanocidal activity of IC₅₀ value of 2.5 µg/ml (8.6 µM) against *Trypanosoma brucei rhodesiense*, the causative agent of the acute form of human African trypanosomiasis.⁵⁵³

ERYTHRINA SENEGALENSIS



Botanical Name — *Erythrina senegalensis* DC

Synonyms — *Chirocalyx latifolius* Walp., *Duchassaingia senegalensis* (DC.) Hassk.

Family — Leguminosae

Common Names — Coral flower, parrot tree

African Names — Bini: eranigbonyakehi; Efik: edeng; Hausa: majiriya; Igbo: echichi; Masai: al oboni; Ndebele: umkawana, ummpumbuluku; Shona: munyanyudza; Yoruba: ologun sheshe; Tiv: showoh

Description — *Erythrina senegalensis* is a medium-size shrubby tree, 3–4.5 m high but sometimes growing up to 15 m in height and 1.5 m in girth, and prickly. The bark is very rough and fissured, becoming remarkably so in old trees. It has crooked branches with an irregular crown; the thorns on the old wood are slightly curved, with thick woody bases. The slash is yellowish, turning brown on exposure to air. The leaves are rather variable in shape and size, with three leaflets 15 × 10 cm, with the central leaflet the largest. They are usually lanceolate to broadly ovate, glabrous, and sometimes with prickles on the midrib. The flowers are produced September–January in slender racemes up to 30 cm long and scarlet, but they turn black over time. The petals are about 2.5–5 cm long, and when leafless, are folded very flat so that the stamens are hidden. The pods are about 12 cm long and irregularly constricted but usually between seeds; the seeds are red, glossy, with a white hilum about 0.6 cm long.^{8,28,33}

Habitat and Distribution — The species is a common savanna tree, occurring on the banks of streams and sometimes planted for its medicinal properties. It is distributed from Senegal to Cameroon and also grows in Kenya, Tanzania, Zimbabwe, and Ethiopia.

Ethnomedicinal Uses — The root infusion is used in Nigeria as a toothache remedy and in the Ivory Coast for venereal diseases. The stem bark is employed extensively in traditional medicine, and several trees in homesteads are often stripped of the barks. The aqueous extract of the bark is used for the treatment of jaundice in northern Nigeria; an infusion mixed with lime and pepper is administered for venereal diseases. A decoction of the bark has been used for the treatment of bronchial infections, coughs, and throat inflammation. The pounded bark and leaves are used in soups to treat female infertility. Extract of the bark is given to women during childbirth; in Guinea, it is administered after delivery, whereas in Nigeria it is given to women during labor to ease pain. The wood is reputed to be an aphrodisiac. In central Africa, infusion of the bark and roots is used as an enema for fevers, inflammation, and stomachache.

Constituents — The plant yields alkaloids with curariform activity, collectively known as *Erythrina* alkaloids. The major ones include α - and β -erythroidine, erysodine, erysovine, erysotrine, and erysopine. Over 30 alkaloids have been recorded from the genus, and in *E. senegalensis*, erysodine represents 50% of the total alkaloids.^{78,554}

Pharmacological Studies — The *Erythrina* alkaloids have been extensively evaluated for their curarizing effects. Earlier studies showed that, based on grams of frog curarized per gram of seed, the species has a value of 20,000 versus 44,000 IU for the related *E. sigmoidea*.⁵⁵⁵ The alkaloids, which have the advantage of being active when taken orally, have been found useful as muscle relaxants in a number of clinical applications, such as for the control of convulsions; as an adjunct to general anesthesia, especially to relax muscles of the abdominal wall; and in electroconvulsive therapy.^{428,556} The mechanism of action of the *Erythrina* alkaloids is similar to that of curare, the paralyzing effect being due to synaptic blockage of the nervous impulse traveling toward the skeletal muscle, without CNS involvement. Unlike curare, which is excreted in the urine, alkaloids of *Erythrina* are excreted in various ways, and the paralyzing effect is useful in various surgical procedures in which temporary muscular relaxation is required. β -Erythroidine has been shown to compete with acetylcholine, and its curare-like effect is inhibited if quaternization of the nitrogen in its molecule is modified.

It has been shown that a relationship exists between the structure of *Erythrina* alkaloids and their biological activities, with the sulfoacetic esters of erysovine and erysopine, as well as erysothiovine

and erysothiopine, consistently more active than the free bases;⁵⁵⁷ the quaternary bases are, however, of shorter duration. Other activities of the alkaloids include CNS depression, neuromuscular blocking, anticonvulsant activity, and hydrocholerectic effects.^{428,558,561}

EUCALYPTUS GLOBULUS

Botanical Name — *Eucalyptus globulus* Labill.

Synonyms — *Eucalyptus abbreviata* Blakely & Jacobs., *Eucalyptus acervula* Hook. f., *Eucalyptus cannonii* R.T. Baker

Family — Myrtaceae

Common Names — Eucalyptus leaf, blue gum tree (E), eucalyptus (F)

African Names — Arabic: kafur; Hausa: Igbo: nkwu-ishi; Swahili: mti- ulaya

Description — They are very tall trees with straight trunks that often have white peeling bark; sometimes, they attain a height of up to 100 m. The leaves are orbicular, with a bluish or silvery surface, and exude a fragrance when crushed; they measure about 230 cm in length and 4 cm in width and are ensiform, acute, entire, coriaceous, brittle, and punctate. The inflorescence is umbellate with white flowers. The plant produces capsular fruits. It has an agreeable and aromatic odor, and the taste is aromatic, pungent, and slightly bitter.

Habitat and Distribution — This is a subtropical plant that originated from New South Wales and Queensland but was introduced in Africa as a cultivated crop. This and related species, such as *E. citriodora*, *E. divans*, and *Eismithii*, are cultivated in many parts of the continent, especially in well-drained subtropical and Mediterranean regions.

Ethnomedicinal Uses — The leaves of *Eucalyptus* are employed as a remedy for colds. They are also ingredients in the potherb used as steam therapy for malaria.

Constituents — The plant contains up to 3% volatile oil, the major constituents of which are cineole, together with tannin, a bitter principle, and resin. The oil also contains (+)- α -pinene, phellandrene, geraniol, alkyl aldehydes, methyl cinnamate, and a variety of terpenes.

Pharmacological Studies — The essential oil has been found to possess antimicrobial (including antitubercular) activity.^{559,560} The plant is listed in the *Martindale Extra Pharmacopoeia* for catarrh and as a rubefacient.²⁰⁵

Toxicity — Side effects of excessive eucalyptus consumption include nausea, vomiting, dizziness, muscular weakness, and a feeling of suffocation. Fatality due to severe poisoning is known.²⁰⁵

EUPHORBIA (MILKWEEDS)

Three species of *Euphorbia* are common in Nigeria: *E. desmondi* and *E. kamerunica*, which are medium-size trees, and *E. hirta*, a small herb. Other species are described in specialized textbooks of economic botany; they include *E. aegyptiaca*, *E. balsamifera*, *E. convolvuloides*, and *E. lateriflora*. The three species mentioned first are all considered important, but *E. hirta* is by far the most widely used in the preparation of traditional remedies. There is little problem in differentiating *E. hirta* from the other two species, although *E. hirta* is practically indistinguishable from *E. convolvuloides*. Since in traditional medicine both plants are not distinguished in their use, the drug euphorbia should apply to both *E. hirta* and *E. convolvuloides*. All the species produce irritant milky sap.

EUPHORBIA HIRTA

Botanical Name — *Euphorbia hirta* Linn. Syn. *E. pilulifera*

Synonyms — *Chamaesyce gemella* (Lag.) Small., *Desmonema hirta* (L.) Raf., *Ditritea hirta* (L.) Raf., *Tithymalus pilulifer* (L.) Moench

Family — Euphorbiaceae

Common Names — Asthma herb, malomen, Australian asthma herb, malomay

African Names — Hausa: nonan kurchiya; Igbo: udani; Yoruba: ege-ile, emi-ile; Efik: etinkeni-ekpo; Bini: asen-uloko; Tivi: mbasombol mange; Bari: like babe

Description — *Euphorbia hirta* is a herb that grows to about 20–30 cm, with more or less erect branches, spreading from a near-erect base and bearing yellowish hairs. The leaves are opposite and in pairs, arising from somewhat swollen nodes. They measure about 4.5 cm long and 1.5 cm broad; they are ovate to rhomboid, unequal sided at the base, and serrulate.¹³⁶ The flowers are stalked globose clusters. The fruits occur as single stalked capsules.

Habitat and Distribution — *Euphorbia hirta* is widespread and common throughout the continent.

Ethnomedicinal Uses — An aqueous decoction of the plant is used for the treatment of acute enteritis and dysentery. The latex is instilled into the eye for the treatment of conjunctivitis. The plant has a reputation as a remedy for bronchitis and asthma, and it is listed in the (British) *Martindale Extra Pharmacopoeia*²⁰⁵ (pp. 599–560) for the treatment of coughs and asthma in the form of a liquid extract or tincture. Other uses include those for increased lactation, as a tonic anthelmintic, for treatment of wounds and tumors, and as an anticonvulsant, mild sedative, and antimicrobial agent. The plant is slightly narcotic.

Constituents — The latex contains I-inositol, pyrogalllic, and catechuic tannins and an alkaloid xanthorhamnine.⁷⁸ Taxerol, friedelin, β -sitosterol, myricyl alcohol, ellagic acid, and hentriacontane have been isolated from the stem extracts.⁵⁶¹ A number of amino acids and ellagic gallic, chlorogenic, and caffeic acids have been reported as occurring with the flavonoids kaempferol, quercitol, and quercitrin in the plant.⁵⁶¹ Arthur indicated the presence of hydrogen cyanide and a triterpenoid in the herb.⁵⁶² For the constituents and uses of the Asian species, please consult the work of Perry.²²⁶

Pharmacological Studies — It has been shown that the plant contains two active principles, one exerting a spasmodic or histamine-potentiating activity and the other an antispasmodic property.⁵⁶³ The antispasmodic principle was identified as shikimic acid and the contracting principle as choline by EI Nagggar and his colleagues; they also isolated iso-inositol, glucose, and sucrose.⁵⁶⁴ An alcoholic extract of the aerial parts of this herb, containing shikimic acid, produced relaxation of the guinea pig ileum and was used in the treatment of asthma, hay fever, bronchitis, and other respiratory conditions. The extract showed an antispasmodic effect on the smooth muscles of mice and guinea pigs and was effective in clinical trials for the treatment of amebic dysentery.⁵⁶⁵ A single oral treatment appeared to be long lasting and produced remissions in 83% of the cases treated for up to 6 months. The hypoglycemic activity of the plant and its antiprotozoal effects have been reported.⁵⁶⁶ The alcohol extract also showed activity against leukemia virus in mice. A maximum dose of 1 g/kg p.o. has been recorded as tolerated by mice.

The drug appears to be well tolerated and was a proprietary product in both Europe and the United States.⁷⁸ The processed extract was reported to be 20 times more active than the crude extract when tested against *Entamoeba histolytica*. It does appear that the activity of *Euphorbia* is due to a wide range of compounds rather than a single isolate; it is therefore necessary to intensify efforts at the purification of the extracts along the lines suggested by Ndir and Pousset.⁵⁶⁷ *Euphorbia* was previously accorded official status (B.P.C. 1954, Indian P.C., N.F. 1939) and was withdrawn because of reports of toxicity.

GARCINIA KOLA



Botanical Name — *Garcinia kola* Heckel

Synonyms — *Garcinia akawaensis* Spirlet., *Garcinia bergheana* Spirlet

Family — Clusiaceae

Common Names — Bitter kola, false kola, male cola

African Names — Bini: edun; Efik: efiari; Ibibio: efiat; Igbo: akilu, aki-inu, adi, akara-inu, ogolu; Ijaw: okan

Description — *Garcinia kola* is a medium-size tree, but sometimes grows up to 12 m tall and 1.5 m wide. It is a spreading tree with a dense and heavy crown; the bole is straight; the bark is greenish brown, thick, and smooth. It has broad leaves, 5–10 cm long, elongated elliptic to broadly elliptic, acute or shortly acuminate, cuneate, leathery, with very distinct resinous canals. It has 10 pairs of lateral veins that run parallel to the margin but not forming a marginal nerve; the midrib is prominent at the underside; the stalk is stout, finely hairy in young leaves, and about 8 mm long.¹⁶⁸ It bears male and female flowers separately, usually December–March and May–August. Female flowers are yellow and fleshy, globose, 1.5 cm wide; male flowers are smaller but with more prominent stamens (4 bundles), 4 sepals, and 4 greenish-white petals. It produces characteristic large fruits (6 cm in diameter), with the size and color of an orange, containing 2–4 brown seeds embedded in an orange-color pulp.⁹

Habitat and Distribution — It is found in moist forests and cultivated in homesteads. It is distributed throughout West and Central Africa and has been located in Sierra Leone, Ghana, Nigeria, Cameroon, and Congo.

Ethnomedicinal Uses — It is used extensively in traditional medicine for the treatment of various diseases. The drug is chewed in southern Nigeria and parts of West Africa as a masticatory, in spite of its very bitter taste. The stem bark is used as a purgative, and the powdered bark is used for the treatment of malignant tumors. The sap is used for parasitic skin diseases. The latex (gum) is used internally for gonorrhea treatment and applied externally to fresh wounds. The twigs of *G. kola* can be used as tapers, and the roots yield the favorite bitter chew sticks sold in small bundles in local markets in West Africa. The seeds are used to prevent or relieve colic, cure head or chest colds, and relieve cough. The seeds are chewed as an aphrodisiac and the dried nuts for dysentery treatment. The seeds are also used in the treatment of diabetes, bronchitis, and throat infections. The plant has been employed in the treatment of liver disorders.⁵⁶⁸ The peeled stem and twigs are cut into small pieces and placed into a bottle of local gin, which is allowed to “mature” over a couple of days for drinking as an aphrodisiac. The alcohol is replenished several times until the resultant infusion becomes colorless.

Constituents — *G. kola* and other members of the genus are known to elaborate a complex mixture of phenolic compounds, including biflavonoids, xanthenes, and benzophenones.^{569–571} The most important constituents of the plant include the antimicrobial benzophenone, kolanone,⁵⁷² and biflavonoids based on eridictoyl/taxifolin moiety GB1, GB2, GB3, kolaflavanone, and garciniflavanone.^{573,574} The seeds also contain the chromanols garcinoic acid and garcinal and their derivatives, as well as tocotrienol.⁵⁷⁵

Pharmacological Studies — *G. kola* has been shown to possess remarkable antihepatotoxic activity against a variety of experimental hepatotoxins, including carbon tetrachloride, 2-acetylaminofluorene, paracetamol, and galactosamine,^{576–581} and protection against the accumulation of heavy metals in the liver.⁵⁸² Chronic ingestion of *G. kola* seeds caused inhibition of gastrointestinal motility and weight reduction and prevented castor oil-induced diarrhea in rats.⁵⁸³ Other activities of the biflavonoid mixture include those involving anti-inflammatory, antimicrobial, antidiabetic, and antiviral properties.^{584–586} The antiviral activity is quite broad and showed remarkable inhibitory effects against a variety of viruses, including Punta Toro and Pichinde viruses, sandfly fever, influenza A, Venezuelan equine encephalomyelitis, and ebola. The IC₅₀ values are in the range of 7.2–32 µg/ml with an MTC of more than 320 µg/ml.⁵⁸⁷

The seed extract and the dried powder have been formulated into various dosage forms, including tablets, lozenges, creams, vials, and toothpaste.⁵⁸⁸ The biflavonoids also possess antidiabetic activity and inhibited the activity of rat lens aldose reductase.⁵⁸⁹ Examination of the liver, kidney, and duodenum of rats fed a diet containing 10% (w/w) dry powdered seeds of *G. kola* for 6 weeks has been reported as revealing some histological alterations in these organs.⁴⁶⁵ Studies indicated a possible role in the treatment of dermatological disorders associated with melanin hyperpigmentation. The methanol extract and a *Garcinia* biflavonoid displayed inhibitory activity (>60%) against tyrosinase (E:C:1.14.18.1), the rate-limiting enzyme in melanin synthesis.⁵⁹⁰

Kolaviron, the mixture of biflavonoids, benzophenones, and chromanols, as well as other phenolic compounds in *G. kola*, possesses strong antioxidant activities. Several reports on the experimental validation of the antioxidant properties of *Garcinia* are due essentially to kolaviron. An evaluation of the antioxidant properties of garcinoic acid (structurally similar to vitamin E) and its congeners, including investigation of the structure-antioxidative activity relationships, identified a semisynthetic derivative with antioxidant activity that was 18.7 times stronger than dl- α -tocopherol.⁵⁹¹ The aqueous extract showed antidiabetic activity in hyperglycemic rats.⁵⁹² At a concentration of 200 mg/kg body weight, over a period of 21 days, the extract significantly ($p < 0.05$) decreased the blood glucose level and increased the activity of SOD ($p < 0.05$) and that of malondialdehyde (MDA) ($p < 0.05$). The extract, however, had no significant effect ($p > 0.05$) on the activity of CAT.

The clinical outcome observations on the phytomedicines prepared from the standardized whole seeds or extracts of *G. kola* seem to support the laboratory findings reported and the use of the plant as an adaptogen. Its bronchodilatory effect has been evaluated with a clinical study of 19 male adults. The only respiratory parameter changed by 15 g of *G. kola* was a peak expiratory flow rate, indicating a mild bronchodilatory effect.⁵⁹³ Observational studies at the International Centre for Ethnomedicine and Drug Development (InterCEDD) Nsukka (Nigeria) indicated potential application as a remedy for colic in dysentery, liver disorders, upper respiratory infections, asthma, cough, sore throat, laryngitis, arthritis, menstrual and intestinal cramps, and headache. Topical uses awaiting clinical validation include its use as a wound dressing, as an antiparasitic lotion, and in oral hygiene (as a chewing stick). The possible clinical uses for *Garcinia* based on the analysis of the studies include its use as an antiviral, antihepatotoxic, and immune booster in cases of flu and liver and respiratory diseases, as antioxidant, and in the management of diabetes.

Toxicity — No serious adverse effects have been reported following the consumption of *Garcinia*. In response to the public health concern in West Africa about the long-term use of

Garcinia and in view of the presence of a complex mixture of phenol compounds in *Garcinia kola* seed, investigators at the University of Ibadan's (Nigeria) College of Medicine evaluated the hepatic, testicular, and spermatozoa antioxidant status in rats chronically treated with *Garcinia kola* seed. It was observed that long-term treatment with *Garcinia kola* had no adverse effect on the spermatozoa characteristics but significantly elevated testosterone concentration when compared to the control group. Improvement of antioxidant systems was accompanied by a significant decrease in MDA level in the liver, testes, and spermatozoa of *Garcinia kola*-treated rats. Histological observation revealed that chronic administration of *Garcinia kola* had no effect on the liver and testes at all doses when compared with the control.⁵⁹⁴

GLYCYRRHIZA GLABRA



Botanical Name — *Glycyrrhiza glabra* L.

Synonyms — *Glycyrrhiza glabra* L. var. *typica* Reg. et Herd., *Liquiritia officinalis* Moench.

Family — Leguminosae

Common Names — Liquorice (E), reglisse, bois dous, racine douce, herbe aux tanneurs (F)

African Names — Arabic: irksos

Description — *Glycyrrhiza glabra* is a perennial herb or subshrub, 1–2 m tall, with long, highly developed stoloniferous roots. The leaves are compound alternate imparipinnate from 9 to 17 leaflets. It produces flat pods of 2 × 6 mm. Three varieties of *C. glabra* are known in commerce: *C. glabra* L. var. *typica* Reg. et Herd., *G. glabra* var. *glandulifera* Wald. et Kit, and *C. glabra* var. *vislacea*.

Habitat and Distribution — The plant is a temperate crop, cultivated in the arid regions around the Mediterranean basin of North Africa and parts of southeastern countries.

Ethnomedicinal Uses — In North Africa, the plant is used mainly as a cough remedy and to prevent extreme thirst in desert areas. In southern and eastern Africa, it is used as a remedy for appendicitis and pulmonary tuberculosis and as a lotion for eye diseases.⁷⁹

Constituents — The principal constituents of liquorice are glycyrrhizin and oleanane triterpene glycosides, also known as glycyrrhizinic or glycyrrhizic acid. The aglycone is glycyrrhetic acid (or glycyrrhithic acid). Co-occurring with glycyrrhizin are the terpenes liquiritic acid, glycyrrhetol, glabrolide, and 28-hydroxyglycyrrhizinic acid.^{595,596} The plant also contains flavonoids, including liquiritin, rhamnoliquiritin, licoflavone, licoisoflavones A and B, licoisoflavonone, glabrol, glyzarin, formononetin, and liquiritigenin.^{597,598} Chalcones, such as lichochalcones A and B, liquiritigenin, licuraside, and echinatin, have been isolated from liquorice.⁵⁹⁹ Other constituents include glucose, amino acids, and volatile oil consisting of fenchone, linalone, furfuryl alcohol, and benzaldehyde.¹²³

Pharmacological Studies — Liquorice has been employed in the treatment of a variety of illnesses and the pharmacological properties ascribed to the drug reflect the varied uses and heterogeneous nature of the constituents. The plant drug is an effective anti-inflammatory agent, demulcent, expectorant, antitussive, spasmolytic, antiviral, immunostimulant, and therapeutic agent in the treatment of adrenocortical insufficiency. It is difficult to select any of these actions as the most important property of liquorice, although the focus in this section is on the anti-inflammatory activity of the drug; references are made to some of its other pharmacological and biochemical properties. Its potential use for treatment of human acquired immune deficiency syndrome (AIDS) and its antiviral properties are subjects of ongoing research.

Glycyrrhizin and its aglycone, glycyrrhetic acid, have been shown to possess remarkable anti-inflammatory activity.^{600,601} It inhibited edema induced by formaldehyde and carrageenan, as well as activity against cotton pellet granuloma, granuloma pouch, and tuberculin reaction in BCG-sensitized guinea pig.⁶⁰⁰ In the carrageenan-induced edema model, an ED₂₅ of 30 mg/kg for glycyrrhetic acid was reported. It was also found to have an inhibitory effect on mononuclear leukocyte migration in dextran shown to inhibit both the COX and 5-LOX pathways in AA metabolism.⁶⁰² In AA-induced mouse ear edema, it was found that the hemiphthalate derivatives were more active than the parent compound, and the effect appears to be due to a direct anti-inflammatory action rather than modulation of steroid-mediated antiphlogistic activity through secondary formation of a reactive protein.⁶⁰³ Inoue and his colleagues have demonstrated a similar effect on 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced ear edema.⁶⁰⁴ Glycyrrhizin is also an effective antiallergic agent. The aglycone has been shown to inhibit almost completely the dexamethasone-induced increase in both the histamine content and histidine decarboxylase activity of cultured mastocytoma P-815 cells at a dose of [³H]dexamethasone binding to the cytoplasmic receptor, but it inhibited the release of histamine from antigen-stimulated rat mast cells and intensified the inhibitory activity induced by dexamethasone. It also inhibited antigen-induced release and incorporation of [³H]dexamethasone AA in immunized rat mast cells.⁶⁰⁵

The anti-inflammatory activity of *Glycyrrhiza* is not due to the triterpenoid constituents alone. The chalcones licochalcone A (2-methoxy-4,4-dihydroxy-5,7-dimethylallylchalcone) and licochalcone B (2-methoxy-3,4,4-tri-hydroxychalcone) at concentrations of 10⁻³ to 10⁻⁶ M, inhibited calcium ionophore A23187-induced LTB₄ and LTC₄ formation in human PMN leukocytes.⁶⁰⁶ It has previously been shown that the nonglycyrrhetic acid-containing (but flavonoid-rich) fraction of liquorice had anti-inflammatory activity, especially AN antigastric effect that is independent of that attributed to the terpenoids.⁶⁰⁷ An IC₅₀ of 4.6 × 10⁻⁷ was reported for licochalcone A in the leukotriene inhibition assay, and 4.2 × 10⁻⁶ M of licochalcone was required for the same purpose. The two chalcones also increased the cyclic AMP level in human PMNs at concentrations of 10⁻⁴ to 10⁻³ M and induced by calcium ion ionomycin dose dependently, in the presence of 1 mM Ca²⁺ or 1 mM EGTA (ethyleneglycol-bis(β-aminoethylether)-N,N'-tetraacetic acid).²²⁹ In addition to the anti-inflammatory activity of *glycyrrhiza*, most of the other therapeutic applications associated with

the drug have been confirmed by the results of laboratory and clinical studies.^{608,611} In essential hypertension, glycyrrhizin caused a marked reduction in elevated plasma renin activity, with a concomitant reduction in serum potassium concentration and plasma aldosterone.

The antitussive properties have been evaluated using the water-extracted (WE) polymeric fraction of *Glycyrrhiza glabra*. This arabinogalactan protein-enriched fraction, 85% or more of which becomes precipitated with Yariv reagent, consisted mainly of 3- and 3,6-linked galactopyranosyl and 5- and 3,5-linked arabinofuranosyl residues. Per oral administration of this polymer in a dose of 50 mg/kg body weight decreased the number of citric acid-induced cough efforts in guinea pigs more effectively than codeine. It did not induce significant change in the values of specific airway resistance or provoke any observable adverse effects.⁶⁰⁹

The cardioprotective effect of *Glycyrrhiza glabra* against ischemia-reperfusion (I-R) injury induced by ligation of the left anterior descending coronary artery (LADCA) in rats has been reported.⁶¹⁰ Ligation of the LADCA for 45 min followed by 60 min of reperfusion has induced significant ($p < 0.05$) heart dysfunction as evidenced by a significant ($p < 0.05$) decrease in mean arterial pressure (MAP), heart rate (HR), and contractility; (+)LVdP/dtmax and relaxation; and (–)LVdP/dtmax along with increased left ventricular end diastolic pressure (LVEDP). Ligation induced I-R injury also significantly ($p < 0.05$) decreased myocyte injury enzymes, creatine phosphokinase-MB (CK-MB) isoenzyme, and lactate dehydrogenase (LDH) as well as antioxidant enzymes; and SOD, CAT, and glutathione peroxidase (GSH-Px). Furthermore, I-R injury also induced lipid peroxidation, as evidenced by significant ($p < 0.05$) increase in malondialdehyde (MDA) formation and histological perturbations concomitant to depletion of GSH from the heart. However, pretreatment with *G. glabra* significantly ($p < 0.05$) prevented the depletion of the antioxidant enzymes; SOD, CAT, GSH-Px, and myocyte injury marker enzymes; CK-MB isoenzyme and LDH. Pretreatment with *G. glabra* also prevented GSH depletion and inhibited lipid peroxidation in the heart. In addition to improving biochemical indices of myocardial function, *G. glabra* significantly ($p < 0.05$) reinstated MAP, HR, (±)LVdP/dtmax and attenuated an abrupt rise in LVEDP. Histopathological preservation evidenced by reduced infiltration of cells and myonecrosis depicted the myocardial salvaging effect of *G. glabra*. These findings suggest the cardioprotective potential of *G. glabra* against myocardial infarction by amelioration of oxidative stress and favorable modulation of cardiac function.

Clinical Properties — Clinical reports on glycyrrhizin, its aglycone, or any of the semisynthetic derivatives are usually listed under the generic name of carbenoxolone, which is actually the name of the semisynthetic succinic acid ester of 18-glycyrrhetic acid. Clinical studies have shown that liquorice exerts an inhibitory activity against prostaglandin and thromboxane synthesis in humans.⁶¹¹ The drug is used as oral tablets at a dose of 5–10 g or is incorporated into tropical preparations for the treatment of skin diseases. Liquorice roots are used in Japan and China in the treatment of allergic inflammation and atopic dermatitis.⁶⁰⁶ Its deoxycorticosterone effects have led to its use in the treatment of rheumatoid arthritis, Addison's disease, and various inflammatory conditions. It is a major ingredient in the Japanese Kampo drugs and features in nearly every Kampo prescription included in recent reviews.⁶¹² In the drug preparation called Shakuya-du-kanzo-to (Tj-68), glycyrrhiza root and peony root are used in equal proportions in the treatment of inflammation and hyperandrogenism. Other clinical uses of glycyrrhiza, including the treatment of gastric ulcer, cancer, and AIDS, are discussed elsewhere in related texts on phytotherapy. Its use for the treatment of ulcer may be due partly to its effect on adhesion of harmful organisms to gut. It has been shown that an aqueous extract (1 mg/ml) of *Glycyrrhiza glabra* significantly inhibited the adhesion of *Helicobacter pylori* to human stomach tissue.⁶⁰⁹ This effect was related to the polysaccharides isolated from the extract, with one purified acidic fraction (0.25 SPB) as the main active polymer. Purified polysaccharides did not exhibit direct cytotoxic effects against *Helicobacter pylori* and did not influence hemagglutination. In addition, raw polysaccharides from *Glycyrrhiza glabra* were shown to have strong antiadhesive effects against *Porphyromonas gingivalis*.¹⁰⁷⁸

Pharmacokinetics — Glycyrrhizin is well absorbed in the gastrointestinal tract. A clinical evaluation with human volunteers²³⁴ used the enzyme immunoantibody technique to measure the disposition of the compound and its aglycone.⁶⁰⁰ It was found that the time required for maximum serum concentration of glycyrrhizin was less than 4 h after oral administration of a decoction of liquorice containing 133 mg of glycyrrhizin. Most of the drug was eliminated from the blood in the majority of the cases within 72 h. The aglycone reached a maximum serum concentration at about 24 h, and in two of the five cases, the glycyrrhetic acid was still detected in the blood after 96 h. It was interesting to note from the study that in the two clinical cases with symptoms of pseudoaldosteronism by liquorice, glycyrrhetic acid levels were up to 70–80 mg/ml, whereas the serum levels of the glycosides were comparatively low. It is probable that pseudoaldosteronism is restricted to the use of the aglycone and not the glycoside.

Glycyrrhizin has been shown to bind with intracellular and serum-binding proteins. In rabbits, the inhibitor constant values for glucocorticoid receptor binding (dissociation constant of 1.0 nmol/l) in the liver cytosol were found to be 2.0 nmol/l for glycyrrhizin and 1.7 nmol/l for glycyrrhetic acid, and for the mineralocorticoid receptor binding (dissociation constant = 1.1 nmol/l) in the livercytosol, they were 3.5 nmol/l for glycyrrhetinic acid and 3.0 nmol/l for glycyrrhizin.⁶¹⁴ It follows that the activity of glycyrrhizin is due, at least in part, to its effect on glucocorticoid and mineralocorticoid receptors. The compounds did not show any significant effect on estrogen receptors or serum sex hormone-binding globulin.⁶¹⁴

Glycyrrhetinic acid hydrogen succinate (GAHS) as the disodium salt has been found to be well absorbed by nasal instillation, and it was also observed that nasal absorption of insulin was greatly enhanced by the presence of 1% GAHS.⁶¹⁵

Toxicity and Adverse Reactions — Liquorice is well tolerated, and not many serious side effects have been reported when used within normal therapeutic dosage ranges. Most of the adverse reactions are due to hypersensitivity to liquorice, and the few cases of toxicity have been associated with excessive doses. Epstein and his colleagues reported a case of a woman who consumed 30 to 40 g of liquorice daily for 9 months as a starving diet to control her obesity. Her serum potassium level fell to about 1–6 mEq/l, and her urine was dark brown and contained myoglobin. She was reported as lethargic, with dulled reflexes, and had flaccid weakness. She also suffered from sodium retention, which resulted in hypertension, and high aldosterone levels.⁶¹⁶ Cumming et al. have also reported another case of a patient who, after taking as little as 150 mg glycyrrhetic acid per week, showed symptoms of hypokalemia (1.2 mmol/l) and flaccid quadriplegia.⁶¹⁷

It is believed that the observed pseudoaldosteronism associated with glycyrrhizin intoxication is due to the inhibitory effect of liquorice on 11 β -hydroxysteroid dehydrogenase. The results of clinical and laboratory experiments supported this conclusion.⁶¹⁸

GNETUM AFRICANUM

Botanical Name — *Gnetum africanum* Welw.

Synonym — *Thoa africana* (Welw.) Doweld

Related Species — *Gnetum buchholzianum* Engl.

Family — Gnetaceae

Common Names — Gnetum, eru

African Names — Efik (Nigeria): áfàng; Ibibio: afang; Igbo: okazi, ukazi; Yala (Ogoja, Nigeria): eruru; Yoruba: àjáàbalè, ajakobale

Description — *Gnetum* is a dioecious liana up to 10 m long but sometimes longer; it grows in the wild in West and Central Africa; branches are somewhat thickened at the nodes, glabrous. Leaves are decussately opposite, sometimes in whorls of 3, and simple; stipules are absent; the

petiole is up to 1 cm long and canaliculate above; the blade is ovate-oblong to elliptical-oblong, rarely lanceolate, 5–14 × 2–5 cm, with base attenuate, apex abruptly acuminate, obtuse, or minutely apiculate, entire, thick-papery, glabrous, pale green above, paler beneath, with 3–6 pairs of strongly curved lateral veins looped near the margin. Inflorescence occurs in an unbranched catkin, axillary or terminal on a short branch, solitary but male inflorescences at the apex of branches and often in groups of 3, up to 8 cm long, jointed, with a peduncle 1–1.5 cm long, with a pair of scale-like, triangular bracts; male inflorescence occurs with slender internodes and whorls of flowers at nodes; female inflorescence has slightly turbinate internodes and 2–3 flowers at each node. Flowers are small, about 2 mm long, with moniliform hairs at the base and an envelope; male flowers have a tubular envelope and exerted staminal column bearing 2 anthers; female flowers have a copular envelope and naked, sessile ovule. Seed, resembling a drupe, is orange-red when ripe and ellipsoid, 10–15 × 4–8 mm, and enclosed in the fleshy envelope.¹¹⁴⁰

Ethnomedicinal Uses — Both species are used as a vegetable, eaten raw or cooked in soups and salads. The aerial parts have been used in traditional medicine for the treatment of diabetes, piles, and high blood pressure; as medicine against enlarged spleen and sore throat; and as a purgative. In the Central African Republic, the leaves are eaten to treat nausea and as an antidote to arrow poison made from *Periploca nigrescens* Afzel. In Cameroon, the leaves are chewed to mitigate the effects of drunkenness, and they are taken as an enema against constipation and to ease childbirth. They are also used to treat boils and fungal infections on the fingers.¹¹⁴⁰

Constituents — *Gnetum* leaves contain C-glycosylflavones, 2''-xylosylisowertisin and 2''-glucosylisowertisin. Perhaps of chemotaxonomic importance is the presence of 2''-O-rhamnolysowertisin and apigenin-7-hesperidoside and the absence of vitexin and 2''-O-glycosylvitexin in *Gnetum africanum*.⁶¹⁹ Stilbenes, as well as their dimeric, polymeric, and hydroxylated derivatives, have been isolated from some *G. africanum* and other *Gnetum* species.

Pharmacological Studies — Most of the studies on eru are on its nutritional properties. It has been shown that extracts of the leaf of *Gnetum africanum* induced vaginal openings and increased weights of the uterine muscle in a manner similar to the effect of repeated administration of estrogen to immature female rats. The uterine muscle enlargement suggests the antifertility potential of the popular vegetable in the female reductive system of rats.⁶²⁰ However, the result on rats may not correlate directly to human use. The antioxidant quality of *Gnetum* has been evaluated by the determination of lag time, concentration of polyphenol that will inhibit 50% of oxidation of LDL plus very low-density lipoprotein (VLDL) (IC₅₀) and phenol antioxidant index (PAOXI). It was observed that both hydrolyzed and nonhydrolyzed extracts were better antioxidants than vitamin E in the inhibition of copper-mediated LDL-plus-VLDL oxidation.⁶²¹ This observation is interesting in view of the reported presence of the antioxidant compound resveratrol and stilbenes in *Gnetum*.^{622,623}

Agriculture — *Gnetum* is still collected from wild species. But, trial cultivations have begun in Cameroon, Nigeria, and Benin Republic. The main problem is that the plant in its natural habitat seems to prefer shaded forest canopies. In experiments in Cameroon, propagation by seed was difficult because the seed is slow to sprout, with germination taking 1 year or more. Perhaps the seeds need pretreatment, such as passing through the intestines of a bird, fruit bat, squirrel, or other animal, before they germinate. Seed is normally found only in the tree canopy. Seed collection is thus far from easy, a further reason why eru is hardly cultivated.¹¹⁴⁰ Experimental cultivation using leafy stem cuttings have produced encouraging results.

Commerce — Even with the little work done on the chemistry and pharmacology of eru, there is already a high demand for this highly priced and much prized vegetable. With its remarkable antioxidant profile and reputed nutrient properties, the current trade within the West and Central African zone will likely expand. The major limitation remains the scarcity of the plant in the wild.

GONGRONEMA LATIFOLIUM

Botanical Name — *Gongronema latifolium* Benth

Synonyms — *Marsdenia latifolia* (Benth.) K.Schum., *Marsdenia glabriflora* Benth., *Marsdenia leonensis* Benth., *Marsdenia racemosa* K.Schum.

Related Species — *Gongronema angolense* (N.E.Br.) Bullock

Family — Apocynaceae (Asclepiadaceae)

Common Names — Bush buck, tafel boom

African Names — Igbo (Nigeria): utazi; Yoruba (Nigeria): arokeke; Ghana: aborode, akam, nsurogya

Description — *Gongronema* is a small genus comprising five species in Africa, much resembling *Dregea*, APG has assigned the subject species *G. latifolium* as a member of the genus *Marsdenia*. The name *Gongronema*, however, is used here for ease of cross-reference with earlier information on this medicinally important plant. It is a weak climbing plant with a soft and fibrous stem. The stem is green with little swollen internodes. Both the stem and leafy stalk produce milky latex when cut. The leaves are cordate at the base and a little pointed at the apex. The leaves are smooth. The flowers are cream, and the fruits are ovoid in shape. When dried, they split to expose woolly materials.

Habitat and Distribution — *Gongronema* is widespread in tropical Africa and occurs from Senegal east to Chad and south to DR Congo.

Ethnomedicinal Uses — *Gongronema latifolium* is widely used in West Africa for medicinal and nutritional purposes. It has a sharp-bitter and sweet taste and is widely used as a leafy vegetable and as a spice for sauces, soups, and salads. Leaves of *Gongronema* are used as a bitter tonic to treat loss of appetite and for management of diabetes. It is also used for hypertension and cholesterol control. An infusion of the aerial parts is taken to treat cough, intestinal worms, dysentery, dyspepsia, and malaria. It is taken with lime as a purge to treat colic and stomachache in Sierra Leone. The pulverized leaves are applied as an embrocation in Senegal and Ghana on the joints of small children to help them walk. The boiled fruits in soup are eaten as a laxative. In Nigeria, a leafy stem infusion is taken as a cleansing purge by Muslims during Ramadan. The latex is applied to teeth affected by caries. It is also taken for controlling weight gain in

lactating women and overall health management. Asthma patients chew fresh leaves to relieve wheezing. A cold maceration of the roots is also taken as a remedy for asthma. A decoction of the roots, combined with other plant species, is taken to treat sickle-cell anemia. A maceration of the leaves in alcohol is taken to treat bilharzia and viral hepatitis and as a general antimicrobial agent.¹¹⁴⁰

Constituents — The leaves contain preganane glycosides, 17 β -marsdenin derivatives, β -sitosterol, lupenyl cinnamate, lupenyl acetate, lupeol, essential oils, and saponins. The main components of the essential oil from the leaves are linalool (19.5%), (E)-phytol (15.3%), and aromadendrene hydrate (9.8%). The fixed oil contains saturated (50.2%) and unsaturated (39.4%) fatty acids. Palmitic acid accounts for 36% of the total fatty acid content; minor saturated fatty acids are stearic acid (4.6%), behenic acid (3.7%), and arachidic acid (2.8%). The main UFA is linoleic acid (31.1%), followed by oleic acid (7.1%) and linolenic acid (7.1%). The nutritional composition of the dry leaves is crude protein (9.8–27.2%), lipid extract (6.1%), ash (5.8–11.6%), crude fiber (8.7–10.8%), tannin (0.3%), and nitrogen-free extractives (44.3%). The composition of minerals per 100 g dry matter is K 244.8–332.1 mg, Na 110–113 mg, Ca 115.4–154 mg, P 125.5–326.9 mg, Fe 7.8 mg, Zn 13.4 mg, Pb 0.2 mg, Cu 2.3–43.5 mg, Mg 53.8 mg, Cd 0.1 mg, Co 115.9 mg, oxalate 70 mg, and ascorbic acid 187.1 mg. The major essential amino acids are leucine, valine, phenylalanine, aspartic acid, glutamic acid, and glycine.¹¹⁴⁰

Pharmacological Studies — Several laboratory studies have demonstrated the possible anti-diabetic activity of *Gongronema*. Different alcoholic leaf extracts showed promising hypoglycemic and antihyperglycemic activities in a dose-dependent way on normal and alloxan-induced or STZ-induced diabetic rabbits.^{1140,624–626} An ethanolic leaf extract possessed significant antilipid peroxidative activities. In a small clinical trial, the blood glucose concentration of healthy humans was determined after consumption of the leaves and showed a significant reduction in blood glucose level. Leaf extracts also showed antioxidant, anti-inflammatory, hepatoprotective, antiplasmodial, antiasthmatic, antisickling, antiulcer, analgesic, antipyretic, gastrointestinal relaxing, laxative, and stomachic activities. The antimicrobial activity of essential oil and extracts of *Gongronema* has been demonstrated on bacterial isolates from the bloodstream of patients infected with HIV.⁶²⁷ The leaf extract has also been shown to be protective against acetaminophen hepatic toxicity in Wistar rats.⁶²⁸

Toxicity — *Gongronema* is considered a nontoxic vegetable. An oral toxicity test on rats gave an LD₅₀ of 1450.5 mg/kg, and an intraperitoneal injection in mice gave an LD₅₀ of 1678.6 mg/kg.

Agriculture — The herb is cultivated in gardens and homestead farms in Nigeria and other parts of West Africa. It can be propagated by seed or softwood, semihardwood, and hardwood cuttings. Fresh seeds have a germination rate of up to 85% at 25–29°C. Cold storage for a brief period improves seed germination. When seeds from green-yellow follicles are matured enough to germinate, they can be stored for a longer period than seeds from yellow follicles. Softwood stem cuttings have better shoot and root development during the wet season, whereas semihardwood and hardwood cuttings perform better during the dry season.¹¹⁴⁰

Commerce — A relatively modest trade in *Gongronema* occurs throughout West Africa but mainly for its use as a bitter vegetable and spice. Its importance as a dietary supplement is based on pharmacological activities, including hypoglycemic, antioxidant, anti-inflammatory, hepatoprotective, antiplasmodial, antiasthmatic, antisickling, antiulcer, analgesic, and antipyretic activities.

Formulation and Dosage Forms — *Gongronema* is an ingredient in two commercial products: Physogen Tea (for diabetes by Neimeth Pharmaceuticals) and a general bitter tonic by InterCEDD Health Products. *Gongronema* has also been used experimentally with positive results to replace hops as a bitter principle in brewing beer.

GRIFFONIA SIMPLICIFOLIA

Botanical Name — *Griffonia simplicifolia* (DC.) Baill

Synonyms — *Bandeiraea simplicifolia* (DC.) Benth., *Schotia simplicifolia* M. Vahl ex DC.

Family — Leguminosae

Common Names — Griffonia

African Names — West Africa: atooto, gboggotri, kajya, kanya, kwakuo-aboto

Description — *Griffonia simplicifolia* is a woody climbing shrub native to West and Central Africa. It grows to about 3 m and bears greenish flowers followed by black pods. Leaves alternate and are simple, glabrous; stipules are triangular, 1 mm long, soon falling; the petiole is up to 1.5 cm long; the blade is ovate, 6–12 × 3–6 cm, with the base rounded to cordate, apex rounded to short-acuminate, 3(–5) veined from the base, with reticulate veins prominent on both sides. Inflorescence is an axillary, pyramidal raceme 5–20 cm long; bracts and bracteoles are triangular, very small, and persistent. Flowers are bisexual, almost regular, and 5-merous; the pedicel is 3–4 mm long; the receptacle is urn shaped, 1–1.5 cm long, and pale green; the calyx tube is 12–15 mm long, orange, with triangular lobes and up to 2 mm long; petals are almost equal, elliptical, 10–12 mm long, fleshy, greenish, and sparsely short-hairy on the margin; stamens⁶ have filaments filiform, up to 2 cm long; the ovary is superior, about 4 mm long, stiped, with a style 1–2 mm long, persistent, stigma small. Fruit is an oblique-cylindrical pod about 8 × 4 cm, the stipe is 1–1.5 cm long, inflated, leathery, and 1–4 seeded.¹¹⁴⁰

Habitat and Distribution — *Griffonia simplicifolia* is native to West Africa and parts of Central Africa. It grows in grass savanna, in coastal plains on termite mounds, in scrub thickets, in secondary and disturbed forest, and along the margins of primary forest and old farms.

Ethnomedicinal Use — The peeled stems and roots are used as chewing sticks and in Ghana also beaten into fibers to yield chewing sponges, a popular means of tooth cleaning. The leaf extract is used for kidney diseases and migraine and as an aphrodisiac. It is also used as eyedrops to cure inflamed eyes. Aerial parts have been used for wound dressing, as an enema for erectile dysfunction, for vomiting, and for mental disorders. The pulp is used in Côte d'Ivoire, Ghana, and Nigeria

for the treatment of syphilitic sores. A decoction of stems and leaves is taken as a purgative to treat constipation and is used externally as an antiseptic wash to treat suppurating wounds. Stems and stem bark are made into a paste that is applied to decaying teeth, and a paste made from the leaves is applied to burns. In Nigeria, an extract from the powdered roots has been used to treat sickle-cell anemia. The leaves are used in the production of palm wine and give the wine a bitter taste. Sap that exudes from cut stems can be drunk to quench thirst. In Ghana, the roots are chewed and dried to produce a white powder that is used by women to powder their faces. The leaves are highly valued as animal feed and are said to stimulate reproduction.

Constituents — The leaves of *Griffonia simplicifolia* contain volatile oil, 5-hydroxy-L-tryptophan (5-HTP), indole-3-acetyl-aspartic acid, 5-hydroxy indole-3-acetic acid (5-HIAA), 5-hydroxy-tryptamine (5-HT; = serotonin, 0.1–0.2%), and coumarone. The seeds contain very high levels of 5-HTP, up to 18%. The cyanoglucoside lithospermoside (= griffonin) has been isolated from the roots, and it is believed to be the active ingredient against sickle-cell anemia.

Pharmacology — *Griffonia* is valued for the high content of 5-HTP in the leaves and seeds. In humans, 5-HTP increases the synthesis of serotonin in the CNS and has been shown to be effective in treating a wide variety of conditions, including depression, fibromyalgia, obesity, chronic headaches, and insomnia. 5-HTP is poisonous to insects, for instance, bruchids (*Callosobruchus maculatus*).¹¹⁴⁰ The potential of *Griffonia* in the treatment of anxiety states has been evaluated in laboratory animals. *Griffonia simplicifolia* seed extract was shown to exert an anxiolytic-like effect in rats. *Griffonia simplicifolia* seed extract, dosed at 1, 5, 10, and 25 mg/kg, was orally administered in rats, which were submitted to the dark-light test and open-field test 60 min after the treatment. In the dark-light test, the administration of the extract at the doses of 10 and 25 mg/kg was able to significantly increase the time spent in the light compartment ($p < 0.05$). In the open-field test, the extract dosed at 5, 10, and 25 mg/kg induced an antitigmotactic effect, as indicated by a significant increase of time spent in the central area of the open field ($p < 0.01$).⁶²⁹

In the sexual behavior of SD male rats, acute treatment significantly increased mount latency (at any dosage), intromission and ejaculation latencies (at 100 mg/kg), and postejaculatory interval (at 50 and 100 mg/kg). It was also found that subchronic treatment failed to exert a significant influence on copulatory behavior. The daily administration of the extract dosed at 50 and 100 mg/kg for 9 days significantly reduced food intake and body weight.⁶²⁹ However, a single administration of *G. simplicifolia* significantly reduced lordosis response and increased rejection behavior in female rats treated with the highest dose, while it did not influence proceptive behaviors. On the other hand, the subchronic administration of the extract significantly reduced proceptivity but not receptivity and increased rejection behavior. It was found that all tested dosages were able to markedly decrease food intake and body weight after a 9-day treatment. Taken together, the present results, possibly ascribed to increased levels of 5-hydroxytryptamine x(5-HT) in the brain, suggest a cautious administration of the plant extract owing to its negative influence on female sexual behavior.⁶²⁹

Several clinical studies have established the value of *Griffonia* and 5-HTP in the management of depression.¹¹⁴¹ It has been observed that *G. simplicifolia* extracts direct modulation of the serotonergic system and have a clinically demonstrable value for the treatment of psychological suffering associated with unreciprocated romantic love.⁶³⁰

Commerce — The seed of *Griffonia simplicifolia* is exported to Europe from Ghana, Côte d'Ivoire, Nigeria, and Cameroon. Exports from Ghana account for more than 60% of the global market for the unprocessed seeds as an industrial source of 5-HTP. The annual export to Western Europe was about 120 tonnes in 2010 at a wholesale price of US\$15 per kg.

Agriculture — *Griffonia* is still collected mostly from the wild. Domestication efforts have met limited success. In productivity trials, wildlings were successfully used as planting material; this is impractical at a larger scale. Use of stem cuttings has not been successful. Seed propagation gave poor results, and different seed treatments did not improve germination.

HARPAGOPHYTUM PROCUMBENS



Botanical Name — *Harpagophytum procumbens* DC.

Related Species — *Harpagophytum zeyheri* Decne.

Family — Pedaliaceae

Common Names — Devil's claw, grapple plant.

African Names — Twana: Kanako

Description — It has a characteristic large, hooked, claw-like fruit. It derives its name from the translation of the German name *Teufelskralle*, which means devil's claw. At the beginning of the rainy season, the larger nodular roots produce young shoots that lie flat on the ground, growing up to 1.5 m in length. The tuber is up to 6 cm in diameter with a yellowish-brown longitudinally striated bark. It produces bright red flowers that rise rather abruptly from the leaf axils. It is the tuber that is used in the preparation of popular African antirheumatic teas. *Harpagophytum* is available in commerce as circular or fan-shaped pieces; it has an astringent taste and is odorless.

Habitat and Distribution — It grows in savanna and deciduous forests. It is a native of southern Africa, where it is cultivated as a drug plant.

Ethnomedicinal Uses — The tuber of the plant is used for a variety of purposes in southern Africa. An infusion of the tubers is used for the relief of fever and for blood disease.⁷⁹ It is administered to pregnant women in doses of about 0.25 g three times a day to relieve pain and in postpartum medication at lower doses. It is a general analgesic and an ointment for sprains, sores, and boils. The drug has been used as a bitter tonic and a digestive aid. Grapple plant is dispensed as an anti-inflammatory agent and is administered both orally and topically for various inflammatory conditions. The fresh tubers are applied as an ointment on women to facilitate labor.

Constituents — Devil's claw yields a variety of compounds, including the glycosides of the flavonoids kaempferol and luteolin, and chlorogenic and cinnamic acids.⁶³¹ It also contains iridoid glycosides such as procumbide, harpagide, and harpagoside,^{632,633} as well as a quinone, harpagoquinone; terpenes ursolic and oleanolic acid derivatives and esters; and stachyose and other sugars.^{471,631}

Pharmacological Studies — The anti-inflammatory activity has been investigated *in vivo* in a rat pore edema test; it was shown to inhibit the inflammation caused by a variety of agents.⁶³⁴ The antirheumatic and antiphlogistic properties are comparable to those of pyrazole derivatives,⁵¹¹ and the analgesic effect has been equated with that of phenylbutazone.⁴⁷⁵ It has no spasmolytic or antidiuretic properties. Grapple plant is used as a bitter tonic, and it is reported to have 6000 or more bitterness equivalence to that of gentian root.

The extracts have been shown to cause a reduction in arterial blood pressure in rats, a decrease in heart rate in rabbits, and a protective effect against arrhythmias caused by adrenalin, chloroform, and calcium chloride.^{471,635} The secondary storage roots or tubers are used for the preparation of the

medicinal extract. In summary, scientific studies revealed that *H. procumbens* exhibits analgesic, antioxidant, antidiabetic, antiepileptic, antimicrobial, and antimalarial activities.⁶³⁶ Iridoid glycosides and phenylpropanoid glycosides have been the focus of phytochemical investigations as the biological activity has been ascribed to the iridoid glycosides (such as harpagoside and harpagide), which are common in nature and are known to possess anti-inflammatory activity. It has been shown, however, that the hydrolyzed products of harpagoside and harpagide have more pronounced anti-inflammatory activity when compared to the unhydrolyzed compounds.¹⁰⁹³

Clinical Applications — *Harpagophytum* extracts have been used by Africans for a long time in the treatment of rheumatic diseases and gastrointestinal disorders. It was introduced into Europe as an herbal tea for the same purpose by a German farmer, G. H. Mehnert. Grapple plant tea is indicated in the treatment rheumatic diseases, especially arthritis and low back pain due to spondylosis. Good results have been reported in the use of the drug for the treatment of rheumatoid arthritis, neuralgia, and headaches. The drug has also been found effective in the treatment of diseases of the upper duodenum with pancreatic involvement, as well as for improvement of enterohepatic circulation and bile acid activation.⁴⁹⁰ Clinical evaluation of patients with hypercholesterolemia indicated a marked reduction in blood cholesterol and neutral fatty levels. The drug was therefore found to be beneficial for the treatment of elderly patients with rheumatic complaints, obesity, and hyperlipidemia. The plant is available in Europe as medicinal teas for oral administration, in ampoules for parenteral medication, and as an ointment for external use.

The effects of the crude methanol extract, harpagoside, and harpagide on some smooth muscles *in vitro* have been studied by Occhiuta et al.⁶³⁷ It was suggested that harpagoside and other constituents interfere with the mechanism that regulates the influx of calcium in the cells. In Langendorff preparations of rat heart, hyperkinetic ventricular arrhythmias (HVAs) induced by an ischemic perfusion were prevented by extract of *H. procumbens* and harpagoside in a dose-dependent manner.⁶³⁸

The major problem with the use of *Harpagophytum* is that of availability, and many of the products currently marketed in Europe are derived from *Scrophularia nodose* and *Verbascum thapsiforme*, which are said to contain the iridoids harpagoside and harpagide. It should be noted that the activity of the grapple plant has not been specifically linked to any of its constituents. The use of the so-called active constituents must be considered with caution. It has been reported that when the constituents deemed to be the biologically active compounds were isolated, the efficacy was lower than that of the whole extract. This means that it is likely that the whole plant is necessary, and all the constituents may be working in synergy to exert the observed pharmacological effects.

Toxicity and Contraindication — *Harpagophytum* is reported to have some oxytocic properties and should not be taken during pregnancy.⁶³⁹

HELIOTROPIMUM INDICUM

Botanical Name — *Heliotropium indicum* L.

Synonyms — *Eliopia riparia* Raf., *Tiaridium indicum* (L.) Lehm.

Common Names — Indian heliotrope, turnsole, Cock's comb

Family — Boraginaceae

African Names — Hausa: kalkaashin korama; Yoruba: agogo-igun

Description — It has a characteristic long terminal, brush-like inflorescence of stalkless, whitish flowers. It is a small herb, about 1 m long. The leaves are oval in shape, about 10 cm long and 7 cm wide, shortly pointed at the apex and rounded or very slightly wedge shaped at the base. The leaf surface is raised between the veins, with saw-edged margins. The fruits consists of two cells, about 8 mm in diameter.⁷⁷

Ethnomedicinal Uses — The plant is a major ingredient for the preparation of *agbo*, a Yoruba traditional remedy. It is employed as an alcoholic extract for the treatment of venereal diseases. In

East Africa, the roots are either boiled or pounded and soaked in water and the extract drunk 2–3 times a day for the treatment of yaws.³⁷⁸ An infusion of the plant is used as an eye lotion and for application to cleanse ulcers. The leaf juice is administered orally as a vermifuge. It is given as an enema and applied mixed with emollient clay to arrest abortion.⁷⁷ A related species, *H. subulatum*, is used in postpartum medication. A topical preparation with castor oil is applied to stings, poisonous bites, and skin eruptions.

Constituents — The genus contains pyrrolizidine alkaloids. The principal alkaloids include europine, heliotrine, lasiocarpine, and 5'-acetyeuropine,⁶⁴⁰ as well as 7-angelylheliotrine, 9-angelolretronecine, and its N-oxide.

Pharmacological Studies — The alkaloids possess antimicrobial^{641,642} and antitumor properties.⁶⁴³ The pyrrolizidine alkaloids from *Heliotropium* are very toxic and have been associated with the veno-occlusive disease of the herbal tea.⁶⁴⁴ The compounds are excreted through the milk in lactating animals, and their presence in milk has been identified as posing a potential toxicity hazard to neonates.⁶⁴⁵

HIBISCUS SABDARIFFA — BISSAP, ZOBO



Botanical Name — *Hibiscus sabdariffa* L.

Synonyms — *Abelmoschus cruentus* (Bertol.) Walp., *Furcaria sabdariffa* Ulbr., *Hibiscus cruentus* Bertol., *Hibiscus fraternus* L., *Hibiscus gossypifolius* Mill., *Hibiscus palmatilobus* Baill., *Sabdariffa rubra* Kostel

Related Species — *Hibiscus acetosella* Welw. ex Hiern, *Hibiscus rosa-sinensis*, *Hibiscus cannabinus* L.

Family — Malvaceae

Common Names — Roselle, red sorrel, zobo, Jamaican sorrel, Indian sorrel, bissap, karkadeh, hibiscus flower

African Names — Hausa: abin kan iyaka, zobo; Igbo: okworo-ozo; Yoruba: amukan; Swahili: ufuta, ufuta dume

Description — The shrub is erect, slightly branched with a smooth or slightly hispid plant that can grow up to 4 m in height. The stem is glabrous to sparsely pubescent, sometimes sparsely prickly, green or reddish. It has lobed leaves and big yellow flowers with a purple center. The epicalyx and calyx are fleshy and succulent, bright red and persistent. The fleshy calyx is situated at the base of the flowers and is about 1.5–2 cm wide and on maturity of the fruit becomes enlarged to 3–3.5 cm. The plant takes about 6 months to mature, and it is harvested at the fruiting stage. Hibiscus flower, as the harvested product is called, is edible with a sweet-sour taste.

Habitat and Distribution — *Hibiscus sabdariffa* originated from Africa, where it may have been domesticated in Sudan and northern Nigeria about 6000 years ago, first for its seed and later for leaf and calyx production. However, apparently truly wild plants of *Hibiscus sabdariffa* have been collected in Ghana, Niger, Nigeria, and Angola. It is believed that the vegetable types were introduced to India and the Americas in the seventeenth century. Selection for fiber production took place in Asia, where cultivation is reported from the beginning of the twentieth century (e.g., in India, Sri Lanka, Thailand, Malaysia, and Java). Roselle is now found throughout the tropics. In tropical Africa, it is especially common in the savanna region of West and Central Africa. It is often found as an escape from cultivation.¹¹⁴⁰

Ethnomedicinal Uses — Zobo is used throughout West and North Africa as a vegetable and a tonic for the improvement of general body function, blood circulation, and hypertension. Leaves are used as a gargle for cough, toothache, and throat inflammation. It is reported as providing good relief for coughs, biliousness, and symptoms of plethora. The flowers are applied in wound dressing. The root is effective for application to abscesses and bronchitis. Calyces are used to produce a beverage, which serves as a blood tonic and for high blood pressure. Whole dried aerial parts have been used for sexual asthenia, cough, peristalsis, toothache, boils, bronchitis, and conjunctivitis; as a poultice, diuretic, mouthwash, and laxative; and to ease childbirth.

Constituents — Many chemical constituents have been isolated from the calyx and flowers of roselle. These include alkaloids, ascorbic acid, β -carotene, anisaldehyde, arachidic acid, citric acid, malic acid, tartaric acid, glycine, betaine, trigonelline; anthocyanins as cyanidin-3-rutinoside, delphinidin, delphinidin-3-glucosylside (also known as hibiscin, the major anthocyanin in *H. sabdariffa* flowers), delphinidin-3-monoglucoside, cyanidin-3-monoglucoside, cyanidin-3-sambubioside, cyanidin-3,5-diglucoside; the flavonols glycosides hibiscetin-3-monoglucoside, gossypetin-3-glucoside, gossypetin-7-glucoside, gossypetin-8-glucoside, and sabdaritrin; quercetin, protocatechuic acid (PCA), pectin, polysaccharides, mucopolysaccharides, stearic acid, and wax.^{646,647} The phytosterols campesterol, stigmasterol, ergosterol, β -sitosterol, and α -spinasterol have been reported from the seed oil.²³ The petals yielded 65% (dry weight) of mucilage, which on hydrolysis gave galactose, galacturonic acid, and rhamnose. In addition to these compounds, *Hibiscus sabdariffa* extract (HSE) contains complex polyphenolic acids (1.7% dry weight), flavonoids (1.43% dry weight), and anthocyanins (2.5% dry weight).

Pharmacological Studies — The various biological activities associated with *Hibiscus sabdariffa* can be related to the compounds found in the shrub. These molecules are bioactive in several biological models and responsible for the pharmacological effects presented by the extracts of this species. Various antioxidant constituents are found in the calyx and flower petals of roselle, such as hibiscus anthocyanins (HAs), quercetin, ascorbic acid, steroid glycosides (such as β -sitosteroid glycoside), and PCA.

It has antispasmodic, anthelmintic, and bactericidal properties. The antihypertensive and cardioprotective effects of tea made from roselle calyces have been demonstrated in various animal

tests and in a few clinical tests. The phenolic compound PCA isolated from roselle flowers showed antioxidant, antitumor, and hepatoprotective activities. It has been demonstrated to be an efficacious agent in inhibiting the carcinogenic action of various chemicals in different tissues, such as diethylnitrosamine in the liver, 4-nitroquinoline-1-oxide in the oral cavity, azoxymethane in the colon, N-methyl-N-nitrosourea in glandular stomach tissue, and N-butyl-N-(4-hydroxybutyl)nitrosamine in the bladder, in murine models. PCA also shows mild cytotoxicity to PC14 and MKN45 human tumor cell lines and induces apoptosis in human leukemia HL-60 cells by means of the reduction of retinoblastoma protein phosphorylation and Bcl-2 expression. Thus, PCA may play a role in dietary chemoprevention.

Hibiscus exacts have been shown to lower serum cholesterol in men and women in a dose-dependent manner. In a clinical study, 42 volunteers were observed over a period of 4 weeks. The volunteers ranged from 18 to 75 years old with cholesterol levels of 175 to 327 mg/dl. Subjects were randomly assigned to three groups: group I (1 capsule of HSE during each meal), group II (2 capsules), and group III (3 capsules). Serum cholesterol levels were determined at baseline before the study commenced and at 2 and 4 weeks of the treatment period. In general, taking HSE led to a significant decrease in serum cholesterol level in subjects from groups I and II after 4 weeks. After HSE had been administered for 2 weeks, serum cholesterol levels were found to be lower in all groups ($p < 0.05$ for groups I–III) compared with baseline values by 7.8% to 8.2%. A similar response was observed, a reduction in serum cholesterol level by 8.3% to 14.4%, after 4 weeks of taking the supplement. It is important to note that the serum cholesterol level for 71% of group II volunteers was significantly lowered, with a mean reduction of 12% ($p < 0.05$). The authors concluded that a dosage of 2 capsules of HSE (with a meal) for 1 month can significantly lower the serum cholesterol level. The observation of lowered serum cholesterol in these subjects suggests that HSE may be effective in hypercholesterolemic patients.⁶⁴⁸ This clinical study validated an earlier result from feeding experiments in hypercholesterolemic rats.⁶⁴⁹

In another clinical study, HSE was shown to possess a significant uricosuric effect.⁶⁵⁰ The study involved a human model with 9 subjects with no history of renal stones (nonrenal stone, NS) and 9 with a history of renal stones (RS) was used in this study. A cup of tea made from 1.5 g of dry roselle calyces was provided to subjects twice daily (morning and evening) for 15 days. A clotted blood and two consecutive 24-h urine samples were collected from each subject three times: (1) at baseline (control), (2) on days 14 and 15 during the tea-drinking period, and (3) 15 days after the tea drinking was stopped (washout). Serum and 24-h urinary samples were analyzed for uric acid and other chemical compositions related to urinary stone risk factors. The results when analyzed showed that serum parameters were within normal ranges and similar between the two groups of subjects and among the three periods. Vis-à-vis the urinary parameters, most of the baseline values for both groups were similar. After taking the tea, the trend was an increase in oxalate and citrate in both groups and uric acid excretion and clearance in the NS group. In the RS group, both uric acid excretion and clearance were significantly increased ($p < 0.01$). When the fractional excretion of uric acid (FEUa) was calculated, the values were clearly increased in both the NS and RS groups after the intake of tea and returned to baseline values in the washout period. These changes were more clearly observed when the data for each subject were presented individually.⁶⁵¹

The antihypertensive activity of HSE has been demonstrated in several human and animal studies. Ajay et al. established the probable mechanisms to explain the pharmacological basis of the observed clinical hypotensive activity of HSE.⁶⁵² The study observed the effects of a crude methanolic extract of the calyces of HSE on vascular reactivity in isolated aortas from SHRs. HSE relaxed, concentration dependently, aortic rings precontracted with KCl (high K^+ , 80 mM) and phenylephrine (PE, 1 μ M), with a greater potency against the α_1 -adrenergic receptor agonist. The relaxant effect of HSE was partly dependent on the presence of a functional endothelium as the action was significantly reduced in endothelium-denuded aortic rings. Pretreatment with atropine

(1 μM), L-NAME (10 μM), or methylene blue (10 μM), but not indomethacin (10 μM), significantly blocked the relaxant effects of HSE. Endothelium-dependent and -independent relaxations induced by acetylcholine and sodium nitroprusside, respectively, were significantly enhanced in aortic rings pretreated with HSE when compared to those observed in control aortic rings. The results thus demonstrated that HSE has a vasodilator effect in the isolated aortic rings of hypertensive rats. These effects are probably mediated through the endothelium-derived NO-cGMP-relaxant pathway and inhibition of calcium (Ca^{2+}) influx into vascular smooth muscle cells.⁶⁵²

Toxicity — The aerial parts of roselle, zobo, or hibiscus flower have been used as a safe tea substitute and a nutraceutical for centuries without any manifest toxicity. With the popularity of HS as a long-term food-medicine for the management of elevated blood pressure and hypercholesterolemia, it became necessary to investigate any possible toxicity in acute animal models and cohort long-term studies in human subjects. One such study was aimed at assessment of the potential adverse effects of HSE on sperm morphology and testicular ultrastructure of albino mice. Thirty adult male albino mice were divided into three equal groups and were given (a) distilled water, (b) cold *Hibiscus* aqueous extract, or (c) boiled *Hibiscus* aqueous extract. *Hibiscus* extract was administered orally daily for 4 weeks in a dose of 200 mg/kg body weight/mouse. Twenty-four hours after the last treatment, mice were decapitated, and the testes and epididymides were excised and processed for transmission electron microscopy to assess ultrastructural and sperm abnormalities. The results clearly demonstrated that aqueous extracts from dried calyx of *H. sabdariffa*, either cold or boiled, altered normal sperm morphology and testicular ultrastructure and adversely influenced the male reproductive fertility in albino mice.⁶⁵³ Another toxicity study on experimental animals evaluated the effect of HS on rat liver enzymes and indicated possible hepatotoxicity of prolonged use of HSE.⁶⁵⁴ These findings, although not easily transferable to the human situation, tend to suggest that *Hibiscus* extract may pose some human risk on prolonged use at high doses. It is interesting to observe that a later study actually indicated that HSE displayed antihepatotoxic activity when tested against azathioprine-induced acute liver damage.⁶⁵⁵

Commerce — *Hibiscus sabdariffa* still remains a grossly underutilized plant. It is an important industrial crop for its fibers, and the demand for roselle fiber is likely to increase as a result of the rising interest in natural, biodegradable fibers. It has a global market as a colorant for herbal teas. Its rising profile and application as a nutraceutical agent makes it a commercially dependable crop. This multipurpose crop provides farmers with food and cash income when other vegetables have become scarce. Processing generates additional family income, from which women benefit in particular. Use of roselle as a vegetable or as a beverage should be promoted through research to improve cultivars, husbandry, and postharvest technologies. Applying rigorous quality standards for grading, processing, and packaging will boost competitiveness in the international market. The current market price for HS in the international market is US\$2350–2450 metric ton/cost, insurance and freight (MT/CIF).

Agriculture — The seedlings for cultivation are collected during thinning, the period of vegetative growth when the plants are 6–8 weeks old; branches of about 50 cm long are picked two or three times. Calyces are harvested manually 2–3 weeks after flowering, usually 4–6 months after sowing, before the fruit has dried and dehisced. Regular picking prolongs flowering. The calyces are dried in the shade. When harvested for fiber, stems are cut before flowering, 4–5 months after planting. Fiber quality declines rapidly after the start of flowering. A single roselle plant may yield as many as 250 calyces, or 1–1.5 kg fresh weight. In Africa, average yields are much lower and variable because of environmental conditions and extensive management. Sudan reports an average yield of dry calyces of 93 kg/ha. In Senegal, maximum production of calyx on a dry weight basis is 500 kg/ha. Average fiber yields from roselle are 1.5–2.5 t/ha, depending on cultivar and management. India reported an average yield of 1.9 t/ha for 1997–2001. Reported seed yields ranged from 200 to 1500 kg/ha.¹¹⁴⁰

HILLERIA LATIFOLIA

Botanical Name — *Hilleria latifolia* H. Watt.

Synonyms — *Hilleria elastica* Vell., *Mohlana latifolia* (Lam.) Moq., *Rivina latifolia* Lam.

Family — Phytolaccaceae

African Names — Igbo: aka-ato; Yoruba: ago

Description — This is a slender herb up to 1 m tall. The leaves are oval in shape, slightly elongated toward the apex, about 15 cm long and 6 cm broad. The surface is covered with numerous short lines of crystals. There are six prominent lateral veins on either side of the midrib. The leaf-stalk is long and covered with stiff hairs in the upper side. It has small pinkish or whitish flowers, borne on terminal long common stalks of up to 12 cm long, which are unclustered by the leaves. There are no petals; the sepals and stamens are 4 each, with one very short style. It produces more or less globose, smooth, and reddish fruits, about 2 mm in diameter and net veined.⁷⁷

Habitat and Distribution — It is a lowland rainforest plant and prefers rich clay soil where its presence is believed to indicate soils suitable for growing cocoa.⁷⁷

Ethnomedicinal Uses — The decoction of the leaves and twigs is used in Ghana for the treatment of jaundice; it is also used as a steam bath for the same purpose. The herb is boiled alone or in palm oil soup and drunk as a remedy for guinea worms and urethral discharges.

Constituents — There is no isolation work reported on this species. Preliminary phytochemical spot tests showed the presence of saponins and flavonoids.

Pharmacological Studies — An extract of the plant was found effective *in vitro* against *Onchocera-volvulus filarioidea* adults and microfilariae.⁶⁵⁶

HOLARRHENA FLORIBUNDA



Botanical Name — *Holarrhena floribunda* (G.Don) Dur. et Schinz.

Synonyms — *Holarrhena Africa* A. DC., *Holarrhena wulsbergii* stapf., *Rondeletia floribunda* G. Don.

Family — Apocynaceae

Common Names — Holarrhena (English, French)

African Names — Arabic: ola-ina; Bambara: fufu, nofo, kedan; Pehul: indama, taraki; Sukuma: mweriweri; Yoruba: ako-ire, are-ibeji, areno, isai

Description — This is a big tree, reaching 15 m high and 1 m in girth. The bark is gray, smooth, with a pale brown slash and yielding copious latex. The leaves are small and lanceolate, 8–12 cm long and 4–6 cm broad; it is glabrous below, with 8–12 pairs of prominent lateral nerves, which fade close

to the margin, and displaying a close network of veins between. It produces white, scented flowers. The plant bears linear cylindrical follicles hanging in pairs reaching 60 cm in length and enclosing flattened seeds with numerous brownish silky hairs (ca. 5 cm long) in a tuft at the apex.^{9,164}

Habitat and Distribution — It is found in the drier forest regions and fringing savanna forests. The plant is distributed from the Republic of Guinea to Angola.

Ethnomedicinal Uses — The bark macerated in palm wine is used in the treatment of dysentery and fever.⁶ The leaf, bark, and roots are used in many parts of the continent as a remedy for malaria. A root decoction of the plant is used alone or in a mixture with other herbs for the treatment of female sterility. Various parts of the plant are employed in the preparation of topical medications for skin infections. It has also been used as an ingredient in a steam bath for malaria and fevers.

In eastern and southern Africa, the bark is dispensed as a febrifuge and as a tonic.¹⁸ The root is boiled in milk and used to wash boys entering puberty and as a remedy for snakebite and for treatment of venereal disease.⁶⁵⁴

Constituents — *Holarrhena* contains about 0.1% alkaloid of the glucosteroid type, including conessine, durchine, holacurtenin, and holacurtin.⁷⁸ The stem bark alkaloids are derived from pregnane.⁶⁵⁷ The plant also contains nonsteroidal alkaloid, triacanthine, and phenolic acids and the flavonoids kaempferol and quercetin.⁶⁵⁸

Pharmacological Studies — The alkaloidal fractions of the plant reduced intestinal amebiasis in rats and hepatic amebiasis in hamsters. Conessine and kurchamine have been shown to be the active constituents of this species.⁷⁸ A clinical trial of conessine on patients with intestinal and hepatic amebiasis gave results that were comparable to those of emetine.^{659–661} The steroidal alkaloids found in the plants also possess hypotensive, local anesthetic, and spasmolytic activity. Some of them are cardiotoxic.

The nonsteroidal alkaloid triacanthine has hypotensive activity, as well as cardiotonic, vasodilatory, antispasmodic, and analeptic characteristics.⁶⁶² The compound has been shown to act on experimental anemia in rats, probably due to its stimulation of erythropoiesis.⁶⁵⁷ The *Holarrhena* alkaloids also exhibit diuretic activity and cause sodium retention.⁶⁶³

Toxicity — The use of conessine in the treatment of dysentery has been discontinued due to its systemic toxicity. The compound is, however, applied externally in the treatment of *Trichomonas vaginalis* and urethritis.⁶⁶⁴ The side effects are mainly neurological complications during therapy and include delirium, agitation, sleeplessness, vertigo, and anxiety.⁷⁸

HOSLUNDIA OPPOSITA



Botanical Name — *Hoslundia opposita* Vahl

Synonyms — *Clerodendrum micranthum* Gilli., *Micranthes menthoides* Bertol., *Orthosiphon physocalycinus* A.Rich.

Family — Lamiaceae

African Names — Igbo: oke-ota; Yoruba: anikan-gbiju

Description — This is a medium-size, tender shrub, up to 5 m high. The leaves are oval in shape, about 10 cm long and 4 cm broad. They are broadly lanceolate, pointed at the apex, wedge shaped at the base. They are usually oppositely arranged at the nodes, but some nodes carry 3 leaves, with saw-edged margins. It bears tiny white flowers, usually many on multibranched terminal stalks. The calyx tube is cylindrical, about 3 mm long, with 5 equal pointed tips, and hairy. The corolla is tubular, about 5 mm long, 2 lipped (lips equal in length); one of the lips is hooded, and the other is 3 lobed. There are 2 stamens and 1 style, all projecting from the corolla tube. It produces round, yellowish or orange berries.⁹

Habitat and Distribution — It inhabits open forest areas and is distributed throughout the forest regions of the continent.

Ethnomedicinal Uses — The boiled leaves are used for the treatment of constipation. The infusion of the whole herb is used to treat convulsions in children. The crushed flowers and leaves are used as lotion for skin diseases, and the juice of the fresh leaves is applied topically to wounds. The leaves together with those of *Ocimum* are applied topically as an antidote for snakebite. The plant materials are also mixed and burned with the head of a freshly killed snake, and the ash is used for snake bite.⁷ The twigs and leafy stem tips are used in the preparation of a remedy for epilepsy, vertigo, and conjunctivitis. The powdered roots are ingredients of a popular sore lotion in Ivory Coast and Burkina Faso. Decoction of the root is administered in Tanzania for colds, sore throats, and oral wounds and in Ivory Coast, Ghana, and Burkina Faso for the treatment of abdominal pains. The Shambala use the plant for the treatment of liver diseases, for cough and pains in the chest, fever, hookworm, stomach disorders, and wound healing and for the treatment of mental disturbance.⁷⁹ The volatile oil is known in Uganda as *Kamyuyu oil* and is used extensively in traditional medicine as an anti-infective agent.

Constituents — The plant yields sweet-smelling volatile oil,⁶⁶⁵ which consists mainly of diterpenes, sesquiterpenes, and sesquiterpene alcohols.⁶⁶⁶

Pharmacological Studies — The root bark extract has been shown to possess moderate activity against the multidrug-resistant KI strain of the malaria parasite, *Plasmodium falciparum*.⁴⁶⁶ The petroleum showed the greatest activity with IC₅₀ in the 5- to 9-μg/ml range. The methanol extract possesses antibacterial⁶⁶⁷ and anticoagulant activities.⁶⁶⁸ The plant has been shown to be effective as an external application for the treatment of herpes zoster.⁴⁵⁷

Toxicity — There is one report on possible toxicity of the plant.⁶⁶⁹

HYBANTHUS ENNEASPERMUS



Botanical Name — *Hybanthus enneaspermus* F. von Muell.

Synonyms — *Calceolaria enneasperma* (L.) Kuntze., *Ionidium rhabdospermum* Hochst., *Polygala frutescens* Burm. f. ex DC., *Solea enneasperma* Spreng., *Viola guineensis* Schumach. & Thonn.

Family — Violaceae

African Names — Igbo: usolala-ocha; Tuareg (Arab): alwaas; Yoruba: abi-were

Description — This an erect herb, up to 50 cm, usually with one or more vertical branches arising from the base and a slightly ribbed stem. The leaves are opposite or alternate on the stem and branches and are broadly lanceolate or long and narrow, with a sharply pointed apex; they are 4–7 cm long and 0.5–1 cm broad. They have very distinct lateral veins and toothed margins. The plant produces small lilac or bluish flowers with 5 tiny sepals and a corolla of one large (usually colored) petal and two tiny (whitish) ones. The flowers are borne solitary in the axils of the leaves, on long stalks. The fruits occur as tiny 6-seeded capsules crowned with persistent styles.⁷⁷

Habitat and Distribution — It grows wild in deciduous forests.

Ethnomedicinal Uses — The leaves are used for the preparation of a remedy for irregular bowel movement. The plant is used to garnish the food of pregnant women, especially before childbirth and after delivery as a general tonic. It is a common ingredient in Yoruba agbo infusions for young children.

IRVINGIA GABONENSIS

Botanical Name — *Irvingia gabonensis* (Aubry-Lecomte ex O'Rorke) Baill.

Synonyms — *Irvingia barteri* Hook.f., *Irvingia caerulea* Tiegh., *Irvingia duparquetii* Tiegh., *Irvingia erecta* Tiegh., *Irvingia griffonii* Tiegh., *Irvingia hookeriana* Tiegh., *Irvingia platycarpa* Tiegh., *Irvingia tenuifolia* Hook.f.; *Irvingia velutina* Tiegh.; *Mangifera gabonensis* Aubry-Lecomte ex O'Rorke.

Related Species — *Irvingia wombolu* Vermeesen (APG = *Irvingia tenuinucleata* Tiegh.), *Irvingia excelsa* Mildbr.

Family — *Irvingiaceae*

Common Names — African bush mango, dika bread, dika bread tree, dika nut, wild mango, sweet bush mango, ogbono

African Names — Igbo: ugiri, ogbono, Odika; Yoruba: apon, oro; Hausa: biri, goron; Cameroon: etima; Gabon: oba; Ivory Coast: odika, ogbono, sioko; Sierra Leone: bobo; Zaire: meba, mueba

Description — The genus *Irvingia* comprises 7 species, 6 occurring in tropical Africa. Two of the species, *Irvingia gabonensis* (ugiri) and *Irvingia wombolu* (APG = *Irvingia tenuinucleata* Tiegh.), are closely related and difficult to distinguish from each other. *Irvingia gabonensis* has edible fruit pulp, while that of *Irvingia wombolu* (adoh) is bitter and inedible. The seeds from both species are used as soup thickeners in West Africa. Both species are called bush mango, but *Irvingia gabonensis* is referred to as rainy season bush mango, and *Irvingia wombolu* is called dry season bush mango to reflect their respective fruiting periods. They can also be differentiated in commerce as sweet bush mango for *I. gabonensis* and bitter bush mango for *I. wombolu*.

Sweet African bush mango is a small-to-large tree, up to 40 m tall; the bole is generally straight, up to 100 cm in diameter, with buttresses up to 3 m high; outer bark is smooth to scaly, gray to yellow-gray, and inner bark is yellow and fibrous; the crown is spherical or taller than wide and dense. Leaves are alternate, simple, and entire; stipules are up to 4 cm long, unequal, and forming a cone protecting the bud, caducous, leaving an annular scar on the branches; the petiole is up to 5 mm long; the blade is elliptical, 4.5–8 × 2–4 cm, the base is cuneate, the apex is acute or indistinctly acuminate, thinly leathery, and pinnately veined. Inflorescence occurs as an axillary panicle up to 9 cm long. Flowers are bisexual, regular, 5-merous, and small; the pedicel is up to 5 mm long; sepals are free, 1–1.5 mm long; petals are free, 3–4 mm long, and yellowish white; stamens are 10,

inserted below the disk, free, equal, with filaments 4–5 mm long; the disk is 1.5 mm in diameter, bright yellow, nectariferous; the ovary is superior, 2 celled, with a style 1–2 mm long. Fruit is an ellipsoid to cylindrical drupe, occasionally nearly spherical, slightly laterally compressed, 4–6.5 × 4–6.5 × 3.5–6 cm, smooth, green when ripe; pulp is bright orange, soft, juicy, sweet to slightly bitter, with a few weak fibers, stone woody, 1 seeded. Seed usually is 2.5–4 × 1.5–2.5 × about 1 cm in size.¹¹⁴⁰

Habitat and Distribution — Three centers of genetic diversity in *Irvingia gabonensis* have been identified to be southern Cameroon, southeastern Nigeria, and central Gabon. *Irvingia gabonensis* prefers moist lowland tropical forest below 1000 m altitude and with annual rainfall of 1500–3000 mm and mean annual temperatures of 25–32°C. *Irvingia gabonensis* is better adapted to acid ultisols in high-rainfall areas than to less-acidic alfisols; it prefers well-drained sites. Often, 2–3 trees grow together, and in some areas it is reported to be gregarious. The plant is indigenous to the humid forest zone of the Gulf of Guinea from western Nigeria east to the Central African Republic and south to Cabinda (Angola) and the westernmost part of DR Congo; it has also been found in São Tomé et Príncipe. The presence of *Irvingia gabonensis* is often associated with former human habitation. The bigger *Irvingia* species, *Irvingia excelsa* Mildbr., is somewhat restricted to the rain forest of Cameroon and Gabon, while *Irvingia robur* Mildbr. and *Irvingia smithii* Hook.f. are found co-occurring with *I. gabonensis* throughout the region.

Ethnomedicinal Uses — All parts of the plant are used in traditional medicine. The seeds are used as soup thickeners in West Africa. An edible oil is extracted from the seed that is also used in cooking. The fruit of *Irvingia gabonensis* is juicy and sweet, is eaten fresh like mango, and makes a refreshing tonic drink. Unlike the fruit pulp of most other *Irvingia* spp., which is bitter, the pulp of ugiri has been used for the preparation of juice, jelly, jam, and wine and can be fermented sometimes to yield an alcoholic beverage. The seed is used for the preparation of a very slimy soup given to nursing mothers to prevent postpartum weight gain. Dika fat is solid at ambient temperatures and has been used as a substitute for cocoa butter in beverages and in cosmetics. The stem bark has been used for dysentery. It is used to increase male fertility and for yellow fever, scabies, and skin diseases. The plant has been used in Laos for the treatment of liver diseases, gonorrhea, body pain, gastrointestinal diseases, diarrhea, edema, male sexual dysfunction, and toothache.

Constituents — *Irvingia* is valued for its edible seeds and fruit pulp. The seeds yield fat (40–75 g/100 g), called dika fat, which consists of lauric acid (20–59%), myristic acid (33–70%), palmitic acid (2%), stearic acid (1%), and oleic acid (1–11%). The nutritive value of the kernels per 100 g edible portion is water 4 g, energy 2918 kJ (697 kcal), protein 8.5 g, fat 67 g, carbohydrate 15 g, Ca 120 mg, Fe 3.4 mg, thiamin 0.22 mg, riboflavin 0.08 mg, and niacin 0.5 mg.¹ The pulp yields about 75% juice, which is rich in vitamin C, and wine produced from it was found to be of good color, mouthfeel, flavor, and general acceptability. The pulp contains zingiberene and α -curcumene, ethyl and methyl esters of cinnamic acid, and dodecanal and decanol, which are the main flavor components and are responsible for imparting spicy-earthly, fruity, and wine-yeast flavor notes. The nutritive value of the fruit pulp per 100 g edible portion is water 81 g, energy 255 kJ (61 kcal), protein 0.9 g, fat 0.2 g, carbohydrate 15.7 g, Ca 20 mg, P 40 mg, Fe 1.8 mg, and ascorbic acid 7.4 mg.¹¹⁴⁰

Pharmacological Studies — The stem bark was found to have analgesic effects in tests with mice. Aqueous extracts of the leaves have caused a reduction in intestinal motility in test animals. A nutritional evaluation related to the performances of growth and the analysis of increasing amounts of dika nut fat (0, 5.1%, 7.34%, and 13.48%) in young Wistar rats has shown that increasing amounts of dietary *Irvingia gabonensis* fat was in correlation with the rising of myristic acid (23.53% to 58.86%), modified cholesterol metabolism, and increased the concentration of HDL

cholesterol without any change in the quantity of LDL receptor.⁶⁷⁰ Clinical observational studies in humans have also shown that addition of a supplement of 4 g/day of “dika bread” to the diet of patients with type 2 diabetes for 1 month reduced plasma glucose and lipid levels. There was remarkable reduction in the LDL plus VLDL cholesterol and triglyceride levels, while the levels of beneficial HDL cholesterol increased. The three ATPases of the erythrocyte membrane of the diabetic patients were significantly lower than in normal subjects.⁶⁷¹ The use of African bush mango for treatment of obesity has been established by several laboratory and clinical studies.^{672,673} In a double-blind, randomized study involving 40 subjects (mean age 42.4 years), 28 subjects received *Irvingia gabonensis* (1.05 g three times a day for 1 month), while 12 were on placebo and the same schedule. During the 1-month study period, all subjects were on a normo-caloric diet evaluated every week by a dietetic record book. At the end, the mean body weight of the *I. gabonensis* group had decreased by $5.26\% \pm 2.37\%$ ($p < 0.0001$) and that of the placebo group by $1.32\% \pm 0.41\%$ ($p < 0.02$). The difference observed between the IG and the placebo groups was significant ($p < 0.01$). The obese patients under *Irvingia gabonensis* treatment also had a significant decrease of total cholesterol, LDL cholesterol, and triglycerides and an increase of HDL cholesterol. On the other hand, the placebo group did not manifest any changes in blood lipid components.¹¹⁴⁹

The male fertility enhancement of *Irvingia* has been evaluated in a study in which hormonal parameters of male guinea pigs were investigated and compared with that of Proviron using an enzyme immunoassay method, which was done by reaction of antibody with serum testosterone and testosterone label, magnetic solid phase separation, and color development step. The aqueous extract of the seeds (50–400 mg/kg) caused a statistically significant increase ($p < 0.05$ analysis of variance [ANOVA]) of testosterone in male guinea pigs, from 2.70 ± 0.26 ng/ml to 3.10 ± 0.42 ng/ml on day 7 and to 3.30 ± 0.48 ng/ml on the 28th day of the administration of the extracts. The highest increase was 3.30 ± 0.48 ng/mL, obtained after 28 days of treatment. These effects were similar to those of Proviron, which were 2.80 ± 0.28 ng/ml and 3.00 ± 0.41 ng/ml on the 7th and 28th day of treatment, respectively.⁶⁷⁴

The extracts of the leaves and roots showed significant antimicrobial activities that were found comparable to those of gentamicin and tioconazole used as controls.⁶⁷⁵ The mutagenicity of dika nut as evaluated by Ames assay, *in vitro* and *in vivo* chromosomal aberration test, and *in vivo* micro-nucleus assay did not reveal any genotoxicity of the extract. The results of a subchronic toxicity study suggested the no observed adverse effect level (NOAEL) for *I. gabonensis* extract (IGOB131) was greater than 2500 mg/kg/day, the highest dose tested.⁶⁷⁶

Commerce — Kernels of *Irvingia gabonensis* are valuable articles of trade domestically and between countries in West and Central Africa. There has been a recent increase in demand due to international trade because of its use in the preparation of an effective weight loss dietary supplement. Domestication of this species offers great opportunity for the sustainability of production. A few plantations exist in Nigeria and Cameroon, but these are hardly sufficient to meet the growing demand and have resulted in substitutes from Asia and fake products containing ordinary mango. International Centre for Research in Agroforestry (ICRAF), cited in Ladipo,⁶⁷⁷ reported that in 1975 the market for kernel products was worth in the region of US\$50 million. The market has been growing since then. The global trade on raw dika nuts and products was estimated at about US\$165 million in 2010.

Agriculture — *Irvingia gabonensis* has a slow growth on planting but gradually picks up. It is mainly propagated by seed. Germination of *Irvingia gabonensis* seeds takes more than 14 days, and they should first be extracted from the fruit and dried for at least 2 days. A germination rate of 80% can be reached in this way. Methods of vegetative propagation through rooting of leafy stem cuttings under mist have been developed, and micropropagation, grafting, and marcotting experiments

have yielded good results. Preliminary results showed that plants from bush mango marcotts can fruit 2–2.5 years after transplanting.

Formulation and Dosage Forms — Proprietary formulations of *Irvingia* are available in Europe and America mainly for the treatment of obesity. These are usually dried extracts of the seeds in capsules and tablets. The total seed powder is produced by InterCEDD Health Products (Nigeria) in cubes for cooking as soup thickeners and for the management of diabetes. Local production of the dika wine is limited to parts of western Cameroon and eastern Nigeria.

JATEORHIZA PALMATA

Botanical Name — *Jateorhiza palmata* Miers

Synonyms — *Cocculus palmatus* D.C., *Menispermum palmatum* Lam.

Family — Menispermaceae

Common Names — Calumba

African Names — Lindi (Konde): roamwa; Yoruba: agbihi, atutu

Description — The plant is a climber. The root possesses a thick bark and a depressed center, with a grayish-brown surface. The fracture is short and mealy, and the transverse section is yellowish with vascular bundles in radiating lines. It is very bitter and mucilaginous, with a slight odor.^{9,28,77}

Habitat and Distribution — The plant grows in rich alluvial soil. It is distributed in East Africa, Malagasy, and parts of the West Coast. It is cultivated as a medicinal plant in Kenya, Ghana, Tanzania, Malagasy, and Mauritius. A related species, *J. macrantha* Ecell & Mendonca, is distributed from southern Nigeria to Gabon and Rwanda.

Ethnomedicinal Uses — The root bark is used as a general tonic. The whole herb, especially the leaves, yields a pleasant bitter and stomachic. It is used extensively in traditional medicine, especially for the preparation of remedies for hypertension, bronchial infections, and male impotence. In East Africa, the plant is reputed to be an effective dysentery remedy. The root decoction is used in the treatment of fevers (probably malaria) and as an anthelmintic.

Constituents — The plant elaborates a complex mixture of isoquinoline alkaloids, of which the major ones include palmatine, columbamine, jatrorrhine, and bisjatrorrhizine. It also contains bitter terpene-dilactones, such as calumbin and dihydronaphthalene (chasmantoin and palmanin). Thymol is a major component of the volatile oil. The sapogenins diosgenin and kryptogenin occur in low quantities.

Pharmacological Studies — Palmatine has hypotensive, antimalarial, and uterine stimulant activity. Jatrorrhizine is hypotensive, sedative, and antifungal.¹²³ The extract possesses antimicrobial activity. The drug is official in many countries as a bitter flavoring agent; it is listed in Japanese, Portuguese, and Spanish pharmacopoeias and in the *Martindale Extra Pharmacopoeias*.²⁰⁵

JATROPHA

Three species of *Jatropha*, *J. curcas* Linn., *J. gossypifolia* L., and *J. podagarica* Hook, are common in Africa. They are believed to have been introduced to West Africa by the Portuguese. *J. curcas* is by far the most widely used species in traditional medicine, although the others are more available to investigators because of their use as ornamental plants and as hedges. No chemotaxonomic delimitation has been reported, and the species appear to have similar uses in folk medicine, the same chemical constituents, and similar pharmacological activity. A distinct

differentiation can be effected by the macroscopic examination of the leaves and the variations in the dominant colors of the flowers. *J. curcas* has yellowish-green flowers; *J. gossypifolia* Linn has deep red purple flowers and in lax cymes; and *J. podagrica* has dark red flowers and in congested cymes. The profile mainly concerns *J. curcas*, but references are made to the other species as appropriate.

JATROPHA CURCAS



Botanical Name — *Jatropha curcas* Linn.

Synonyms — *Castiglionea lobata* Ruiz & Pav., *Curcas adansonii* Endl., *Manihot curcas* (L.) Crantz., *Ricinus americanus* Mill.

Family — Euphorbiaceae

Common Names — Physic nut, termite nut, Barbados nut, fig nut

African Names — Hausa: bini da zugu, chi ni da zugu; Fulani: jkwolkwelaje; Bwari: kwotewi; Bini: oru-ebo; Igbo: ololu-idu, uru-eekpa, elu, and more; Efik: eto-mkpa; Anang: mbubok; Ibibio: eto-mkpo; Yoruba: botuje, lapalapa, seluju, polopolo, and more; for other Yoruba district names, see the work of Gbile.⁶⁷⁸

Description — This is a shrub or small tree growing up to 6 m high with viscid milky sap, which sometimes is reddish and gummy. The leaves are 5 lobed or sometimes entire, openly cordate at the base, with small stipules and undulating margins, 15 cm long and broad. It flowers April–May; yellowish-green, the male and female flowers are borne at different times of the same inflorescence; petals are 6–7 mm long. The fruits occur as long, black subspherical capsules, scarcely lobed, 2.5–4 cm long, and containing about three blackish oil-rich seeds, about 2 cm long.⁹

Habitat and Distribution — It is a widespread tropical plant and cultivated as an ornamental tree throughout the continent.

Ethnomedicinal Uses — The leaf decoction is used as a lactagogue, rubefacient, and suppurative. A mixture of the leaf decoction and lime juice is used for fevers and convulsions and as an anthelmintic. The ash from the burnt leaf is applied to guinea worm sore, and it is believed to be able to draw out the worm. An infusion of the young leaf shoots (at a dose of 2 cigarette tins, i.e., ca. 200 g three times a day) is used for most “urinary complaints”.²⁶⁶

The stem and twigs are used to arrest bleeding and for toothache, eye inflammation, and wound healing. The latex is used on carious teeth and to help children’s teeth erupt.⁷ The root decoction is used for the treatment of gonorrhea. The powdered root bark is used as dressing for wounds and sores. The latex is mixed with salt as a tooth cleanser and mouthwash.²⁶⁶ An infusion of the root is indicated for rheumatism, dyspepsia, diarrhea, and incontinence. The root pulp is mixed with xylopia fruits for the treatment of dysentery.

The seed yields a strong purgative, “Pulza oil” or “Pinhen oil ” which is applied externally in cases of itch and herpes and is also rubefacient. Roasted seeds are mixed with pepper and shea butter for the treatment of guinea worm infestation. Preparations containing the seeds of *Jatropha* have been used for remedies for dropsy, gout, tumors, syphilis, and parasitic skin infestation and as an abortifacient. Every part of the plant is used as an ingredient in the preparation of a variety of other remedies. The seeds are considered poisonous, and their use as a purgative has been abandoned.

Constituents — The seeds contain 50% of a fixed oil and a mucilage, which consists of xylose, galactose, rhamnose, and galacturonic acid, and a toxalbumin, curcin.⁶⁷⁹ The shell has been found to contain traces of glycosides. The nondrying fixed oil in the seed of *J. curcas* consists mainly of glycerides of stearic, palmitic, myristic, oleanolic, and curcanoleic acid.⁷⁹ The flavonoids vitexin and isovitexin have been isolated from *J. curcas* growing in India.⁶⁸⁰ Cyanic acid has been detected in the fruits, roots, and bark.⁷⁹ The stem of *J. podagrica* yields tetramethylpiazine.⁶⁸¹ The genus contains diterpenes.

Pharmacological Studies — The purgative activity of the seeds and leaves has been investigated.^{79,682} The purgative activity of the oil (0.3–0.6 ml) has been shown to be greater than that of castor oil but less than the activity of croton oil.⁶⁸³ The fruits and seed isolates possess contraceptive activity.⁶⁸⁴ The ethanol extract has shown activity against P388 lymphocytic leukemia.⁶⁸⁵ The latex of *J. multifida* showed activity on human complement activation and on PMN leukocyte activation.⁶⁸⁶ The extract of *J. gossypifolia* exhibited *in vitro* activity against *Plasmodium falciparum*.⁶⁸⁷ Jatrophone, a diterpene isolated from *J. elliptica* at concentrations of 1–300 μ M, caused a concentration-dependent relaxation effect against acetylcholine (Ach)-oxytocin and KCl-induced uterine sustained contraction.⁶⁸⁸ The observed effect was not modified by phorbol ester, forskolin, MIX, TMB-8, and W-7. The diterpenes from *J. curcas* have been found not to induce mutation in *Salmonella typhimurium* TA98 and TA100.⁶⁸⁹

Toxicity — *Jatropha* is a very toxic plant and should be considered dangerous as a drug, especially if taken in fresh preparations without boiling. The seed contains curcin, a toxalbumin, and an uncharacterized toxic protein. *Jatropha* poisoning is characterized by nausea, followed by acute abdominal pain, vomiting, and diarrhea. These symptoms occur within 1 h of the ingestion of the drug. Fatalities are rare except in very high doses, when depression, syncope, and coma may occur. Cases of toxicity due to accidental ingestion of the plant by children are common. In one reported case involving two children aged 3 and 5 years, the clinical syndrome observed included restlessness, severe vomiting, and dehydration.⁶⁹⁰ In another case, eight children who accidentally ingested the seeds of the plant also exhibited the same clinical syndrome of nausea, vomiting, and diarrhea, and five of the patients needed intravenous rehydration.⁶⁹¹

The seed oil has been shown to contain tumor promoters.⁶⁹² The diterpenes, mainly phorbol esters found in oil, are believed to be responsible for the tumor-promoting activity.⁶⁹³ The main use of *Jatropha* currently is in the industrial production of biodiesel from the oil.⁶⁹⁴

KHAYA SENEGALENSIS

Botanical Name — *Khaya senegalensis* (Desr.) A. Juss.

Synonym — *Swietenia senegalensis* Desr.

Family — Meliaceae

Common Names — African mahogany, Senegal mahogany, cail cedrat, dry zone mahogany

African Names — Ashanti: kuntunkuri; Biron: korobaa; Dagarti (Mampridi, Moshi, Nankani, Wala): koko, koka; Fulani: dalehi; Hausa: mdachi; Igbo: ono; Itsekiri: okpe; Kanuri: kagam; Tiv: ha; Yoruba: ogonwo

Description — *Khaya senegalensis* is a tall evergreen tree, 15–30 m high, up to 3 m in diameter, with a clean bole 8–16 m, dark gray bark, with small, thin, reddish-tinged scales. The slash is dark pink to crimson, exuding a red bitter sap. The plant is recognized by its round evergreen crown of dark shining foliage. Leaves are pinnate, alternate, compound, and without stipules. The leaflets are 3–4 in number, rarely 5–7, usually in opposite pairs, oblong to narrowly oblong-elliptic, 4–12 cm long, 2–5 cm wide, apex acute to shortly acuminate, base rounded, margins entire, pale green, and with 4–8 pairs of lateral nerves. The flowers, about 4 mm long, are borne individually in conspicuous panicles, with pale green sepals, cream petals, and a bright red disk beneath the (4-celled) ovary. It produces a characteristic, almost spherical, woody capsule, 4–6 cm in diameter, opening by 4 valves from the apex. Six or more seeds are contained in a cell, broadly transversely ellipsoid to flat, about 25 mm long, 18 mm wide, with margins narrowly winged. The wood is valued as a savanna mahogany, although of an inferior quality to the wood of *K. ivorensis*.⁹

Habitat and Distribution — The species is found in the savanna woodland and riverine forests. It occurs from West Africa to the Sudan and has been found growing in Gambia, Mali, Guinea, Senegal, Guinea Bissau, Sierra Leone, Ivory Coast, Ghana, Togo, Benin, Niger, Nigeria, and Cameroun. It is also found in Chad, Sudan, Uganda, and Central African Republic.

Ethnomedicinal Uses — *Khaya* is used extensively in West Africa as a bitter tonic and a fever remedy. Its name, *Quiquiona du Senegal*, in Francophone West Africa, is attributed to its use in the treatment of malaria. It is also used as a vermifuge, taeniocide, and antimicrobial agent for the

treatment of venereal diseases. The crushed bark and seeds have been employed as an emmenagogue. The drug is highly valued in traditional veterinary practice: For the treatment of cattle suffering from liver fluke, an infusion made by steeping the bark in a mixture of brine and water is given as a draught and as a dressing for ulcers on camels, horses, and donkeys; decoction of the bark is administered to horses for internal ailments associated with mucous diarrhea.

Constituents — The plant yields limonoids, of which the major ones include khivorin, 7-ketokhivorin, 3-deacetylkhivorin, 3-deacetyl-7-ketokhivorin, 7-ketogedunin, methyl anglensate, methyl-6-hydroxy anglensate, mexicanolide, 6-hydroxymexicanolide, 7-deacetyl-7-oxo-gedunin, 6-deoxyswietenolide esters, and khayasin.^{695–697} The bark contains a bitter principle called “calicedrin” in commerce, which contains triterpenes with a lactone or epoxide function and a furan ring. Similar principles also occur in *K. ivorensis*.^{698,699} The coumarones scopoletin, aesculetin, and scoparone have been shown to be constituents of the bark, while the fruits yield scopoletin.⁷⁰⁰

Pharmacological Studies — The crude aqueous alcohol extracts of the stem bark possess sedative and reduced locomotor activity, as well as CNS depressant activity in mice. The coumarones found in the plant have been associated with analgesic, antipyretic, and moderate anticonvulsant action.^{701,702} Earlier studies of the bitter “principle” caliderin showed that when injected through the subcutaneous or intraperitoneal routes, it produces a significant lowering of temperature in experimental hyperthermic animals.^{703,704} Extracts of the plant were found to be antimicrobial at very low concentrations.²⁷³

KIGELIA AFRICANA



Botanical Name — *Kigelia africana* (Lam.) Benth.

Synonyms — *Kigelia pinnata* (Jacq.) DC.; *Kigelia aethiopica* Decne., *Bignonia africana* Lam., *Crescentia pinnata* Jacq., *Tanaecium pinnatum* (Jacq.) Willd.; 30 other synonyms and subspecies

Family — Bignoniaceae

Common Names — Sausage tree, cucumber tree

African Names — The sausage tree is found throughout tropical Africa, and there are local names for the plant among the several hundred tribes. The following list gives only a selection of the common names: Afrikaans (South Africa): worsboom; Swahili: mvungunya, mwegea, mwicha, mranaa; Igbo (Nigeria): uturukpa, iteni, amo-ibi, uturu-bein, izhi, umu-aji, okpe sera, oke ogisi; Ijo-Izon (Nigeria): ogirizi; Twi (Ghana): nufuten, nufoten, nufutsen; Fante (Ghana): etua, etua, nufutsen, (e-) nufutsen; Yoruba (Nigeria): orara, pandoro, orora, uyan, epo amayan; Edo (Nigeria): ugbon-gbon, usuonbon, ugbon-gbon, usuonbon; Hausa (Nigeria): hantsar giiwaa, noonon giiwaa; Fulani-Fulfulde (Nigeria): jirlaare (fruit), jirlahi; Tiv (Nigeria): tyembegh, tyambeg; Manding-Bambara (Senegal): sidiamba; Wolof (Senegal): dobale, dabal, diambal, dabole, dombale; Zulu (South Africa): umBongothi, umZingulu, unbongothi, unfongothi, umvunguta, umzingula, ibele-ndlovu, umVongothi; Swazi (Southern Africa): umVongotsi; Taita (Kenya): mwaisina; Somali (Somalia): bukural,

bukror, berde, saad, sag; Luo (Uganda): jago; Ngakarimojong (Uganda): edodoi; Lunde (Zambia): muvunguvungu; Lunyul (Uganda): mujungwe; Luo (Kenya): yago; Luo (Uganda): jago; Lusoga (Uganda): muvunjudza; Maa (Kenya): oldarpoi, ortarboi; Maasai (Tanzania): ol darboi, ol darboi; Ngoni (Zambia): muvungula; Nguu (Tanzania): mvungwe; Mbukushu (Namibia): ghuvunguvungu, ghuvenguvungu; Malinke (Gambia): sanjubaha, limbi; Malinke (Guinea): limbi lamban, dindon; Malinke (Ivory Coast): lamban, lembe, limbi; Malinke (Mali): dindon, limbi, tudo

Description — *Kigelia* comprises a polymorphous species. It is extremely variable in habit and leaf morphology, which has led to the distinction of up to 10 separate species and many synonyms. *Kigelia africana* is a small- to medium-size semideciduous tree, up to 25 m in height. The bark is gray and smooth at first, peeling on older trees. It can be as thick as 6 mm on a 15-cm branch. The wood is pale brown or yellowish, undifferentiated, and not prone to cracking. The tree is evergreen where rainfall occurs throughout the year, but deciduous where there is a long dry season.

The leaves are opposite or whorled, usually in whorls of 3–4, usually crowded toward the apex of branches, imparipinnate, up to 60 cm long; stipules are absent; petiole is up to 15 cm long and rachis up to 25 cm long; leaflets are 5–13, with lateral ones subopposite, subsessile except rounded to cuneate, more or less asymmetrical, apex rounded or retuse to broadly tapering, margin entire, serrate, toothed or wavy, papery to leathery, glabrous to more or less hairy at both surfaces, with 6–13 pairs of lateral veins. Inflorescence is a terminal, pendulous, very lax panicle, up to 100 cm long, with a long peduncle. Flowers are bisexual and very large; pedicel is up to 11 cm long, upcurved at the tip; the calyx is shortly tubular to campanulate, 2–4.5 cm long, suddenly widening and incurving upward, with limb 2-lipped, the superior lip 2-lobed, the lower one 3-lobed and recurved, lobes are rounded, at first yellowish, later becoming reddish to purplish with darker streaks; stamens 4, didynamous, adnate to the corolla tube, 4–7.5 cm long, staminode 1; disk annular, thick; ovary superior, 1 celled, up to 1.5 cm long, with 2 parietal placentas, style filiform, up to 7 cm long. The fruit is a large, sausage-like, pendulous berry up to 100 × 18 cm, with a peduncle up to 100 cm long, indehiscent, wall woody, surface heavily marked by lenticels, and gray-brown when mature. The fruit pulp is fibrous and pulpy and contains numerous seeds.

Habitat and Distribution — *Kigelia* is widely distributed throughout tropical Africa, particularly in the drier regions. It is a very resilient plant.

Ethnomedicinal Uses — The plant is used in traditional medicine for various purposes, including chronic constipation, fainting, anemia, sickle-cell anemia, epilepsy, respiratory ailments, hepatic and cardiac disorders, and nutritional illnesses such as kwashiorkor, rickets, wasting, and weakness. The fruit is used for edema, cancer, rheumatism, snakebites, fevers, malaria, and syphilis, and an alcoholic beverage similar to beer is also made from it.¹¹³⁸ The unripe fresh fruit is considered poisonous and strongly purgative and is used internally only in small doses. It can be prepared for consumption by drying, roasting, or fermentation. The leaves and stem bark have been used for dysentery, constipation, wound dressing, boils, and fevers. The leaves are sometimes used to prepare a general tonic for improved health and growth. The stem bark decoction has been used as an aphrodisiac and for the treatment of kidney diseases, solar keratosis, diarrhea, coughs, and inflammation. The bark and leaves are decocted and administered as an abortifacient. Sexual complaints such as infertility, poor libido, sexual asthenia, and impotence are treated with medicines containing the fruits, roots, or leaves.¹ The root is a remedy for boils, sore throat, constipation, and tapeworm infestation.⁷⁰⁵

Kigelia is also used in the treatment of skin diseases and in traditional cosmetics preparations as a skin lightening agent, to reduce wrinkles, and to promote smooth skin. In Nigeria, the ground fresh or dried fruits are formed into a paste and rubbed on the breast to treat “cancer” of the breast or abscess.⁷⁰⁶ In some parts of Africa, it is considered a sacred plant and is used in religious rituals.

Constituents — The sausage tree elaborates a complex mixture of secondary plant metabolites, including iridoids, naphthoquinones, phenylpropanoids and phenylethanoid derivatives, coumarins, lignans, flavonoids, fatty acids, and steroids. The fruits have been shown to contain the following iridoids: jiofuran, jioglutolide, 1-dehydroxy-3,4-dihydroaucubigenin, des-p-hydroxybenzoyl

kisasagenol B, ajugol, verminoside, 6-trans-caffeoyl ajugol, 7-hydroxy viteoid II, 7-hydroxy eucommic acid, 7-hydroxy-10-deoxyeucommiol, and 10-deoxyeucommiol.⁷⁰⁷ The major iridoids found in the root bark and stem bark of *K. africana* are specioside, verminoside, and minecoside.⁷⁰⁸ The major flavonoid components of the leaves and fruits are luteolin and quercetin. They also contain the phenolic acids 4-hydroxy cinnamic acid, ferulic acid, and caffeic acid.

Pharmacological Studies — Extracts of *Kigelia* and isolated compounds have been shown to possess antibacterial, antifungal, antineoplastic, analgesic and anti-inflammatory, antimalarial, antiprotozoal, antidiarrheal, and CNS stimulant activities.⁷⁰⁹ Bioassay-guided fractionation and separation of *K. africana* led to the isolation of norviburtinal and isopinnatal, which are partially responsible for the antineoplastic effect of the plant. Norviburtinal showed a much greater cytotoxic effect but showed little selectivity toward melanoma cell lines. Isopinnatal displayed slightly greater cytotoxic activity against the melanoma cell lines, but its high cytotoxicity against the noncancer fibroblasts indicates that it probably has a general cytotoxic effect that precludes it from being considered as a lead molecule for novel anticancer agents. It is interesting to note that the crude extract of *Kigelia* had a lower IC₅₀ value than the isolated compounds alone, which suggests that several compounds are working together synergistically to give the observed antineoplastic effect.^{710,711}

The short-term effects of *Kigelia africana* fruit extract (KAFE) on cisplatin-induced testicular histomorphometric changes in SD rats have been investigated.⁷¹² It was found that cisplatin treatment caused over 37.5% mortality of SD rats. Qualitative histological assessment showed no deleterious changes following treatment with KAFE alone or as a pretreatment with cisplatin. KAFE posttreatment resulted in focal vacuolar changes in the seminiferous tubules (STs) of the SD rats. Cisplatin treatment negatively affected the histoarchitecture of these STs, with massive loss of spermatogenic cells. There was also a significant reduction in testicular weight/volume, ST diameter, and cross-sectional areas ($p < 0.001$), but KAFE positively improved these parameters. KAFE alone and as prophylaxis significantly increased body weight, serum testosterone, and follicle-stimulating hormone ($p < 0.001$). It showed a significant elevation in CAT activity, decline in MDA, and upregulation of GSH levels ($p < 0.001$). These parameters were negatively affected by cisplatin treatment. It was suggested that the cytoprotection against cisplatin-induced testicular damage by KAFE is likely via an antioxidant modulatory pathway and also the possibility that KAFE may possess an androgen-stimulating property.⁷¹²

The extracts from the fruits have been shown to possess remarkable antidiabetic properties. In STZ-induced diabetic Wistar rats, daily oral treatment with the methanolic extract of *K. africana* flowers and standard drug for 21 days significantly reduced blood glucose, serum cholesterol, and triglyceride levels. The HDL cholesterol level was improved ($p < 0.01$) compared to the diabetic control group. Iridoids isolated from *Kigelia* have been evaluated for a GLUT4 translocation modulatory effect in skeletal muscle cells. 7-Hydroxy eucommiol and three related iridoid glycosides showed significant stimulation of GLUT4 translocation to the cell surface in skeletal muscle cells without any adverse effect on cell viability. The effect of these four compounds was concentration dependent and comparable to the standard drug rosiglitazone. These findings indicate that constituents of *K. africana* may provide leads for the therapeutics for insulin resistance and diabetes.⁷¹³

The anti-inflammatory and analgesic properties of the extracts of *Kigelia africana* have been shown to be comparable to those of synthetic anti-inflammatory agents and analgesics. Supercritical CO₂ extracts of *Kigelia* have been shown to be more effective than indomethacin (a potent synthetic anti-inflammatory agent) when evaluated against two anti-inflammatory assays, the inhibition of “oxidative burst” on human neutrophils and inhibition of COX-2.⁷¹⁴ The methanol extract of the flowers exhibited significant ($p < 0.01$) anti-inflammatory and analgesic activities with doses of 100, 200, and 400 mg/kg in rats and mice, respectively.⁷¹⁵ The plant extracts and the constituent compounds showed significant antioxidant activity and a potent effect against *Trypanosoma brucei brucei*, *T.b. rhodensiensis*, and *Entamoeba histolytica*. In the *E. histolytica* studies, it was found that when tested against the HK-9 strain, verminoside had twofold the antiamoebic activity of metronidazole, the standard antiamoebic drug, while specioside showed comparable activity with metronidazole.⁷¹⁶

In cosmetics, extracts of the plant have been evaluated for their ability to heal damaged skin and for the treatment of various dermatological conditions. A topical preparation containing the fruit extract is used to remove sunspots on the face and hands, “solar keratosis.” Several patents have been granted for the use of *Kigelia* extracts as antiwrinkling agents and for skin lightening and general skin rejuvenation. The fruit extract is useful to develop the bust and the stability of breast collagen fibers.

Commerce — *Kigelia* is not yet a major article of trade in most countries in Africa. In Nigeria, it is sold mainly in the local herb market for the preparation of a remedy for enlarged breasts. Most exports are for the cosmetic industry and are limited to a few tons per annum. Greater demand is envisaged because of the increasing scientific data that tend to support the traditional uses of the plant.

Agriculture — *Kigelia* is sometimes grown as an ornamental plant. Experimental cultivation as a commercial medicinal plant has been successful.

Formulations and Dosage Forms — *Kigelia* has been incorporated in skin creams, shampoos, and scalp applications as a cosmeceutical agent because of its beneficial effect on skin elasticity, reduction of wrinkles and skin blemishes, tightening of the delicate skin around the eyes, antimelanoma property, and repair of sun-induced skin damage.

LAWSONIA INERMIS

Botanical Name — *Lawsonia inermis* L.

Synonyms — *Lawsonia alba* Lam., *Rotanthea combretoides* Baker., *Alcanna spinosa* Gaertn.

Common Names — Henna, Cypress shrub, Egyptian pivot, alkanna

Family — Lythraceae

African Names — Arabic: enah; Bambara: jabi; Hausa: lalle; Igbo: uhie inine; Swahili: mhina; Yoruba: laali

Description — A slender shrub or small tree. The branchlets are spiny when old. The leaves are simple, oppositely arranged, with short pointed apex, about 1.3–2.5 cm long and 2 cm broad. The flowers are creamy white, sweet scented; they are borne on common, leafy bracts. The petals are crisped, stamens 4–8. The fruits are globular, about 5 mm in diameter.^{9,28}

Habitat and Distribution — The herb is used for the treatment of skin infections. The powdered dry leaves are an ingredient in the preparation of local cosmetics. The herb is soaked in water to which a little lime has been added and applied for tinting the hands, feet, and nails. It is applied topically by the Hausas of northern Nigeria to control perspiration. The leaves and roots are believed to have properties that stimulate menstrual discharges and are also anthelmintic. The root is employed in North Africa in the treatment of hysteria and general malaise.

Constituents — Naphthoquinones such as lawsone, a 2-hydroxy-1, 4-naphthoquinone, are the major constituents of the leaves. The plant also contains resins and hennatannin. The plant is noted as a source of dye for hair, hands, and feet and as a cosmetic colorant.

Pharmacological Studies — An extractive from the plant has strong antimicrobial activity, which has been evaluated as comparable to the antibiotic activity of sulfonamides and penicillin.⁷¹⁷ Lawson exhibits slight antihemorrhagic properties. The compound also has emmenagogic and oxytocic properties.⁶⁶² The herb possesses significant *in vivo* activity against the growth of tubercle bacilli from sputum and *Mycobacterium tuberculosis* H37R at very low dose,⁷¹⁸ 6 µg/ml for the *in vitro* study and 5 mg/kg in the *in vivo* assay. The stem bark extract is fungitoxic to 13 ringworm fungi, and the activity was not affected by autoclaving, high temperature, or prolonged storage.⁶⁹¹

LEPIDIUM SATIVUM

Botanical Name — *Lepidium sativum* L.

Synonyms — *Arabis chinensis* Rottlerex Wight., *Cardamon sativum* (L.) Fourr., *Nasturtium crispum* Medik., *Thlaspi sativum* (L.) Crantz.

Family — Brassicaceae

Common Name — Garden cress

African Names — Hausa: lafsur; Soto: umatholisa; Zulu: umathoyisa

Description — This is an annual herb, erect, smooth, with distinguished leaf size and shape. The majority of the leaves are deeply lobed with linear segments. It has small white flowers borne on common stalks. The fruits are ellipsoid, compressed, notched at the top, and slightly winged toward the apex and enclose oval-shaped brown or red seeds. Three varieties of the herb (red, white, and black) exist.

Ethnomedicinal Uses — The whole herb, especially the seeds, is used for the treatment of bacterial and fungal infections. The soaked seeds, which are mucilaginous, are valued as a remedy for diarrhea and dysentery and externally as a liniment and for dressing sores in camels and horses. The soup is used in the treatment of bronchitis and cough and as a poison antidote. A related species, *L. myriocarpum* Sond, is used as a vegetable for cooking.⁷⁹

Constituents — *Lepidium* leaves yield about 0.12% volatile oil, known as cress oil. The major constituents of the oil are phenylacetoneitrile and aromatic isothiocyanates. The seeds also contain similar compounds. Alkaloids, terpenes, and saponins are present in the herb.

Pharmacological Studies — The volatile oil has been shown to inhibit the growth of *Bacillus subtilis* and *Staphylococcus aureus*.⁷¹⁹ The active constituents, the benzyisothiocyanates, were excreted intact in the urine within an hour of ingestion. The herb also exerts antitoxic activity.⁷²⁰ It has been shown to be a good model for the assay of phytotoxic compounds.⁷²¹ A member of the genus, *L. capitatum*, has been effective as a postcoital contraceptive.⁷²²

LONCHOCARPUS CYANESCENS



Botanical Name — *Lonchocarpus cyanescens* (Schum. & Thonn.) Benth.

Synonyms — *Robinia cyanescens* Schum. & Thonn., *Philenoptera cyanescens* (Schum. & Thonn.) Roberty.

Family — Leguminosae

Common Names — Indigo vine, West African wild indigo

African Names — Ashanti: dwira; Bafo (and Blong): mutely; Balandi: mubakote; Basa: wee-chu; Bini: ebelu; Ewe: avantime, adzudzu; Fulani: talakiri; Hausa: talaki; Igbo: anunu; Tiv: suru; Twi (and Ga): akase; Yoruba: elu

Description — This is a shrub or small tree, sometimes woody climber, 5–7 m high and about 50 cm in girth. The stem is brown or yellow, and the branchlets are silky when young. The leaves are pinnate, occur in 4–5 pairs, are ovate or elliptic, 30 × 12 cm, with 5 pairs of prominent lateral veins. The leaves turn blue-green on drying and yield the popular indigo dye. The flowers are reddish or bluish white, sweet scented, and occur in panicles between May and June. The fruits are 30 × 20 cm and occur as flat pods, indehiscent, and enclose 1–5 seeds. The fruits turn bluish black on drying.⁹

Habitat and Distribution — The plant grows in fringe, deciduous, and savanna forests. It occurs from Guinea to Cameroon.

Ethnomedicinal Uses — The main use of indigo vine is in the preparation of local embrocation for sprains and for healing of yaws. The leaves are also used as a poultice for ulcers and as dressing for skin diseases. In Ivory Coast, women have been reported as using a decoction of the roots and leafy stems as postpartum medication.⁹ The leaves have been used as ingredients for the preparation of stomachic in Ghana and as treatment for leprosy and cataract in Sierra Leone.⁹ The stem bark and roots have been employed as a general tonic and remedy for fevers. The leaf decoction has also been used for venereal diseases and semen insufficiency.²⁶⁶

Constituents — It contains the insecticide rotenone. Glycyrrhetic acid and related oleanolic acid derivatives have been shown to be present in the plant.⁷²³ Flavonoids and pterocarpanes have also been reported from a related species, *P. laxiflorus*.⁷²⁴

Pharmacological Studies — Extracts of *L. cyanescens* have been shown to reduce carrageenan-induced rat paw edema, as well as adjuvant-induced polyarthritis in rat.⁷²⁵

LONGHOCARPUS SERICEUS

Botanical Name — *Lonchocarpus sericeus* (Poir.) Kunth.

Synonyms — *Robinea sericea* Poir., *Derris sericea* (Poir.) Ducke

Family — Leguminosae

Common Name — Senegal lilac

African Names — Ashanti: totoro; Igbo: njassi; Sefwi: boma; Twi: jwandwoananin, ofefrae, osantewa; Wassaw: dukaw; Yoruba: ipapo

Description — This is a shrub but often grows to a medium-size tree, about 12–15 m high and 1.2–1.4 m girth, sometimes branching near the base. In poor soils, usually by the roadside, it occurs as a struggling shrub less than 5 m high. It has a smooth, grayish bark, with a yellowish-brown slash with reddish tints. The twigs and young shoots are covered with brownish velvety hairs. Leaves are pinnate, with 3–5 (sometimes 7) pairs of opposite leaflets 6–14 cm long, 3–9 cm wide, increasing in size toward the terminal leaflet, ovate-elliptic or elliptic, apex shortly or bluntly acuminate, base rounded to broadly cuneate or subcordate, margins entire or slightly wavy, glabrous above, pubescent below, midrib prominent below, and lateral nerves in 6–10 pairs. It produces pale purple or lilac color flowers, with a broadly cup-shaped calyx, 5 mm long and densely hairy. The flowers are borne December–February and April–July. The fruits occur as flattened indehiscent pods, clustered, persistent, about 12 cm long and 1 cm wide, irregularly constricted between the seeds and more or less twisted, both ends acute with thickened margins. The pods encapsulate oblong kidney-shaped, reddish-brown seeds, about 7 mm long and 5 mm wide.^{28,33}

Habitat and Distribution — The species grow in coastal savanna woodland and in fringe and transition forests. Due to the ease in generating the plant from the seeds and the ability to withstand fairly long periods of drought, it is planted as a shade tree in many parts of tropical Africa. The plant has been located in many countries in West Africa, including Cameroon, Ghana, Nigeria, Senegal, Gambia, Guinea Bissau, Guinea, Sierra Leone, Ivory Coast, and Benin.

Ethnomedicinal Uses — Extract of the bark is used in Nigeria as a stomachic and a laxative. An external application prepared from the stem bark is employed in the treatment of convulsion and backache, and the lotion is applied for parasitic skin conditions and eruptions.⁷⁸

Constituents — *Lonchocarpus* is a source of the insecticide rotenone. A compound named lonchocarpine, 5-hydroxy-2,2-dimethyl-3-chromen-6-yl-strylylketone, has been shown to be a component of the roots, seeds, and leaves of this species.⁷²⁶ Other constituents of the plants include quercetin, rutin, *p*-coumaric acid, and β -sitosterol, as well as isoflavonoids and pterocarpanes.^{78,727,728}

Pharmacological Studies — A resin that occurs in the seeds and the fruit is considered to be a violent poison.⁷²⁹ The extract has insecticidal action due to its rotenone content.

MALLOTUS OPPOSITIFOLIUS

Botanical Name — *Mallotus oppositifolius* Geisel. Muell. Arg.

Synonyms — *Acalyphadentata* Schumach. & Thonn., *Claoxylon cordifolium* Benth., *Croton oppositifolius* Geiseler., *Echinus oppositifolius* (Geiseler) Baill., *Ricinocarpus dentatus* (Schumach. & Thonn.) Kuntze., *Rottlera dentata* Baill.

Family — Euphorbiaceae

Common Names — The name Kamala, camala, or *Glandulae rottlerae* in official monographs refers to the trichomes and glands from the fruits of *Mallotus philippinensis*.

African Names — Hausa: kafar; Igbo: okpokirinya; Yoruba: eja

Description — This is a shrub up to 13.5 cm long and 2.5–10 cm wide. The leaves are oval in shape and long stalked. The apex is shortly pointed, and the base is more or less heart shaped. There are 3 main veins from the base. The lower sides of the leaves are densely dotted with glands. The lateral veins end in small glands at the leaf margins. The margins are slightly toothed. The stalks are 2.5–5 cm long. It produces tiny, white, fragrant flowers, borne on slender common stalks at the end of the twigs or in the axils of the leaves. The fruits are produced throughout the year, deeply lobed, 3 celled, about 5 mm in diameter, and covered with glandular hairs. The hairs and glands covering the fruit are easily rubbed out, sifted, and made to float on water as a red motile powder.

Habitat and Distribution — It grows in old farms, in secondary forests, and thickets. It thrives also in savanna vegetation. The drug is native to East Africa, India, and Arabia. In Africa, it is distributed almost throughout the continent.

Ethnomedicinal Uses — The whole herb is used for the treatment of dysentery and as a vermifuge. The stem is chewed to fibrous brush and used as chew sticks for teeth cleaning. The fresh leaves are crushed and applied to fresh cuts to stop bleeding. The leaf juice has been used as nasal drops for headache. Irvine indicated that the leaves of the plant are used with those of *Trema*, *Bandeirae*, and *Dalium guineense* in Akropong and Akwapim (Ghana) for urinary disorders during pregnancy.⁹

Constituents — Kamala consists of a red pigment, isoallorotlerin; the yellow component methylene-bis-methylphloroacetophenone, and other phloroglucinol derivatives, such as rottlerin and isorottlerin, as well as two compounds, kamalins I and II of undetermined structure.^{730,731} The fruit contains terpenes, flavonoids, chalcones, and saponins.^{732–734} Five hydrolyzable tannins⁷³⁵ and cytotoxic phloroglucinol⁷³⁶ have been reported from the bark of *M. japonicas*. Cytotoxic chromene derivatives have been isolated from the pericarp of the same species.⁷³⁷

Pharmacological Studies — Kamala is a purgative and taeniafuge and has been employed in India and many parts of the world for the treatment of tapeworm infestation. Both the alcoholic and

dithylether extracts of the fruit showed taenicial action *in vitro* and *in vivo*.⁷³³ The drug has been found to possess antifertility activity when tested in rats and guinea pigs, and this action has been attributed to the presence of rottlerin.⁷³⁸ Other derivatives of crude Kamala extract have hypoglycemic, antibacterial, antispasmodic, and antitumor activity against human epidermoid carcinoma of nasopharynx in tissue culture and sarcoma 180 in the mouse.⁷³⁷ In clinical medicine, Kamala is also applied topically as an ointment for ringworm, scabies, herpes, and other parasitic skin diseases.

MANNIOPHYTON FLAVUM

Botanical Name — *Manniophyton flavum* Muell. Arg.

Synonym — *M. africanum* Muell. Arg.

Family — Euphorbiaceae

African Names — Bini: ebumen; Igbo: ege; Mano: fei, fai; Mende: njuli

Description — This is a hairy wood climbing plant or a straggly shrub; the young stems are pithy or hollow, and the branchlets are covered with brown stinging hairs. It has polymorphous leaves, mainly entire, often 2–5 lobed, and asymmetrical with caudate base, with parallel tertiary nerves and covered on both surfaces with prickly stellate hairs. It is up to 25 cm long and about the same size in breadth. The flowers are small and occur in clusters on the common stalks. Male and female flowers are separate, up to 25 cm long. There are between 10 and 20 stamens in a flower. The female panicles are smaller than the male ones. It produces 3-lobed capsules, 2–5 cm long, almost rounded with raised ribs.

Habitat and Distribution — This is a rainforest plant, found mainly in mixed deciduous and evergreen forests. It is distributed from Sudan to Tanzania and occurs in the West Coast up to Sierra Leone.

Ethnomedicinal Uses — The main use of the plant in many parts of the continent is in the treatment of skin infections. The seed oil, which is rich in iodine, is applied externally for yaws. The bark and stem are chewed as a remedy for cough. A decoction of the leafy twigs and roots is drunk as a medicine for stomachache and for gonorrhea. A fresh decoction is used for treating snakebite and scorpion stings.

MASSULARIA ACUMINATA



Botanical Name — *Massularia acuminata* (D.Don) Bullock ex Hoyle

Synonym — *Randia acuminata* (Benth)

Family — Rubiaceae

Common Name — Chewing stick tree

African Names — Igbo: atu-uhie; Yoruba: pako-ijeju, orin-ijeju

Description — *Massularia* is a medium-size shrub or small tree, growing up to 5 m high. The leaves are large, practically stalkless, elliptic-oblongate, acuminate, almost glabrous, papery, and subsessile. The flowers, usually red, are borne in short axillary cymes and appear around January. The fruits are 5 cm long, narrowly ovoid, beaked, and yellow-white in color.

Habitat and Distribution — It is a tropical plant, found usually in undergrowth of closed moist forests. It is distributed from Sierra Leone to Zaire. Related species grow in the East Coast.

Ethnomedicinal Uses — The stems are prized as chewing sticks in southern Nigeria. The pulped roots are employed as an enema for dysentery and as an aphrodisiac. The juice from the incised fruits is used as eyedrops in Sierra Leone.⁹ The pulped leaves are used externally as liniment for lumbago and muscular pains.⁷³⁹ The stem is believed to be an aphrodisiac, and it is sold in Nigerian cities for this purpose.

Constituents — Preliminary phytochemical tests on the stem bark and roots of the plant (in the author's laboratory) showed the presence of alkaloids, saponins, and polyphenolics. The aqueous extract of the stem contained alkaloids (0.22%), saponins (1.18%), anthraquinones (0.048%), flavonoids (0.032%), tannins (0.75%), and phenolics (0.066%).⁷⁴⁰

Pharmacological Studies — It has been shown to possess significant antimicrobial activity against oral pathogens associated with orodental infections,⁷⁴¹ including *Bacteroides gingivalis* and *B. melaninogenicus*.⁷⁴² The aqueous extract of the plant has an MIC of 0.5 and 2 µg/ml against *Bacteroides gingivalis* and *B. melaninogenicus*, respectively.⁷⁴⁶ The adherence of *Streptococcus* mutants to the surfaces of the teeth was effectively inhibited by a 1% concentration of the aqueous extract of *Massularia*.⁷⁴³

The possible effect of *Massularia* on male reproductive system has been investigated in laboratory animals. Extracts of the stem at various doses (20–1000 mg/kg) produced a significant increase ($p < 0.05$) in testes–body weight ratio, testicular protein, glycogen, sialic acid, cholesterol, testosterone, and luteinizing and follicle-stimulating hormone concentrations of male rats throughout the period of administration. The testicular gamma glutamyl transferase activities were decreased significantly ($p < 0.05$) after the first dose and were sustained throughout the experimental period.⁷⁴⁴

MATRICARIA RECUTITA

Botanical Name — *Matricaria recutita* L.

Synonyms — *M. chamomilla* L., *M. suaveolens* L.

Family — Compositae

Common Names — Matricaria flowers, German or Hungarian chamomile flowers

African Names — Arabic: bahboonig; Xhosa: msolo

Description — The flowers of *Matricaria* can be differentiated from those of the English chamomile by their hollow receptacle, which is devoid of paleae. The capitulum spreads out to 10–17 mm in diameter and consists of an involucre, up to 20 marginal ligulate florets, and many central tubular florets. Comparatively, *Matricaria* has smaller flower heads than chamomile. It has a bitter and aromatic taste, but the odor is usually weaker than that of Roman chamomile.

Habitat and Distribution — The plant is largely a Mediterranean crop, but grows well in North Africa and cooler regions of southern and eastern Africa.

Ethnomedicinal Uses — African chamomile is reputed as an herbal tea and is dispensed as a sedative, carminative, antiseptic, analgesic, antispasmodic, and anti-inflammatory. It has been used for the treatment of gout, indigestion, diarrhea, and insomnia and in pediatric practice for infantile convulsions, colic, and teething pains.¹²³

Constituents — It yields a pleasant-smelling volatile oil, with the sesquiterpene α -bisabolol composing up to 50%. The volatile oil content is about 2% of the dry weight of the flowers. Other components of the volatile oil include chamazulene, guiazulene, farnescene, α -bisabol derivatives,

and matricine.^{744,745} The plant also contains flavonoids apigenin, luteolin, patuletin, and quercetin and related glycosides.⁷⁴⁶ Coumarins, spiroethers, and polysaccharides have been shown to be present in *Matricaria*.

At least four chemotypes of the drugs can be distinguished depending on the composition of the oil: chemotypes with or without chamazulene (European origin); those with α -bisabolol (Portuguese and Spanish origin); those with α -bisaboloxide A (African, Bulgarian, and Turkish origin); and those with α -bisaboloxide B (Argentine origin).⁷⁴⁷

Pharmacological Studies — Extracts and tincture of the plant have been shown to possess many and varied pharmacological properties due to its many biologically active compounds. It appears that the anti-inflammatory activity is the predominant effect of *Matricaria* extract when applied externally, and smooth muscle-relaxing effects predominate when taken internally. The azulenes of both species of chamomile have been shown to be antiallergenic and anti-inflammatory.⁷⁴⁸ One of its major constituents, α -bisabolol, has been shown to have anti-inflammatory, antibacterial, antimycotic, and ulcer-protective properties.⁷⁴⁴ In experimental animals, the compound was also found to inhibit ulcer development induced by indomethacin, stress, and ethanol and reduced the healing times for ulcers induced by chemical stress or heat coagulation.⁷⁴⁹ Natural (-)- α -bisabolol has been shown to be more effective than the synthetic racemic bisabolol in healing burns; it also decreases the temperature of skin exposed to UV light.^{744,745} Bisabolol has a spasmolytic activity comparable to that of papaverine.⁵⁸³ Other constituents of *Matricaria* with spasmolytic activity include apigenin (2–5 times the activity of papaverine), apiin, patuletin, α -bisaboloxide A and B, and the cis-spiroethers (10 times as active as papaverine). The wound-healing property of the drug is aided by the immunostimulating activity of the polysaccharides, which activate macrophages and B lymphocytes.⁷⁵⁰ In a comparative evaluation, *Matricaria* ointment (Kamilllosan) was found to be more effective in experimentally induced toxic contact dermatitis than the ointment base or 0.1% hydrocortisone acetate ointment; the topical preparation was assayed by a profilometry determination of the structural changes of the epidermal surface.⁷⁵¹

Toxicity — The drug has low toxicity. The acute LD₅₀ of the volatile oil is approximately 15 ml/kg in rats and mice. The teas prepared from pollen-laden flower heads cause contact dermatitis and anaphylaxis on hypersensitive individuals.^{752,753} Sensitivity to *Matricaria* has been ascribed to type I immunoglobulin E (IgE)-mediated immunologic response, and persons suffering from pollen-induced hay fever are particularly susceptible.⁷⁵⁴ Cross-reactivity has been demonstrated among chamomile tea extract and the pollens of *Matricaria*, *Ambrosia trifida* (giant ragweed), and *Artemisia vulgaris* (mugwort) using an ELISA (enzyme-linked immunosorbent assay) inhibition study.⁷⁵⁸

MAYTENUS BUCHANANII

Botanical Name — *Maytenus buchananii* (Loes.) Wilczek

Synonyms — *Gymnosporia buchananii* Loes., *Maytenus ovata* (Walp.) Loes. var. *ovata*

Family — Celastraceae

African Names — Digo: mudziadzyah; Katenga: mukululubishia; Rwanda: umutukuza, urutka; Shona (Zambia): mutumbwishia; Kindembo (Zaire): musoma; Musaka (Zaire): umushubi; Kitabwa (Zaire): mubamba ngoma, mumpulukuswa, pulukusva; Kiluba (Zaire): musonga, sombo; Kinyaruanda (Zaire): umusakara, umutakaza

Description — This is a glabrous woody shrub or small evergreen tree 2–12 m high, with paired spines up to 2.8 mm long. It has a fairly hard slash, with the inner bark of large stems red with a thin, bright yellow layer just under the outer gray surface; small stems have pink slash without a yellow layer. The leaves are simple, petiolate, and spirally arranged. The lamina is elliptic or elliptic-oblong to ovate, oblanceolate, or suborbicular, 1–1.7 m long, 0.8–8 cm wide, apex obtuse to rounded or rarely acute to shortly acuminate, especially when young, with lateral nerves and

sense reticulate venation more prominent below than above. It has solitary inflorescence, with axillary, dichasial, or monochasial cymes, 0.5–2.3 cm long; whitish puberulous; peticels 2–5 mm long, articulated in the lower half. The flowers are whitish, usually cream colored, 3–25 per cyme, about 2.5 mm in diameter; the petals are oblong, with margins ciliate to more or less entire. The sepals are lanceolate to triangular, 0.5–1.25 mm long, apex acute to subacute, margins ciliate. It produces long, pale green to reddish fruits enclosing 2–3 shiny red seeds partly embedded in fleshy white or pale yellow aril.^{9,28,33}

Habitat and Distribution — It is a native to the well-watered savanna regions of the continent. It is a light-demanding tree of open lowland, riverine forests, and forest margins. It occurs on a wide range of soils, including sandy, larval, and limestone soils; acid soils are preferred. The plant is distributed mainly in southeast Africa, including Kenya, Tanzania, Zimbabwe, and Ethiopia. The species also grows in Nigeria, Ghana, Cameroon, Gabon, Fernando Po, Central African Republic, Rwanda, Burundi, South Sudan, Uganda, Malawi, Mozambique, and Zambia.

Ethnomedicinal Uses — The powdered bark is reputed as a Moshi remedy for wounds, ulcers, and boils. In Togo, a leaf decoction was used for the treatment of mouth infections and wounds and is still used in folk medicine in West Africa as a mouthwash for mouth ulcers and toothache. The related species, *M. senegalensis* (Lam.) Exell (the confetti tree), is also used in traditional medicine; the chipped roots are added to beer and used in Zambia as an aphrodisiac.²²⁷ The roots, which are slightly bitter, are also mildly laxative and are used in various parts of tropical Africa for gastrointestinal troubles, especially dysentery,⁹ and a poultice of the green leaves has been used to dress sores in Tanzania.⁷⁵⁵

Constituents — The plant contains the antileukemic ansa macrolides maytansine, originally isolated from *M. seratta* collected from Ethiopia,⁷⁵⁶ and maytanbutine.^{757,758} The genus also yields the spermidine alkaloids celacinnine and cellalocinnine^{759,760} and the nicotinoyl sesquiterpene alkaloids maytoline and maytolidine, catechin, PACs, and phenoldienone triterpenes.⁷⁶¹

Pharmacological Studies — The main pharmacological activity of this genus is its remarkable antitumor activity. The compound has been extensively studied as a part of the drug development program of the Division of Cancer Treatment, National Institutes of Health, Bethesda, Maryland. The ansa macrolides have shown significant activity against various animal tumors, including B-16 melanoma, lymphatic lymphoma, and carcinosarcoma. Cytotoxic activity appears to be caused by inhibition of the proper formation of the mitotic spindle and thus cessation of cell division.⁷⁶² Various side effects were observed in the phase I human studies, including gastrointestinal, hepatic, and neurological disorders. Adverse reactions such as nausea, vomiting, diarrhea, and lethargy have been reported as being dose limiting.⁷⁶³ Reviews containing reports of the development of maytansine are available.^{764,765}

MERREMIA ANGUSTIFOLIA

Botanical Name — *Merremia angustifolia* Hall. f.

Synonyms — *Convolvulus oligodontus* Baker., *Ipomoea angustifolia* Jacq., *Xenostegia tridentata* (L.) D.F. Austin & Staples

Family — Convolvulaceae

African Names — Hausa: yimbururu; Yoruba: atewegbore, abiarunum

Description — This is a prostrate or climbing herb. It has narrow leaves, alternately arranged on the stem, about 3 cm long, pointed, almost lanceolate and lobed at the base. The stalks are very short. The flowers are yellow in color, funnel like, and about 8 mm long, with 5 persistent sepals and a corolla with 5 lobes. The 5 stamens are attached to the base of the corolla tube. It yields small rounded fruits.⁷⁷

Habitat and Distribution — It grows mainly in secondary forests and savanna. The plant has been located in the Jos and Kaduna areas of Nigeria, and in the southern part of the continent, it has been collected from Kenya, Zimbabwe, and Botswana.

Ethnomedicinal Uses — The boiled tuber is used in southeastern Nigeria as a fever remedy. In West Africa, a decoction of the plant together with native carbonate of soda (natron) is administered as a remedy for gonorrhea. The root is eaten with bran to acquire prolonged immunity against scorpion sting.

MITRAGYNA CILIATA

Botanical Name — *Mitragyna ciliata* Aubr. & Pell.

Synonyms — *Adina ledermanni* K. Krause, *Mitragyna ledermanni* (K. Krause) Risd.

Family — Rubiaceae

Common Names — Poplar (Liberia), African linden (*M. stipulosa*)

African Names — Bini: eben; Efik: uwen; Igbo: uburu; Kimbundu: mulangu; Mzima: baya; Shambala: mlombelombe; Twi (Wassaw): subaha; Yoruba: abura

Description — *Mitragyna ciliata* is an evergreen tree that grows up to 30 m high or more and about 1 m in diameter, with cylindrical, straight bole and clear branches for up to 20 m or more, rarely buttressed. The bark is grayish brown with flat, thin scales; the slash is cream yellow with a pinkish under layer that turns brown on exposure and is thick and fibrous. The crown is small, compact, and irregular. It bears red leaves when young. Mature leaves are large, simple, opposite, petiolate with large, conspicuous interpetiolate stipules; the petiole is 1.5–4 cm long, with stipules ovate-elliptic to obovate, 4–10 cm long, 3–7 cm wide, tomentose; the blade is broadly elliptic to suborbicular, 10–65 cm long, 8–44 cm wide, with apex rounded or obtuse, base truncate to cuneate, margins slightly wavy, medium green above, pale below, glabrous except a tuft of hairs in the leaf axils; midrib and 7–12 pairs of lateral nerves prominent below. It flowers in March and November and produces white flowers that are hermaphrodite, 5–7 merous, with each flower surrounded by up to about 15 wedge-shaped bracts about 4 mm long, with the bract ciliate at the apex. The fruits occur in June and July, and heads are up to 2.3 cm in diameter, with many amphora-shaped capsules 5–8 mm long with numerous seeds, 1.5 mm long, flat, and slightly winged.⁹

Habitat and Distribution — This species, as well as *M. inermis*, *M. stipulosa*, and about four other related species, is indigenous to the continent. The subject species grows in freshwater swamps in closed rain forests. It is common in narrow fringing belts along streams in high forest areas, grass plains, and low-lying swampy areas of deciduous and evergreen rain forests. It has been found in swampy areas at high altitudes (e.g., at 500 m at Udi plateau in Nigeria and at 600 m at Vane in Ghana). It is also present along riverine forests within the savanna. The plant is distributed throughout the coastal regions of West Africa, in Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, and Equatorial Guinea and in Zaire, Congo Republic, Angola, Tanzania, and some parts of southern Africa.

Ethnomedicinal Uses — The bark and the leaves are used in West Africa for the treatment of bacterial infections, especially gonorrhea and dysentery. In Cameroon and parts of Central Africa Republic, the bark boiled with *Capsicum* (pepper) seeds and those of piper guineense is reputed to be a remedy for chest complaints. It is listed by Walker as an ingredient with the bark infusion of *Coula edulis*, *Isolana letestui*, and *Berberia fistulosa* with an extract of the leaves of *Alchornea cordifolia* in a remedy used by the Bupunus to cure sterility in women.¹⁹⁸ A major use of *Mitragyna* species in Africa is as a febrifuge and for the treatment of malaria. A decoction of the stem bark mixed with *Garcinia kola* seed extract is used in southeastern Nigeria for the treatment of African sleeping sickness.

Pharmacological Studies — The *Mitragyna* alkaloids have been shown to possess pharmacological activities resembling those attributed to the crude drug in traditional medicine. The oxindoles rhynchophylline, mitraversine, and mitraphylline have been shown to have antihypertensive and local anesthetic activity and to decrease the rhythm of the heart.⁷⁸ Mitragynine has been credited with analgesic properties equivalent to those of codeine but without any of the side effects of the opiate;³³ the compound is also reported as being hallucinogenic.⁷⁶⁶ The alkaloids possess antiprotozoal activity and strong stimulatory action on the contractility of intestine and uterine muscles.⁷⁶⁷

MOLLUGO NUDICAULIS



Botanical Name — *Mollugo nudicaulis* Lam.

Synonym — *Lampetia nudicaulis* (Lam.) Raf.

Family — Molluginaceae

Common Name — Daisy-leaved chickweed

African Name — Hausa: narba

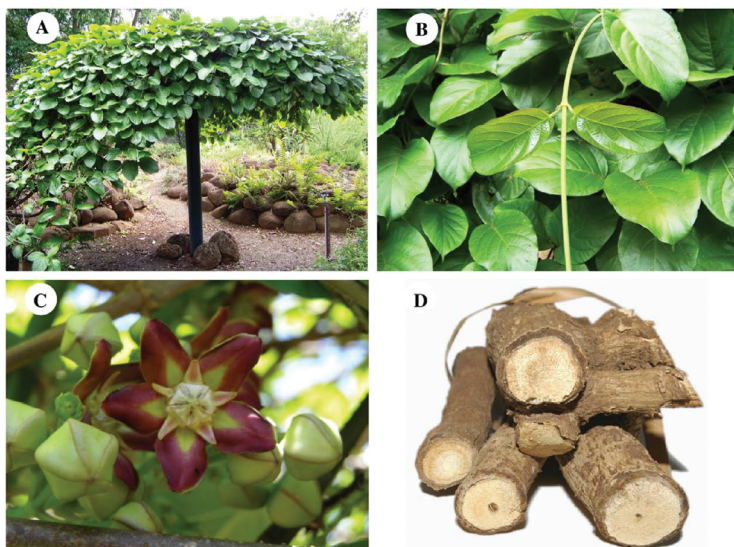
Description — *Mollugo* is an erect weed and is small, rarely exceeding 30 cm in height. The leaves are long oval in shape, widening toward the apex and rounded, and the base is wedge shaped. The leaves form a rosette on the ground. The flowers are whitish green, small, and borne on long, terminal, thin stalks of many ascending branches. The fruits occur as small capsules with many warty seeds.¹³

Habitat and Distribution — This occurs in deciduous forests and is distributed from Sierra Leone to South Africa.

Ethnomedicinal Uses — The whole herb is used as a cough remedy and is reputed to be effective in the treatment of whooping cough. The leaves are macerated in water to which some lime juice has been added and drunk as a worm expeller.

Constituents — The plant is rich in flavonoids and related phenolic compounds. It also contains CNGs, terpenes, and saponins. The total phenolic content (TPC) of the methanolic and aqueous extracts of leaves was 47.01 ± 0.8 and 46.4 ± 0.05 mg/100 g, respectively. The total flavonoid content (TFC) from the methanolic and aqueous extracts of leaves has been estimated to be 41.3 ± 0.04 and 36.2 ± 0.01 mg/100 g, respectively.⁷⁶⁸

Pharmacological Studies — The methanolic and aqueous extracts of the leaves have been shown to possess significant antioxidant properties, with IC_{50} values of DPPH radical scavenging as 48 and 190 μ g/ml, respectively. In the 2,2-azinobis-3-ethylbenzo-thiazoline-6-sulfonate (ABTS) radical scavenging assay, the IC_{50} values for the methanolic and aqueous extracts were 83 and 198.3 μ g/ml, respectively. The same extracts were found to have antimicrobial activities against *Pseudomonas aeruginosa*, *Proteus* sp., *Streptococcus* sp., and *Enterobacter* sp.¹¹¹³ The plant has shown a protective effect against acute liver injury induced by perchloroethylene in experimental rats.⁷⁶⁹

MONDIA WHITEI

Mondia whitei (A) creeping and well-supported on an iron bar; (B) twining stems with leaves; (C) young buds and fully opened flowers; and (D) mature roots. With permission from Prof. Van Staden (Aremu *et al.* 2011).

Botanical Name — *Mondia whitei* (Hook.f.) Skeels

Synonym — *Chlorocodon whitei* Hook.f.

Related Species — *Mondia ecornuta* (N.E. Br.) Bullock.

Family — Apocynaceae

Common Names — White's ginger, tonic root (Eng.)

African Names — Angola: mundondo, mudondo; Cissongo (Central African Republic): mundondo, bondo, molo busio; Ngwaka (DR Congo): nlondo, kimbiolongwa, kumba; Lugware (DR Congo): ubasangbwandiya, gatimba; Tshiluba (DR Congo): mujimbaye; Fula (Guinea, Guinea Bissau): lacadje; Kenya: mkombela; Malawi: citumbulo; Zulu: umondi, mundi, mindi; Uganda: sedando omutona; Shona (Zimbabwe): mungurawu.

Description — According to a description provided by the South Africa National Biodiversity Institute, *Mondia whitei* is a perennial, woody, rather robust and vigorous climber that grows from a large tuberous rootstock. The roots are aromatic and apparently taste like ginger or liquorice and have an aroma reminding one of vanilla. The leaves are attractive, large (100–300 × 50–150 mm), opposite, with a deeply notched heart-shaped base and stalks that are 30–55 mm long. The stipules are well developed and consist of frilly teeth. The flowers are borne in branched inflorescences. They are large and relatively short lived (die after 3–4 days). The reddish-purple corolla lobes are ±14 mm long and usually have a green margin. Plants flower from October to March in the southern and from May to August in the northern distribution areas of the species. The large fruits (75–100 × 44 mm) are almost woody and contain many seeds.⁷⁷⁰ Because the plant grows as a climber with the basal portion of the stem usually leafless, the leaves and flowers mainly appear in the canopy of the supporting vegetation and are thus rarely noticed.

Habitat and Distribution — *M. whitei* is native to Africa, and it is considered endemic in almost all African regions with the exception of the northern part of the continent. *Mondia* occurs mainly in moist-to-wet forests. It is found in vegetation types that range from swamp forest, swampy shrubby grassland, and riverine forest to disturbed forest, at altitudes from sea level to 1800 m. In West Africa, the species is commonly found in Guinea, Ghana, and Nigeria; in the

Central Africa region, it occurs in Cameroon, Gabon, and DR Congo; in East Africa, it is found in Kenya, Tanzania, and Uganda; and in southern Africa, it occurs in South Africa, Malawi, Angola, Mozambique, and Zimbabwe.

Ethnomedicinal Uses — *Mondia* roots have a slightly bitter taste at first but a sweet aftertaste and a pleasant vanilla odor and are used to make a tonic beverage similar to ginger beer. The young roots are sweet in taste and are less valued. It is used as an appetite stimulant and for indigestion, anorexia, and stress. In West Africa, the roots are brewed in alcohol to make an energizing drink for wedding parties. *Mondia* can be used as a tea. The plant is reputed to be an effective aphrodisiac and is valued as a medicine for the treatment of chronic male sexual erectile dysfunction and impotence. It has been used as a general anodyne and for the treatment of hypertension, stroke, anemia, asthma, hangover, mastitis, and allergies; it is also taken to improve sleep, enhance urination, and ease birth pains, and for use as a mouth freshener and toothbrush and for the treatment of fits in children.⁹⁴

Constituents — The plant has been shown to contain a potent tyrosinase inhibitor, 2-hydroxy-4-methoxybenzaldehyde, (–)-loliolide, isovanillin, coumarins, and coumarinolignan, as well as chlorinated coumarinolignan. *Mondia* elaborates a mixture of triperpenes, flavonoids, reducing sugars, and tannins. Nutritional analysis indicated that *Mondia* is rich in minerals and vitamins. The yields of the various nutrients, roots and leaves, respectively, are as follows (mg/g): potassium (11.34, 32.05); sodium (5.61, 24); magnesium (1.40, 2.83); calcium (3.08, 8.25); iron (0.20, 0.43); zinc (0.03, 0.07); copper (0.003, 0.06); manganese (0.64, 0.05); cadmium and lead (trace, trace); crude protein (4.35, 21.8); beta-carotene (0.004, 0.022); thiamine (0.78, 3.70); niacin (0.52, 8.15); riboflavin (0.62, 2.45); fructose (0.008, 0.015); xylose (9.17, 18.70); and glucose (2.40, 9.0).

Pharmacological Studies — Some of the biological activities associated with *Mondia* have been evaluated in a number of scientific studies to validate some of the traditional uses. The studies include biological assays on the aphrodisiac, antimicrobial, anti-inflammatory, antityrosinase, and antioxidant activities. The aphrodisiac efficacy of *M. whitei* roots has been established in various animal studies.^{771,772} The extracts displayed significant inhibition of tyrosinase, and this property could account for its observed cytotoxicity against certain types of cancer *in vitro*. The methanol extract has also been shown to possess *in vitro* antioxidant activity⁷⁷³ and an anti-inflammatory property, as evidenced by the remarkable inhibition (>80%) of COX-1 enzyme.⁷⁷⁴ The ethanol leaf extract showed moderate antidepressant activity *in vitro* in the serotonin reuptake transport (SERT) assay.⁷⁷⁵ Bioguided isolation identified the presence of (–)-loliolide in the active fraction with an IC₅₀ of 977 μ M. The extract had significant *in vivo* activity in both the tail suspension test (TST) and forced swim test (FST), and locomotor activity tests.⁷⁷⁶

Commerce — *Mondia* is widely traded in most parts of the continent for its aphrodisiac properties and the treatment of male erectile dysfunction. Because it is not usually traded across borders, not much information is available on the volume of trade or harvest of the species. The fresh roots are sold for US\$7–12/kg. In East Africa, the wholesale price for the whole plant is US\$0.20–0.30/kg, and it retails for more than US\$2/kg. In Nigeria, small pieces (0.01–0.02 m in diameter and up to 0.4 m in length) of the roots are sold by street vendors for US\$0.20 each.

Agriculture — This species is easily cultivated from seed. Seeds are collected as the fruit starts to split open, with the seeds picked off from their parachute-like tuft of hairs before it opens. The seeds are best sown fresh, but they can be stored for about a year under normal room conditions. Wood ash from a fire is mixed with the seed to prevent attack by insects. The plant, however, is largely harvested from the wild. The root is the plant part used most in traditional medicine, and studies of *M. whitei* have also focused on the root/root bark extracts, which is an indication of the high stress on the underground plant part. The plant is seriously threatened by overharvesting. There have been proposals on the possibility of sustainable harvesting of the species from the wild.

MONODORA MYRISTICA

Botanical Name — *Monodora myristica* (Gaertn.) Dunal

Synonyms — *Monodora borealis* Scott-Elliot., *Monodora claessensii* DeWild., *Annona myristica* Gaertn.

Family — Annonaceae

Common Name — Calabash nutmeg

African Names — Hausa: gujiya'dan miwa; Igbo: churu, efuru; Yoruba: abo lakoshe, arigho, eyinaghose

Description — *Monodora myristica* is an ornamental tree up to 30 m high, with dense foliage and spreading crown. The stem is fluted; the bark is fissured geometrically; the outer bark is thin and dark brown; and the inner bark is light brown above and pale cream beneath. The sapwood is soft, white, and slowly turns pinkish after slashing. The stem is aromatic. The leaves are elliptic, sometimes becoming wider at the apex, about 14–15 cm long and 5–14 cm broad, arranged alternately. The apex is shortly pointed, and the base is rounded or slightly caudate. The leaves display up to 20 pairs of prominent lateral veins and parallel secondary nerves. It flowers from September to April, at the time of the appearance of new leaves. The fruits are large, fragrant, and pendant, hanging on very long stalks with a crinkly bract about 2.5 cm long near the end of the stalk. Sepals are about 4 cm long, spotted with red, and with wavy edges and crisped. There are 6 petals, the outer ones, about 10 cm long, are brightly yellow in color and with dark red marks on the edge and toward the end. The inner petals are subtriangular, dull cream yellow, with red spots in the inner side.

The fruits are produced April–September, are about 15 cm in diameter, green, round, and are woody, suspended in a long stalk. The pulp is white and contains numerous seeds about 2.5 cm long.

Ethnomedicinal Uses — The seeds yield a colorless volatile oil with a pleasant taste and odor and are used as condiments for soup and added into snuffs as a flavoring agent. The seeds are also used to treat migraine (external application on the forehead) and as a stomachic and mixed with palm oil as a stimulant.⁷⁷ A pomade is made from the pulverized seeds fried in oil and the powder is used to treat guinea worms and other sores.⁷⁷ A related species, *M. tenuifolia* is used as an anthelmintic and in Yoruba traditional medicine for the treatment of toothache.

Constituents — The plant contains volatile oils, alkaloids belonging to the benzyltetrahydroisoquinoline group, prenylated indoles, diterpenes, and sesquiterpenes. A related species, *Monodora brevipes*, yields the proaporphine alkaloids crotsparine and stepharine, 3-formylindole, the sesquiterpene (-)- α -cadinol and the monoterpene $1\alpha,6\beta$ dihydroxy-4 α -p-menth-2-ene, and clerodane diterpenes.⁷⁷

Pharmacological Studies — The essential oils and extracts of *M. myristica* are known to possess antimicrobial properties. The antibacterial and antifungal activities have been evaluated against some microorganisms.⁷⁷⁸ In the *in vitro* assay against *Mycobacterium tuberculosis*, methanolic extract of the seeds showed both mycobacteristatic (IC₅₀ = 512 μ g/ml) and mycobactericidal (IC₅₀ = 1024 μ g/ml) activities on two strains of the organism tested.⁷⁷⁹

MORINDA LONGIFLORA

Botanical Name — *Morinda longiflora* G. Don

Synonyms — *Morinda longiflora* var. *breviloba* DeWild.

Family — Rubiaceae

African Names — Fulani: kodudu; Mende: wawe, leve rokbeni; Mano: gie gbindi; Wolof: rambeul; Yoruba (Oyo): oju-olgbo

Description — *Morinda longiflora* is a climbing shrub common up to 6 m high. The leaves are simple, oval-elliptic, pointed at the apex, and rounded at the base. They are smooth and shiny and

oppositely arranged on the stem and branches. It has white, sweet-scented flowers, borne on terminal heads, about 5 cm long and up to 3 cm broad. The fruits occur as crowded berries, about 5 cm across, flat sided, and joined together by means of the persistent calyx on each section. They mature to an attractive orange color.^{9,33}

Habitat and Distribution — *M. longiflora* occurs in the lowland forest areas. It is abundant in the West Coast and is found also in Zaire, Tanzania, and Zambia.

Ethnomedicinal Uses — A decoction of the leaves and fruits is taken for colic and constipation caused by worms. A lotion for crawl-crawl (scabies) is made from the leaves. It is not used for the treatment of fevers or malaria as is *M. lucida*, discussed next. It is also used as a systemic anthelmintic.

MORINDA LUCIDA

Botanical Name — *Morinda lucida* Benth

Related Species — *M. citrifolia* Chev

Family — Rubiaceae

Common Name — Brimstone tree

African Names — Bambara: sangongo; Bondoukou: alongua; Ewe: amake; Ho: maticiki; Kimbundu: ngole; Nzima: sema; Twi: konkroma, ope-asi-akwa; Umbundu: ngongouve; Yoruba: oruwo, owuru

Description — *Morinda lucida* is a medium-size tree up to 15 m high. It has characteristic yellow wood, from which it derived its name “brimstone tree.” It has slender branchlets and a dense crown. The leaves are broadly elliptical to broadly ovate, acuminate, and entire, about 20 × 15 cm. The base is rounded to broadly cuneate and often dark purplish or black when dry. It produces white flowers January–July and September–October. It fruits March–April.^{9,28,33}

Habitat and Distribution — The species occurs in fringe forests and flooded areas. Sometimes, it takes over secondary clearings in rain forests. It is distributed from Burkina Faso to Zaire, Angola, Kenya, and Tanzania.

Ethnomedicinal Uses — The leaves are used in the preparation of fever teas, which are used not only for the treatment of malaria but also as a general febrifuge and analgesic. All parts of the plant are used as a laxative. A weak decoction of the stem bark is administered for the treatment of severe jaundice, often characterized by hemoglobinuria and hematuria. The treatment induces vomiting, diarrhea, and diuresis, and cure is determined from the clearance of yellow coloration of the urine.

The extract of the leaves and stem bark has been recommended for the prevention and treatment of hypertension and its cerebral complications.⁷⁸⁰ It has also been employed for the treatment of dysentery.⁷⁸

Constituents — The plant contains tannins, methylantraquinones, and heterosides.⁷⁸

Pharmacological Studies — The use of the plant in the treatment of jaundice has been validated by controlled studies.⁷⁸¹ The extract of the leaf and stem bark has been shown to possess strong but short-acting antihypertensive activity.⁷⁸⁵ This therapeutic activity may be due to its pronounced diuretic and tranquilizing properties. Due to its apparent lack of acute toxicity, the drug is recommended for chronic treatment of hypertension and in cases requiring high doses or frequent medication to arrest elevated blood pressure.⁷⁸²

The anthraquinone fraction has been shown to possess molluscicidal properties, and the activity may be due to oruwacin.⁷⁸³ Aqueous alcohol extract of the leaves showed significant activity against *Trypanosoma brucei* infection in mice at a dose of 1000 mg/kg given intraperitoneally.⁷⁸⁴ The LD₅₀ was calculated to be 2000 mg/kg. The extract was also found to possess purgative activity.⁷⁸⁵ The leaf extract demonstrated significant schizonticidal activity against *Plasmodium berghei* in mice.^{786,787} The lyophilized aqueous extract of roots of *M. citrifolia* showed a significant, dose-related, central analgesic activity in the writhing and hot plate tests.⁷⁸⁸ The activity was antagonized by naloxone. The extract caused sedation on the experimental animals at high doses, as evidenced by the decrease of all behavioral

parameters in the two-compartment test, the light/dark choice situation test, and the staircase test, as well as the induction of sleep.⁷⁹³ At the doses tested, the extract did not show any acute toxicity.

Morinda induced relaxation of vascular smooth muscle, which occurs via endothelium-dependent and -independent mechanisms, the former of which involves the NO-cGMP pathway.⁷⁸⁹ At a concentration of 0.25–9.0 mg/ml, the extract of *Morinda lucida* elicited vasorelaxation in noradrenaline-precontracted rings. This relaxation response was partially attenuated by removal of the endothelium and completely inhibited by pretreatment of rings with L-NAME and methylene blue.⁷⁹⁰

MORINGA OLEIFERA

Botanical Name — *Moringa oleifera* Lam.

Synonyms — *M. pterigosperma* Gaerthn., *Hyperanthera moringa* (L.) Vahl., *Guilandina moringa* L.

Family — Moringaceae

Common Names — Oil of Ben tree, horseradish tree, Ben aile (French)

African Names — Arabic: habbah ghaliah; Ewe: babatsi; Hausa: zongallagandi, danga; Igbo: okwe-beke (okwe-oyibo); Yoruba: ewe igbale

Description — *Moringa oleifera* is a small deciduous tree about 8 m high, with pale gray bark and soft wood. It has a crooked stem that often is forked near the base. The twigs and young shoots are densely hairy. The leaves are tripinnate, usually with 6 pairs of pinnae, large, and alternately arranged on the stem. Secondary and tertiary leaflets are oppositely arranged, dark green above and pale green below the surface, with variable shapes and sizes but mostly obovate. The flowers are small, sweet scented, and borne on loose axillary common stalks up to 15 cm long, cream colored, with unequal petals that are usually larger than the sepals; the latter are 5, pale green, up to 1.2 cm long, and finely hairy. The fruits are 3 angled, pod-like, up to 45 cm long and 1.3 cm broad, slightly constricted at intervals, gradually tapering to a tip, containing rows of blackish, rounded, oily seeds, each of which has 3 papery wings.⁷⁷

Habitat and Distribution — It is a tropical plant, cultivated in parts of the continent but probably native to Morocco, Egypt, and Tunisia.

Ethnomedicinal Uses — *Moringa* leaves and young pods are used as vegetables and added to soups and salads to aid digestion and to stimulate appetite. The infusion of the root bark is dispensed for venereal infections and the treatment of fevers. The kernel yields clear, sweet oil that is applied externally as a counterirritant like mustard.⁷ The pounded root mixed with salt is used as a poultice for inflammatory swellings. The tree is planted on graves to keep away hyenas, and its branches are used in the preparation of a charm against witches. The seeds are used in Sudan and other parts of North Africa for water purification. In East Africa, the seeds are used in the induction of abortion.

In India, the root is used as a stimulant in paralytic syndrome and for the treatment of epilepsy, nervous disorders, hysteria, and spasmodic, as well as for a cardiac circulatory tonic.⁸² In India, the plant is cited for the treatment of diseases of the liver, spleen, and articular pains; the tender leaves are indicated for scurvy and catarrh and given to children suffering from flatulence.¹⁷⁰

Constituents — The leaves are rich in amino acids, including aspartic acid, glutamic acid, serine, glycine, threonine, α -alanine, valine, leucine, isoleucine, histidine, lysine, cysteine, methionine, arginine, and tryptophan.⁷⁹¹ The flowers and the fruits also contain amino acids.⁷⁹² The root bark yields the sulfated amino bases moringinine and spirochine, as well as benzylamine and glucotropaeine.⁸² The seeds contain an almost-colorless fixed oil, known in commerce as *Beni* or *Moringa* oil. The oil consists of a 60% liquid olein fraction and 40% solid fat. The major constituents of the oil are oleic acid (65%), stearic acid (10.8%), behenic acid (8.9%), myristic acid (7.3%), palmitic acid (4.2%), and lignoacetic acid (3.0%).^{170,793} The stem bark has been shown to contain sterols and ter-

penes,⁷⁹⁴ as well as 4-hydroxymellin, vanillin, β -sitosterol, β -sitosterone, and octacosanoic acid.⁷⁹⁵ The roasted seeds contain 4- α -L-rhamnosyloxyphenylacetone nitrile, 4-hydroxyphenylacetamide.⁷⁹⁶

Pharmacological Studies — The juice from the leaves and stem bark showed antibacterial and antitubercular activity,^{797,798} and root bark extract showed antiviral effect against vaccinia virus⁷⁹⁹ and anti-inflammatory and analgesic activity (Kapoor). Ethanol extract of the whole plant demonstrated significant cytotoxic activity against human epidermoid carcinoma of the nasopharynx in tissue culture and *in vivo* activity against P388 leukemia in mice.⁸⁰⁰ Moringinine has been shown to exhibit sympathomimetic activity similar to that of adrenalin.⁸² The compound has cardiac stimulant activity, as well as peripheral vasoconstriction and elevation of blood pressure. It has a depressive action on smooth muscle fibers, relaxes the bronchioles, and inhibits the tone and movement of the intestine in rabbits and guinea pigs.⁸⁰¹

Two complex benzyliothiocyanates found in the root, pterospermine and anthomine, possess strong antimicrobial activity; the latter is also active against cholera vibron.⁷⁸ Spirocholine at a dose of 0.035 g/kg accelerates and amplifies the heartbeat in humans, and at an elevated dose of 0.35 g/kg, the compound exhibits an opposite effect.⁷⁸ The compound produces generalized paralysis of the CNS and possesses antimicrobial activity.⁸⁰²

The plant has remarkable antifertility properties. The oral administration of an aqueous extract of the root has estrogenic, antiestrogenic, progestational, and antiprogestational effects.⁸⁰³ It was shown that the extract progressively increased the uterine wet weight of bilaterally ovariectomized rats. The estrogenic activity was supported by stimulation of uterine histoarchitecture. In 50% of the rats tested, a dose of 600 mg/kg of the extract interfered with the formation of deciduoma, which is indicative of antiprogestational activity, although the same dose failed to induce a decidual response in the traumatized uterus of ovariectomized rats.⁸⁰⁴ Treatment of rats with the extract caused an enlargement of lumen, and luminal epithelium remained unstimulated; the uterus was nondematous; in the control group, the glandular cells showed hypertrophy, and in the endometrium the leukocytic infiltration was increased. The antifertility activity of the plant could therefore be due to the non-receptive state of the uterus throughout the treatment period.⁸⁰⁴ The biochemical and physiological alterations in the genital tract of female cyclic rats following administration of aqueous extract of the plant have been investigated. It was observed that after administration of the drug, there was an initial stimulation of the uterine structures and metaplastic changes in the cervical epithelium, and considerable cornification in the vaginal epithelium was provoked. These effects were followed later by significant inhibition in the histoarchitecture and changes in some biochemical parameters.⁸⁰⁵

The aqueous extract of the seeds, which is used for water purification in Sudan, has been shown to effect a turbidity reduction of 80–90.5% and concomitant reduction in the bacterial count after 1–2 h of treatment, with the bacteria concentrated in the coagulated sediment.⁸⁰⁶ *Moringa* should be regarded as consisting of three distinct herbs: the highly nutritional leaves, the seeds, and the aerial parts.

Many scientific and clinical studies have provided much evidence to support the use of the leaves as dietary supplements for the treatment of hyperlipidemia, hypertension, diabetes, and diseases due to oxidative stress, anemia, and chronic arthritis. A traditional herbal formulation that contains *Moringa oleifera* leaves, *Bidens pilosa*, and sodium chloride is used in Côte d'Ivoire with positive results for the treatment of high blood pressure. The herbal supplement at doses of 5×10^{-8} to 5×10^{-2} mg/kg caused a dose-dependent hypotension. The herbal supplement elicited drops in blood pressure ranging between $7.14\% \pm 4\%$ and $100\% \pm 7.5\%$, compared to normal blood pressure of rabbits. The 50% effective dose of herbal supplement was 3.95×10^{-4} mg/kg, which was similar to the hypotension induced by acetylcholine, the one caused by herbal supplement at a dose of 3.95×10^{-4} mg/kg in rabbit was progressively inhibited by atropine dosed between 5×10^{-4} and 5×10^{-2} mg/kg. The percentage drop of recorded blood pressure ranged from $50.3\% \pm 1.87\%$ to $3.71\% \pm 1.09\%$ compared to the normal blood pressure value. In the presence of atropine, the herbal supplement effect was partially inhibited. The same increasing doses of herbal supplement reduced

significantly the increase of blood pressure induced by adrenaline dosed at 4.76×10^{-4} mg/kg from $89.3\% \pm 2.19\%$ to $1.19\% \pm 0.59\%$.⁷⁹⁰

MUCUNA PRURIENS



Botanical Name — *Mucuna pruriens* (L.) DC.

Synonyms — *Carpopogon pruriens* (L.) Roxb., *Dolichos pruriens* L., *Mucuna aterrima* (Piper & Tracy) Merr., *Mucuna axillaris* Baker, *Mucuna cochinchiniensis* (Lour.) A. Chev., *Mucuna nivea* (Roxb.) Wight & Arn., *Mucuna prurita* (L.) Hook., *Stizolobium prurimum* (Wight) Piper, plus 5 others

Related Species — *Mucuna pruriens* var. *hirsuta* (Wight & Arn.) Wilmot-Dear, *Mucuna pruriens* var. *pruriens* (L.) DC., *Mucuna pruriens* var. *utilis* (Wall. ex Wight) L.H. Bailey

Family — Leguminosae

Common Names — Lacuna bean, bengal velvet bean, black velvet bean, buffalo bean, hell fire bean, itchy bean

African Names — Igala (Nigeria): inyelekpe; Igbo (Nigeria): ukpo; Kiswahili: upupu; Malawi: chitedze; Yoruba: yerepe or warapa; Madagascar: aga

Description — The plant consists of three related species, noted for the extreme itchiness they produce on contact, particularly with the young foliage and the seed pods. They differ significantly in their morphological characteristics. Detailed descriptions of the three species are available in PROTA.¹¹⁴⁰ The subject species, *Mucuna pruriens* (L.) DC, according to the description in Wikipedia,¹¹³⁸ is an annual climbing shrub with long vines that can reach over 15 m in length. The young plant is almost completely covered with fuzzy hairs, but when older, it is almost completely free of hairs. The leaves are tripinnate, ovate, reverse ovate, rhombus shaped, or widely ovate. The sides of the leaves are often heavily grooved, and the tips are pointy. In young plants, both sides of the leaves have hairs. The stems of the leaflets are 2 to 3 mm long. Additional adjacent leaves are present and are about 5 mm long.

The flower heads take the form of axially arrayed panicles. They are 15 to 32 cm long and have 2 or 3 or many flowers. The accompanying leaves are about 12.5 mm long; the flower stand axes are from 2.5 to 5 mm. The bell is 7.5 to 9 mm long and silky. The sepals are longer or of the same length as the shuttles. The crown is purplish or white. The flag is 1.5 mm long. The wings are 2.5 to

3.8 cm long. In the fruit-ripening stage, a 4- to 13-cm long, 1- to 2-cm wide, unwinged, leguminous fruit develops. There is a ridge along the length of the fruit. The husk is very hairy and carries up to 7 seeds. The seeds are flattened uniform ellipsoids, 1 to 1.9 cm long, 0.8 to 1.3 cm wide, and 4 to 6.5 cm thick. The hilum, the base of the *funiculus* (connection between placenta and plant seeds), is surrounded by a significant arillus (fleshy seed shell). It bears white, lavender, or purple flowers. Its seed pods are about 10 cm long and are covered in loose orange hairs that cause a severe itch if they come in contact with skin. The seeds are shiny black or brown drift seeds.

Habitat and Distribution — It is found occurring naturally in tropical parts of Africa, Asia, and Caribbean.

Ethnomedicinal Uses — *Mucuna* seeds are used in traditional medicine mainly for the treatment of diabetes and male sexual dysfunction and as a soup thickener for general weakness. The pod hairs mixed with syrup, molasses, or honey are taken as an anthelmintic and anti-inflammatory. Boiled seeds are occasionally eaten as a pulse and boiled immature pods and young leaves as vegetables. It enjoys a reputation as a potent aphrodisiac and source of vitamins and minerals.

Constituents — *Mucuna pruriens* seeds contain protein (15–30%), amino acids, fixed oils (8%), calcium, fiber, and vitamins. Two important nonprotein amino acids are found in the seed and in smaller amounts in the stems and leaves: L-dopa (L-3,4-dihydroxyphenylalanine), from which dopamine, an important medicine to relieve the effects of Parkinson's disease, is prepared, and DMP (N-dimethyltryptamine), which has hallucinogenic properties. The L-dopa content varies from 1.6% to 3.3% and is sufficiently high both as a phytomedicinal and for commercial extraction of the active constituent. The seed also contains a number of alkaloids, the most important of which are mucunaine, prurienine, and serotine. The stinging hairs of velvet bean, used as an anthelmintic, contain a pruritogenic, proteolytic enzyme and granular matter, tannic acid, and resin.¹¹⁴⁰ The concentration of L-dopa in the defatted *Mucuna* meal was greatly increased when extracted by supercritical carbon dioxide, performed in a laboratory-scale unit at 40°C and 60°C over the pressure range 150 to 250 bar. A constant flow rate of CO₂ close to 3 ml/min was maintained. This finding is industrially useful in the production of L-dopa from *Mucuna* without the problem associated with residual solvent after extraction of plant materials for clinical use.⁸⁰⁷

Pharmacological Studies — The chemical compounds responsible for the itch are the protein mucunain and serotonin. The seed powder of *Mucuna pruriens* has been clinically assessed in several studies for its application in the treatment of Parkinson's disease.^{808,809} The clinical effects of *Mucuna* seed powder and levodopa (L-dopa) pharmacokinetics were evaluated following two different doses of mucuna preparation and were compared with standard L-dopa/carbidopa (LD/CD). In the study, 8 patients with Parkinson's disease with a short duration L-dopa response and on period dyskinesias completed a randomized, controlled, double-blind, crossover trial. Patients were challenged with single doses of 200/50 mg LD/CD and 15 and 30 g of mucuna preparation in randomized order at weekly intervals. L-dopa pharmacokinetics were determined, and the Unified Parkinson's Disease Rating Scale and tapping speed were obtained at baseline and repeatedly during the 4 h following drug ingestion. Dyskinesias were assessed using modified AIMS and Goetz scales. The 30-g mucuna preparation when compared with standard LD/CD, led to a considerably faster onset of effect (34.6 vs. 68.5 min; $p = 0.021$), reflected in shorter latencies to peak L-dopa plasma concentrations. Mean on time was 21.9% (37 min) longer with 30 g mucuna than with LD/CD ($p = 0.021$); peak L-dopa plasma concentrations were 110% higher, and the area under the plasma concentration-versus-time curve (area under curve) was 165.3% larger ($p = 0.012$). No significant differences in dyskinesias or tolerability occurred. These findings suggest that the rapid onset of action and longer on time without concomitant increase in dyskinesias on mucuna seed powder formulation indicate that this natural source of L-dopa might possess advantages over conventional L-dopa preparations in the long-term management of Parkinson's disease.⁸⁰⁸

The antidiabetic activity has been established in a rat model. Chronic administration of the alcoholic extract of *Mucuna pruriens* seeds resulted in a significant dose-dependent reduction in

the blood glucose level ($p < 0.001$). Acute toxicity studies indicated that the extract was relatively safe at low doses; although some adverse reactions were observed at higher doses (8–32 mg/kg body weight), no death was recorded. Furthermore, oral administration of *M. pruriens* seed extract also significantly reduced the weight loss associated with diabetes.⁸¹⁰ In another study, the effect of ethanolic seed extract of *M. pruriens* on mitochondrial dysfunction and the DNA damage in hyperglycemic rat epididymal spermatozoa was investigated.⁸¹¹ Significant reduction in the sperm count, motility, and viability and a significant increase in the number of abnormal sperm in STZ compared to the control group was observed. STZ rat sperm showed a significant increase in lipid peroxidation (LPO) and DNA damage. Both the enzymic and nonenzymic antioxidants were decreased; mitochondrial membrane potential (MMP) and the mitochondrial functions were severely affected in STZ group. The diabetic rats supplemented with *M. pruriens* showed a remarkable recovery in antioxidant levels and reduced LPO with well-preserved sperm DNA. The MMP and mitochondrial function test were also preserved in STZ plus *Mucuna pruriens* (MP) rat sperm. The findings clearly demonstrated the potency of *M. pruriens* to reduce the diabetic-induced sperm damage induced by oxidative stress. It is inferred from these results that a similar mechanism may account for the effect of *Mucuna* in humans.⁸¹¹

Agriculture — Propagation of *Mucuna pruriens* is mostly by seed. The seed requires no scarification, but dry seed requires soaking in water for 24 h. The germination rate of fresh seed is 90–100%, declining with time. Seed stored in a cool dry place remained viable for about 2 years, but seed stored in a sealed jar for 3 months lost its viability. Germination takes 4–7 days. It is cultivated more for its soil fertility benefits than as a medicinal plant. In India and other parts of Asia, the plant is cultivated commercially.

Commerce — *Mucuna* is a major commodity in international medicinal plant trade, but it is neither cultivated on a large scale nor exported in any significant manner in the continent. Annual world seed production has been estimated to be 900,000 t. Small quantities exported from Cameroon in 2011 were sold at US\$2.5 per kg.

MYRISTICA FRAGRANS

Botanical Name — *Myristica fragrans* Houtt.

Synonyms — *M. moschata*., *M. officinalis* L.

Family — Myristiaceae

Common Names — Nutmeg tree, muscadier (Fr.)

African Names — Arabic: goz el-tieb; Igbo: ehuru; Swahili; kungu; Yoruba: abolakose, ariwo

Description — Nutmeg is the dried kernel of the seed, while mace is the dried outer covering or aril. *Myristica fragrans* is a dioecious evergreen tree, growing up to 60 feet, but most are about 40 feet high, with grayish-black bark, which is longitudinally fissured in old trees. The leaves are elliptic or oblong-lanceolate, and coriaceous, and the flowers occur as umbellate cymes. The yellow fruits, with fleshy pericarp, are 6 to 9 cm long, glabrous, and usually drooping. The seeds are pale brown, about 3 cm long and 2 cm broad, with a reticulate surface patterned with grooves, lines, and specks. The seed has a characteristic aroma and bitter taste.

Habitat and Distribution — It grows in humid tropical forest regions and is widely cultivated throughout the continent.

Ethnomedicinal Uses — The essential oil is used as a carminative and applied externally for rheumatism.⁸² It is used in soaps as a postpartum medication.

Constituents — Nutmeg contains about 10% volatile oil composed of linene and camphene as the major constituents, and the minor constituents include myristicin, safrole, elemicin, terpineol, cymene, α -thujene, γ -terpinene, linalool, eugenol, isoeugenol, methyleugenol, and several minor terpenoids. The plant also yields up to 40% fixed oil, proteins, and diarypropanoids, as well as elimicin and safrol.⁸¹²

Pharmacological Studies — The drug is a mild hypnotic agent, and the component responsible for this activity is myristicin. The drug is an inhibitor of prostaglandins and related endochemicals produced by the human colon^{813–815} and has also been found to decrease prostaglandin levels in the rat.⁸¹⁶ It has carminative, spasmolytic, antiemetic, or oxygenic activity and has been used clinically for the treatment of a variety of stomach disorders, including nausea, flatulence, indigestion, and diarrhea, especially diarrhea secondary to thyroid medullary carcinoma. The drug has platelet aggregation inhibition activity, associated with the eugenol and isoeugenol content.⁸¹⁷ The hypnotic effect does not appear to be manifest when nutmeg is used as a culinary spice.

Toxicology — High doses of nutmeg are highly hypnotic and toxic. Reported adverse effects include hypothermia, giddiness, nausea, weak pulses, and general feeling of heaviness in the chest and lower abdomen.⁶⁰⁸ It also causes tachycardia, and the oil decreases fertility in rats.⁸¹⁸ One of the constituents of nutmeg, safrole, has been found to be carcinogenic in mice.⁸¹⁹

NUCLEA LATIFOLIA

Botanical Name — *Sarcocephalus latifolius* (Sm.) E. A. Bruce

Synonyms — *N. esculentus* (Afz. ex Sab.) Merrill, *Sarcocephalus esculentus* Afz., *S. sasan-drae* Chev., *S. samucinus* Schum., *S. russegeri* Kotschy ex Schweinf.

Family — Rubiaceae

Common Names — African peach, Guinea peach, doundake, country fig

African Names — Ashanti: kusia, kankanu (Ejura); Bron: hwene hwenti; Ewe: nyimo; Fanti: ekusiawa

Description — *Nuclea latifolia* is a straggling or scandent shrub or small spreading tree, usually about 7 m high but growing up to 35 m in closed forests. The leaves, 17 × 12 cm, are glabrous, obvate, sharply acuminate, with a darker upper surface. The stipules are broad, ovate, and persistent. The flowers are sweet scented, large, and fleshy. The fruits are red, fleshy, and shallow pitted, with numerous embedded seeds surrounded by edible, sweetly acrid pulp.

Habitat and Distribution — The species is essentially a savanna plant. It has been found in savanna forests and fringe tropical forests from Senegal to Zaire. The related species *N. diderrichii* Merrill is restricted to deciduous and evergreen forests.⁹

Ethnomedicinal Uses — The genus is used in Nigeria and neighboring countries for the preparation of tonics and fever medicine. The soot is used as chewing sticks and for the treatment of toothache, caries, and septic mouth. An aqueous decoction of the root bark has been used as a malaria remedy. The dried fruit is used in the treatment of dysentery and piles, but the fresh fruit, when taken in excess, causes diarrhea. The stem bark has been used as a homeostatic, analgesic, anthelmintic, and diuretic. A lotion made from the stem bark is effective in the treatment of complex skin disease resembling cutaneous leishmaniasis.

Constituents — *Nuclea* contains several indole-quinolizidine alkaloids and glycoalkaloids.^{820,821} The major ones include angustine, angustoline, angustifoline, nauclefine, and nauclefine.^{822–824}

Pharmacological Studies — An aqueous extract of the leaves and stem bark collected from Nigeria has been shown to lower the rectal temperature of the guinea pig for several hours when the drug was administered intraperitoneally.⁸²⁵ The hypothermic activity has also been demonstrated in dogs, and the extract further produced a sudden decrease of the carotid pressure followed by the opposite effect, as well as vasoconstriction.⁸²⁵ Extracts of the leaves and bark possessed cardiac activity,⁸²⁶ and the leaf extract showed anticancer activity against transplantable sarcoma 180 tumors and against Lewis carcinoma.⁸²⁷ An alkaloidal isolate from the roots has been found to be anticholinergic and relaxed smooth muscles.⁸²⁸ Extracts of the plant exhibited molluscicidal activity against laboratory-reared *Lymnaea natalensis*.⁸²⁹

NEOSTENANTHERA MYRISTIFOLIA

Botanical Name — *Neostenanthera myristifolia* (Oliv.) Excell

Synonym — *Stenanthera myristifolia* Engl. et Diels.

Family — Annonaceae

African Name — Bini (Edo): uyenghen eze

Description — *Neostenanthera myristifolia* is a shrub or small tree about 10 m high. The stem is slender, the bark is grayish-brown, and the slash is whitish. Sometimes, it is stilt rooted. The twigs and young leaves are usually covered with small hairs but become smooth with age. The leaves are simple, oblong-elliptic, 10–30 cm long and 5–10 cm broad, with a short apex that tapers to a tip. There are about 12 pairs of lateral nerves. The flowers are greenish at first, turn yellow later, and are borne on slender, short, and hairy stalks. It produces egg-shaped fruits, which appear from May to July;^{13,81} they are about 1.3 cm long and attached to stalks through individual shorter stalks.

Habitat and Distribution — This is a forest tree and occurs in Liberia, Ghana, Gabon, and probably Nigeria and Cameroon.

Ethnomedicinal Uses — The dried and pulverized leaves are used like snuff for treating tumors of the nose. A related species, *N. hamata*, is used as a vermifuge in Liberia.

OCIMUM

Many members of the genus *Ocimum* are used for the preparation of remedies in African traditional medicine. The most important ones include *O. basilicum*, *O. gratissimum*, *O. canum*, and *O. suave*. All four species are used as a febrifuge, and some are used as food flavors. They all yield volatile oils, but the oils differ significantly in their chemical compositions.

OCIMUM BASILICUM



Botanical name *Ocimum basilicum* Linn.

Synonyms — *O. viride* Willd., *O. guineense* Schum. et Thonn.

Family — Lamiaceae.

Common Names — Fever plant, fever leaf, fever plant of Sierra Leone, tea bush

African Names — Ashanti: nunum, onunum; Bini: ihiri eziza, aramogho; Ewe: debeshui, bebbosi; Hausa: dai doya ta gida; Igbo: nchu-anwu; Efik: ntion; Malinke: su-guen-fira; Mandingo: sise-jambo; Mende: kumoi, kumwi; Timme: e-b' onto, o-gbonto; Yoruba: efinrin

Description — This is an erect, small shrub with many branches, usually not more than 1 m high. The leaves are simple, lanceolate to oblong, up to 9 cm long and 4.5 cm broad, with cuneate or unequal-sided base and toothed margins. They are sparsely hairy on the undersurface and pitted with glands. The veins are slightly hairy. The herbs have an aromatic smell when crushed. The flowers are creamy white or yellowish and appear in paniculate racemes about 12 cm long. The calyx is small and 2 lipped; the upper lip is broadly oval in shape with a tiny short point. The lower lip is oblong and toothed, and the petals combine to form a lipped tube. The fruits occur as small 4-lobed capsules.²⁸

Habitat and Distribution — It occurs in deciduous forests and savanna. It is commonly found around village huts and gardens and is cultivated for its medicinal uses and as a food flavor.

Ethnomedicinal Uses — The whole herb is used throughout West Africa as a febrifuge and as an ingredient of many malaria remedies. The crushed leaves are instilled into the eye as a treatment for conjunctivitis. The oil from the leaves is regarded as highly antiseptic and has been applied for the dressing of wounds, as a mouth gargle, and to prevent postpartum sepsis. The leaves are used in Nigeria as a stomachache and catarrh remedy²⁶⁶ and as a general tonic and antidiarrheal. The oil is used in many parts of West Africa to prevent mosquito bites. The oil mixed with alcohol is applied as a lotion for skin infections and taken internally for bronchitis. An infusion of the leaves, the so-called *Ocimum* tea or bush tea, is dispensed as a remedy for fever and as a diaphoretic.

The leaves are boiled with those of *Spondias* and the bark of *Funtumia elastica* and applied as a treatment for hemorrhoids. The leaves are also applied externally for rheumatic pains and lumbago.

Constituents — The leaves yield a very aromatic volatile oil that consists mainly of thymol (32–65%) and eugenol. The plant also contains xanthenes, terpenes, and lactones. The chemical composition of *Ocimum gratissimum* essential oil varies enormously according to chemotypes: timol, eugenol, or geraniol.

Pharmacological Studies — Thymol isolated from the plant has been shown to be antiseptic, antitussive, and antispasmodic.⁸³⁰ Some of the observed biological activity of the plant could be due to the presence of xanthenes, which have been associated with monoamine oxidase inhibition activity,⁸³¹ the tetraoxygenated xanthenes with anticonvulsant properties, and the secoiridoids, which possess stimulant and antispasmodic properties.⁷⁸ A fraction of the crude extract has been shown to contract guinea pig ileum and rat colon and to raise rat mean arterial blood pressure.⁸³² The volatile oil exhibited antimicrobial, insect repellent, and anthelmintic activity.⁸³³ Oral and topical formulations of the plant have been evaluated in Nigeria.⁸³³

Ocimum leaf extract is effective in the treatment of malaria⁸³⁴ and CNS diseases.⁸³⁵ Evaluation of the CNS activity was done using the open-field and rota-rod tests; sleeping time induced by sodium pentobarbital (PBS; 40 mg/kg i.p.) and anticonvulsant activity against seizures induced by both pentylenetetrazole (pTZ; 85 mg/kg s.c.) and maximal electroshock (MES; 50 mA, 0.11 s) were determined. Essential oils obtained in each season were effective in increasing the sleeping duration, and a preparation obtained in spring was able to protect animals against tonic seizures induced by electroshock. In each season, eugenol and 1,8-cineole were the most abundant compounds, and in spring, the essential oil presented the greatest relative percentage of sesquiterpenes, suggesting that these compounds could explain the differences observed in the biological activity in essential oils obtained in different seasons of the year.⁸³⁶

OCIMUM SUAVE

Botanical Name — *Ocimum suave* Willd.

Synonyms — *Ocimum trichodon* Bak. ex Gürke, *Ocimum dalabaense* A. Chev.

Family — Lamiaceae

African Names — Kipare: mrumbash, muodo; Kimeru: induka, mnuka; Kirufiji: kifumbazi, manyinyiikwa; Kisambaa: msumbasha, mvumbash; Kiswahili (Kiluguru): kivumbashi; Kiarusha:

olmanyinyikwa olemura; Kiluguru: msuameno; Kigogo: iwenya, mzenye, izenhye; Kinyiramba: inengafai, ijembaei, idumbasi; Kinyaturu: lumbasi; Kinyamwezi: ilumbasye; Kihehe: iwenye; Rwanda: umwenya

Description — It is a much-branched herb about 1–4 m high, with ribbed stem and glabrous branchlets. The leaves are simple, oppositely arranged, 3–12 cm long, 1.6 cm wide with ovate to ovate-lanceolate or sometimes lanceolate blade, and bluntly serrated margin. The apex is acuminate, and the base is cuneate. It has terminal inflorescence with simple or paniculate racemes. The flowers are hermaphrodite, borne in whorls, and irregularly shaped. The corolla is a whitish or greenish-yellow tube, about 5 mm long, with a 4-lobed upper lip. The calyx is distinctly hairy, 5–7 mm long, with an oval upper lip, with the lower lip displaying 4 triangular teeth. The herb gives a pleasant aromatic odor when crushed.³³

Habitat and Distribution — Like other members of the genus, *Ocimum suave* is widely distributed throughout the continent. It is primarily a savanna species, occurring in a wide range of soils at altitudes between 100 and 20,000 m in areas receiving between 500 and 1500 mm or more annual rainfall. The plant is the dominant species in most of eastern and southern Africa. It has been found to occur in Rwanda, Burundi, Ethiopia, Somali, Uganda, Kenya, Botswana, Angola, Namibia, South Africa, Tanzania, Malawi, Zambia, and Zimbabwe. It also occurs in the West Coast and grows well in Sierra Leone, Guinea, Ivory Coast, Nigeria, and Cameroon, as well as in North Yemen and Comoro Island.

Ethnomedicinal Uses — The plant is used as a local application for the relief of nasal congestion; for this purpose, the fresh herb is crushed and sniffed. Extracts of the plant have been used for the treatment of coughs, abdominal pains, and ear and eye inflammation and as a gargle for mouth infections. The FAO monograph³³ of the species reported that a decoction of the root pieces is administered twice a day for barrenness. The drug was also listed for the regulation of menstruation and for the treatment of prolapse of the rectum. The smoke from the burning plant is used as a mosquito repellent. The plant is also used as a charm against evil spirits.

Constituents — *O. suave* has a high content of volatile oil, which consists mainly of eugenol.⁷⁹

Pharmacological Studies — The plant has antimicrobial activity. Other uses are as described for *O. gratissimum*. Eugenol is used extensively in restorative dentistry as a temporary filling material for root canal. The leaf of *O. suave* is used to perfume chewing tobacco and snuff. Most of the pharmacological activities described under *Ocimum gratissimum* L. are applicable to *Ocimum suave* Willd (*Ocimum gratissimum* subsp. *gratissimum*).

OCIMUM SANCTUM

Ocimum sanctum is a synonym of *Ocimum tenuiflorum* L. The plant occurs in parts of northern and eastern regions of the continent. The medicinal uses are as indicated for the previously discussed species.

An alcoholic extract and aqueous suspension of the leaves of *Ocimum sanctum* have been reported as possessing an immunomodulatory effect on an antigenic challenge of *Salmonella typhosa* and sheep erythrocytes in albino rats.⁸³⁷ It was found that there was definite stimulation of the humoral immunologic response, as represented by an increase in antibody titer in both the Widal and sheep erythrocyte agglutination tests as well as by a cellular immunologic response represented by E-rosette formation and lymphocytosis.⁸¹⁹

OLEA EUROPAEA

Botanical Name — *Olea europaea* Linn.

Synonyms — *Olea pallida* Salisb.

Family — Oleaceae

Common Names — Olive tree, olea

Description — The olive tree yields evergreen leaves that are employed for the treatment of hypertension. The plant is native to the Mediterranean region, where it is cultivated both for its valuable oil and for the leaves. It produces edible blue-black fruit (2–3 cm length) that occurs in drupes. The olive tree grows to a great age but seldom exceeds 12 m in height. The leaves are leathery with scale-like hairs on the underside.⁸³⁸

Ethnomedicinal Uses — The leaves and bark extracts have been used as a remedy for scrofula and intermittent fever, and a weak decoction of the stem is used as a tonic.⁷⁹ The fixed oil from the fruits is employed in southern Africa as an astringent for the treatment of diarrhea. Olive oil is a valuable edible oil used as an emollient and as a dietary supplement.

Constituents — The leaf is rich in tannins. A bitter water-soluble glucoside called oleuropein has been shown to be present in the bark, leaves, and fruits.⁸³⁹ The seed is the source of the commercially important olive oil, which consists of glycerides of oleic acid (70–80%), with the glycerides of palmitic, stearic, and linoleic acids minor components.

Pharmacological Studies — The aqueous extract of the olive leaves has been shown to possess significant hypotensive activity in rats.⁸⁴⁰ The antihypertensive activity of olive leaves may be due to the presence of oleuropein.⁵¹¹ In a work credited to Petkow and Manolow, the drug was found to achieve extended and always reproducible reductions in blood pressure, as well as spasmolytic actions on the smooth musculature.⁵¹¹ The effects were observed to be less marked in rats than in cats. Extracts of the leaves also exhibited direct relaxant action on smooth muscles, dilated the bronchi, and improved blood circulation.⁸⁴¹

Clinical Application — Weiss⁵¹¹ recommended olive leaves for labile and medium-severe hypertension. Proprietary preparations are available containing olive leaves, for example, Osvysat (Burger), or in combination with the diuretic hydrochlorothiazide and potassium chloride (Olivvysat compound). A commercial product, Hyperidyst (Vogel and Wber), exists that contains olive leaves, raulwolfia, arnica root, and mistletoe. A daily dose of 100 ml of an infusion of the leaves for 20 to 25 days has been shown to increase the daily urine output by 10% to 15%, with a concomitant decrease in blood uric acid levels and an increase in the urinary uric acid content, without any significant effect on the blood sodium and chloride levels.^{842,843}

PARKIA BIGLOBOSA



Botanical Name — *Parkia biglobosa* (Jacq.) G.Don

Synonyms — *Inga biglobosa* (Jacq.) Willd, *Mimosa biglobosa* Jacq., *Parkia africana* R.Br., *Parkia clappertoniana* Keay, *Parkia intermedia* Oliv., *Parkia oliveri* J.F.Macbr.

Related Species — *Parkia bicolor* A Chev.

Family — Leguminosae

Common Names — African locust bean, nitta tree, locust bean, monkey cutlass tree

African Names — Yoruba: ewé igba, igiougba, iru; Hausa: dawa dawa, daddawa; Igbo: ogiri-awusa; Ffulde (Nigeria): netteh, nerre; Mandinka (Senegal): netto; Wolof: nette, houlle, ouli; Ewe: moti, wati; Bassa: budo; Mina: woti; Malinké: néré; Baoulé: kparalé, kpalé; Fon: arouati; Peuhl: niri

Description — *Parkia biglobosa* is a medium-size tree up to 30 m tall; taproot is often present, with lateral roots up to 10(–20) m spreading from the bole; the bole is usually straight and robust, cylindrical, up to 130 cm in diameter, often branching low; bark is distinctly longitudinally fissured, often with more or less regular scales between the fissures and is thick, ash gray to grayish brown; slash is fibrous and reddish brown, exuding an amber gum; crown is dense, wide spreading, and umbrella shaped, consisting of heavy branches. Leaves are bipinnate, swollen at the base and therewith an orbicular gland, with 8–16 pairs of pinna, each one composed of 15–35 pairs of leaflets 1 cm long and 2 mm broad. Inflorescence is a pendulous head arranged racemously; the peduncle is 10–35 cm long, turning salmon-pink and many flowered. Flowers are narrow, red, and 3 cm long; stamens have blackish anthers. Pods are slender, a little flattened, and 30 cm long. Seeds are globose-ovoid and embedded in a yellowish farinaceous fleshy endocarp.

Habitat and Distribution — *Parkia biglobosa* is a Sudano-Zambezian species present in a belt between 5° N and 15° N, from the Atlantic coast in Senegal to southern Sudan and northern Uganda. The belt is widest in West Africa (maximum 800 km) and narrows to the east. It was probably introduced to São Tomé and Príncipe.

Ethnomedicinal Uses — The locust bean is used in Africa as a fermented food condiment for seasoning sauces and soups. The use of the fermented beans of African locust bean dates back many centuries and was already described in the fourteenth century. In West Africa, the bark, roots, leaves, flowers, fruits, and seeds are commonly used in traditional medicine to treat a wide diversity of complaints, both internally and externally, sometimes in combination with other medicinal plants. The bark is most important for medicinal uses, followed by the leaves. Medicinal applications include the treatment of malaria; parasitic infections; circulatory system disorders, such as arterial hypertension; and disorders of the respiratory system, digestive system hemorrhages, and dermatosis.¹¹⁴⁰ It has also been used for the treatment of measles, chicken pox, and gingivitis and as an anthelmintic. In the savanna and Sahel regions of West Africa, locust bean plays a role in all major rituals, including those associated with birth, baptism, circumcision, marriage, and death.

Constituents — The boiled and fermented seeds contain 35% proteins, 29% lipids, and 16% carbohydrates and have good organoleptic properties and a positive effect on intestinal flora. The seeds are good sources of protein, fat, and calcium but contain a nontoxic oil of variable composition. The seed fatty acids include arachidic, behenic, stearic, oleic, palmitic, and linoleic acids. The fruit pulp contains up to 80% carbohydrate. The bark was found to contain a long-chain ester of trans-ferulic acid, together with an inseparable mixture of long-chain cis-ferulates. In addition, lupeol, 4-O-methyl-epi-gallocatechin, epi-gallocatechin, epi-catechin 3-O-gallate, and epi-gallocatechin 3-O-gallate were isolated.⁸⁴¹ The bark, leaves, and pod husks are rich in tannins, flavonoids, and coumarins.

Pharmacological Studies — The ethanolic extract of *P. biglobosa* gave a positive response in the brine shrimp lethality assay (LD₅₀ 315.2 µg/ml. This result was reinforced by cytotoxicity assays against tumoral cell cultures NSCLC-N6-L16 human bronchopulmonary carcinoma, IC₅₀ 13.0 µg/ml; KB human nasopharyngeal cancer, IC₅₀ 20.0 µg/ml; and P388 leukemia in mice, IC₅₀ 22.4 µg/ml.⁸⁴¹ The seeds possessed antiplatelet,⁸⁴⁴ antioxidant, and antihypertensive activities and showed antisnake venom activity.⁸⁴⁵ The hydroalcoholic, ethyl acetate, and butanolic extracts of *Parkia biglobosa* leaf, which contained mainly PACs and monomeric flavonoids, induced endothelium-dependent NO- and endothelium derived hyperpolarizing factor (EDHF)-mediated relaxation in

porcine coronary artery rings. The vasorelaxant activity was dependent on their phenolic content and appears to involve mainly PACs. This finding provides a probable mechanism for the antihypertensive activity of *P. biglobosa* leaves.⁸⁴⁶

Commerce — The fermented seeds of African locust bean, known as *soumbala*, *dawa dawa*, *netetu*, *ogiri*, *iru*, *afitin*, and *nététou*, serve primarily as a condiment for seasoning sauces and soups. Roasted seeds are used as a coffee substitute known as “Sudan coffee” or “café nègre.” The extract of the stem bark is used in the preparation of a preventive medicine for cattle known as “cure salee.” The African locust bean is therefore highly valued in Africa, and it is an article of trade in many parts of the continent.

PAUSINYSTALIA YOHIMBA

Botanical Name — *Pausinystalia johimba* (K.Schum.) Pierre ex Beille

Synonyms — *Corynanthe yohimba* K.Schum., *Pausinystalia trillesii* Beille, *Pausinystalia zenkeri* W.Brandt

Family — Rubiaceae

Common Names — Yohimbe, yohimba

African Names — Yoruba (Nigeria): idagbon; Duala (Cameroon): djombe-wa

Description — Yohimbe is an evergreen, medium-size tree and grows up to 30(–35) m tall; the bole is straight, up to 50(–60) cm in diameter, without buttresses but grooved at the base; the bark is easy to peel off and bitter tasting; the bark surface is longitudinally fissured, with transverse cracks, gray to reddish brown; inner bark is fibrous, pinkish and turns reddish brown on exposure; the crown is compact, with branches in whorls. Leaves appear in whorls of 3 and are simple; stipules are 1.5–2 cm long, glabrous, and caducous; the petiole is up to 5(–8) mm long; the blade is obovate or oblanceolate, (11–)13–47 × 5–17.5(–19) cm; the base is cordate, cuneate, or rounded; the apex is short-acuminate; and the margin is often wavy, glabrous, pinnately veined with (8–)10–20 pairs of lateral veins. Inflorescence is a terminal or axillary panicle 5–21(–30) × 9–15 cm, branched in whorls of 3, with flowers in clusters at the ends of branches; the main axes are glabrous; the peduncle is 0.5–5 cm long with 3 ridges. Flowers are bisexual, regular, and fragrant; the calyx consists of a short tube and triangular or rounded lobes. *Pausinystalia johimbe* can be distinguished from *Pausinystalia macroceras* by its larger leaves with shorter or no petioles. In addition, the bark of *Pausinystalia johimbe* is extremely bitter tasting and is easy to peel off, whereas that of *Pausinystalia macroceras* is less bitter and difficult to peel off.¹¹⁴⁰

Habitat and Distribution — *Pausinystalia* comprises 5 species and occurs in West and Central Africa. *P. johimbe* occurs in evergreen lowland forest, in primary as well as secondary forest, and at relatively low densities. It is common in southern Nigeria, Cameroon, Gabon, and Central Africa Republic.

Ethnomedicinal Uses — Yohimbe tree has a reputation as a potent aphrodisiac and for the treatment of male erectile dysfunction. The bark is sold in markets throughout West and Central Africa for the preparation of a general tonic. It has also been used as a local anesthetic, as a hallucinogen, for the treatment of angina, against constipation and intestinal worms, as a performance enhancer for athletes, and to increase the clarity of singers' voices. In Congo, a bark decoction is drunk for the treatment of pelvic pain and for body pain.

Pharmacological Studies — More than 40 alkaloids have been isolated from *Pausinystalia johimbe*, including the indole alkaloids yohimbine (10–15%), mesoyohimbine, yohimbine, corynanthine, alloyohimbine, and ajamalicine. Yohimbine (also known as aphrodine, quebrachine, or corynine) is a selective inhibitor of α -2-adrenergic receptors. It has hypertensive activity at low doses but is hypotensive at high doses, through vasodilation of peripheral vessels. Yohimbine raises the heart rate and norepinephrine levels. The use of yohimbine as an aphrodisiac is attributed

to its dilating effect on the blood vessels of the sexual organs, thus increasing blood supply, while it also provides an enhancement of the reflexes involved in the control of ejaculation.¹¹⁴⁰ Tests have shown that treatment with yohimbine indeed results in increased libido and easier ejaculation. The effects of yohimbine on smooth muscles favor tonus and movement of the intestine. It also acts on α -2-adrenergic receptors of adipocytes, resulting in increased lipolysis. However, double-blind trials on the effectiveness of yohimbine for body weight reduction gave conflicting results, and it is therefore unclear whether yohimbine is effective in reducing body weight.

In normal volunteers, the sympathetic effect of yohimbine occurred at doses of 45 mg or higher, between 60 to 90 min after oral administration, lasting on average 4 to 5 h. Similar effects can be achieved at a very low dose (5.4 mg) in patients with autonomic failure given their denervation hypersensitivity.⁸⁴⁷

Toxicity — The crude yohimbe plant is relatively tolerated at the dosage used in traditional medicine and the over 50 over-the-counter products that contain bark of *Pausinystalia johimbe*. The main active compound, yohimbine, has shown a wide range of adverse effects, including hypertension, mania, bronchospasm, anxiety, agitation, hallucinations, vertigo, stomach problems, headache, and weakness. It may also interact with other prescription drugs, including antidepressants, antihypertensives, and cardiac drugs. People with hypertension, prostate problems, or heart diseases are warned against using yohimbine-based products. Another major compound found in the yohimbe plant, ajamalicine, also has vasodilating activity. Corynanthine closely resembles yohimbine, but is more active as a sympatholytic agent and less toxic.¹¹⁴⁰ In acute and chronic (long-term) studies, yohimbine has been found to be relatively free of side effects over the dose range predicted to be effective in erectile dysfunction. At much higher doses, the most frequently observed effects, consistent with the primary pharmacological action of the drug, are elevation of blood pressure, a slight anxiogenic action, and increased frequency of urination. These side effects are all easily reversible on termination of yohimbine therapy.^{848,849}

Agriculture — The yohimbe tree has not been cultivated to any significant extent in West and Central Africa. Overharvesting due to increased international demand has put the plant under great stress. Various experimental cultivations have been undertaken in Nigeria and Cameroon. It has been shown that *P. johimbe* is amenable to vegetative propagation through the rooting of leafy stem cuttings using low-cost technology polythene propagators.⁸⁵⁰ Using single-mode leafy cuttings, three experiments were investigated in Cameroon, the first with three propagation media (sawdust, 50:50 mixtures of sand and sawdust, and sand alone). Initial observation showed that rooting was best in the mixed medium, but subsequently, cuttings set in the sawdust rooted better than those in sand and the mixture of sand/sawdust. However, there was no significant ($p > 0.05$) treatment effect on rooting percentage or on the mean number of roots per cutting. Second, three types of auxin at 50 mg per cutting (IAA, indole-3-acetic acid; IBA, indole-3-butyric acid; and NAA, 1-naphthalene acetic acid) were dissolved in 10 ml of alcohol. The control treatment received 10 ml of alcohol only. Significant differences in rooting percentage occurred after 3–4 weeks between the auxin-treated cuttings and the control. Within the same period, IBA-treated cuttings rooted better than those with NAA and IBA. The third experiment involved four leaf areas: 0, 50, 100, and 200 cm². Leafy cuttings rooted better than leafless cuttings after 4–5 weeks, with the 50-cm² leaf area the best from week 6. Significantly higher cutting mortality ($p < 0.05$) occurred for leafless cuttings than for leafy cuttings.⁸⁵⁰

PHASEOLUS VULGARIS

Botanical Name — *Phaseolus vulgaris* L.

Synonyms — *P. communis* Pritzel., *P. compassus* DC.

Family — Leguminosae

Common Names — Bean, kidney bean, navy bean, French bean, haricot (Fr.)

African Names — Arabic: fasolia; Hausa: wake; Igbo: akidi, okwe; Swahili: haragwe, haragi; Yoruba: awuje

Description — It is a twining annual herb, erect or recumbent, with short stems, climbing up a length of 5 m. The leaves are trifoliate, opposite, oval pinnate, and acuminate. It produces whitish flowers with yellow or purple spots. The pods are narrow with a beak at the end and contain seeds of various colors.

Habitat and Distribution — It is a cultivated crop grown in most parts of the world. It does not grow well in an atmosphere with high humidity and in lowland areas, where it is frequently attacked by pests.

Ethnomedicinal Uses — The leaves of the plant are used in the preparations of lotions for external use in the treatment of a variety of skin conditions; a paste made with the crushed bean cake has been applied to cutaneous leishmanial lesions. The bean is eaten as a nutrient during convalescence. Duke³⁷⁸ listed the plant as used as a carminative, depurative, acne application, digestive, diuretic, emmenagogue, febrifuge, and cardi tonic, among several other uses.

Constituents — The beans are rich in protein and are recognized as a cheap source of proteins. They also contain starch, cyanogenetic glycoside, and a hemagglutinin, phaseolitin. The leaves, pods, and beans yield several vitamins and minerals, and enormous variation exists in the ratio of these nutrients in plants from different parts of the world and among different hybrids. The fresh beans have been found to contain estrone, estriol, and 17 α -estradiol.⁸⁵¹

Pharmacological Studies — Phaseolin isolated from the beans has fungicidal activity.²²⁷ Aqueous extracts depress the isolated intestine of the rabbit and guinea pig.⁸⁵²

Toxicity — The plant contains up to 0.008% toxic HCN and the tumor-enhancing phytohemagglutinin; both constituents are, however, destroyed during cooking. The seeds also contain trypsin and chymotrypsin inhibitors.³⁷⁸

PHYSOSTIGMA VENENOSUM

Botanical Name — *Physostigma venenosum* Balfour

Synonym — *Physostigma venonum* Balf.

Family — Leguminosae

Common Names — Calabar bean, African ordeal bean, fève de Calabar (F)

African Names — Arabic: shagar lubiyar kalabar; Efik: esere; Igbo: akpi; Yoruba: iso

Description — The plant is a subligneous creeper with smooth climbing stalks, with twining branches climbing to a great height. The leaves are trifoliate, 6 \times 10 cm. The pink or purple flowers are borne in axillary racemes. The pods are up to 15 cm long, oblong in shape, and contain a few ellipsoid seeds 3 cm long. The seeds are dark brown in color, extremely hard, and testa smooth in the neighborhood of the grooved hilum, which runs the whole length of the convex side and around one end; where somewhat wrinkled, on the other side of the groove is a well-marked ridge; in the groove are the grayish, papery remains of the funiculus.^{9,28}

Habitat and Distribution — It is found in the dense rainforest areas of the continent and distributed from Senegal to Zaire.

Ethnomedicinal Uses — The drug is used with other herbs by the Barkwiris in the local treatment of articular rheumatism. An extract of the seeds or a mixture of the seed in palm oil is used for eradicating lice and bugs. In the Ivory Coast, a weak decoction of the seeds is used for edemas.

Constituents — The seeds contain the alkaloids physostigmine (eserine), eseridine, eseramine, physovenine, phytosterol, and starch. They also yield an albumin.

Pharmacological Studies — Physostigmine is used in the treatment of glaucoma as an eye-drop. The compound is a powerful and reversible acetylcholine esterase inhibitor and therefore allows acetylcholine to exert maximal effect on the smooth muscles, glands, and heart. It therefore effectively increases the concentration of acetylcholine at the sites of cholinergic transmission. It

exerts its cholinesterase inhibitor effect in both the periphery and CNS. It dilates the blood vessels and has a slowing effect on the heart. It has been found useful as an antidote for toxicity due to strychnine, nicotine, curare, and atropine and as an adjunct in medication for myasthenia gravis. It was formerly used in clinical medicine as a postoperative medication after abdominal surgery to prevent adhesion by stimulation peristalsis.

In modern experimental medicine, physostigmine remains a safe and quite unique agent wherever increase of acetylcholine in the brain is necessary, examples being intoxications with anticholinergic drugs, recovery from anesthesia, and in psychiatry. Physostigmine is being investigated not only for its role in alleviating symptoms of Alzheimer's disease, but also for its capacity to counteract opiate-induced respiratory depression without abolishing analgesia.⁸⁵³ Eseroline, the first metabolite of physostigmine, is being investigated for its opioid-like and cholinesterase-inhibiting properties. There is a possible application of physostigmine into spinal liquor for its beneficial effects.⁸⁵⁷

Toxicity — Calabar bean has been used in the southeastern region of Nigeria, from where it derived its name, as a ritual plant and ordeal poison. In ancient times, suspected criminals, witches, and people accused of breaking one of the taboos were often forced to drink from a decoction made from the esere seeds. If the accused vomited the poison and lived, the accused was declared innocent, but if guilty, then the verdict of the gods was accepted and the victim was buried without any normal funeral rites. It has a sedative action on the spinal cord, which results in paralysis of the lower limbs and death by asphyxia and, in large doses, concomitant paralysis of the heart. The ordeal trial rationalized that an innocent person was likely to be brave and swallow the decoction in a gulp, which would irritate the stomach and cause vomiting of the drug; the guilty person will be frightened by guilt and would likely drink the poison slowly, with the attendant gastrointestinal absorption and then toxicity. It appears that the elders of the village were aware of the nature of this poison since it featured prominently among the secrets passed on to the initiates of the highly esteemed *Ekpe cult* and in some male puberty ceremonies. When used as a form of capital punishment or suicide, the whole seed was to be chewed, or the drug could be powdered and administered as an enema. The villagers also understood that burning or boiling of the seeds greatly reduced, if not eliminated, the toxicity.

PICRALIMA NITIDA



Botanical Name — *Picralima nitida* (Stapf) Th. & Dur.

Synonyms — *P. klaineana* Pierre, *P. macrocarpa* Chev., *Tabanaemontana nitida* Stapf.

Family — Apocynaceae

Common Name — Akuamma seeds

African Names — Ashanti (Twi): ekuama; Igbo: osi, osu-igwe; Idoma: otosi; Yoruba: erin

Description — The plant is 12–30 m in height and about 0.6–1 m in girth. It has a grayish bark; the slash is yellowish with dark flecks and fibrous, yielding rather scanty latex with other blackish branchlets. The leaves are oblong-lanceolate to broadly oblong-elliptic, shortly acuminate, with the blade rounded to slightly cunneate. They are dark green, leathery, and glossy glabrous. There are numerous parallel nerves, rather faint, with thinner veins between. It produces white flowers, up to 5 cm wide, borne in terminal inflorescence. The entire inflorescence is glabrous; the calyx is about 2.5 cm long, broadly cup shaped at the base with 5 overlapped triangular-ovate lobes. The corolla tube is slender, about 2.5 cm long, showing 5 elliptic corolla lobes.⁸⁵⁴ The fruits occur usually in pairs, hanging at the end of a long stalk. They are broadly ovoid, smooth, glabrous, and leaf green in color, turning to yellow or orange when ripe. They vary enormously in size, up to 15 cm long and 10 cm wide and contain numerous seeds (5–10 cm wide) embedded in a pulp. All parts of the plant are very bitter.⁷⁹

Habitat and Distribution — *Picralima* occurs in deciduous forests and is widely distributed in tropical Africa, although sparse. It has been located in Ghana, Ivory Coast, Angola, Nigeria, Zaire, Cameroon, and Tanzania.

Ethnomedicinal Uses — Extracts of the leaves, seeds, or stem bark are used in the preparation of various fever and malaria remedies. In Central Africa, it is used for the treatment of primary hypertension, malaria, and jaundice.⁸⁵⁵ The crushed seeds are eaten for stomachache and pneumonia. Extracts of the stem bark and seeds are administered for venereal diseases and as a vermifuge. In herbal markets in Ghana, Nigeria, and Ivory Coast, Akuamma seeds, the stem bark, and dried fruit rind are highly prized as antimalarial agents and a remedy for sleeping sickness. The seeds are used in the preparation of a treatment for insanity and related CNS diseases. The root decoction is dispensed as a cure for yellow fever.

Constituents — The plant elaborates a complex mixture of indole and dihydroindole alkaloids, including alstonine, akuammiline, akuammidine, akuammine, Ψ -akuammigine, akuammicine, echitamine, picraline, picratidine, and picraphylline.⁸⁵⁶

Pharmacological Studies — Extracts of the plant have been shown to possess local anesthetic, opiate receptor, antihypertensive, and sympatholytic properties. The plant contains several indole alkaloids, of which the major ones include akuammidine, akuammine, and Ψ -akuammigine. The leaves elaborate picraphylline and picraline, among several other indole bases. Akuammidine has a sympatholytic action and a hypotensive effect, which was reported to be weaker than that of yohimbine.⁸⁵⁷ The compound also showed strong local anesthetic action, which was found to be three times that of cocaine hydrochloride.^{858,859} The aqueous decoction of the bark has been shown to be active against *Trypanosoma brucei*.⁸⁶⁰

The major alkaloids of the fruits of *P. nitida* have been examined for *in vitro* activity against drug-resistant and -sensitive strains of *Plasmodium falciparum*. The alkaloids showed remarkable inhibitory activity against both clones of *P. falciparum* at IC_{50} values of 0.08–0.9 μ g/ml. Among the compounds tested, those belonging to the picraline-akuammine subgroup showed greatest activity, followed by those of the akuammicine type. The alkaloid echitamine was inactive.⁸⁶¹ The alkaloids also demonstrated strong inhibitory activity against clinical isolates of *Leishmania* and trypanosomes.

Although the mechanism of action of *Picralima* is yet to be determined, the drug is presently used as a crude extract in traditional African medicine as an antimalarial and for the control of blood pressure. Alstonine, found in the seeds and fruit rind, has shown antipsychotic-like effects, a putative antipsychotic, which consistently differed from the effects of known drugs in various mouse models.^{862,863} Treatment with alstonine was able to prevent MK801-induced working memory deficit, indicating its potential benefit for cognitive deficits now seen as a core symptom in the disease. Corroborating previously reported data, alstonine was also effective in counteracting MK801-induced hyperlocomotion and social interaction deficit. Ritanserin, a 5-HT_{2A/C} receptor antagonist, prevented alstonine's effects on these three behavioral parameters. Available evidence suggests that 5-HT_{2A/C} receptors are central to the antipsychotic-like effects of alstonine, consistently seen in mouse models relevant to the three dimensions of schizophrenia symptoms.⁸⁶⁴

PIPER GUINEENSE



Botanical Name — *Piper guineense* Schum. et Thonn.

Common Names — Bush pepper, West African black pepper, Ashanti pepper, Guinea pepper

Family — Piperaceae

African Names — Anang: okurusa; Arab (Shuwa): shitta masoro; Ashanti: soro-wisa; Bambara: niamaku; Bakwari (Bota): indoko; Bakundu (Balondo, Batanga): ndonga; Diola: funkungen; Efik: eti-nkeni; Ewe: kale, asonsa; Fanti: sasima; Fulani: chitta masoro; Hausa: masoro; Igbo: uziza; Kanuri: ngolo imassoro; Malinke: fefe; Mano: za wele; Mende: komasimi, neni; Twi: sesaa, asonsa; Yoruba: iyere, ata iyere

Description — *Piper guineense* is a slender climber, up to 12 m high, with prominent nodes and clasping roots. The leaves are elliptical in shape, about 15 cm long and 7 cm broad. They are pointed at the apex and rounded and up to 5-nerved at the base. The leaves when crushed have a pleasant aroma. The flowers are small, borne on common stalks as clusters opposite the leaves or at the terminals of the stem and branches. The fruits occur as racemes and are red or red-brown and turn black when dry.

Habitat and Distribution — *Piper guineense* is found in high forest area; it occupies forest clearings and clings on remaining trees in secondary forests. It is widely distributed.

Ethnomedicinal Uses — The black berries are used as spice to flavor soup. The oil distilled from them is used for perfumery and soap making. The leaves are used to regulate the menstrual cycle and as an ingredient in remedies for female infertility. The weak decoction of the leaves and fresh fruits is used as a cough remedy. The seeds are stomachic and carminative and are indicated especially for gripping stomachaches.⁹ The plant is a reputed antibacterial agent, and the roots and fruits are incorporated in preparations for the treatment of infectious diseases. The roots are listed for gonorrhea, bronchitis, syphilis, and colds; the leaves are applied to wounds; and the seeds are dispensed for bronchial infections. The pulverized seeds are used as an insecticide, and the whole fruit is extracted and employed externally as a stimulating ointment or as a counterirritant.

Constituents — Several lignans have been reported from the plant, including aschantine and yangambine.⁷⁸ The roots yield piperine, trichostachine, and lignans, and the leaves contain the lignin dihydrocubebin.⁸⁶⁵ The essential oil obtained from the berries has been shown to consist mainly of phellandrene, pinene, and limonene.^{866,867} A phytochemical analysis of the fruits led to the isolation of several amide piperines, including sylvatine, *N*-isobutyloctadeca-*trans*-4-dienamide, $\Delta\alpha,\beta$ -dihydropiperlonguminine, $\Delta\alpha,\beta$ -dihydropiperine, and trichostachine.^{868,869} The plant also contains the pyrrolidine amide wisanidine, piperidine amides, dihydrowisanine,⁸⁷⁰ dihydropiperine,⁸⁷⁴ wisanine,^{871,872} and *N*-formyl piperine.⁸⁷³

Pharmacological Studies — The amides have been shown to possess antimicrobial, anticonvulsant, antihypertensive, sedative, tranquilizing, and insecticidal properties.⁸⁷⁴ *P. guineense* seeds

exhibit activity against sickle-cell disorder. The effects have been attributed to the presence of piperine, capsaicin, cubebin, and caryophyllene or closely related compounds in the plant.⁸⁷⁴

Toxicity — High doses of the drug have been reported to cause convulsions and hematuria.⁸⁷⁵

POGA OLEOSA

Botanical Name — *Poga oleosa* Pierre

Family — Rhizophoraceae

Common Names — Inoi nut, African Brazil nut

African Names — Boki: onyo; Bule: angale; Duala (and Mungo): pobo, povo; Igbo: imono; Efik: inoi; Yoruba: iku

Description — *Poga oleosa* is a dominant tree up to 33 m high, with a straight and cylindrical stem and occasionally with buttress roots. The bark is gray and fairly smooth, with a thick, brownish, and granular slash. The branchlets are purplish and rough. The leaves are 9–15 cm long and 5–7 cm broad, leathery, smooth, and glossy, with a slight offset tip. The flowers are very small, without stalks, and borne on common stalks on leafless shoots. There are 4 sepals and 4 petals; each petal has a saw-edged tip. The stamens are 8 and the styles 4. The fruits are roughly spherical and elongated, 5–6.5 cm long and about 5 cm broad. A rind surrounds a very hard shell, which contains 2–4 seeds.⁷⁷

Ethnomedicinal Uses — The kernels are edible and contain proteins and carbohydrates; hence, they are ground and used for cooking and as an emollient.⁷⁷ The oil is used with *Dorstenia multiradiata* as a treatment for psoriasis.

PORTULACA OLERACEA



Botanical Name — *Portulaca oleracea* Linn.

Synonyms — *P. quadrifida* Linn.

Common Names — Pursley, pusley, wild purslane, pigweed

Family — Portulacaceae

African Names — Ashanti: adwere; Bambara: missidi kumbare; Efik: efere-makara; Ewe: afiaa, devio-fe 'ama; Hausa: baba jibji, halshen saniya; Mano: toa p'lo; Malinke: mazahi; Mende: tooge; Wolof: tanguipeta; Xhosa: igwanitsha; Yoruba: papas an; Zulu: amalenyane

Description — *Portulaca oleracea* is a diffusely branched, prostrate, succulent, short-lived annual herb with bright yellow flowers. The leaves are very fleshy, oval shaped, about 4 cm long and 2 cm broad. They are narrower toward the base and rounded at the apex.

Habitat and Distribution — It is a very common weed found in both cultivated and undisturbed land and is distributed in most parts of the continent.

Ethnomedicinal Uses — An infusion of the plant is used as an anthelmintic for children to expel roundworms and in high doses as an emetic. The crushed plant is applied locally on swellings, bruises, and whitlow to ease pains and cause healing.⁷⁷ The pressed juice is instilled in the ears for earache and also applied with cotton lint to carious teeth. The leaf infusion has been reported as a cooling drink, with a mild diuretic effect, and is used as a vegetable for its antiscorbutic properties. The seeds are demulcent, diuretic, and slightly astringent.¹³⁶ The plant has been attributed with insecticidal properties.¹³⁶

Constituents — Oxalates and noradrenalin have been isolated from the plant.⁸⁷⁶ The plant also contains saponins.

Pharmacological Studies — The extract has been shown to possess antidiabetic⁸⁷⁷ and muscle relaxant⁸⁷⁸ activities. The muscle relaxant effects have been found to be similar to the activity of D-600 and dantrolene when tested against rat hemidiaphragm and frog rectus abdominus, and the mechanism of action has been suggested as probably due to inhibition of transmembrane Ca^{2+} influx, interference with the Ca -induced and Ca^+ release process, or inhibition of the release of intracellular Ca^+ from stores in the sarcoplasmic reticulum.⁸⁷⁹ Extract of the plant has also produced dose-dependent negative inotropic and chronotropic effects and a pressor response in the rat.⁸⁸⁰ It has been argued that the extract may act in part on postsynaptic α -adrenoceptors and by interference with transmembrane calcium influx.⁸⁸¹

A related species, *P. grandifolia*, has been shown to possess significant anti-HBsAg as determined using the ELISA technique.⁸⁸¹ The water extract of the same species has been found to be antimutagenic.⁸⁸²

PRUNUS AFRICANA



Botanical Name — *Prunus africana* (Hook. f.) Kalkman

Synonyms — *Pygeum africanum* Hook. f.; *Pygeum crassifolium* Hauman

Family — Rosaceae

Common Names — African stinkwood, African prune, African cherry, bitter almond, iron wood, pygeum, red stinkwood

African Names — Bamileke (Cameroon): alumty; Bansa (Cameroon): kirah; Kom (Cameroon): lluo; Oku (Cameroon): vla; Bakweri: wotangue; Kenya: muiri, mueri; Afrikaans: rooistinkhout; Amharic: tikur inchet; Luganda: ngwabuzito, ntasesa; Tanzania: mkomohoyo; Tanzania: mseneo; Uganda: ntasesa; Ganda: entasesa, ngwabuzito; Xhosa: umkakase; Zulu: inyazangoma-elimnyama

Description — *Prunus africana* is an evergreen tree that is native to the montane regions of sub-Saharan Africa and the Islands of Madagascar, Sao Tome, Fernando Po, and Grande Comore at about 900–3400 m of altitude. The mature tree is up to 25 m high, rarely a shrub 3–5 m tall, or a medium-size tree about 10 m tall; it is much-branched and often pendulous in forest and shorter and with a round crown 10–20 m in diameter in grassland. It requires a moist climate, 900–3400 mm annual rainfall, and is moderately frost tolerant. The bark is dark brown to gray and rugged. Leaves are petiolate; lamina are $4.6\text{--}11(15) \times 2\text{--}4(5.5)$ cm, elliptic, lanceolate-elliptic, or oblong-lanceolate and glabrous, coriaceous, or subcoriaceous; the apex is obtuse to subacuminate; the base is broadly cuneate to rarely rounded; margins are coarsely crenate-serrate to subentire with dark glandular dots in the incisions (the most proximal gland on one or both margins of the leaf sometimes is conspicuous); the petiole is 1–2 cm long, channeled, and often reddish; stipules are \pm linear, 15–20 cm long, and caduceous.

Habitat and Distribution — *Prunus africana* is a Pan-African montane tree species. It is listed as an endangered species by CITES, but experts believe that the species is not remotely in danger of extinction as long as some montane forest survives somewhere within its enormous range.¹¹⁴⁰ It occurs in Cameroon, Congo, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Tanzania, South Africa, Zimbabwe, and other montane zones of the continent. It is commercially collected mainly from Cameroon and Madagascar.

Ethnomedicinal Uses — *Pygeum* is used in traditional medicine in West and Central Africa for malaria, wound dressing, appetite stimulation, gonorrhea, insanity arrow poison, stomach pain, and kidney disease and as a purgative. The plant came into prominence in the 1990s as an herbal remedy for the treatment of benign prostatic hyperplasia (BPH).

Constituents — The major compounds isolated from *Prunus* bark include fatty acids (C22–C24), alkanes, alkanols and phytosterols, lauric acid, myristic acid, n-tetracosanol, n-docosanol, ferulic acid, β -sitostenone, β -sitosterol, and ursolic acid. The relative concentration of these compounds in several *Prunus* bark samples have been used to show an independent evolution of bark metabolism within different phylogeographical lineages, and that the molecular phylogeographic pattern is partly reflected in the variation in concentration of bark constituents. This finding may have important implications for the design of strategies for the sustainable use and conservation of this important African tree species.⁸⁸³

Pharmacological Studies — Extracts of the African prune tree have been shown by many studies to be effective in the treatment of lower urinary tract symptoms (LUTSs) associated with BPH and obstructed bladder. In anti-inflammatory evaluation, it inhibits production of 5-LOX metabolites *in vitro*⁸⁸⁴ and the fibroblast growth tumor (FGF)- and epidural growth tumor (EGF)-induced proliferation of 3T3 fibroblasts.⁸⁸⁵ Two recent clinical trials using *P. africanum* revealed an approximately 40% reduction in the International Prostate Symptom Score (IPSS) and improvement in the urinary flow rates of approximately 18% over baseline.^{886,887} Based on a meta-analysis of 18 clinical trials, Ishani et al. demonstrated that men receiving *P. africanum* were more than twice as likely to be rated with symptom improvement by their physician compared with men receiving placebo (65% vs. 30%, relative risk [RR] = 2.1).⁸⁸⁸

Toxicity — *Prunus* extracts seem well tolerated in both acute and chronic toxicity studies, at doses of up to 8 mg/kg for the acute single dose in rats and mice, and administration for up to 6 months in rats and mice.⁸⁸⁹ Gathumbi et al., however, reported some adverse biochemical and hematological changes in rats given 3.3 mg/kg for 6 days.¹¹⁴¹

Commerce — *Prunus* is a major article of commerce from Cameroon and Madagascar to Europe and the United States. An attempt by the Plantecam Company to add value to the raw material by establishing a process plant at Mutegene in Cameroon was not sustained. The price of the raw material is US\$9.56 kg CIF, and the dried extract sold in Europe is at US\$175.84 per kg CIF.

Agriculture — The tree grows at a moderate rate and responds well to cultivation. The seeds cannot be stored; therefore, fresh seeds are used for cultivation. Moist leaves around the seed minimize moisture loss during temporary storage and transport. It is able to withstand severe bark removal to exhibit complete bark regrowth, but poor harvesting of bark may lead to tree death. Sustainable harvesting is done by collecting the bark only from quarters on opposite sides of trees, from about 35 cm above the ground level to the height of the first branch. In this way, it is believed that the bark can be harvested sustainably every 4–5 years. Bark removal induces early flowering. Mean bark yield per tree is 55 kg, ranging from 34 to 74 kg.

PSIDIUM GUAJAV



Botanical Name — *Psidium guajava* L.

Synonyms — *Guaiaava pyrigormis* Gaertn., *Syzygium ellipticum* K.Schum. & Lauterb.

Family — Myrtaceae

Common Names — Guava

African Names — Hausa: gwabaa; Efik: woba; Igbo: ugwoba; Yoruba: guafa

Description — It is a large shrub or small tree up to 10 m high. The stem is slender, usually not exceeding 30 cm in width; the bark is brownish, thin, smooth, and often flaking off in small patches. The leaves are oblong, slightly oval shaped, and oppositely arranged on the stem and branches, 5–10 cm long, rarely exceeding 15 cm in length. They are light green in the upper surface and downy and pale green in the lower side. They display prominent nerves in the leaf underside. The flowers are white and occur solitarily or as a few in a cluster in the axils of the leaves. They are about 2.5 cm in diameter, with numerous stamens that are arranged in groups. The fruits are globose or pyriform,

yellow, usually 2.5–10 cm long and 2.5–5 cm in diameter, although horticulture varieties with larger fruits are common. They contain many seeds, and the calyx persists in fruit.³³

Habitat and Distribution — The plant is a native of Central America but is found all over Africa in semicultivation.

Ethnomedicinal Uses — The fruits are edible, and the juice is used as a refreshing drink. The major ethnotherapeutic use of the plant is in malaria; for this purpose, its leaves are used as an ingredient in the preparation of fever teas. The leaves are also used as part of the potherb in steam treatment of malaria. A weak infusion of the leaves and tender branches is dispensed for diarrhea and as a tonic in psychiatry.

Constituents — The fruits are rich in vitamins (A and C), iron, calcium, and phosphorus.⁸¹ The essential oil from the leaves has been shown to contain caryophyllene, nerolidiol, β -bisabolene, and β -sitosterol and ursolic, oleanolic, cratogenic, and guayavolic acids.⁴⁹⁴ The plant also contains leukocyanidins, sterols, and gallic acid in the roots.⁴⁹⁴

Pharmacological Studies — The aqueous alcohol extract has been shown to exhibit sedative activity. Oral doses of 188.5, 337, and 1131 mg/kg caused a significant dose-dependent decrease of the motor activity for 90 min after the administration of the extract.⁴⁹⁴ In rats, the plant significantly decreased, in a dose-dependent manner, the intestinal transit time. It also showed *in vitro* antimicrobial activity against *Escheria coli*, *Salmonella typhi*, *Staphylococcus aureus*, *Proteus mirabilis*, and *Shigella dysenteria*.^{890,891}

P. guajava has been evaluated in many laboratory studies to validate its antispasmodic and antimicrobial properties in the treatment of diarrhea and dysentery. It has also been used extensively as a hypoglycemic agent. Literature is available on the ability of guava to exhibit antioxidant, hepatoprotective, antiallergic, antimicrobial, antigenotoxic, antiplasmodial, cytotoxic, antispasmodic, cardioactive, anticough, antidiabetic, anti-inflammatory, and antinociceptive activities, which provided scientific rationale for its traditional uses.

Apart from its antihyperglycemic properties, guava may be beneficial for preventing cardiovascular complications associated with diabetes. It has been established that nonenzymatic glycosylation (glycation) between reducing sugar and protein results in the formation of advanced glycation end products (AGEs), which are believed to play an important role in diabetes-associated cardiovascular complications. Thus, agents that inhibit the formation of AGEs are believed to have therapeutic potential against diabetic complications. The antiglycative potential of the ethyl acetate fraction of *Psidium guajava* has been evaluated by administering the extract to STZ-induced diabetic rats. Daily administration of the extract for a period of 1 month significantly decreased the blood glucose, glycated hemoglobin, and fructosamine levels in a dose-dependent manner. Evaluation of the toxicity markers like SGOT (serum glutamic oxaloacetic transaminase) and SGPT (serum glutamic pyruvic transaminase) revealed the nontoxic nature of the extract. The presence of the cardiac isoform of liver alpha 2 macroglobulin, which is a major protein associated with earlier stages of cardiac hypertrophy, was also evaluated. SDS-PAGE (sodium dodecyl sulfate polyacrylamide gel electrophoresis) analysis showed that the level of this protein decreased significantly in extract-treated groups compared to a diabetic control.⁸⁹²

A wide range of clinical applications has been suggested for the treatment of oxidative stress, infantile rotaviral enteritis, diarrhea, and diabetes.⁸⁹³ The dried leaves and extracts of the fruits have been formulated as dietary supplements.

PUNICA GRANATUM

Botanical Name — *Punica granatum* L.

Synonym — *P. nana* L.

Family — Lythraceae

Common Names — Pomegranate tree, grenadier (French)

African Names — Arabic: roumamman-goulnar, rumman, rummani, ximani; Chagga: nguku-maanga; Mpondo: mbona wesilungu; Swahili: mkoma manga

Description — Pomegranate is one of the oldest drugs known. It was mentioned in the Papyrus Ebers of Egypt written in about 1150 BC and was also included in many Ayurvedic texts. Pomegranate of commerce consists of the stem and root of *Punica granatum* containing at least 0.4% and sometimes 1% of alkaloids, of which the anthelmintic pelletierine tannate is the most important. It is a shrub, which often reaches a height of 2.5 cm, with quadrangular and somewhat thorny stalks. The leaves are lanceolate, 4 to 6 cm. It bears red, solitary flowers 4 cm long. The fruits are spherical and 10 cm in diameter and contain numerous reddish fleshy seeds. The plant is cited in the first edition (Vol. 1) of the *African Pharmacopoeia*.⁴³⁶

Ethnomedicinal Uses — The plant has limited use in traditional medicine but is acclaimed as a potent anthelmintic. The plant is an ingredient in the remedy for dysentery and chronic diarrhea. The fruit rind is used in postpartum medication.

Constituents — The most important compound found in the plant used to be the anthelmintic alkaloid pelletierine, which has been isolated from the root, stem bark, and unripe but mature fruits. Other alkaloids found in pomegranate include isopelletierine, pseudopelletierine, and methylisopelletierine. The ellagitannins punicalin, punicalagin, punigluconin, and punicacortins A, B, C, and D and casuarin are also found in the plant.⁸⁹⁴ The rind of pomegranate, which was once used as food flavor and sometimes added as an adulterant to the drug, does not contain the anthelmintic alkaloids but yields gallotannic acid and other phenolic compounds. The presence of phenolic compounds, such as anthocyanin,⁸⁹⁵ in the leaves and fruits is considered of immense therapeutic importance. An analysis of *P. granatum* juice with high-performance liquid chromatography with diode array detection and tandem mass spectrometry analysis with positive and negative electrospray ionization (HPLC-DAD-ESI[±]/MSⁿ) powered by an ion trap yielded a total of 151 phenolics, consisting of 65 anthocyanin, anthocyanin-flavanol, and flavanol-anthocyanin adducts, including some unusual cyanidin and pelargonidin trihexosides not previously described in natural extracts. Similarly, a total of 86 nonanthocyanin phenolic components were also identified, 39 of them reported for the first time in this juice.⁸⁹⁶

Pharmacological Studies — Pelletierine, the active constituent, possesses a specific action on tapeworms but is ineffective against other intestinal parasites.²⁰⁵ The alkaloids of pomegranate act by causing the tapeworm to relax its grip on the intestinal walls, thereby making it possible to be expelled by cathartics. Pomegranate and its alkaloids are not favored as an anthelmintic due to their toxic effects, muscle cramps, and dizziness.¹²³ The extract of the flowers and the rind has been shown to possess significant inhibitory activity against many bacteria⁸⁹⁷ and some fungi.⁸⁹⁸

The modern use of *Punica granatum* is not because of its anthelmintic principles but its antioxidant activity. Differential solvent extracts of *Punica granatum* leaves (hexane, dichloromethane, ethyl acetate, ethanol, and methanol) have been evaluated for antioxidant, anti-inflammatory, anticholinesterase, and cytotoxic activities. TPC (8.8–127.3 mg gallic acid equivalent/g dry weight), flavonoids (1.2–76.9 mg quercetin equivalent/g dry weight), tannins (63.7–260.8 mg catechin equivalent/kg dry weight), and anthocyanins (0.41–3.73 mg cyanidin-3-glucoside equivalent/g dry weight) of different extracts were evaluated. The methanolic extract presented a good IC₅₀ by DPPH and ABTS assays (5.62 and 1.31 mg/l, respectively). The strongest 5-LOX, acetylcholinesterase, and butyrylcholinesterase inhibition activities were obtained for the ethanol extract (IC₅₀ values of 6.20, 14.83, and 2.65 mg/l, respectively), and the best cytotoxic activity against MCF-7 cells was obtained for the methanol extract (IC₅₀ = 31 mg/l). Although it is the fruits and juice of *P. granatum* that are used as pharmaceutical antioxidants, the leaves could be a potential source of the active molecules intended for applications in the pharmaceutical industry.⁸⁹⁹

PYCNANTHUS ANGOLENSIS

Botanical Name — *Pycnanthus angolensis* Welw.

Synonym — *P. combo* Warb.

Family — Myristicaceae

Common Names — False nutmeg tree, African nutmeg, wild nutmeg

African Names — Abe: walele; Bakwari (Duala, Bosamba, Nasamba, Bakoosi): ngosame; Basa: dihin; Bini: moghan; Efik: abakang; Ibibio: abakang; Fanti: edua; Igbo: egwu-noma, egiri oma; Mende: gboyeyi; Nupe: kpokogi; Nzima: tika; Timme: pompon; Yoruba: akomu

Description — *Pycnanthus angolensis* is a tall tree, up to 33 m high and about 3 m in girth. The bole is long and straight, cylindrical and without buttress roots. The bark is reddish gray, scaly, and fissured lengthwise. In old trees, the bark flakes off in patches. The slash is reddish and exudes a sticky, honey-colored latex that turns red later. The branches are in two whorls; the twigs and leaves are covered with rust-colored, woolly hairs. The leaves are leathery in texture, with a smooth upper surface; the lower surface is covered with rust-colored hairs, which disappear with age; they are generally riddled with holes caused by insects and are simple, 15–21 cm long and 5–9 cm broad, with nearly parallel margins. They have a short apex and short and heart-shaped base. The midrib is very prominent on the lower surface. The stalk is thick and about 1.5 cm long. The flowers are small, brownish red, in small crowded heads, falling in masses around the base of the tree; male and female are borne at different times; there are irregularly branched common stalks, which may be as long as 7–15 cm. The flower stalks are among the leaves or slightly below them. The fruits are egg shaped or almost round, 2–3 cm long and 1.5–2 cm in diameter. The shells are rather hard and split longitudinally into two valves, exposing solitary seeds with bright red arils, which turn brownish with time.⁷⁷

Habitat and Distribution — *Pycnanthus angolensis* is a lowland rainforest tree common in secondary forests. It is distributed throughout the West Coast, Chad, Ethiopia, and parts of Somalia, Zambia, and Zaïre.

Ethnomedicinal Uses — The seeds are aromatic and are used as a soup condiment in many parts of Africa. The seed fat is applied together with the reddish latex on skin diseases. The bark is pounded and drunk with palm wine for loss of appetite. The twigs are sucked to cure sores in the mouth.⁷⁷ The root infusion is used with extracts of *Cassia occidentalis* and guinea grains as an anthelmintic.⁹ In Nigeria, the seeds are used for the preparation of mouthwash for the treatment of thrush.

QUASSIA AFRICANA

Botanical Name — *Quassia africana* (Baill.) Baill.

Synonym — *Simaba africana* Baill.

Family — Simaroubaceae

African Names — Calensi: ogama; Pahoin: olon; Iokundu: bolome; Mayumbe: bundi tse, voanda, kadi; Equateur: Yella atomba; Kitalela: okenzu; Yagambi: weko

Description — *Quassia africana* is a small tree about 3 m high with grayish-green bark and glabrous branches. It bears compound alternate leaves, composed of 2–7 leaflets, a petiole 3–16 cm long, rachis 0–15 cm long, and more or less narrowly constricted at the insertion of the leaflets. The leaflets are opposite, sessile, and lamina obovate or oblong acuminate to obtuse at the apex, coriaceous to papyraceous, with median nerves prominent above and below, and up to 10 pairs of lateral nerves, regularly anastomose. Terminal leaflets are slightly larger than the lateral leaflets. The flowers are borne throughout the year as hermaphrodites, solitary or in fascicles, slender, glabrous, and 5-merous.³²

Habitat and Distribution — The plant occurs in the lowland rain forest of the transition zone from evergreen to semideciduous forest. It is found in southern Sudan, northern Nigeria, Cameroon, Rio Muni, Gabon, Congo, Zaire, and Angola.

Ethnomedicinal Uses — The main use of the species in most of the continent is for the treatment of gastrointestinal disturbances and as a vermifuge. The powdered root is used in the preparation of a remedy for bronchial pneumonia and venereal diseases and for wound dressing, as a febrifuge, and as an anti-inflammatory. An infusion of the leaves is used by the Teke for the treatment of dysmenorrhea.

Constituents — The species has been shown to contain the bitter terpenoid quasinoid lactones, nigakilactone A-J, picrasine B, quassin, 14-deoxy-15-(1'-methylbutyryl)-brucein, and neoquassin.⁹⁰⁰

Pharmacological Studies — The genus has an established pharmaceutical use as a bitter tonic,⁹⁰¹ as a vermifuge for threadworms, and as a treatment for pediculosis.²⁰⁵ Quassin is believed to possess insecticidal and amoebicidal properties.⁹⁰² Quassinoids from various *Brucea* species have been shown to have antileukemic⁹⁰³ and antimalarial properties.

QUILLAJA SAPONARIA

Botanical Name — *Quillaja saponaria* Nolina

Synonyms — *Quillaia saponaria* Mol., *Quillaja poeppigii* Walp.

Family — Quillajaceae

Common Names — Soap bark tree, Panama wood, kilaya (Fr.)

African Names — Arabic (Shuwa): kilay

Description — *Q. saponaria* is a tall tree, growing to about 18 m high. The economically useful bark occurs in flat strips about 1 m long, 20 cm broad, and 3–10 mm thick.⁴³⁶ The outer surface is yellowish white and smooth. It breaks with a splintery and laminate fracture. The back consists almost entirely of phloem with large crystals of calcium oxalate, which may be seen with the naked eye as glistening. The powdered drug produces an abundant froth when shaken with water and is strongly sternutory. Quillaia bark has a characteristic acrid and astringent taste.²⁸

Habitat and Distribution — It is a native of the mountainous terrains of Chile, Peru, and Bolivia but has been introduced into other parts of the world, including North African countries. The plant is rather restricted to a high-altitude savanna belt.

Ethnomedicinal Uses — The dried inner bark of *Quillaja saponaria* and other related species is used in pharmacy as an emulsifying agent. The plant is employed in folk medicine for the treatment of inflammation of the mucous membrane.

Constituents — The plant contains a mixture of saponins known as quillaja-saponin (ca. 10%). The saponins on hydrolysis yield quillaic acid (hydroxygypsogenin) and sugar derivatives.⁹⁰⁴ It also contains tannins and calcium oxalate.¹²³

Pharmacological Studies — Quilla bark is employed in pharmacy as an emulsifying agent. It is also used as an expectorant, as an anti-inflammatory, and as a detergent.²²⁰ The anti-inflammatory and antihypercholesterolemic properties of the saponins in animals have been reported.^{904,905}

The saponin mixture has been shown to possess immunostimulatory properties, and it is employed in veterinary medicine as an adjuvant for vaccines, particularly against foot-and-mouth disease.⁹⁰⁶ The saponin was found to be a powerful adjuvant for the antibody response to strong antigens in the mouse, eliciting both IgG₁ and IgG₂ antibody and cell-mediated immunity, which may account for its success in experimental vaccines against parasitic protozoal diseases such as malaria, babesiosis, and trypanosomiasis.

The exact mechanism of the immunostimulatory activity of quilla saponins has not been determined. It has been suggested that the surface activity and surface-binding property of the saponins may be important factors in the observed immunostimulant activity.^{907,908} The target cell in the immune system to which the saponin activity is directed is believed to be the macrophage or antigen-presenting cell (APC), which is stimulated to release IL-1. It has also been argued that quilla saponin cannot substitute for T-cell helper since the adjuvant activity of saponin for sheep red blood cells (SRBC) in the mouse is abolished by depletion of T lymphocytes.⁹⁰⁹ It is likely that the saponins act by promoting the interaction between APCs and T cells; they are, however, considered adjuvant for T-independent antigen and therefore may be able to boost B-cell function directly.⁹¹⁰

Saponins have been shown to form ordered particulate structures of around 35-nm diameter (i.e., about the size of a virus particle) with the surface proteins from enveloped viruses.^{911,912} These particulate structures, or immunostimulating complexes (ISCOMs) as they are called, are highly immunogenic and contain very little saponin, thus reducing the required dose for an adjuvant effect. ISCOM vaccines against a number of viruses have been prepared, and it is very possible that quilla saponin may be introduced soon into human medicine. The saponin exhibits immunostimulant activity even when given orally.⁹¹³

RAUWOLFIA CAFFRA

Botanical Name — *Rauvolfia caffra* Sond.

Synonyms — *Rauvolfia natalensis* Sond., *Rauvolfia inebrians* K. Schem., *Rauvolfia ochrosioides* K. Schum., *Rauvolfia foetzi* Stapf., *Rauvolfia obliquinervis* Stapf.

Family — Apocynaceae

Common Name — Quinine tree

African Names — Kiswahili: mwembemwitu, mkufi; Kimeru (Kichaegga): msesewe, mseseve, Kisambaa: mweti; Kihehe: muveliveli; Kividuanda: mlolo; Kimassai: oljabokalyan; Kingu: mlen-gwelengwe; Kiarusha: njavolikalia oltawakalian; Kibende: mtawentwe; Kigogo: mkongo; Kirangi: msumai; Kikuyi: mwerere taveta; Meru: nutu; Bemba (Kaonde, Tonga): mwini; Kaonde (Lunda): mototo; Lunda: mutochi; Nyanja: muyesani, mpambamvula, msabua, mvumbamvula, mwimbe

Description — *Rauvolfia caffra* is a medium-size tree with straight bole; it is slightly buttressed, crown dense, and much branched. It has a light brown or gray bark with irregular fissures. The slash is cream, turning light brown, and exudes a bitter white latex. The leaves are simple,

occurring in crowded whorls, 6–32 cm long, and oblanceolate to linear-oblanceolate; the apex is acute or subacuminate, with base cuneate; margins are entire. They are glabrous with a shiny green upper surface and paler below. The veins, about 18–20 pairs, form an irregular open network; the petiole is 0.5–5 cm long. The flowers are bisexual, occurring in much-branched whorl inflorescence; the peduncle is 2–6 cm long, and bracts are minute; flowers are bisexual, 5-merous; pedicels are 1 mm long. The calyx is cup shaped, 1 mm long, with a mouth filled with whitish hairs. The fruits occur as glossy green, subglobose to obovoid drupe, becoming wrinkled and blackish purple, 1–1.5 cm long, 2 cm in diameter if 12 seeded.³³

Habitat and Distribution — *Rauwolfia caffra* occurs in forests, especially lowland forests, swampy areas, and along rivers and streams in the savanna belt. It prefers loamy sands or sandy clay loam soils of mainly volcanic origin at altitudes between 500 and 2100 m, in areas receiving an annual rainfall between 500 and over 1270 mm. The plant is native to eastern and southern Africa and occurs in Zaire, Uganda, Kenya, Tanzania, Mozambique, Zambia, Malawi, Zimbabwe, and the Republic of South Africa. In the West Coast, the plant is found in Nigeria, Cameroon, and Ghana and can be differentiated from the more predominant *R. vomitoria* by its larger size, markedly oblanceolate leaves, and larger fruits.

Ethnomedicinal Uses — In East Africa, extracts of the roots are used for the treatment of fevers, insomnia, and palpitation of the heart. The bark has been reported as a remedy for general body swellings, rheumatism, and pneumonia.⁴⁷⁸ The stem and root bark have also been dispensed as an ascaricide and the powdered unopened inflorescent as a local application to sores on the legs.⁸⁰ An FAO monograph listed other folk uses of the plant, including use as a purgative or an emetic and as a cure for coughs, stitch, and toothache.³³

Constituents — *R. caffra* yields idole and dihydroindole alkaloids similar to those found in other *Rauwolfia* species. The species, however, differs from *R. vomitoria*, *R. cumminsii*, and *R. mombasiana* in containing serpentine series of heteroyohimbine alkaloids found in the Asian *R. serpentine*, as well as the alstonine-type alkaloids found in the previously mentioned African species. The major alkaloids include reserpine, ajmaline, reserpiline, and sarpagine, as well as perakine, peraksine, and ajmaline.^{913–916}

Pharmacological Studies — *Rauwolfia* alkaloids have been extensively investigated for biological activity, and the activities reported for *R. vomitoria* alkaloids also hold for this species.

RAUWOLFIA VOMITORIA



Botanical Name — *Rauwolfia vomitoria* Afzel.

Synonyms — *Rauwolfia vomitoria* Afzel., *Rauwolfia congolana* De Wild. & T. Durand, *Rauwolfia senegambiae* A. DC., *Rauwolfia pleiosadica* K. Schum., *Rauwolfia stuhlmannii* K. Schum., *Hylacium owariense* P. Beauv.

Family — Apocynaceae

Common Names — The swizzle stick, African rauwolfia

African Names — Anyi: baka egbe, ngbe ngbe; Ashanti (Twi, Wassaw): kakapenpen, penpen; Bini: akata; Efik: uto enyin; Igbo: akanta, ekpiri; Swahili: mesesewe; Yoruba: ira-igbo, asofeiyeje

Description — *R. vomitoria* is a small tree that sometimes grows up to 15 m in height. The genus can be characterized by the occurrence of phloem sclereids, nonarticulated lactiferous tubes, nonseptate fibers, and heterogeneous rays. The stem can be differentiated from the root by the presence of a well-defined central pit and unligified fibers in the pericyclic region. The bark is gray with a pale brown slash exuding a bitter white latex, which changes slowly to rose color on exposure to air. It has simple, whorled leaves in groups of 4 or 5. The leaves are widely lanceolate and acuminate, with petioles 8–25 cm long and shadowy grooved above. The margins are entire; the base is cuneate, with a shiny green upper surface, and dull medium green below; the midrib is impressed above, and there are 8–16 pairs of major lateral veins. The flowers are borne in threes at the end of the ultimate branches and puberulus; the corolla is creamy white, up to 1 cm long; there are small lobes and 5 sepals, ovate. It bears red solitary or paired drupes, about 6 mm in diameter. It flowers January–June and fruits April–November.^{9,28}

Habitat and Distribution — It grows in moist lowland forest and well-watered tropical savannas. It is widespread in sub-Saharan Africa, occurring in Sierra Leone, Senegal, Ghana, Cameroon, Nigeria, Gabon, Zaire, Sudan, Tanzania, and Zimbabwe.

Ethnomedicinal Uses — The plant is a common ingredient in traditional medicine, with the dose and method of preparation critical for the various indications. It is boiled with fruits of *Xylopia aethiopica* to treat convulsions in children. A decoction of the leaves, prepared with leaves of *Indigofera macrophylla* and *Cajanus cajan*, and whole herb of *Olyra latifolia* is used as a remedy for smallpox. An infusion of the leaves is indicated for treatment of constipation and indigestion. The root and stem bark infusion is mixed with *Capsicum annum* and taken for malaria fever. In southern Nigeria, the root decoction is prepared with ash from palm husk for the treatment of aggressive maniac behavior.

Constituents — *Rauwolfia* contains more than 40 indole alkaloids, each possessing remarkable pharmacological activities. The alkaloids of *Rauwolfia* can be grouped into five main types: the yohimbine and its esters, including reserpine; the ajmaline type, which includes compounds with vasoactive properties; the ajmaline-sarpagine series with antiarrhythmic dihydroindoles; the anhydronium bases, including the quick-acting hypotensive compound alstonine; and the oxyindoles and pseudoindoxyls.^{917,918} This species contains more reserpine and ajmaline than the Asian species *R. serpentine*.^{919–921}

Pharmacological Studies — *Rauwolfia* alkaloids exert their antihypertensive effect by a combination of various biochemical mechanisms. One of the primary modes of action is the depletion of norepinephrine through inhibition of catecholamine storage in postganglionic adrenergic nerve endings. The hypotensive effect is often accompanied by a reduction in heart rate, contraction of the pupils, and stimulation of intestinal peristalsis.¹⁰ *Rauwolfia* does not cause significant alteration in cardiac output or renal blood flow. The carotid sinus reflex is inhibited, but postural hypotension is rarely observed.⁹²² The cardiovascular and CNS effects may persist even after withdrawal of the drug.

The sedative and tranquilizing properties of *Rauwolfia* are believed to be related to depletion of amines in the CNS. It is this secondary activity that informs the use of *Rauwolfia* in the treatment of chronic anxiety states often associated with the incidence of hypertension. Other pharmacological properties are similar, but not identical, to those described under reserpine.

Clinical Properties — *Rauwolfia* is undoubtedly the most effective and the most widely used plant antihypertensive agent. The drug exerts its hypotensive effects slowly, but the effects persist for a few weeks. *Rauwolfia* therapy produces reduction of congestion of the head, vertigo, cardiac oppression, and general restlessness.¹⁰ Although *Rauwolfia* is very effective in controlling most of the symptomatic manifestations of hypertension, adequate reduction in blood pressure is achieved in only about 40% of mild and 30% of medium-severe cases of hypertension.¹⁰ The drug cannot compete with the more powerful ganglion-blocking agents (such as guanethidine and hexamethonium) in the treatment of severe and malignant hypertension. *Rauwolfia* is not suitable for such conditions and for cases requiring rapid lowering of the blood pressure.

The drug has been formulated with β -blockers, diuretics, or convallaria glycosides. In summary, the clinical indications of *Rauwolfia* are as follows:

1. It is the drug of choice in medium-severe primary hypertension. The drug should be given over a prolonged period, usually up to 6 months and even 1 year.
2. It is effective as an oral antihypertensive but has slow onset of action. The usual regimen is to begin therapy with small doses followed by a gradual dose increase until there is a reduction in blood pressure or the advent of undesirable side effects, which will necessitate lowering the dose.
3. For hypertension therapy, it has the advantage of oral administration and is available in many bio-equivalent dosage forms.
4. *Rauwolfia* is neither a cure for hypertension nor a prophylaxis for the progression of the disease. At a dose of 2–6 mg of the crude drug in divided doses, *Rauwolfia* ameliorates most of the subjective symptoms of hypertension.

The drug is available in the following forms:

1. Powdered *Rauwolfia serpentine* (U.S. Pharmacopoeia; Indian Pharmacopoeia): This consists of *R. serpentine* roots reduced to fine or very fine powder and adjusted to contain 0.15% to 0.2% of reserpine-like alkaloids, calculated as reserpine.
2. *Rauwolfia* dry extract (Indian Pharmacopoeia): The drug is prepared by percolation of roots of *R. serpentine* with 90% of alcohol and the percolate concentrated under reduced pressure (<60°C) to yield a soft extract. The product is adsorbed to starch and dried. It is standardized to contain 4% w/w of total *Rauwolfia* alkaloids; the usual dose is 15 to 16 mg.
3. *Rauwolfia* liquid extract (Indian Pharmacopoeia): This is prepared by percolation as in item 2, but no starch is added, and it is not concentrated. The standardized extract contains 1% w/v of the total alkaloids; the dose is 0.2 to 0.5 ml.
4. Alseroxyton: This is the feebly basic fraction of the alcoholic extract of *Rauwolfia* containing reserpine rescinnamine and deserpidine. The standardized drug contains at least 5 mg/ml of reserpine-like alkaloids.

Pharmacokinetics — When ingested, *Rauwolfia* is slow in onset of antihypertensive effects due to the time required (several days) to deplete existing stores of norepinephrine. One week or more may be required to realize the full antihypertensive effect of drug.

Toxicity — *Rauwolfia* alkaloids are known to cause mental depression, which may persist for several months after the drug has been withdrawn. The drug should be discontinued at the first sign of despondency, early morning insomnia, loss of appetite, impotence, or self-deprecation. Severe cases resulting in maniac depression or suicidal tendencies are extremely rare. The drug is contraindicated in patients with a past history of bronchial asthma or allergy, active peptic ulcer, ulcerative colitis, or pheochromocytoma and in patients receiving electroconvulsive therapy. The safety and efficacy of its use in pregnancy, lactation, and children have not been established. Chronic toxicity and interaction with other drugs are similar to reserpine.

RICINUS COMMUNIS

Botanical Name — *Ricinus communis* L.

Synonyms — *Ricinus speciosus* Burm., *Ricinus viridis* Willd.

Family — Euphorboraceae

Common Names — Castor oil plant, Palmer Christi (English), ricin (French)

African Names — Arabic: khirwa; Bambara: tomontigi; Hausa: zurma, kula kula, 'dan kwasare; Igbo: ogiri, ogiri-ugbo; Swahili: mbono, nyonyo; Yoruba: lapa-lapa-adete, lara, ilara, ilarun

Description — It is a shrub up to 3 m high, branchy at the base. The leaves are alternate, dark green or red, on long leafstalks, and palmatilobate with 7 dentate glandular lobes. The male and female flowers are borne separately. The fruits occur as spiny capsules containing 3 arillated seeds. The *African Pharmacopoeia* described the seeds as rounded, oblong, and somewhat flattened surface from 8 to 12 mm long, 6 to 9 mm wide, and 4 to 8 mm thick. The seed coat, which is thin and brittle, is smooth and glossy, varying in color from grayish brown to gray, and mottled with reddish-brown or black spots and stripes. At one seed extremity there is a prominent and usually pale-colored caruncle, from which the raphe runs along the ventral surface as a distinct line to the other extremity, where it terminates in a raised chalaza. The caruncle can be removed easily, disclosing the hilum beneath as a dark spot. A delicate, silvery white, oily endosperm encloses the embryo with two large, papery cotyledons.²⁸

Habitat and Distribution — It is indigenous to the tropical regions of the continent and grows wild in East Africa but is now pantropic, cultivated for its oil-bearing seeds. The fermented powdered seeds are used by the Igbo people (Nigeria) as a soup flavor. It is best cultivated as an annual with fresh seeds planted every year.

Ethnomedicinal Uses — The leaf decoction is used as an emmenagogue and as a poultice applied to a lactating woman's breast to increase milk flow. The crushed leaves are also used as a hot poultice for application to a guinea worm sore. The oil is used as a purgative but is used only in traditional veterinary practice as an excellent remedy for gripes in horses.²⁶⁶

Constituents — The seeds contain about 50% fixed oil, which consists mainly of glycerides of ricinoleic, isoricinoleic, stearic, and dihydroxystearic acids. The cake left after expression of the oil contains a very poisonous toxalbumin called ricin, the crystalline alkaloid ricinine, a very active lipase, and other enzymes. The seeds also contain some peptides, starch, and mucilaginous substances.

Pharmacological Studies — Castor oil is an effective and safe purgative. The oil is used as a topical application in dermatosis and as a prophylactic in contact dermatitis allergens. Ricin has some antitumor and immune stimulatory properties, and segments of the compounds are being investigated in various laboratories for possible therapeutic application in immune diseases. Castor oil is an excellent vehicle for many pharmaceuticals.

SABICEA CALYCINA

Botanical Name — *Sabicea calycina* Benth.

Synonym — *Sabicea barteri* Wernham

Family — Rubiaceae

African Names — Ashanti: ananse, ananse ntoroma homa; Basa: gor-vah (*S. lasiocalyx*); Mende: namatei; Yoruba: jiri, ogran-aparo

Description — This is a twining or creeping shrub, up to 6.5 m, often rooting at nodes. The leaves are simple, oppositely arranged on the stem and elliptic-oblong, acuminate, with short, pointed apex, and rounded or heart-shaped base, 5–8 cm long, and 3–4 cm broad; the margins are entire, and the lower surface is thinly covered with soft, long hairs. The flowers are white, with about 12 borne on one head; the heads are on long, upright stalks, emerging from the nodes and enclosed by involucre of many greenish and pinkish leafy bracts. They are about 2.0 cm long, narrowly tubular, with 5 pointed lobes. The shrub produces blue-black berries.⁷⁷

Habitat and Distribution — This is found in deciduous and secondary forests, in stream beds and wetlands, and often as sand binder on a sea beach. It is distributed from Sierra Leone to the Congo, Angola, and Zambia.

Ethnomedicinal Uses — *Sabiacea* is used in southern Nigeria as a laxative and is drunk in palm wine. The ground leaves are applied to the limbs of small children to strengthen their bones and help them walk. The crushed leaves are also applied to cuts and wounds. An infusion of the leaves is believed to be good for memory. A member of the genus, probably *S. africana*, is used for the treatment of senile dementia. It is an ingredient in the Yoruba agbo medicine.

SALVADORA PERSICA



Botanical Name — *Salvadora persica* Linn.

Synonyms — *Embellia grossularia* Retz., *Galenia asiatica* Burm.f.

Family — Salvadoraceae

Common Names — Toothbrush tree, Siwak, Miswak

African Names — Arabic: shiwak; Masai: o, remit; Swahili: msuake, mswaki, musuake

Description — *Salvadora persica* is a small tree, usually with crooked stem and drooping branches. The leaves are elliptic lanceolate, obtuse, cuneate, or with a rounded base. Flowers are greenish yellow, borne in axillary and terminal lax, clustered toward the tip of the branches, with panicles 5–12 cm long; the corolla is twice as long as the calyx. It produces one-seeded, globose drupes, 3 mm in diameter and red when ripe.¹⁶⁶ It has been observed that the large amount of intra-axillary phloem and the widely spaced, thick-walled fibers in the pericycle of the root allow the spongy wood to be easily crushed by the teeth and softened, if dry, with water.²²⁷ The fiber-like quality of the wood is also aided by the numerous thick-walled vessels and fibers found in the xylem.

Habitat and Distribution — The plant grows in secondary forests and semisavanna. It is found in North Africa and parts of East and Central Africa.

Ethnomedicinal Uses — *Salvadora persica* has been known as the toothbrush tree for several centuries.⁹²³ It is used widely in Africa, Arabia, and parts of India for cleaning the teeth. *Salvadora* was mentioned in the Arabian ancient script the Muwashsha (AD 900) as a chewing stick or shiwak. The root bark is considered a remedy for ancylostomiasis by the Nyamwezi. The Massai employ the paste of the powdered root in a decoction for venereal diseases and for catarrh. In East and Central Africa, the plant is used for oral hygiene and as an ascarifuge.

Constituents — The plant is rich in chlorine, resin, and trimethylamine and has a high ash value of 27.06%. It also contains sulfur, silica, tannins, saponins, and vitamin C.⁹²⁴ The oil cake from the seeds contains nitrogen (4.8%), potash (2.8%), and phosphoric anhydride (1.05%).¹⁷⁰ One of the major constituents of siwak is benzyl isothiocyanate (BITC), isolated from the roots.⁹²⁴

Pharmacological Studies — *Salvadora* has been incorporated into many commercial toothpastes. It possesses antiplaque activity.⁹²⁵ BITC isolated from *Salvadora* has virucidal activity against HSV, inhibits the growth and acid production of *Streptococcus mutans*, and is fungistatic to *Candida albicans*. *In vitro* studies of shiwak extracts have also demonstrated some antibacterial activity against certain bacterial species implicated in periodontal disease and dental caries.⁹²⁶ Clinical studies on saliva showed that using shiwak sticks or rinsing with aqueous shiwak extract has an immediate inhibitory effect on salivary bacteria.^{927,928} Among chronic or habitual users, clinical studies have shown some positive effects of siwak on their dental health.^{929,930}

In a double-blind, randomized, controlled trial, 68 patients with gingivitis were randomly assigned to miswak group and were instructed to use only issued miswak for oral hygiene during the 3-week experimental period. Registration of plaque, gingival inflammation, and plaque samples were taken at baseline and on completion of the study. Plaque samples were analyzed by a DNA-DNA hybridization technique. Miswak significantly reduced dental plaque ($p = 0.007$) and the composition of subgingival microbiota. Miswak showed an overall effect on dental plaque and gingival inflammation scores. It was suggested that miswak can be used as a dental hygiene method in conjunction with interproximal cleaning aides.⁹³¹

Extracts of the leaves are used in the treatment of scurvy for rheumatism and as a decoction in asthma and for a cough.¹³⁴ Oil obtained from the flower is a stimulant and laxative and has been used as a carminative, anthelmintic, analgesic, and antimicrobial agent.¹⁶⁶ The effects of prolonged administration of a lyophilized stem decoction of *Salvadora persica* have been evaluated in diet-induced rat hypercholesterolemia. The preparation was administered for 15 and 30 days (by gavage at a dose of 500 mg/kg in an aqueous vehicle in a volume of 0.5 ml/100 g body weight). Cholesterol, HDL, LDL, and triglyceride plasma levels were assayed. The results showed that the *S. persica* decoction significantly lowered cholesterol and LDL plasma levels in rats, proving to be more active at 30 days of treatment. The systemic administration of Triton X-100 (surfactant) resulted in a rise in plasma cholesterol and triglyceride levels. The results showed that *S. persica* decoction was inactive

at 18 h after treatment, whereas at 27 h, it was able to reduce cholesterol and LDL plasma levels. The HDL and triglycerides were unchanged however.⁹³² The anticholesterol activity may be due to the presence of stigmast-5-en-3 β -ol isolated from the plant, which has been shown to have antihyperlipidemic and antitumor properties.⁹³³ Miswak also showed antidiabetic activity in animal studies.⁹³⁴

SANSEVIERIA LIBERICA



Botanical Name — *Sansevieria liberica* Gérôme & Labroy.

Family — Asparagaceae

Common Names — African bowstring hemp, leopard lily

African Names — Efik: ekono-ekpe; Hausa: mooda; Igbo: ebube-agu; Tswana: mokgotsi (*S. cylindrica*); Yoruba: ola-koriko

Description — *Sansevieria liberica* is an erect herb with several stiff, red-edged, elliptic leaves, arising from the rhizome. The leaves are upright, up to 60 cm long and 6–10 cm broad, and transversely marked with dark and light green bands, and the margins are marked with red and white lines. The flowers are white and borne on interrupted common stalks. The fruits are reddish, almost round, about 1.25 cm long. Each fruit contains one seed.³³

Habitat and Distribution — It is commonly found in shady places near streams and rock outcrops. It is common in the savanna regions and grassland. It is distributed from Chad to Morocco, Ethiopia, Kenya, and Tanzania.

Ethnomedicinal Uses — The root decoction is a stimulating tonic and a cough remedy and is also administered for hemorrhoids. The roots are used in Ghana as an abortifacient and administered during labor. The expressed juice of the leaves is dropped in the eyes and ears for infections and inflammation. The leaf juice mixed with the fluid expressed from edible snails is used to relieve teething pain. The fumes from the burning leaves are inhaled to relieve feverish headache and cold. The juice pressed from the leaves or a decoction of the leaves is drunk for the treatment of gonorrhea, earache, and toothache and applied to ulcers, sores, and topically in case of earache and toothache. The fermented rhizomes are eaten to cure malaria. A root decoction is used as a remedy for convulsions. As a fetish plant, it is grown on graves, at shrines, and in compounds.¹¹⁴⁰

Constituents — *Sansevieria liberica* contains phytosterols and their glycosides, amino acids, vitamins, and minerals.

Pharmacological Studies — *Sansevieria* possesses anti-inflammatory activity in animal studies. It significantly ($p < 0.05$) inhibited the development of paw edema induced by egg albumen in rats.⁹³⁵ The extract of the leaves showed positive antidiabetic and antioxidant activities. It also exhibited hypolipidemic, immune-modulating, ocular, hepatorenal, and cardioprotective potentials.⁹³⁶ It was found that in a dose-dependent manner, it significantly lowered ($p < 0.05$) ocular MDA content; atherogenic indices; red cell, total white cell, and lymphocyte counts; mean cell hemoglobin concentration; plasma levels of glucose, triglyceride, total, VLDL, LDL, and non-high-density lipoprotein cholesterol; total, conjugated, and unconjugated bilirubin; sodium, urea, and blood urea nitrogen; as well as plasma activities of ALP, alanine, and aspartate transaminases. However, the treatment significantly increased ($p < 0.05$) hematocrit, hemoglobin concentration, mean cell hemoglobin, mean cell volume, neutrophil and monocyte counts, and plasma levels of HDL cholesterol, potassium, chloride, calcium, bicarbonate, and total protein, ocular ascorbic acid content, and ocular activities of CAT and SOD.⁹³⁷

The plant possesses *in vitro* antiparasmodial and anticancer activities.

SCELETIUM TORTUOSUM

Botanical Name — *Sceletium tortuosum* (L.) N.E. Brown

Synonym — *Mesembryanthemum tortuosum* L.

Family — Aizoaceae

Common Names — Kanna, channa, kana, sceletium

African Names — Khoi-khoi (South Africa): kougoed; San (South Africa): kanna; Afrikaans: kougoed

Description — The plant is described by the South Africa National Biodiversity Institute as a prostrate to scrambling perennial succulent herb. The leaves are imbricate, flat triangular in sectional view, with tips incurved, 30–40 × 10–15 mm, with large bladder cells giving foliage a glistening surface, dying back after flowering to leave skeletal remains; flowers (July–September) are white, pale yellow, pale pink, or salmon and ±20–30 mm in diameter; fruits are 4- to 5-locular, with valve wings.

Habitat and Distribution — The plant occurs in South Africa, where it appears restricted to the western and northern Cape provinces. Eight species of *Sceletium* are known to exist, but only *S. tortuosum* is of commercial importance. It can be differentiated by its straight secondary veins, prominent idioblasts, incurved leaf tips, and imbricate leaves.

Ethnomedicinal Uses — The herb is used in traditional medicine by the Khoi-khoi and San peoples of South Africa as a mood enhancer, sedative, and analgesic; for toothache and stomach pains; and as an appetite/thirst suppressant. These properties of kanna were noted and recorded by early settlers at the Cape, who adopted its use for similar purposes. It is also used as a masticatory for social and spiritual purposes.⁹⁴²

Constituents — Indole alkaloids belonging to the mesembrine group (mesembrenol, mesembranol, mesembrenone, and mesembrine) are the major constituents of *Sceletium tortuosum*. Three distinct structural types have been isolated and characterized. Mesembrine appears to be most abundant (0.3% leaves and 0.86% stem). Mesembrenone and 4'-O-demethylmesembrenol are also present. Tortuosamine, also isolated from *S. tortuosum*, represents a second structural type in which the pyrrole ring is opened. Alkaloid levels appear to fluctuate seasonally and may be highest in late spring/early summer; this is the time when plants are traditionally gathered and prepared for use. Investigation of alkaloid ratios and total alkaloid content demonstrated that both are substantially altered by traditional processing methods. Mesembrine and 4'-O-demethylmesembrenol levels were lower in fermented than in unfermented material, while mesembrenone content had doubled during fermentation/drying. Material crushed and dried at 80°C immediately after collection had similar alkaloid patterns to fermented material. The unfermented material showed high levels of oxalates (3.6–5.1%).

The analysis of the relative concentrations of the mesembrine alkaloids has been useful in the quality control of commercial samples of the plant.⁹³⁸ Both reversed-phase ultra high-performance liquid chromatography with photodiode array detector (RP-UHPLC PDA) and GC/MS methods have been used for quantitative assessment of mesembrine-type alkaloids in *S. tortuosum* raw materials and products.⁹³⁹ The use of nonaqueous capillary electrophoresis coupled to mass spectrometry (NACE-MS) was also found efficient for the separation of complex alkaloid mixtures found in commercial kanna teas.⁹⁴⁰

Pharmacological Studies — *Sceletium tortuosum* has been investigated by many groups to validate its application in the treatment of depression, neurological disorders, and neurodegenerative diseases.⁹⁴¹ The extract has been shown to be a potent blocker in 5-HT transporter binding assays (IC_{50} 4.3 μ g/ml) and had powerful inhibitory effects on phosphodiesterase 4 (PDE4) (IC_{50} 8.5 μ g/ml), but not other PDEs. No cytotoxic effects were observed. Mesembrine was the most active alkaloid against the 5-HT transporter (K_i 1.4 nM), while mesembrenone was active against the 5-HT transporter and PDE4 (IC_{50} < 1 μ M). The activity of the *Sceletium tortuosum* extract on the 5-HT transporter and PDE4 provides a probable explanation for the clinical effects of preparations made from this plant. The activities were related to the presence of alkaloids, particularly mesembrine and mesembrenone.⁹⁴² A remarkable feature of the activity of *S. tortuosum* tested is the selectivity of action. Considering that the plant extract will have several components, it is perhaps surprising that the *Sceletium* extract affected so few sites in the extensive panel of receptors, ion channels, transporters, and enzymes used in the study. Selective serotonin reuptake inhibitors are well known as antidepressants, and PDE4 inhibitors have also attracted considerable attention as potential antidepressants, although the pharmaceutical compounds tested clinically have had dose-limiting side effects of nausea and emesis.⁹⁴³

Toxicity — *Sceletium* seems well tolerated in feeding experiments on dogs and cats. In the canine evaluation, milled dry *Sceletium tortuosum* was given at a dose of 10 mg/kg twice a day to seven healthy beagle dogs as well as one dog with dementia for 6 days. The plant material was mixed into the animals' food. Pre- and postfeeding observations and blood tests were made, including those for red cell count, hemoglobin, hematocrit, white cell count, platelet count, blood urea nitrogen, creatinine, glucose, glutamic pyruvic transaminase, total cholesterol, and total protein. Holter monitoring of the electrocardiogram (ECG) was done for the duration of the study. No changes in behavior or adverse effects were noted in the healthy dogs. The blood tests showed no abnormality in the hematology, liver and kidney functions, glucose, or lipid metabolism over the 6-day period. No adverse effects were noted in the dog suffering from dementia. Similar results were obtained from the experiments on cats. However, a slight increase in daytime sleep was noted, and in the blood chemistry, a slight decrease of GOT (glutamic oxaloacetic transaminase) and increase of ALP were observed, which were still within normal limits.^{944,948}

Commerce — The use of *S. tortuosum* alkaloids is the subject of U.S. Patent 6,288,104 by Gericke and Van Wyk,¹⁴² which discloses the use of mesembrine and related compounds, including novel compounds, as serotonin uptake inhibitors and the use of standardized amounts of these compounds in pharmaceutical formulations for use in the management of psychiatric and psychological conditions, including depression, anxiety, drug dependence, bulimia, and obsessive-compulsive disorder. A proprietary product, Zemberin, which contains the standard extract, is being evaluated for use as an antidepressant agent.

SCHUMANNIOPHYTON MAGNIFICUM

Botanical Name — *Schumanniphyton magnificum* (K.Schum) Harms

Synonyms — *Tetrastigma magnificum* K.Schum

Family — Rubiaceae

African Names — Cameroon: abamoto, titimoto; Igbo: akito

Description — *Schumanniphyton magnificum* is a shrub or tree 4–5 m high with a soft, wooded stem and very large, simple leaves. The leaves are larger at the upper half than at the lower

half, about 60–120 cm long and 30–45 cm broad. The flowers are stalkless, large, white or yellow, and occur in dense clusters at the ends of shoots opposite leaves or just above pairs of leaves, subtended by large bracts. The corolla tube is 6–7 cm long, densely hairy, and with 7–10 dagger-shaped lobes, which are up to 2 cm long. The fruits appear around November, almost oval in shape, grayish green in color, and covered with some corky outgrowth.⁹

Habitat and Distribution — It is found in lowland rainforest areas in Cameroon, Sierra Leone, southeastern Nigeria (Calabar and Igbogodo), and Ghana.

Ethnomedicinal Uses — A decoction of the bark is used in an enema as a remedy for dysentery. It is used also as a lotion after circumcision. Fresh leaves (cold expression) and stem extracts are used in the treatment of snakebite.

Constituents — The plant yields a mixture of chromone alkaloids, including schummaniophytine, isoschummaniophytine,^{945,946} *N*-methyl schummaniophytine, schumaginine, and schumannificine,^{947,948} as well as the related bases trigonelline, rohitukine, and the chromone noreugenin.⁹⁴⁹ The *n*-butanol extract of the root bark of the Cameroonian species has also been shown to contain new chromone glycosides and schummaniofoside A and B.⁹⁴⁹

Pharmacological Studies — The polar extracts of the stem possess both *in vivo* and *in vitro* activity against cobra cardiotoxin.^{950,951} The activity has been attributed to the presence of a chromone alkaloid glycoside schummaniofoside isolated from the stem bark.⁹⁵² A nonalkaloidal compound RW12 has also been isolated from the plant with activity against cobra cardiotoxin.⁹⁵³ The compound, when tested on chick biventer cervicis nerve preparation challenged with cobra cardiotoxin, demonstrated anticardiotoxin activity in a dose-dependent manner at a dose range of 0.4 to 1.4 µg/ml, with an ID₅₀ of 0.63 µg/ml.⁹⁵⁴ Schummaniofoside and trigonelline have also been shown to exhibit antimicrobial activity.⁹⁵⁴

The antiviral activity has been evaluated and its activity against HIV and HSV; the nonpolar fraction of a methanolic extract of the root bark was present in a fraction containing the chromone secondary amine schumannificine.⁹⁵⁵ Other chromone alkaloids present in the plant were isolated and tested for inhibition of HIV and HSV infections in C8166 and Vero cells, respectively. Acyl and methyl derivatives were prepared and tested. Of all the compounds tested, schumannificine 1 displayed the greatest activity against HIV, whereas potent anti-HSV activity was observed for a number of its derivatives. The presence of a piperidine ring and unsubstituted hydroxyl groups on the molecules seemed to favor the anti-HIV activity. The anti-HIV activity was considered to be due to irreversible binding to gp120 rather than inhibition of reverse transcriptase or protease.⁹⁵⁶

SCHWENKIA GUINEENSIS



Botanical Name — *Schwenkia guineensis* Schum. & Thonn.

Synonyms — *S. Americana* L., *S. hirta* Wright.

Family — Solanaceae

African Names — Hausa: dandana; Yoruba: ale odan

Description — *Schwenkia guineensis* is a thin, erect, herbaceous weed, with much branched stem, and is up to 50 cm tall. The leaves are oval in shape, about 4 cm long and 2 cm broad; the stalks are sparsely covered with short, soft hairs. It produces greenish or purple flowers, with cylindrical calyx, about 3 mm long and with pointed lobes. The corolla is tubular, cylindrical, and about 8 mm long, narrow, and 5 lobed. The fruits are small, round capsules, about 3 mm long, with 4 protrusions, and they contain many tiny seeds.⁷⁷

Ethnomedicinal Uses — The root and stem wood are used as a chewing stick for tooth cleaning and oral hygiene. A decoction of the plant is administered both orally and topically to treat rheumatic pains and swellings. It is used by nursing mothers to prevent neonatal diarrhea and also given to the suckling baby for the same purpose. The pounded whole plant is used as a fish poison. The root extract is used in Ghana as a cough medicine and in Angola for the treatment of chest pains.⁷⁸

Constituents — The plant contains a glycoside called schwenkioside, steroidal sapogenins, and traces of alkaloids.^{957,958}

Pharmacological Studies — The sapogenin isolated from the plant has cardiotoxic activity.⁹⁵⁸ The compound caused an initial inhibition of toad heart followed by prolonged stimulation. Extracts obtained from various parts of the plant cause hemolysis of red blood cells.⁹⁶⁸

SCLEROCARYA BIRREA



Botanical Name — *Sclerocarya birrea* (A. Rich.) Hochdst.

Synonyms — *Spondias birrea* A. Rich, *Poupartia birrea* (A. Rich.) Aubrev.

Family — Anacardiaceae

Common Names — Marula fruit, daniya

African Names — Bambara: N' guna; Boran: didissa; Dugbani: mu-mugga; Issala: burunogo; Hausa: daniya, huli, nuu; Nankani: nanogba; Sebei: katetalam; Shona: muganu, mufura, ikanyi; Sonrai: diney; Swahili: mugongo; Tamacheck: tuwila; Wolof: birr; Zulu: umganu

Description — *Sclerocarya birrea* is a tall tree about 14 m high and up to 1 m in diameter. It is light gray, finely fissured and flaking in small or large scales; slash is orange pink with green edges,

fibrous, exuding a nearly colorless gum; there is a short bole and stout branchlets. The leaves have a slender glabrous common stalk 10–22 cm long, compound, alternate, and tufted at the ends of the branchlets. The leaflets are opposite or nearly opposite, 5–10 pairs with an off-terminal leaflet, elliptic to obovate, 2–5 cm wide, and apex more or less rounded but with a very short, sharp tip; the base is cuneate, with margins usually entire, dentate on young and coppice undergrowth, glaucous, pale green, with venation obscure, subsessile. The flowers appear when the tree is leafless and are dioecious, greenish white or reddish; subtending bracts are reddish, broadly ovate, and conspicuous at first. The male flowers have 12 or more stamens and occur as solitary, erect spikes; the female flowers occur 2 or 3 together, and pedicels are stout, 2–2.5 long, with sepals purple-red. The petals are recurved, green with purple-red tips. The fruit occurs as a pale yellow drupe, subglobose, 3–4 cm long, 2.5–3.5 cm in diameter, and containing 2–3 seeds surrounded by a leathery rind and fibrous pulp.³³

Habitat and Distribution — The plant occurs in the drier savannas of northern tropical Africa, usually on sandy soils and sometimes on lateritic or stony soils. It can thrive in areas with rainfall as low as 300 mm per annum; in higher-rainfall areas, 450–800 mm, the tree is often conspicuous as an emergent tree through the canopy of the neighboring savanna trees. It is distributed in the savanna belt between Senegal and Ethiopia and in drier areas of southern Africa. It has been located in Togo, Mali, Guinea Bissau, Gambia, Ivory Coast, Burkina Faso, Ghana, Togo, Benin, Niger, Nigeria, Chad, Sudan, and Uganda.

Ethnomedicinal Uses — The main use of the plant in traditional medicine is for the treatment of diabetes. The Hausas use a cold infusion of the stem bark for the treatment of dysentery. And in Senegal, the leaves and root barks are employed with other plants in the preparation of plaster as a remedy against snake- and scorpion bites. An infusion of the bark is used to wash infants as a treatment for malaria or inflammation.⁹⁵⁹ The eastern and southern African species *S. caffra* Sond is employed extensively in traditional medicine and has been used for the treatment of dysentery, diarrhea, and malaria and as a general tonic. *S. birrea* is administered by the Venda in the form of the powdered bark to expectant mothers to regulate the sex of the child: Bark from a male tree is dispensed for a boy and bark from a female tree for a girl.⁷⁹ The plant is used in religious rituals by the Shagana in divining dice. Both species yield pleasant-tasting fruits that are often fermented to give a refreshing drink.

The marula fruits are highly aromatic and can be eaten fresh or used in making juices, jams, and alcoholic beverages, such as Amarula and Tombo.

Constituents — The plant has been shown to contain flavonoids, catechins, and gallotannins. The pulp and kernels of the fruit contain glucosides, amino acids (especially glutamic acid and arginine), and lipids (mostly oleic [60%], myristic, and stearic acid). The fruits are rich in vitamin C. The nutritional profile of the pit has been evaluated, and it contained relatively large amounts of copper (24.8 mg/g dry weight), magnesium (4210 mg/g dry weight), and zinc (62.4 mg/g dry weight). The protein content of the pit was high (36.4% of dry weight); however, the protein fraction contained relatively low proportions of leucine, phenylalanine, lysine, and threonine. Fatty acids accounted for 47 mg/g dry weight of the pit, two-thirds of which was due to oleic acid. The essential fatty acid linoleic acid was present (24.5 mg/g dry weight), but the other essential fatty acid, α -linolenic acid, was absent.⁹⁶¹

Pharmacological Studies — Extract of the plant has been shown to possess hypoglycemic action following intraperitoneal or oral administration.^{960–962} The activity is believed to include peripheral stimulation of glucose uptake and metabolism. The anti-inflammatory effects of the aqueous and methanolic stem bark extracts (500 mg/kg p.o.) have been examined on rat paw edema induced by subplantar injections of fresh egg albumin (0.5 ml/kg). Acetylsalicylic acid (ASA, 100 mg/kg p.o.) was used as the reference anti-inflammatory agent for comparison. Both the aqueous and methanolic stem bark extracts of *S. birrea* (500 mg/kg p.o.) progressively and

time dependently reduced rat paw edema induced by subplantar injections of fresh egg albumin. However, the methanolic extract of the plant produced relatively greater and more pronounced anti-inflammatory effect than its aqueous extract counterpart in the experimental animal model used. The two extracts of *S. birrea* stem bark were found to be markedly less potent than ASA as an anti-inflammatory agent.⁹⁶³

Various extracts (crude decoction, aqueous, ethanolic, and chloroformic extracts) showed significant antagonistic effect on caffeine-induced calcium release from sarcoplasmic reticulum. Crude decoction was the most active, followed by ethanolic, aqueous, and chloroformic extracts in a dose-dependent manner.⁹⁶⁴ Other activities found with *Sclerocarya* extracts include *in vitro* inhibition of *Helicobacter pylori*, antioxidant properties, and use for the management of elevated blood pressure.

SENNA ALEXANDRINA

Botanical Name — *Senna alexandrina* Mill.

Synonyms — *Cassia acutifolia* Del., *Cassia senna* L., *C. lanceolata*, *C. lentiva* Brisch.

Family — Leguminosae

African Names — Arabic: sana, senamiki, sena; Hausa: ilesko, rinji, filaskon maka; Peul: falajin, sanjerehi; Swahili: msahala

Description — It is a subshrub up to 1 m tall with erect stalks but irregular branches. The leaves are paripinnate, alternate, with 4 or 5 pairs of leaflets, and yellow flowers that blossom in axillary bunches. The fruits, known as Alexandrian senna pods, occur as legumes; the entire fruit is compressed laterally, almost flat, broadly oblong or subreniform, thin and papery, 3 to 4 mm wide, and attached to ventral suture by thin funicles. The seeds have a reticulated whitish-green surface and a short raised ridge on each of the flat sides.⁴³⁶

Habitat and Distribution — The plant occurs in the semidesert and sudano-sahelian zones of Africa. It grows in Egypt, Morocco, Mauritania, Mali, and Sudan. *Cassia* is also found in the drier fringe forests.

Ethnomedicinal Uses — The plant is employed in North Africa as a purgative and as an ingredient in various fever remedies. Duke³⁷⁸ reported that the plant has a milder laxative action than Tinnevely senna, and that it has griping effects. The plant has also been used for ascites and dyspepsia. The pulverized leaves are applied to wounds and burns.³⁶⁷

Constituents — The major constituents of *Cassia* species are anthrones and anthraquinones, amino acids, and proteins. The pods yield 2–5% anthraquinone glycosides, known as sennosides. They also contain kaempferol, chrysophanol, isorhamnetin, rhein, sennacrol, and cathartic acid. The leaves contain free anthraquinones, and the seeds do not contain anthraquinones.

Pharmacological Studies — The fruits, leaves, and extracts of these parts of the plant, as well as the purified sennosides, are used in clinical medicine as a laxative, in various dosage forms.

SENNA ALEXANDRINA — VARIETY TINNEVELLEY

Botanical Name — *Senna alexandrina* Mill.

Synonyms — *Cassia angustifolia* Vali., *C. lanceolata* Royle, *C. elongata* Lam.

Family — Leguminosae

Common Names — Tinnevely senna, Mecca senna, Indian senna

Description — The species is an herbaceous subshrub, usually smaller in height than Alexandrian senna, about 0.75 m tall. It has compound leaves that are 15 cm long with 4 to 8 pairs of elongated and lanceolate, almost sessile, leaflets. The leaflets (5–6 cm long, 5–12.5 mm wide) are smooth on the upper surface and slightly downy beneath, bluish green. The flowers are bright yellow, borne in erect axillary and terminal racemes. The pods are dark brown, oblong, thin, and flat, 4–7 cm long and 2 cm wide. Each pod contains 5 to 7 obovate, dark brown, smooth seeds.³⁶⁷

Habitat and Distribution — Tinnevely senna is native to Somali and Djibouti. It has also been located in Kenya, Ethiopia, and southern Sudan.

Ethnomedicinal Uses — Infusion of the leaves and pods is administered as a laxative. The powdered leaf is made into a paste with vinegar for the treatment of skin diseases. As a postpartum medication, a weak infusion of the leaves is taken daily (from the fourth day) after childbirth for a few days to regularize bowel movement.

Constituents — The plant contains anthraquinone glycosides and the other compounds listed under *Cola acuminata*.

Pharmacological Studies — These are the same as for *Senna alexandrina*.

SESAMUM INDICUM

Botanical Name — *Sesamum indicum* L.

Synonyms — *Sesamum alatum* Thoninig, *Sesamum capense* Burm., *Sesamum sabulosum* A. Chev., *Sesamum indicum* L., *Sesamum orientale* L.

Family — Pedaliaceae

Common Names — Benniseed (West Africa), sesame, benue oil seed, sim-sim (East Africa), sesamier (F)

African Names — Arabic: simsim; Bambara: benefin, bene; Hausa: ridi; Peuhl: beme, poeu-loel; Sotho: molekelele; Swahili: ufuta; Yoruba: yanmoti

Description — *Sesamum indicum* is an annual herb attaining up to 2 m in height, with divided or palmilobate stem. The leaves are hairy and opposite. The tubular flowers are white or pink with purplish-red spots. It produces erect capsules 5 cm long and awl shaped. The seeds are nonwinged, reticulate or smooth, and asymmetrical; they are flattened, ovoid, pointed at one end, about 3 to 4 mm long, 2 mm broad, and 1 mm thick, buff colored or whitish, finely punctate, with 4 delicate longitudinal ridges at the hedges of the flat faces.²⁸

Habitat and Distribution — Sesame is native to Africa and is grown as a cash crop in sub-desert savanna. It is drought resistant and is cultivated in Chad, Sudan, Cameroon, Nigeria, Upper Volta, Ivory Coast, Mali, Senegal, and Ghana.

Ethnomedicinal Uses — The oil is used mainly for cooking and as an emollient. A decoction of the leaves is used as an aphrodisiac. The Sortho drink a decoction of the plant for malaria and are reported to chew the leaf instead of tobacco.⁷⁷ The powdered leaf is applied to snakebite by the Swahili and as a remedy for cough and bronchitis. Decoction of the seeds is administered in severe cases of hemorrhoids and for the regulation of the menstrual cycle. Benniseed is used as a nutritive diet during convalescence.

Constituents — The seed contains up to 60% fixed oil, 20% proteins, 4% mucilage, and about 1% sesamin, a lignan. The oil consists of glyceryl esters of palmitic, stearic, myristic, oleic, and linoleic acids.

Pharmacological Studies — Sesamin has been shown to have insecticidal activity and is synergistic to pyrethrum.⁹⁶⁵ The oil has a demulcent, emollient, diuretic, emmenagogue, lactagogue, and laxative effect.¹⁶⁶

SORGHUM BICOLOR



Botanical Name — *Sorghum bicolor* (L.) Moench

Synonyms — *Sorghum vulgare* Pers., *S. drummondii*, *S. guineense*, *S. roxburghii*, *S. nervosum*, *S. dochna*, *S. caffrorum*, *S. nigricans*, *S. caudatum*, *S. durra*, *S. cernuum*, *S. subglabrescens*, and many varieties and crossbreeds

Family — Poaceae

Common Names — Guinea corn, chicken corn, great millet, sorghum, milo, sorgo, sudangrass

African Names — East Africa: mtama, shallu, feterita; Egypt: durra; South Africa: kafir corn; Sudan: durra, feterita; West Africa: great millet, guinea corn, feterita. Other indigenous names are usually for the various millet varieties, especially pearl millet, *Pennisetum glaucum*. The names do not denote taxonomic differentiation or group but rather a functional or agronomic classification.

Description — Sorghum is a cane-like grass that grows up to 6 m tall. Most are annuals; a few are perennials. Their stems are usually erect and may be dry or juicy. The juice may be either insipid or sweet. Most have a single stem, but some varieties tiller profusely, sometimes putting up more than a dozen stems. These extra stems may be produced early or late in the season. Plants that tiller after the harvest has occurred can be cut back, allowed to resprout, and grown without replanting (like sugarcane). Leaves are alternate, simple; the leaf sheath is 15–35 cm long, often with a waxy bloom, with a band of short white hairs at the base near the attachment, reddish in dye cultivars, and auricled; the ligule is short, about 2 mm long, and ciliate on upper free edge; the blade is lanceolate to linear-lanceolate, 30–135 × 1.5–13 cm, initially erect, later curving, with margins flat or wavy. Inflorescence occurs as a terminal panicle up to 60 cm long; the rachis is short or long, with primary, secondary, and sometimes tertiary branches, with spikelets in pairs and in groups of 3 at the ends of branches. Fruit is a caryopsis (grain), usually partially covered by glumes, 4–8 mm in diameter, rounded and bluntly pointed. Soil permitting, the plant produces a deep taproot; some have a large number of multibranched lateral roots.

Habitat and Distribution — Sorghum is of African origin and is cultivated throughout the tropical parts of the continent. It is primarily a plant of hot, semiarid tropical environments but is quite adaptable to very harsh ecological systems. It is particularly adapted to drought due to a number of morphological and physiological characteristics, including an extensive root system, waxy bloom on leaves that reduces water loss, and the ability to stop growth in periods of drought and resume it when the stress is relieved. A rainfall of 500–800 mm evenly distributed over the cropping season is normally adequate for cultivars maturing in 3–4 months. Sorghum tolerates waterlogging and can also be grown in areas of high rainfall. It tolerates a wide range of temperatures and is also grown widely in temperate regions and at altitudes up to 2300 m in the tropics. The optimum temperature is 25–31°C, but temperatures as low as 21°C will not dramatically affect growth and yield. Sterility can occur when night temperatures fall below 12–15°C during the flowering period.

Ethnomedicinal Uses — Sorghum grain is a traditional staple food in most of tropical Africa. It is a global grain used for the preparation of alcoholic beverages, malted drinks, and for bakery and food purposes for which maize or wheat is used. In traditional medicine, it has various applications but usually in combination with other plants. The seed extracts are drunk to treat hepatitis, and decoctions of twigs with lemon are used against jaundice; leaves and panicles are included in plant mixtures for decoctions against anemia. One of the most remarkable uses of sorghum is in the preparation of an effective hemoglobin-regenerating tonic with the stalk, especially the red variety. For this purpose, the ground plant material is macerated with a water-alcohol mixture with “potash” for 2 days, boiled for a few hours in an open pot, and left overnight before use. The tonic is administered for 2 weeks with an observable effect on general health. The red pigment is used for the treatment of various microbial and fungal infections. In Nigeria, the red sorghum dyes were traditionally used by the Bunu, Aworo, Igbira, and Okpella people for a fabric called *abata*, used as a funeral hanging, decorated with patterns made by thick threads added to the weft of the fabric. The fabrics in which the dominant colors were derived from sorghum were known as *ifala*. Sorghum is also used to provide the violet colors decorating the masks worn during certain dances by Yoruba people in southern Benin and in southwestern Nigeria. In Côte d’Ivoire, sorghum and other tannin-rich dyes are used in combination with mud to create the patterns of the painted cloths produced in the Korhogo region. The dye was formerly exported to Morocco, where it was used in the leather industry.¹¹⁴⁰

Constituents — According to the U.S. Department of Agriculture, the composition of sorghum grain per 100 g edible portion is water 9.2 g, energy 1418 kJ (339 kcal), protein 11.3 g, fat 3.3 g, carbohydrate 74.6 g, Ca 28 mg, P 287 mg, Fe 4.4 mg, thiamin 0.24 mg, riboflavin 0.14 mg, niacin 2.9 mg, and ascorbic acid 0 mg. The essential amino acid composition per 100 g edible portion is tryptophan 124 mg, lysine 229 mg, methionine 169 mg, phenylalanine 546 mg, threonine 346 mg, valine 561 mg, leucine 1491 mg, and isoleucine 433 mg. The principal fatty acids per 100 g edible portion are as follows: linoleic acid 1305 mg, oleic acid 964 mg, and palmitic acid 407 mg. Sorghum grain is first limiting in lysine, then in methionine and threonine. Much of the protein in sorghum is prolamine (39–73%), which is poorly digestible, making the maximum available protein in sorghum grain less than 10%. Apigenin, quercimeritrin, kaempferol glucosides, apigenidin glucosides, apigeninidin, luteolinidin, and 7-O-methyl-luteolin-glucoside have been isolated from red sorghum grain. The yields of some of the pigments are anthocyanidin apigeninidin (17%) and the flavonoids luteolin (9%) and apigenin (4%). The color of the sorghums appears to be dependent on their flavonoid-anthocyanin content; the red/purple variety had the highest levels of 3-deoxyanthocyanidins (8–187 µg/g), and the lemon-yellow sorghum had the highest levels of flavones (268–362 µg/g).⁹⁶⁶

Changes of the phytochemical profiles, antioxidant, α -glucosidase, and α -amylase inhibitory activities of sorghum grain during the processes of sorghum tea production have been observed.⁹⁶⁷ Significant ($p < 0.05$) changes of TPC, TFC, and PAC contents were found in sorghum grains during soaking, steaming, and roasting processing. Significant ($p < 0.05$) increases of ferulic (free) and p-coumaric acid (bound) were present in sorghum on steam processing. Roasting processing

(150°C, 1 h) caused significant ($p < 0.05$) increases in phenolic acids, TPC, TFC, and PACs compared with the soaking and steaming stages. Accompanied with the changes of phytochemicals of sorghum grain, there were complex changes of biological activities during the successive processes. Our study also showed that there were positive linear correlations between TPC, TFC, PACs, and bioactivities of sorghum grain; however, PACs had the strongest correlation (0.979, 0.968, and 0.912, respectively, $p < 0.0001$) with DPPH radical scavenging activity, α -glucosidase, and α -amylase inhibitory activities.

Pharmacological Studies — *Sorghum* is valued as a highly nutritious plant. Much published literature exists on the food value of this crop; therefore, the emphasis here is on its possible medicinal uses. The use of the red pigment in the treatment of anemia has been confirmed in tests with rats. Sorghum stem extract was administered to 21-day-old weaning rats that were maintained on iron-sufficient or iron-deficient diets for 6 weeks before the administration of the aqueous extract of *Sorghum bicolor* stem bark at various doses for 7 days. The extract produced a significant increase in hemoglobin, packed cell volume, and red blood cells in iron-sufficient and iron-deficient groups ($p < 0.05$). There was also a significant ($p < 0.05$) increase in the CAT activity of the rat liver and kidney without any significant change ($p > 0.05$) in the serum CAT activity. The results showed that the extract reversed the anemic condition in the iron-deficient group, thus indicative of the possible role of *Sorghum* in the management of anemia.⁹⁶⁸ A standardized extract from *S. bicolor* stem developed at InterCEDD Laboratories Nsukka (Nigeria), called Phytoerythropoetin-K (PEP-K), has also demonstrated consistent value in the treatment of anemia in chronic diseases. It is believed to improve the iron-binding capacity (transferring) and the percent saturation, as well as better incorporating iron in developing red cells.⁹⁶⁹

A patented product by Nigeria's National Institute for Pharmaceutical Research and Development (NIPRD) called Niprisan, which contains *Sorghum bicolor* leaves in a mixture with other plants, has been shown to be effective in the management of sickle-cell anemia with remarkable results.⁹⁷⁰ The patent described a phytochemical composition for treating sickle-cell disease; the composition is a cold water extraction product of a mixture containing *Piper guineenses* seeds, *Pterocarpus osum* stem, *Eugenia caryophyllum* fruit, *Sorghum bicolor* leaves, and potash. Also described are mixtures of phytomaterials used for preparing the extraction product, methods for making the extraction product, and methods for using the extraction product.

A related product marketed also in Nigeria, Jobelyn (formerly called Jubi Formula), has been shown to be effective in the management of sickle-cell anemia. An *in vitro* study has been reported that examined the anti-inflammatory and immune-modulating properties of Jobelyn.⁹⁷¹ Freshly isolated primary human PMN and MNC subsets were used to test selected cellular functions in the absence versus presence of aqueous and ethanol extracts of *Sorghum bicolor* leaf sheaths (SBLs). Both aqueous and nonaqueous compounds contributed to reduced ROS formation by inflammatory PMN cells and reduced the migration of these cells in response to the inflammatory chemoattractant leukotriene B₄. Distinct effects were seen on lymphocyte and monocyte subsets in cultures of PBMCs. The aqueous extract of SBLs triggered robust upregulation of the CD69 activation marker on CD3-CD56 plus natural killer (NK) cells, whereas the ethanol extract of SBLs triggered similar upregulation of CD69 on CD3 plus CD56 plus NKT cells, CD3 plus T lymphocytes, and monocytes. This was accompanied by manyfold increases in the chemokines RANTES/CCL5, MIP-1a/CCL3, and MIP-1b/CCL4.⁹⁷¹

SOLANUM AETHIOPICUM

Botanical Name — *Solanum aethiopicum* L.

Synonyms — *Solanum gilo* Raddi, *Solanum olivare* Paill. & Bois., *Solanum pierreanum* Paillex & Bois

Related Species — *Solanum macrocarpon* L.

Family — Solanaceae (nightshade family) section *Oliganthes*

Common Names — African eggplant, garden egg, scarlet eggplant, bitter tomato, mock tomato, Ethiopian eggplant, African bitter pea-aubergine, wild pea-aubergine, wild African aubergine, tomato-fruited eggplant, Ethiopian nightshade

African Names — Igbo (Nigeria): anara, afufa; Yoruba: igbagba, ikan; Ghana: agbitsa; Sudan: guta, quta; Swahili: ngilo; Uganda: nakati, nakasuga; Burkina Faso: banse, goyo, kumba; Senegal: djackattou, jaxatu, njakatu; Rwanda: intobo, umucucu; Afrikaans (Namibia): bitterappel, grysbitterappel; Afrikaans (South Africa): bitterappel, gifappel, grysbitterappel; Kikuyu (East Africa): mutongu; Boran (Kenya): idi-gaga; Digo (Kenya): mtunguza-koma; Gabbra (Kenya): h'iddi-loonni; Chagga: nduo; Ilwana (Kenya): muhidi; Kamba (Kenya): mukondu; Damara/Nama (Namibia): soropes; Herero (Namibia): omundumburiri, omundumbwiriri, omutimburiri; Himba (Namibia): omundumbwiriri; Khoekhoegowab (Namibia): soropees; Ki-arusha: indulele; Kibende: ntufululu; Kifiome: nangali; Kihene: ndula; Kijita: mtobolo; Kikerewe: mtobotobo

Description — *Solanum aethiopicum* is a woody deciduous annual, or occasionally perennial herb, up to 200 cm tall, often much branched; the root system extends both vertically and laterally; branches and leaves are with or without prickles and stellate hairs. Leaves are alternate and simple; stipules are absent; the petiole is up to 11 cm long; the blade is broadly ovate, (6–)12–30 × (4–)7–21 cm, obtuse or cordate at the base, acute to obtuse at the apex, slightly to deeply lobed at the margin, and pinnately veined; upper leaves are smaller, narrower, less lobed, and often subopposite.¹¹⁴⁰ In the vegetative stage, a plant of the Gilo group looks like a common eggplant (i.e., *Solanum melongena*). Features distinguishing it from the other species are the small, white, star-shaped flowers. In addition, the calyces are never long, and the inflorescence has short (1-cm) rachis. The fruits are 3–6 cm in diameter, varying in shape from ellipsoid to almost round. They contain 2–6 locules and are normally firmly attached to thick fruit stalks that turn downward. The flowers are pollinated by large bees.⁹⁷² The species exist in different forms, which were in the past described as about 20 species. Recent studies have shown that all these plants are highly interfertile and better treated as one species, having arisen by domestication from a single wild progenitor, *Solanum anguivi*. Four main groups of cultivars of *Solanum aethiopicum*, with different uses, are now recognized: the *Shum*, *Kumba*, *Gilo*, and *Aculeatum* groups. The first three are native to Africa and are used as food and medicine; the fourth is of European origin and has inedible fruits.¹¹⁴⁸

Habitat and Distribution — *Solanum aethiopicum* occurs in virtually all of sub-Saharan Africa but is less well known in (or probably absent from) South Africa and Madagascar. It is believed to be a domesticated cultivar from the wild *Solanum anguivi* Lam., via the semidomesticated *Solanum distichum* Schumach. & Thonn. The two species occur throughout tropical Africa, *Solanum anguivi* in disturbed vegetation and *Solanum distichum* in gardens. *Solanum aethiopicum* is grown throughout tropical Africa and South America (mainly Brazil) and occasionally elsewhere (e.g., in southernmost France and Italy). It is one of the leading vegetables in tropical Africa. In the humid zone of West Africa, it is mainly grown for its immature fruit (garden egg), in the savanna area frequently for both its leaves and immature fruits (often called *djakattou*), and in East Africa, especially Uganda, mainly as a leaf vegetable (called *nakati*).¹¹⁴⁰

Ethnomedicinal Uses — The immature fruits of *Solanum aethiopicum* are eaten raw and sometimes as cooked vegetables in stews. The leaves and shoots are also used as a cooked vegetable. Igbo people of southeastern Nigeria traditionally welcome visitors into the family house by offering the fruits either alone or with seeds of *Cola nitida* and *Aframomum melegueta*. Fruits of the bitter cultivars and roots are used in traditional medicine in many African countries. They have been used for the treatment of diabetes, hypertension, and stomach complaints and as a carminative and sedative and for colic. The leaf juice has been used as a sedative to treat uterine complaints; an alcoholic extract of leaves is used as a sedative and antiemetic and to treat tetanus after abortion, and crushed and macerated fruits are used as an enema.

Constituents — The nutrient value of *Solanum aethiopicum* fruits is comparable with that of eggplant. A 100 g edible portion yields the following: water 90.6 g, energy 135 kJ (32 kcal), protein 1.5 g, fat 0.1 g, carbohydrate 7.2 g, fiber 2.0 g, Ca 28 mg, P 47 mg, Fe 1.5 mg, β -carotene 0.35 mg, thiamin 0.07 mg, riboflavin 0.06 mg, niacin 0.8 mg, and ascorbic acid 8 mg. The composition of fresh leaves per 100 g edible portion is water 82.1 g, energy 215 kJ (51 kcal), protein 4.8 g, fat 0.3 g, carbohydrate 10.3 g, fiber 2.4 g, Ca 523 mg, P 94 mg, Fe 6.0 mg, β -carotene 6.40 mg, thiamin 0.23 mg, riboflavin 0.44 mg, niacin 1.8 mg, and ascorbic acid 67 mg. Other constituents of the fruits include the phytosterols betulin and sterolin (sitosterol glucoside), flavonoids, and terpenes. The characteristic bitter taste has been attributed to furostanol glycosides.

Several sesquiterpenoids, the antifungal agents lubimin and epilubimin, have been found in the roots. The leaves contain oxalate and alkaloids (e.g., solasodine), which has glucocorticoid effects. Their concentration is reduced by cooking.¹¹⁴⁰

Pharmacological Studies — *Solanum aethiopicum* has been evaluated mainly for its nutritional value. The bitter cultivars with steroidal alkaloids exhibit the pharmacological activity associated with that class of compounds. The anti-inflammatory activity of the fruits has been evaluated using the egg albumin-induced rat paw edema model. Extracts of garden egg significantly ($p < 0.05$) reduced the fresh egg albumin-induced rat paw edema and also significantly ($p < 0.05$) reduced the granuloma tissue formation in the treated groups when compared to the control.⁹⁷³ In a comparative study to determine the effect of African garden egg, *S. aethiopicum*, against gastric ulcer, a methanol extract of the fruit was administered orally at dose levels of 100, 200, and 400 mg/kg and 100 mg/kg of ranitidine to rats with experimentally induced ulcers. For the indomethacin and aspirin models, ulcerogenic agents (indomethacin 50 mg/kg and aspirin 200 mg/kg) were given 30 min after extract treatments, and animals were sacrificed 8 h later. The acidified ethanol model (ethanol 60% + 0.1 mol/l HCl) was given 1 h after extract treatment, and animals were sacrificed 1 h later. The ulcer index was checked and analyzed with appropriate statistical tools. The extract of *S. aethiopicum* showed a positive effect on all the models used. It produced higher ulcer inhibition than ranitidine in the indomethacin and acid-ethanol models. All the antiulcer effects of the extract at different doses were dose dependent, but only in the indomethacin model did it produce statistically significant ($p < 0.05$) ulcer reduction in all doses compared to the control. Garden egg therefore has a high potential as a cheap and available source for a natural antiulcer remedy.⁹⁷⁴

The plant has also been found to possess antifungal, antioxidant, and hepatoprotective activities.⁹⁷⁵

Toxicity — Some members of the Solanaceae family contain steroidal alkaloids, and some of them are known to be toxic. The rule of thumb is to avoid very bitter cultivars. The related *Solanum macrocarpon* has been shown to contain antinutrient principles (phytate and cyanide) in the leaves. The aqueous infusion of the fresh leaves of *S. macrocarpon* caused hemolysis of human erythrocytes *in vitro*. The blood type SS were more susceptible to hemolysis than either AA⁹⁷⁶ or AS.⁹⁷⁷ It was therefore concluded that the various conventional food-processing techniques significantly reduce the nutrient and antinutrient content of eggplant leaves without adversely affecting the estimated Zn bioavailability to a critical level. Furthermore, the leaf infusion had high hemolytic effect on genotype SS *in vitro*.⁹⁷⁷

Agriculture — The African garden egg plants are cultivated extensively throughout tropical Africa. It is an easily grown plant that thrives well in most soils. Nonetheless, it does best in soils of high fertility, especially those high in nitrogen and phosphorus. Sandy loam to friable clay soils with a pH range of 5.5 to 6.8 have been declared particularly suitable. It has been shown that simultaneous planting of cowpea and scarlet eggplant produced 90–99% the fruit yield of sole scarlet eggplant, while planting cowpea 2 and 4 weeks ahead produced 65–80% and 58–60% of sole crop yield, respectively. Competition between component crops, however, was most favorable for both cultivars of cowpea when planted 2 weeks ahead of scarlet eggplant. Planting cowpea 2 weeks ahead of the main crop also produced the highest land equivalent ratio (LER), most likely due to more efficient utilization of sunlight, water, and soil nutrients. Simultaneously planting cowpea

and transplanting scarlet eggplant was therefore recommended for such an additive intercropping system, aimed at full yield of scarlet eggplant with additional cowpea for food, income, or fodder.⁹⁷⁸

Three of the four cultivar groups that are recognized within *Solanum aethiopicum* are important for Africa:

- *Gilo Group*. The fruits are consumed. This is the most important cultivar group; it includes cultivars with smooth fruits that are popular in West and East Africa and cultivars with more or less strongly ribbed fruits. Mature leaves are covered with stellate hairs and are generally not prickly; fruit is subglobose to ellipsoid, 2.5–12 cm long. Depending on the location, preference is given to cultivars with pure white, creamy white, pale green, dark green, brown, or purple fruits or cultivars with fruits striped in two or more colors. Cultivars of Gilo group are grown throughout tropical Africa in the more humid areas.
- *Shum Group*. Only the leaf is used (the fruits being too bitter). This has fairly small, subspherical fruits and small glabrous leaves. It is distributed throughout Central Africa, as well as in western equatorial Africa, Nigeria, Benin, Togo, and Ghana.
- *Kumba Group*. This has much-lobed glabrous fruits that are pumpkin shaped and only slightly bitter. When ripe, they are light green to red-orange—very ornamental and unusual looking with lots of bumps. Both leaves and fruits are eaten. The species is restricted to the subsahelian region from Senegal, Mali, Bukina Faso, Niger to northern Nigeria and parts of Cameroon.

Members of the plant Family Solanaceae often contain toxic steroidal alkaloids; therefore, horticultural breeding has to be carefully done in order not to introduce toxic cultivars by mistake.

SOLANUM INCANUM



Botanical Name — *Solanum incanum* L.

Synonyms — *Solanum sanctum* L., *Solanum esculentum* Drege., *Solanum subexarmatum* Dunal., *Solanum delagoense* Dunal., *Solanum beniense* De Wild.

Family — Solanaceae

Common Name — Bitter apple

African Names — Hausa: gautan-kuuraa, aata, kulufitaa; Rwanda: intobo umucuu; Igbo: angara-muo; Kihene: ndula; Mizaramo: bwantula, bwanhula, mtula; Kibende: ntufululu; Kirufiji:

mnyanya-mvitu; Kisambaa: ntula; Kifiome: nangali; Kipare: mdangu; Kisukima: matulu; Ki-arusha: indulele; Kiberewe: mtobotobo; Kijita: mtobolo; Kiswahili: ntunguja, mndulele; Kinyamwezi: mdulamu, mtulantu; Shona: mudulukwa; Swahili: mtungujamito; Yoruba: ikan

Description — *Solanum incanum* is a small perennial herb about 2 m high; the stem and branches are with stout prickles. It has simple leaves, 2.5–12 cm long, 2.5–8 cm wide, alternate, and stipules absent. The blade is ovate to ovate elliptic, the apex is rounded or acute, the base is truncate or subcordate, and margins are repand-sinuate, with 2–4 rounded lobes on each side, greenish gray. The flowers are solitary, hermaphrodites, and 5-merous. The calyx is cup shaped and 5 lobed; the corolla is purple-violet or white. It produces yellowish berries 2–4 cm in diameter with numerous compressed-ovoid seeds.³³

Habitat and Distribution — The plant occurs throughout the continent on a variety of soils from sea level to about 2200 m or more in semiarid areas receiving about 250 mm annual rainfall. The species has been recorded from Senegal, Guinea Bissau, Togo, Benin, Ghana, Nigeria, Cameroun, Zaire, Rwanda, Burundi, Chad, Sudan, Ethiopia, Somalia, Uganda, Kenya, Tanzania, Mozambique, Malawi, Zambia, Zimbabwe, Botswana, Angola, Namibia, and South Africa.

Ethnomedicinal Uses — *Solanum incanum* is employed in eastern and southern Africa for the treatment of skin diseases and venereal infections and as a remedy for abdominal pains, dyspepsia, fever, stomachache, and indigestion. The fruits are mostly used in the preparations of remedies; both the roots and leaves find occasional use in the treatment of certain diseases. In traditional veterinary medicine, the fruit juice is instilled into sheep's nostrils as a cure for cough. The plant is also used as a snakebite remedy, for the treatment of liver and spleen diseases, and as a remedy for toothache and earache. In northern Nigeria, the root and sometimes the fruits are used as an ingredient for the preparation of arrow poisons. The plant is regarded as poisonous in most parts of West Africa, and earlier reports of its use internally should be interpreted with caution.

Constituents — The plant contains steroidal alkaloids.

Pharmacological Studies — The pharmacological activity of solanine and related steroidal alkaloids includes antifungal, analgesic, and cytotoxic properties. In southern Africa, the plant has been reported as effective in the treatment of a variety of external benign tumors in veterinary practice.⁷⁹

SOLANUM NIGRUM

Botanical Name — *Solanum nigrum* L. (APG = *Solanum americanum* Mill.)

Synonyms — *S. fistolotum* Rich, *S. nodiflorum* Jacq., *S. guineense* (L) Lam.

Family — Solanaceae

Common Names — Black nightshade, common nightshade, garden nightshade

African Names — Arabic: enab el-ddeb; Hausa: goutan kadji; Igbo: afufa muo; Swahili: mtura; Yoruba: odu, ogumo, igba yirin elegun

Description — *Solanum nigrum* is an annual, medium-size plant; it is herbaceous, growing up to 60 cm in height. The stem branches are slightly pubescent and green in color with a purplish tinge, which intensifies with the age of the plant. The leaves are whole or tortuous, ovate, and briefly ciliated; they are arranged alternately and display agnation with the branches; they are 6–9 cm in length and 4–6 cm in width and have an acute apex. It is slightly hairy on the upper surface of the midrib. There about 6–9 lateral veins that leave with the midrib at an angle of about 45°C. The flowers are pedicellate, white, 2–10, borne on a slender peduncle, and somewhat umbellate in shape. It produces berry-shaped, globular fruits about 5 mm in diameter that blacken on ripening.²⁸ The fruits contain numerous white seeds, attached to an axial placenta. The fruits of this species of *Solanum* are edible and used as a masticatory.

Habitat and Distribution — The plant grows wild and is also cultivated in the rainforest and deciduous areas of the continent. It is distributed from Sudan to Botswana.

Ethnomedicinal Uses — The fruits are used as a stomachic. The young leaves are boiled in soups as a laxative and diuretic. Tender leaves from the young shoots are crushed and applied externally for treatment of psoriasis and skin diseases.⁶

Constituents — The green fruit contains the steroidal alkaloids solanine, solasodine, solamargine, and solanigrine. Other alkaloids found in the plant include solasodamine, tomatine, solauricine, solangustine, and other derivatives.

Pharmacological Studies — Solanine possesses cytostatic and cholinesterase inhibitory activity.⁹⁷⁹ In the French Pharmaceutical Codex 1937, *S. nigrum* was listed as “Huile de Jusquame,” and the leaves were used as a poultice, an emollient, and an antineuralgic.⁵¹⁹ It is also considered to be slightly narcotic and antimitotic. The compound possesses analgesic and sedative properties and has been indicated for migraine, gastralgia, and paralysis agitans, as well as an antipruritic in certain skin diseases.⁷⁸ Another constituent of the plant, solasodine, antagonizes adrenaline-induced tachycardia.⁹⁸⁰

SPHENOCENTRUM JOLLYANUM



Botanical Names — *Sphenocentrum jollyanum* Pierre

Family — Menispermaceae

African Names — Ashanti: krakoo; Bini: obalabi, obalabe; Twi: edurukokoo

Description — *Sphenocentrum jollyanum* is an erect shrubby plant, growing up to 1.5 m in height, with very few branches. The leaves, up to 20 cm long and about 5–12 cm broad, are elliptical; margins are entire, with short and blunt apex and a wedge-shaped base. They are smooth on both surfaces. The leafstalk is 2–7 cm long, bent, and thickened at the point of attachment to the leaf. It produces small, cream or yellowish-white flowers, which occur as clusters on common stalks in the axils of the leaves. The fruits are borne as small drupes, oval in shape and covered with soft hairs, about 2 cm long and 1.5 cm broad, and brightly orange when ripe.^{9,77}

Habitat and Distribution — The plant occurs mainly in the rainforest areas, usually in damp places under forest cover. It is distributed from Sierra Leone to Cameroon.

Ethnomedicinal Uses — The stem bark is valued as an aphrodisiac and general tonic. The root, when chewed, imparts a sweet taste to food eaten afterward. It is used as a chewing stick and medicine for constipation. A cough drug is prepared from the fruits together with the fruits of *Piper guineense* and lime juice. The fruits are edible and are used as an antifatigue snack. The plant is reputed to be a wound-healing agent; for this purpose, the wound is washed with a decoction of the leafy twigs and dressed with powdered bark.

Constituents — The plant yields several isoquinoline alkaloids, including palmitine and columbamine. The plant, like other members of the family Menispermaceae, also contains bitter-tasting diterpenes.

Pharmacological Studies — The crude extracts and an isolated constituent showed anti-inflammatory activity when evaluated with carrageenan-induced hind paw edema of healthy adult albino rats and utilizing the oral route of administration. The fruit methanol extract (79.58% inhibition at 200 mg kg⁻¹) gave higher anti-inflammatory activity than the root extract (53.75% inhibition at 200 mg ml⁻¹). Further purification of the most active methanol fruit extract (MFE) led to the isolation of three furanoditerpenes, identified as columbin, isocolumbin, and fibleucin, as well as a flavonoid-rich fraction (FDE). Both columbin (67.08% inhibition at 20 mg kg⁻¹, $p < 0.05$) and FDE (76.25% inhibition at 200 mg kg⁻¹, $p < 0.05$) gave significant anti-inflammatory activities in a comparable range with reference ASA (72.50% inhibition at 100 mg kg⁻¹).⁹⁸¹ The extracts of the fruits and seeds of *Sphenocentrum jollyanum*, when tested *in vitro*, showed potent anthelmintic activity on the earthworm *Eudrilus eugeniae* and wireworms.⁹⁸²

SPIGELIA ANTHELMIA



Botanical Names — *Spigelia anthelmia* L.

Synonyms — *Spigelia domingensis* Gand., *Spigelia fruticulosa* Lam., *Spigelia multisfica* var. *discolor* Progel, *Spigelia nervosa* Steud., *Spigelia quadrifolia* Stokes, *Spigelia stipularis* Progel

Family — Loganiaceae

Common Names — Worm grass, worm seed, Indian pink, pinkroot

African Name — Yoruba: ewe aran

Description — *Spigelia anthelmia* is a small, erect herb that grows up to 80 cm in height; the stem is smooth and rounded. The leaves occur in whorls, usually 4 in number at the end of the stem or branch. They are oval in shape, elongated, up to 15 cm long and about 7.5 cm broad. They are almost transparent and without stalks. The flowers are pale pink in color and with dark stripes, about 1.3 cm long. The calyx has 5 pointed lobes with narrow segments and a funnel-shaped corolla, which also has 5 small lobes. There are 5 stamens attached to the corolla tube. The style is single. The fruits are small, round, warty, and two lobed.⁷⁷

Habitat and Distribution — *Spigelia anthelmia* is a native of tropical and subtropical America but is widely naturalized in tropical Africa and Indonesia. It occurs in Africa as a common weed in abandoned farmlands, in deciduous forests, and semisavanna. It is distributed from Senegal to the Congo and as far east as Ethiopia.

Ethnomedicinal Uses — All parts of the plant are used as an anthelmintic. The method of preparation differs according to the locality. In many cases, medication is followed within 12 h by administration of a purgative or enema. The fresh leaves are believed to be poisonous to domestic animals, being able to cause their death in 2 to 3 h. High doses of the plant extract are very toxic, and fatalities in adults have been reported with very high doses.

Constituents — The major constituents of *Spigelia* are quaternary alkaloids, the principle ones being spiganthine, ryanodine, and structurally related compounds. The highest concentrations of alkaloids are present in the roots and in the fruit wall. Spiganthine and ryanodine are the main cardioactive principles. The plant also contains diterpenes. A detailed phytochemical study of the aerial parts yielded derivatives of the known cardiotonic compounds spiganthine and ryanodine, 20-deoxyspiganthine, 8 α -hydroxyspiganthine, 20-norspiganthine-5-carboxylic acid, 10-*epi*-ryanodine, 8,9-dehydro-10-*epi*-ryanodine, and 20-hydroxyryanodine.⁹⁸³

Pharmacological Studies — *Spigelia* is used in alternative medicine in Europe as a cardiotonic. The constituents have cardioactivity and insect antifeedant activity. It has anthelmintic properties. The ethyl acetate extract induces tonic paralysis *in vivo*, decreases amplitudes of twitches, and increases tonus of skeletal muscle *in vitro* in laboratory animals.⁹⁸⁴ It was reported that an ethyl acetate extract of *Spigelia anthelmia* with validated anthelmintic activity was evaluated for its acute toxicity and general effects in albino Swiss mice and for neuromuscular relaxant activity in the frog sciatic-gastrocnemius and rectus abdominis preparation. The extract induced a dose-related myotonia and muscular paralysis of rapid onset at higher doses. The calculated LD₅₀ after oral and intraperitoneal administration were 345.9 (241.4–484.7) mg/kg and 60.8 (47.4–80) mg/kg, respectively. In broilers, intramuscular injection of the extract induced spastic paralysis qualitatively similar to that obtained after succinylcholine administration and contrasting to the flaccid paralysis induced by d-tubocurarine. The contraction elicited by direct stimulation of the gastrocnemius was blocked by the extract, and the twitches evoked by stimulation of the sciatic nerve were also blocked. It did not decrease tonic contractions induced by a high-potassium Ringer solution but blocked acetylcholine-induced contractions in the frog rectus abdominis.⁹⁸⁴

STEPHANIA ABYSSINICA

Botanical Name — *Stephania abyssinica* Dill & Rich.

Synonym — *S. abyssinica* Walp.

Family — Menispermaceae

African Names — Chagga: mkwamabewa; Yoruba: gbejedi; Zulu: umthombo, umtambane

Description — *Stephania abyssinica* is a slender glabrous liane growing up to 12 m high. The leaves, 5–7 cm, are dark green at the upper surface and glaucous underneath.

Habitat and Distribution — The plant grows the tropical regions of the continent, preferring rainforest areas. It occurs from Sierra Leone to Gabon and from Zaire to Botswana.

Ethnomedicinal Uses — It is used as a mild purgative in southern Nigeria. The root is used as an anthelmintic and for the treatment of menorrhagia. Related species are used in Asia for the treatment of cardiovascular disorders, including hypertension.

Constituents — Members of the genus contain isoquinoline and dimers joined in a tail-to-tail manner with α,β -stereochemistry at the chiral isoquinoline carbons.⁹⁸⁵

Pharmacological Studies — The activity of the alkaloids is typified by tetrandrine, which has been shown to exhibit negative inotropic activity in isolated cardiac muscle and shortening of the cardiac action potential.^{986,987} Its hypotensive activity in normotensive and SHRs has been reported.⁹⁸⁸ A similar blood pressure lowering effect has been observed in dogs, and the activity was associated with a mild bradycardic effect.⁹⁸⁹ The plant also possesses antiviral, anti-inflammatory, and antiparasmodial activities.

STEPHANIA DINKLAGEI

Botanical Name — *Stephania dinklagei* (Engl.) Diels

Synonym — *Cissampelos dinklagei* Engl.

Family — Menispermaceae

African Names — Hausa: damargaji, jibjar kasa; Yoruba: ogbagi-akokko

Description — *Stephania dinklagei* is a climbing shrub, up to 24 m long. The young stems are ridged, with the stem swollen, and warty at the base. The leaves are broadly ovate to suborbicular, up to 15 cm in diameter. It produces greenish flowers on old leafless branches. The fruits are depressed-globose and yellow when ripe and contain crescent-like seeds.

Habitat and Distribution — It occurs mainly in deciduous forests. It is distributed throughout the continent but mainly in the East Coast from Uganda to Tanzania.

Ethnomedicinal Uses — The species, like other members of the family, are employed extensively in the preparation of folk remedies. In Sierra Leone, the plant is used as a sedative and as a medication for menorrhagia. The plant is also administered in the treatment of infertility and as an anthelmintic. Extracts of the plant are employed as an antitussive in Ghana.⁹⁹⁰

Constituents — The plant contains alkaloids belonging to the aporphine and isoquinoline group.^{991,992} The major alkaloids found in the plant include corydine (which constitutes 0.27% as the most abundant), dinklageine, norcorydine, isocorydine, stephanine, stephalagine, *N*-methylglucine, and *N*-methylecorycine.

Pharmacological Studies — Corydine is slightly sedative and hypnotic and has a depressant activity on the heart and respiratory system. The alkaloid mixture has a sympathetic action on the central and peripheral nervous system. A fraction of the alkaloid extract has been shown to act on the cerebral cortex to exert a stimulatory action on the CNS.⁹⁹³ The root infusion showed antispasmodic activity in the isolated rabbit intestine at concentrations of 1% and above. A drop in contractile tone and arrest of peristalsis was observed at 4% concentration.⁵²³ At 5% concentration, it reversed the acetylcholine- and barium chloride-induced contraction.⁵²³ An alkaloidal cepharanthine (CT) isolated from a related Asian species, *S. cepharantha*, has been found useful in clinical practice in the treatment of leukopenia during radiation therapy or cancer chemotherapy,^{994,995} aphthous stomatis,⁹⁹⁶ and alopecia areata,⁹⁹⁷ as well as for the treatment of snakebites.⁹⁹⁸

Several biochemical mechanisms have been proposed to account for the clinical efficacy of CT; these include stabilization of cell membranes, inhibition of histamine release from mast membranes, inhibition of lipid peroxidation, and stimulation of hematopoiesis.^{999,1000} It has been shown that although CT exhibits an enhancement or rhythmic perfusion of microvascular blood due to vasomotion, this microvascular dilatory effect appears not to have any direct association with the systemic hemodynamics.¹⁴⁶

Another medicinally important member of the genus is Indian *S. glabra* (Roxb.) Mier, which is employed in traditional Indian medicine for the treatment of asthma, dysentery, and fevers. Several alkaloids isolated from this species have been investigated for various pharmacological activities, including antitumor (cycleanine), bactericidal, anticholinesterase (palmitine), and antispasmodic (pronuciferine) effects and hyperthermia in rats (tetrahydropalmitine hydrochloride).¹⁴⁷

STROPHANTHUS SPECIES

Family — Apocynaceae

The seeds of the major African *Strophanthus* species *S. kombe* and *S. gratus* Hook (Strauch) yield very potent cardiac glycosides, thestrophantins. Similar glycosides are present in less well-known species, such as *S. sarmentosus* D.C., *S. hispidus* D.C., and *S. gracilis* Schum.

S. kombe yields a mixture of glycosides collectively known as strophanthin K. The aglycone is strophanthidin, and the principal glycosides are K-strophanthoside, K-strophanthin-B, and cymar. *S. gratus* produces a stable glycoside bearing a rhamnose moiety, g-strophanthin or ouabain. The compound can be isolated in very pure crystalline form, and it is used as the biological standard for the assay of other cardiac glycosides. Ouabain is active at relatively low doses, is very soluble in water, and offers several pharmacokinetic advantages over digitalis glycosides for patients requiring rapid digitalization. The effect is of shorter duration, and the drug is not cumulative. Ouabain is badly absorbed when given orally and therefore is administered mostly as an injection. It does not cause peripheral vasoconstriction as digitalis does.⁵¹⁹

S. hispidus contains about 2% K-strophanthoside-a and about 8% of other cardiac glycosides, including cymaroside, saponosides, and the amorphous strophanthin H.

S. sarmentosus yields two main glycosides depending on the geographical locations where the plant was collected. The genin in the glycosides of the plant found in Zaire, Togo, and southern Nigeria is sarvogenin, while the plants that grow in the savanna belt of northern Nigeria and Mali elaborate glycosides based on sarmentogenin. The sugars associated with these genins are known as sarmentose and digitalose.^{437,519,1001} *S. gracilis* yields the largest quantities of total glycosides in the mixture. The major compounds found in the plant include strophanthidin, strophanthidol, emicymarin, odorside H and G, and gracilside.^{437,519}

Pharmacological Properties of Strophanthidin and Its Congeners — *Strophanthus* glycosides exhibit essentially the same therapeutic activity as the digitalis glycosides. The cardiovascular activity of *Strophanthus* glycosides cannot be matched by those of digitalis. Strophanthins generally have extremely rapid onset of activity following an intravenous injection.

According to Weiss,⁵¹¹ the effect on the pulse and easing of the dyspnea can be observed within minutes, even while the slow intravenous injection is being administered. The drug has been found useful in coronary insufficiency and its attendant angina. The possibility of strophanthin-induced coronary infarction is a contraindication in the use of strophanthin as the initial drug for this purpose, except when muscular insufficiency has been clearly established.⁵¹¹ The drug is active in very low doses, and the dangers of toxicity with potential fatality make the use of the drug for outpatient medication somewhat precarious. *Strophanthu*, however, is formulated with belladonna and valeria in the form of tinctures (1:1:2 ratio) for the oral treatment of vagotonia, extrasystoles, and hypertension. In cases of angina symptoms of vasomotor origin, a formulation containing equal amounts of *Strophanthus* tincture, valerian tincture, and “nitrous ether spirit” has reportedly been employed with good results.⁵¹¹

Pharmacokinetics — Strophanthosides are poorly absorbed through the gut. Proprietary preparations exist for sublingual administration via the base of the tongue. Only 16% of K-strophanthoside-a was absorbed when administered per os in a study with 33 human volunteers.¹⁰⁰² Following an intravenous injection of the drug, 73% of the dose administered was excreted through the kidney, and the half-life of elimination was 99 h. About 70% of the total drug excrement

was excreted as the unchanged drug and the remaining as various metabolites. The elimination of the drug administered orally followed different patterns. Only 11% of the given dose was excreted with a half-life of elimination of 22 h. Eighty percent of the quantity consisted mainly of conjugated K-strophanthoside and other metabolites; only 6% was excreted as the unchanged drug.¹⁰⁰³

Toxicity — The strophanthins, including ouabain, are very potent drugs and therefore can be extremely dangerous. Deaths due to strophanthin intoxication are uncommon.⁵¹¹ Such deaths are mainly due to overdosage or acute *Strophanthus* intolerance. In diabetic patients, it was found that tolbutamide and carbutamide enhanced the toxicity of strophanthin and digitalis glycosides. Glibenclamide, on the other hand, decreased the toxicity due to strophanthin in a dose-dependent manner.¹⁰⁰⁴ It is therefore advisable to treat diabetics requiring cardiac glycoside therapy with glibenclamide instead of the other antidiabetic agents to avoid the enhancement of multifocal ectopic beats or coupling due to premature ectopic ventricular beats during strophanthin therapy.

STRYCHNOS ICAJA

Botanical Name — *Strychnos icaja* Baill.

Synonyms — *Strychnos kipapa* Gilg., *Strychnos dewevrei* Gilg., *Strychnos pusilliflora* S. Moor., *Strychnos mildbraedii* Gilg., *Strychnos dundunsanensis* De Wild., *Strychnos venulosa* Hutch.

Family — Loganiaceae

African Names — Hausa: k'ok'ihmo (*S. tricalysiods?*); Twi: pepere; Cameroon: mbondo, kpo, membandi, kpombondo; Zandi: mbenge; Ndebele: umhlali; Kiswahili: mwavi; Kitembo: kinyakabi turumbu; Tschiluba: kampopi; Babua: benge; Kitalinga: bwende; Shona: matamba; Swati: umkwakwa; Ugwalla: dama, ghasambe, sambedale; Zulu: umkuhlu

Description — *Strychnos icaja* is a medium-size liane, 20–100 m long, 4–15 cm in width, with pale gray to dark brown bark, and often umbellately branched. The leaves are long, glabrous, opposite, and petiolate; the petiole is 4–12 mm long, with the size of the leaves varying according to access to light. The flowers are hermaphrodite, 4-merous, with pale green sepals, broadly ovate to suborbicular, 0.4–1 mm wide; the corolla is greenish yellow-white. The fruits are basset, indehiscent, dark yellow, and globose.¹⁰⁰⁵

Habitat and Distribution — The species is found in various vegetation zones of the continent, including rain forest, secondary forest, swamp, and gallery forests. The plants have been reported in an FAO monograph³³ as occurring in Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Central African Republic, Rio Muni, Gabon, Congo, Zaire, and Angola.

Ethnomedicinal Uses — The species is considered toxic and does not find wide applications as a folk remedy but is usually administered under the supervision of a traditional medicine man. The main use of the plant is in the treatment of skin diseases and chronic and persistent malaria. A cold infusion of palm wine has been reported for treating painful gastrointestinal conditions and hernia.^{1006,1007}

Constituents — It produces a mixture of closely related tertiary indole alkaloids based on the strychnine moiety. Strychnine itself and 12-hydroxystrychnine have been isolated from the leaves, stems, and roots.^{1003,1008} Dimeric tertiary alkaloids exemplified by bisnorhydrotoxiniferine and sungucine have been shown to occur in the roots.¹⁰⁰⁹ Also found in the roots are quaternary alkaloids such as *N*-strychninium.¹⁰¹⁰

Pharmacological Studies — Two distinct pharmacological activities have been associated with alkaloids of *S. icaja*. The strychnine-type compounds exert convulsant action, whereas the bisindoles have muscle relaxant properties. The activity of the extracts is therefore dependent on the method and solvent of extraction. Kambu et al. have shown that it may be possible to prepare alkaloid extracts that have either predominantly convulsant (strychnine-like) or muscle-relaxant properties.¹⁰¹¹ The authors have shown that the quaternary alkaloidal fraction, which is more water soluble than the tertiary alkaloidal fraction, has a pronounced muscle relaxant activity and strong cardiotonic action, with negative chronotropic and inotropic effects ending in irreversible cardiac arrest.

STRYCHNOS NUX-VOMICA

Botanical Name — *Strychnos nux-vomica* L.

Synonyms — *S. lucida* Wall, *S. vomica* St. Lag.

Family — Loganiaceae

African Names — Arabic: Bizrul gawzel mokway's

Description — *Nux vomica* consists of the seeds of *Strychnos nux-vomica* L. and *S. ignatii* (Fam. Loganiaceae). *Nux vomica* seeds, usually irregularly white pulp, are disk shaped, nearly flat, umbonate, but occasionally are irregularly shaped and gray or greenish gray in color. It has a silky surface that is characteristically covered by a dense mass of radiately arranged, closely pressed, outwardly directed lignified trichomes. It is 10 to 30 mm in diameter and 4 to 6 mm thick, with a round or somewhat acute margin, raised hilum that is connected to the micropyle by a radial ridge. *Nux vomica* seeds can be pried open to reveal a translucent, horny endosperm and central disk-shaped cavity, which encloses an embryo adjacent to the micropyle.¹⁶⁴

Pharmacological Studies — The pharmacological activity of *nux vomica* seeds is determined largely by the strychnine content of the plant. Strychnine is a competitive antagonist of the inhibitory transmitter glycine at the postsynaptic sites and produces the characteristic “spinal” convulsions in high doses.⁸¹⁷ It is a potent CNS stimulant and has been used as a tonic and analeptic.

In India, powdered *nux vomica* seeds are used in the treatment of dyspepsia and nervous system diseases, chronic dysentery, atonic diarrhea, paralytic and neuralgic affections, and male sexual impotence.⁹⁸⁰ Its bitter taste increases appetite, it has been incorporated in low concentrations in proprietary products to stimulate the appetite, and it is used in the treatment of chronic constipation because of gastrointestinal stimulant activity. Strychnine is employed in pharmacological investigation as a classical CNS stimulant.

Toxicity — The biological utility of strychnine is limited by its serious toxicity. Fatalities from accidental or deliberate poisoning by strychnine are well known, with the victims first suffering severe muscle stiffness and spasm; clamping of the jaws before death results in the fixed grinning expression known as “risus sardonicus,” and respiratory arrest occurs due to contraction of the abdomen and the diaphragm.²⁰⁵ Brucine is less toxic than strychnine but not as active.

SYZYGIUM AROMATICUM



Botanical Name — *Syzygium aromaticum* (L.) Merr. et Perry

Synonyms — *Caryophyllus aromaticus* L., *Eugenia aromatica* (L.) Baill., *Eugenia caryophyllata* Thumb., *Jambosa caryophyllus* (Spr.) Neid., *Eugenia caryophyllus* Spreng.

Family — Myrtaceae

Common Names — Clove (E), clou de girofle, giroflier (F)

African Names — Arabic: karanfal; Bambara: benefundi; Hausa: kanumfari, karanho, kade; Igbo: osaragbogo-eze; Swahili: karafwu; Yoruba: konofuru

Description — Cloves are small evergreen trees 10 to 15 m high. The leaves are opposite, petiolated lanceolate with translucent aromatic glands. They have a pungent odor and are pink when young. The inflorescence occurs as racemose panicles and bears buds that take on the form of nails before blossoming to constitute the spice. The flowers are red and have four concave, overlapping petals that drop as soon as the flower opens. There are numerous stamens and four calyx teeth. The fruit is a dark and red, fleshy drupe. Clove buds have a strong aromatic characteristic odor and a pungent and spicy taste, followed by a slightly aromatic, characteristic odor and a pungent and spicy taste, followed by a slight numbness. Clove readily exudes oil when pressed or scratched by the fingernail.

Habitat and Distribution — The plant originated in Indonesia but is now grown in some parts of Africa, especially in the islands of the Indian Ocean (the Comoro archipelago, Madagascar, Reunion Island, and Zanzibar).

Ethnomedicinal Uses — Clove and clove oil are used as anodynes for toothache and mouth infections. The plant is used as an antiseptic dressing for wounds. It has also been dispensed for coughs and stomachache and as a stimulant and carminative. Other *Syzygium* species, especially *S. guineense* and *S. cordatum*, are also used as remedies for various diseases. *S. guineense* is used in West Africa and by the Swahili as a remedy for dysentery. In Central Africa, a decoction of the bark is used in the treatment of diarrhea. The Bemba use a decoction of the leaf of *S. cordatum* as a remedy for stomachache and diarrhea, and they apply a poultice of the pounded leaf, bark, and root to the breast of the nursing mother to increase the flow of milk. The Zulu use the plant and a related species, *S. gerrarde*, as a tuberculosis remedy and emetic.⁷⁹ The powdered bark is sprinkled on the water as an effective fish poison but is not toxic to big fish and warm-blooded animals.⁷⁹

Constituents — It yields 15–20% volatile oil, which consists of up to 90% eugenol and about 13% gallic acid and β -caryophyllin, methyl salicylate, benzaldehyde, and sesquiterpenes α -cubebene, cardenes, and α -copene.¹⁰¹² Two ellagitannins, syzyginins A and B, were isolated from the leaves.¹⁰¹³ The plant also contains the sterols sitosterol, campesterol, and stigmasterol, as well as the flavonoids kaempferol and rhamnetin.

Pharmacological Studies — Clove has been shown to possess antiseptic, antispasmodic, antihistaminic, and anthelmintic properties.¹⁰¹⁴ Eugenol is widely used in dentistry to deaden the pain of toothache and to probe tooth decay. The oil and aqueous extracts potentiate the activity of trypsin.¹²³ It possesses antioxidant¹⁰¹⁵ and antimicrobial activities.

It has been used in combination with *Lavandula angustifolia* and *Geranium robertianum* for the treatment of acute external otitis (AEO). The combination herbal eye drop (Lamigex) preparation was compared with the ciprofloxacin 0.3% drop in the alleviation of AEO symptoms. All assessed symptoms (tenderness, itching, erythema, edema, and discharge) were equally improved in the ciprofloxacin and Lamigex groups by the end of the trial ($p > 0.05$). There were remarkable reductions in the visual analog scale score by the end of the trial in both groups ($p < 0.001$). However, the rate of pain improvement was not found to be significantly different between the groups at either the 3rd or 7th day of trial ($p > 0.05$). The numbers of positive cultures for all tested microorganisms were clearly reduced by the end of the trial in both groups but were not significantly different between the groups ($p > 0.05$).¹⁰¹⁶

It has shown activity against *Trypanosoma cruzi*,¹⁰¹⁷ *Lymanaea acuminata*,¹⁰¹⁸ and xerophilic aflatoxigenic fungi associated with marketed tea.¹⁰¹⁹ The hexane extract has a biphasic action on testicular function:¹⁰²⁰ A low dose (15 mg) of the extract for 35 days increased the activities of Δ^5 3 β -HSD and 17 β -HSD and the serum level of testosterone; the higher doses (30 and 60 mg) of the extract inhibited these parameters and induced nonuniform degenerative changes in the STs associated with

a decrease in daily sperm production and depletion of the 1C (round and elongated spermatids) population. These results indicated that caution is required in the use of the flower bud of *Syzygium aromaticum* as an aphrodisiac in indigenous systems of medicine or as a dietary supplement.¹⁰²⁰

The probable biochemical mechanism of the antidiabetic action of clove has been outlined by Adefegha and Oboh.¹⁰²¹ It was found that the phenolics-rich extracts inhibited alpha-amylase and alpha-glucosidase in a dose-dependent manner. However, the alpha-glucosidase inhibitory activity of the extracts was significantly ($p < 0.05$) higher than their alpha-amylase inhibitory activity. The free phenolics (31.67 mg/g) and flavonoid (17.28 mg/g) contents were significantly ($p < 0.05$) higher than bound phenolic (23.52 mg/g) and flavonoid (13.70 mg/g) contents. The extracts also exhibited high antioxidant activities, as typified by their high reducing power, DPPH and ABTS radical scavenging abilities, as well as inhibition of Fe²⁺-induced lipid peroxidation in rat pancreas *in vitro*. It was suggested that these activities could explain the biochemical rationale by which clove elicits a therapeutic effect on type 2 diabetes.

TABERNANTHE IBOGA



Botanical Name — *Tabernanthe iboga* Baill.

Synonyms — *T. albiflora* Stapf., *T. bocca* Stapf., *Iboga vateriana* Braun-Blanq. & K.Schum.

Family — Apocynaceae

Common Names — Iboga, eboka, bitter grass, sacred wood, leaf of God

African Names — Igbo: ochima; Gabon: iboga; Zaire: lopundja, lopundu mokundji

Description — *Tabernanthe iboga* is an evergreen tree or shrub, usually growing up to 8 m tall. The leaves are broadly ovate, sometimes oblong-elliptic or broadly elliptic. They occur as single opposite leaves attached to the branches or directly appendaged to the young stems. It exudes copious white latex. The root, which is the part usually employed in medicine, is characteristically yellow in color.

Habitat and Distribution — It grows in the rainforest belt. It is known to occur mainly in the western-central region of the continent. It has been located in southeastern Nigeria, Gabon, the Central African Republic, and the island of Equatorial Guinea.

Ethnomedicinal Uses — *Tabernanthe iboga* and related *Tabernaemontana* species (Fam. Apocynaceae) are used in West Africa as ritual hallucinogenic agents. The plant is employed in many secret rituals by cults in various parts of the region. *Tabernanthe* species are employed in traditional African medicine for the treatment of a variety of diseases, including manic depression and leprosy, and as a nerve stimulant, appetizer, and aphrodisiac. The use of iboga in West African religious experience has been documented by Lewis and Elvin-Lewis.²²⁷ The plant is, however, rarely used alone but in a mixture with members of the plant families Apocynaceae, Loganaceae, and Euphorbiaceae.

The dried plant part or liquid extract is administered to initiates of secret societies and members of masquerade groups to enable them to see the gods and spirits of deceased relatives.

It is very important in the initiation ceremonies of the Bwiti tradition in Gabon, southern Cameroon, equatorial Guinea Congo, and DR Congo. The root bark is eaten whole or crushed and ground, rolled into small balls, and sometimes mixed with other ingredients; sometimes, a decoction of the crushed roots is taken. It is a true hallucinogen, assisting the initiate in self spiritual discovery and to make contact with deceased relatives and ancestors and the spirit world, hence enabling the individual to “come to terms with death.” After the initiation ceremony, the initiate is reborn as an adult into the tribe, having been cleansed of illnesses and sociopsychological blockages accumulated during childhood. Iboga is taken in these ceremonies in large quantities.¹¹⁴⁰

The “magic of the Igbos” is also used in Ogbanje rituals to induce a state of psychosis in which the user is believed to be capable of revealing objects he reputedly buried in former lives. The Ogbanje phenomenon or *abiku* is prevalent in the southeastern Nigeria, where certain individuals, mainly children, are believed to undergo repeated reincarnations at short intervals to the torment of their parents at each death. Iboga preparations are believed to enable the Ogbanje during the restoration rituals to reveal the place they hid their treasures in their previous lives to avert yet another cycle of death and reincarnation or a social calamity on the entire community. Iboga is not a popular drug of abuse and is usually restricted to religious and cultural ceremonies.

In the Congo, a root macerated in palm wine is used for coughs, urinary infections, and toothache and as an anthelmintic.

Constituents — The dried roots contain about 6% indole alkaloids. The major narcotic alkaloid in iboga is the indole alkaloid ibogaine, a tryptamine derivative, which is apparently restricted to the genus. Other alkaloids found co-occurring with ibogaine include coronaridine, tabersonine, and vocangine, as well as tabernanthine, ibogamine, kisanthine, and gabonine.¹⁰²²

Pharmacological Studies — The principal alkaloid, ibogaine, is a strong CNS stimulant.¹⁰²³ It is a potent cholinesterase inhibitor. The compound possesses a hypotensive effect and stimulates the appetite and digestion.¹⁰²⁴ After parenteral administration, ibogaine has been identified in various biological materials, including blood and urine (humans) and in the liver, kidney, and brain of laboratory animals. Ibogaine produces complex effects on locomotor activity in rodents.¹⁰²⁵

TAMARINDUS INDICA



Botanical Name — *Tamarindus indica* L.

Synonyms — *Tamarindus occidentalis* Gaertn, *Tamarindus officinalis* Hook.

Family — Caesalpiniaceae

Common Names — Tamarind tree (E), tamarinier, tamarin (F)

African Names — Bambara: tombi, ntomi, tumi; Hausa: tsamyia, tsamia; Masai: ol massam-burai; Nyamwezi: mshishi; Peuhl: dam, dabe, dami, djamini; Shona: musika; Swahili: ukwaju, mkwayo; Igbo: icheku; Yoruba: ajagbon

Description — *Tamarindus indica* is a medium-size tree, with short bole, striped scaly dark brown bark, and a dense crown. The leaves are peripinnate with 7–12 pairs of opposite leaflets, unequally rounded at the base. The flowers occur in small terminal racemes, are yellowish with red or purple stripes with 3 petals and 4 sepals. It produces thick pods, about 10–20 cm long, with edible fibrous pulp with 5 to 6 seeds. The fruit has a faint characteristic odor, and the taste is acrid and sweet.

Habitat and Distribution — It occurs wild in the tropics and is widespread throughout the continent. It is probably native to Africa as well as India. It is cultivated for its fruits and as shade and avenue trees. It is widely distributed and is found in Ghana, Nigeria, Chad, Ethiopia, Angola, Kenya, and Tanzania.

Ethnomedicinal Uses — The sweet fruit pulp is used for the preparation of a refreshing drink and is eaten as an occasional snack. It is also fermented into wine. In northern Nigeria, the roots are used as an ingredient in the preparation of medication for leprosy treatment. The leaves have been administered for fevers as a laxative. In many parts of West Africa, a decoction of the roots is the principal ingredient in a remedy for cardiac diseases. The bark infusion is drunk by women after childbirth as a general tonic. The fruit pulp is processed in various ways and added to certain meals as a form of mild laxative. In northern Ghana, Sokoto Province of Nigeria, Chad, and southern Sudan, the evaporated pulp is often added to boiled cereal pap for the treatment of constipation. The leaves are used as a cicatrizer in wound dressing.

Constituents — The fruit flesh is highly acidic and yields up to 15% tartaric acid. It also contains citric, malic, and acetic acids. The fresh ripe tamarind is rich in reducing sugars (ca. 30% to 41%). The unripe tamarind contains little sugar or acid but may have some vitamin C. The plant also contains volatile oil, consisting of cinnamaldehyde, ethyl cinnamate, geraniol, limonene, α -terpineol, piperitone, alkylthiazoles, pyrazines, methylsalicylate, and safrole.¹⁰²⁶ All parts of the plant contain phenolics, including catechin, epicatechin, quercetin, and isorhamnetin.

Pharmacological Studies — The fruit pulp has laxative properties and is highly nutritive. It is dispensed in China to treat nausea in pregnancy. The fruit pulp extract reduced the fluoride concentration in blood and bone and enhanced its urinary excretion in animal studies, which is indicative of the ameliorative potential of fruits of tamarind in fluoride toxicity.¹⁰²⁷ The pulp fruit extract (5%) given to hypercholesterolemic hamsters decreased the levels of serum total cholesterol (50%), non-HDL cholesterol (73%), and triglycerides (60%) and increased HDL cholesterol levels (61%). *In vitro*, the extract presented radical scavenging ability, as assessed by the DPPH and superoxide radical assays, and led to decreased lipid peroxidation in serum, as assessed by the thiobarbituric acid reactive substances (TBARS) assay.¹⁰²⁸ It has antihyperglycemic properties and has been used for the treatment of diabetes.

Tamarind has strong antioxidant properties attributed to the high concentration of phenolics in the leaves, fruits, seeds, veins, and skins. The effects of solvents, of varying polarities, on the extraction of antioxidant phenolics from the leaves, seeds, veins, and skins of *Tamarindus indica* (*T. indica*) have been studied. The efficiencies of the solvents for extraction of the antioxidant phenolics were found to be in the order methanol > ethyl acetate > hexane. Methanol leaf extract had the highest phenolic content and was the most potent scavenger of DPPH and superoxide radicals. Methanol vein extract had the highest ferric-reducing activity, whereas methanol seed extract was the most potent ABTS radical scavenger. A positive correlation existed between phenolic content and antioxidant activities of the plant parts.¹⁰²⁹ Four major antioxidants are known to occur in the

plant: 2-hydroxy-3,4-dihydroxyacetophenone, methyl 3,4-dihydroxybenzoate, 3,4-dihydroxyphenylacetate, and epicatechin, as well as other minor phenolic compounds.

The most widely used tamarind is the seed extract, tamarind seed extract (TSE), which has been shown to exhibit strong antioxidant scavenging activity against hydroxyl radicals and superoxide anions produced by the ABTS/H₂O₂/FeCl₃ (Feton reaction) and hypoxanthine-xanthine oxidase (neotetrazolium) systems, respectively. It has also displayed scavenging activity against peroxy radicals generated by ABTS/H₂O₂/peroxidase and ABTS/H₂O₂/myoglobin systems.¹⁰³⁰ It also inhibited the *in vitro* and *in vivo* production of both nitrite and NO. The anti-snake-venom property of TSE has been evaluated. TSE completely inhibited the phospholipase A2 (PLA2), protease, hyaluronidase, L-amino acid oxidase, and 50-nucleotidase enzyme activities of *Vipera russellii* venom dose dependently. It completely neutralized the venom-induced edema, hemorrhage, and myotoxicity, including lethality. The venom-induced lethality (2LD₅₀ dose) was antagonized dose-dependently *in vivo*.¹⁰³¹

The seed coat has antioxidative activity, as well as antiacne and antidiabetic activity, and is used as a tanning material.

TETRAPLEURA TETRAPTERA



Botanical Name — *Tetrapleura tetraptera* (Schum. & Thonn.) Taub.

Synonyms — *Adenanthera tetraptera* Schum. & Thonn., *T. thonningii* Benth.

Family — Leguminosae

African Names — Bini: ighimiakia; Efik: edeminang; Etsako: imininie

Description — *Tetrapleura tetraptera* is a medium-size tree, up to 24 m high and 1.5 m in girth. It has sharp buttresses, fern-like foliage, and silvery gray to reddish smooth bark. The leaves are very sensitive, bipinnate, with 6–8 pairs of pinnae. The leaflets are opposite, alternate, oblong-elliptic, with rounded ends, practically glabrous, and 8–12 pairs. It has prominently grooved, wing-like ribs, which are slightly curved, dark purple-brown, glabrous, and glassy. Two of the wings contain soft sugary pulp, oily and aromatic, and the other two are garde and woody.⁹

Habitat and Distribution — It occurs in deciduous and evergreen forests. It is found in Senegal, Sierra Leone, Ghana, Nigeria, Cameroon, Kenya, Zimbabwe, and Tanzania.

Ethnomedicinal Uses — The plant is used in West Africa to flavor soups taken as general tonics and stimulants or as part of postpartum diet therapy. The powdered fruit is used as fish poison and in ointment for the treatment of skin diseases. The infusion of the fruits is used in Ghana as a bath solution for fevers and malaria. The stem bark extracts have been used, among other things, for gonorrhea and viral diseases and as a tonic. A decoction of the roots is used in Ghana as a bath solution for fevers and malaria. A decoction of the roots is used in jaundice. The fruits are also added as an ingredient to anticonvulsant remedies. It is an ingredient in traditional remedies for arthritis and other inflammatory conditions, asthma, diabetes mellitus, hypertension, and epilepsy.

Constituents — The root bark has been shown to contain saponins and tannins.⁷⁸ Oleanolic acid glycosides, scopoletin, and coumarin have been isolated from the fruit.^{1032,1033}

Pharmacological Studies — Alcoholic extracts of the fruit showed a sedative effect in mice within 30–40 min after intraperitoneal injection of leptazol, giving a protection score of 60% against the convulsant effects of the latter.¹⁰³⁴ Scopoletin has been shown to possess *in vitro* and *in vivo* antibronchoconstrictor and antiarrhythmic effects.¹⁰³⁵ Extracts of the fruits and the powdered drug exhibited molluscicidal activity.^{213,1036} Its antimalarial activity has been evaluated and at a dose of 300–900 mg/kg day exhibited significant ($p < 0.05$) blood schizonticidal activity in both a 4-day early infection test and an established infection with a considerable mean survival time comparable to that of the standard drug, chloroquine, at 5 mg/kg day.¹⁰³⁷

Laboratory studies showed that *T. tetraptera* fruit aqueous extract possesses anti-inflammatory and hypoglycemic properties. *Tetrapleura tetraptera* extract (50–800 mg/kg p.o.) produced dose-related, significant reductions ($p < 0.05$ – 0.001) of the fresh egg albumin-induced acute inflammation of the rat hind paw edema. In the antidiabetic assay, the plant extract (50–800 mg/kg p.o.) also produced dose-dependent significant reductions ($p < 0.05$ – 0.001) in the blood glucose concentrations of both fasted normal and fasted diabetic rats.¹⁰³⁸ A commercial product that contains dried aqueous extract of *Tetrapleura tetraptera* is marketed in Nigeria by InterCEDD Health Products as an antioxidant and for the treatment of hypercholesterol.

THEVETIA NERIIFOLIA

Botanical Name — *Thevetia neriifolia* Juss.

Synonyms — *Thevetia peruviana* (Pers.) K. Schum., *Cerbera thevetia* L., *Cerbera peruviana* Pers.

Family — Apocynaceae

Common Names — Yellow oleander, laurier jaune des Indes (F)

African Names — Arabic: thefatiah; Yoruba: oloimiojo

Description — *Thevetia peruviana* is a shrub or small tree, usually about 6 m high, bearing small latex. The leaves are alternate, quasilinear lanceolate. The flowers are ball shaped, yellow, about 7 cm long, and occurring in terminal cymes. It produces spherical drupes as fruits, which ripen to a yellow color and then become dark, containing seeds enclosed in an angular bilobed shell.³²

Habitat and Distribution — It is cultivated as an ornamental plant throughout the continent.

Ethnomedicinal Uses — *Thevetia* is considered extremely poisonous and is rarely used as an ingredient in the preparation of remedies. A weak decoction of the stem bark is used for the treatment of intermittent fevers.

Constituents — The plant contains the cardenolides, thevelin A, thetin B, nerifolin, fixed oil, and protein. An irridoid heteroside, aucubine, has also been isolated from the extract of the leaves and fruits. The kernels yield a colored oil (ca. 95%).

Pharmacological Studies — Thevetin, peruvoside, and nerifolin are short-acting cardiotonics. The glucosides are rapidly eliminated and not considered important in clinical medicine since there is little difference between effective and toxic doses. Thevetin is indicated for limited use in cases of intolerance for digitalis and persistent edema even after digitalis therapy.⁷⁸ It has also been dispensed for cardiac insufficiency with dyspnea and for ventricular insufficiency due to hypertension and atherosclerosis.⁷⁸

TREMA GUINEENSIS

Botanical Name — *Trema guineensis* (Schumm. & Thonn.) Ficalho

Synonyms — *Trema orientalis* (L.) Blum.

Common Names — Pigeon hood

Family — Ulmaceae

African Names — Twi (Ashanti, Wassaw, Fante, Bron): sesea; Nzema: seazealeba; Baule: aisle; Anyi: sekye, somobra; Ew: wadzawadza; Bini: ehuogo; Igbo: telem-ugwu; Swahili: mpesi; Kikuyu: mupethu, muhethu; Teita: mwesu; Meru: muethu; Kispigi: poponet; Kakamega (Tiriki): musakala; Tavata: mbaranyungu; Bemba: mutumpu; Kaonde: kambombo; Nyanya: mehinde; Tonga: mululwe; Yoruba: afafe

Description — *Trema guineensis* is a shrub or short-lived small tree that grows up to 15 m high, with smooth, light gray bark. The slash is creamy white to light yellow, fibrous, and bright green immediately beneath the bark. The leaves are small (4–7 mm long), simple, alternate, and stipulate and shed easily. The blade is oblong-lanceolate, 20 cm long, 1.2–7.2 cm wide, apex acuminate, unequally rounded or slight cordate at the base, with margins finely and regularly serrate along the entire length, glossy dark green above and dull paler green below; venation is depressed above and more or less prominent below. The flowers appear February–August and are small, polygamous, mostly male with a few female or hermaphrodite flowers at the apex. The fruits occur as dark purple, glabrous drupes, that turn black over time; they are thinly fleshy, ovoid to globose, and 3–6 mm in diameter, with the remains of styles often persistent.¹⁰³⁴

Habitat and Distribution — In Ivory Coast and parts of Ghana, an aqueous decoction of the bark is used as a remedy for cough, bronchial congestion, and asthma. The bark is also used as a vermifuge and for the treatment of dysentery and yellow fever. A gargle prepared from the bark and leaves has been used for sore throat, toothache, and mouth infections. The plant has a bitter taste and has been administered for its antispasmodic activity in severe stomachache. The leaf extract is administered to dogs as an anthelmintic. Tender leaves and those of *Amaralia sherbourniae* are used in the preparation of soup taken at sunset in Liberia for female infertility.⁹

Constituents — The species has been shown to contain octacosanoic acid and 1-octacosanyl acetate (0.006%), β -sitosterol, triterpenic alcohols, and ketones such as simiarenol (3 β -hydroxy-friedohop-5-ene) (0.003%), episimiarenol, simiarenone (0.04%), and trematol.¹⁰³⁵ Co-occurring with these compounds are some saponins and condensed tannins.

Pharmacological Studies — Laboratory studies on the species showed that intravenous injection in dogs produced progressive and prolonged hypotension.⁹ It was also reported as toxic to mice at a dose of 2.50 g but was nontoxic to fish.⁹ It has CNS activity¹⁰³⁹ and may have some potential benefit in the management of epilepsy.¹⁰⁴⁰

TRICHILIA EMETICA

Botanical Name — *Trichilia emetica* Vahl.

Synonyms — *Trichilia umbrifera* Swynn., *Trichilia somalensis* Chiov., *Trichilia grotei* Harms., *Trichilia roka* Chiov., *Trichilia jubensis* Chiov.

Family — Meliaceae

African Names — Arabic: safsaafa; Ashanti: chele, yofunosi, kisiga, asabrabise; Bari: korillon; Hausa: jan saiwa; Dinka: apolgum; Igbo: ubenwenwe (*T. lanata*); Tigre: gumeh; Yemen: roqah, rugah, rogah, roka; Somali: goro-mas; Kilia: mukeko, mukeka; Cinyanja: msikitsi, mwavi; Chindao: musikdidzi, musikiri, misikiri; Singuni: nkulu or umkuhlu; Swaziland: mhisi; Swahili: miti-mai, mnwamaji, mnwamai; Kikuyu: mururi; Tswana: tsandi, mosikiri; Xhosa: umkhulu; Kamasia: sor-get, sok; Meru: musunui; Kisi: omenyakige; Bemba: mushikishi; Lozi (Tonga): musikili; Nyanya: msikizi; Diola: bouriete; Mandigo: queco; Yoruba: ashapa; Zulu: vungu, umkhulu

Description — *Trichilia emetica* is a small deciduous or evergreen tree 2–30 m high and up to 90 cm in diameter. The bark is gray to brown, smooth to rough, and the twigs are corky. It has deep reddish-pink slash becoming brownish and paler inward and colorless or off-white later. The leaves

are pinnate, with 3–5 pairs of leaflets, opposite or almost opposite, and a terminal leaflet; distal leaflets are larger, narrowly elliptic, or obovate to elliptic, oblong or ovate, 1.5–15 cm long, 1–6.5 cm wide, with the apex obtuse or notched; thinly pubescent, dark glossy green above, sometimes glabrous, 9–14 pairs of lateral veins. It produces yellow flowers that are 5-merous, monoecious but with very little external differences between sexes; they are borne in leaf axils or on older twigs. The calyx is cup shaped, deeply lobed almost to the base, with lobes ovate, 1.5–7 mm long, 2–5 mm wide. The fruits are characteristically fig shaped, orange or purple-red in color, glabrous, usually opening by 4 valves, and containing seeds embedded in an orange-colored aril.³³

Habitat and Distribution — *Trichilia emetica* is native to the savanna belt and open woodland of Africa. Two subspecies are known; subspecies *emetica* occurs in the open savanna woodlands subject to grass fires, while subspecies *suberosa* is generally confined to the more fertile soils of the riverbanks and seasonally flooded riverbeds. The species is distributed widely in the tropical savannas and occurs from Liberia to Congo and in parts of southern Africa. The subspecies *emetica* is found mainly in the eastern parts of Africa and occurs in Ethiopia, Somalia, Zaire, Uganda, Kenya, Tanzania, Zambia, Zimbabwe, Malawi, Mozambique, Botswana, Angola, Namibia, and Swaziland. The other subspecies, *suberosa*, occurs in the western Africa region and has been located in Gambia, Guinea Bissau, Guinea, Mali, Ivory Coast, Burkina Faso, Ghana, Togo, Benin, Nigeria, and Cameroon.

Ethnomedicinal Uses — In West Africa, the pounded bark is used as an external application to treat parasitic skin infections and inflammation. The plant is purgative, and the bitter root extract is administered as an enema for this purpose. An infusion of the stem bark is used as a purgative in many parts of the continent. The plant is also considered emetic in high doses and has been used as an antiseptic and general tonic and for bronchial inflammation.

Constituents — The plant yields fats, resin, tannins, and a bitter principle that was shown to be related to calicedrin.¹⁰⁴¹ The bark of the related species, *T. heudelotti*, showed the presence of pyrocatechuic acid, a bitter principle, and sterols.¹⁰⁴² The seeds of *Trichilia* species contain a fat (40–60%), which consists of oleic, palmitic, and linoleic acids.⁷⁸ A meliacine, prieurianine, has been shown to be a constituent of the Nigerian plant *T. prieriana*.⁶⁹⁵

Pharmacological Studies — The seeds of *Trichilia* were found to be purgative and emetic; the seedcake has been shown to be toxic to cattle.⁷⁸

TRIGONELLA FOENUM-GRaecum



Botanical Name — *Trigonella foenum-graecum* L.

Synonym — *T. tibetana* (Alef.) Vassilcz.

Family — Meliaceae

Common Names — Fenugreek (E), fenugrec (F)

African Name — Arabic: helba

Description — *Trigonella foenum-graecum* is an erect herbaceous annual, 10–40 cm tall, aromatic, smooth. It has compound leaves 7–12 cm long. The flowers are whitish or purplish blue, blossoming solitarily or in groups of 2. The fruits occur as 2–10 cm pods that are long, thin, and pointed and contain 10–20 seeds.

Habitat and Distribution — It is found in temperate and Mediterranean regions of Africa. It occurs in Egypt, northern Sudan, Libya, and Tunisia. The plant is cultivated on a small scale in the Jos plateau of Nigeria and in the Rift valley of East Africa.

Ethnomedicinal Uses — In North Africa, the seeds are used as an oral antidiabetic. The plant is used as a galactagogue in the Sudan.¹⁰⁴³ The leaves are used in various folk remedies for the relief of indigestion and general stomach disorders. The seeds are edible and have been used in remedies for rheumatism, chronic cough, and enlargement of the spleen and liver and as a general tonic. Extracts of the seeds are incorporated into several cosmetics claimed to have an effect on premature hair loss and as skin cleanser.

Constituents — The seeds contain trigonelline (*N*-methylnicotinic acid), choline, nicotinic acid, and diosgenin. Essential oil, mucilage, and fixed oil are also major components of the seeds. Fenugreek has been shown to be a feasible source of diosgenin, which occurs in the embryo of the seeds^{1044,1045} before acid hydrolysis improves the sapogenin yield.^{1046,1047} It contains amino acids, and 4-hydroxyisoleucine (4-HI) constitutes about 80% of the total content of free amino acids in *Trigonella foenum-graecum* seeds.

Pharmacological Studies — A 2% concentration of the saponin fraction showed *in vitro* spermicidal action against rat and human semen.¹⁰⁴⁸ The alkaloid trigonelline has been shown to counteract the hyperglycemic effect of cortisone given 2 h before or simultaneously.⁷⁸ Nicotinic acid and coumarin, which co-occur in the plant, are also hypoglycemic. The compound was moderately effective in alloxan diabetic rats and in human subjects.^{1049–1051}

Fenugreek has been shown to possess antidepressant activity, which has been attributed to the hydroxyisoleucine content. It was found that oral acute administration of 4-HI showed the dose-dependent reversal in forced swim-induced increased immobility behavior in normal and reserpinized mice in the dose range of 3 to 30 mg/kg; the spontaneous motor activity (SMA) scores were not affected by 4-HI in normal or reserpinized mice except for the dose of 30 mg/kg, which showed a central rather than peripheral mechanism of 4-HI; a significant increase in the number of 5-HTP (precursor of serotonin) -induced head twitches was shown by 4-HI. In conclusion, 4-HI showed antidepressant-like effects in animal models of depression by brain serotonin turnover enhancement.¹⁰⁵² 4-HI has also been found to possess antidyslipidemic and antihyperglycemic activities. It significantly decreased the plasma triglyceride levels by 33% ($p < 0.002$), total cholesterol by 22% ($p < 0.02$), and free fatty acids by 14%, accompanied by an increase in HDL-C/total cholesterol ratio by 39% in the dyslipidemic hamster model.¹⁰⁵³

The plant has immunomodulatory, gastrointestinal protective, antioxidant, and AChEI activities, and these effects make fenugreek a very valuable herbal medicine and dietary supplement.

UNCARIA GAMBIE

Botanical Name — *Uncaria gambier* Roxb.

Synonyms — *Umcaria qabir* Roxb., *Nauclea gambir* Hunt.

Family — Rubiaceae

Common Names — Pale cathecu (E), gambier (f)

African Names — Arabic: qafir hindi, fufal hindi

Description — *Uncaria gambier* is a climbing plant with strong curved thorns (sterile peduncles). The leaves are opposite, briefly petiolated, onate or ovate lanceolate, contracted at the tip into a short tail or acuminate of 10–12 cm, and coriaceous and smooth.⁴³⁶ Yellowish flowers are in axillary bunches, with pedunculate flowers on a tomentose calyx with a corolla of about 12 mm. Fruit are a septicidal capsule of two lobules containing numerous seeds. The processed dried extract is odorless with a bitter astringent taste at first but afterward is sweetish.²⁸

Habitat and Distribution — This species is native to India but is naturalized in Mediterranean Africa. It occurs in Morocco, Egypt, Libya, and northern Sudan.

Ethnomedicinal Uses — The extract of the leaves and twigs is used as an antiseptic in wound dressing. In North Africa, a popular mouthwash is prepared with the dried extract. It is employed to treat diarrhea and for healing of mouth sores. It has also been used for the treatment of convulsion, hypertension, epilepsy, eclampsia, and cerebral diseases.

Constituents — It is a known source of the drug catechu, which consists of catechin (7–33%), catechu-tonic acid (22–50%), quercetin, wax, and oil in small quantities. Members of the genus *Uncaria* yield indole alkaloids and sesquiterpenes. *U. gambier* contains the alkaloids rhynchophylline, gambirdine, isogambirdine, and related indoles.

Pharmacological Studies — The extracts have astringent properties and have been employed for the treatment of diarrhea and sore throat and as an ingredient in various cosmetic preparations. *Uncaria* alkaloids possess a mild central depressive effect; a weak noncompetitive, antispasmodic action in mice intestine; and a hypotensive effect in rats.¹⁰⁵⁴

UVARIA CHAMAE



Botanical Name — *Uvaria chamae* P. Beauv.

Synonyms — *U. cylindrica* Schum & Thonn., *U. crista* R. Br. ex Oliv., *U. nigrescens* Engl. Diels., *U. echinata* Chev., *Xylopiastrum macrocarpum* (Dunal) Roberty.

Family — Annonaceae

Common Names — Finger-root, bush banana (fruits)

African Names — Ewe: gbanagbana; Fanti: akotomposten; Fulani: boile; Hausa: atore; Igbo: afuru-agu; Mende: ndogho-njele; Swahili: ngandasimba (*U. leptoclodon*); Twi: anweda; Yoruba: eru

Description — *Uvaria chamae* is a climbing shrub or small bushy tree that grows up to 5 m high. The leaves (15 × 5 cm) are aromatic, alternate, elliptic or oblong-elliptic, shortly acuminate, entire, glabrous, and glossy. They display 10–12 pairs of lateral nerves and are rounded at the

base. The flowers are fragrant, yellowish in color, and borne on leafy branchlets. The brown fruits are edible and resemble a small bunch of bananas, with characteristic fruiting carpels (10–20) and distinct stripes, and hairy; they are yellow when ripe. The seeds are embedded in sweet-tasting pulp.⁹

Habitat and Distribution — The plant grows in fringing forests, deciduous and savanna forests, and dry coastal shrubs. It is distributed from Senegal to Zaire. Related species occur in most forest regions of the continent.

Ethnomedicinal Uses — The main use of *Uvaria* in West Africa is in the preparation of a remedy for jaundice and intermittent fevers. The root bark is used for respiratory catarrh and for dysentery. An infusion of the root is used in the treatment of severe abdominal pain. The root decoction is also administered as a purgative for the treatment of hepatitis. The juice of the fresh leaves is applied to fresh wounds and sores and sometimes is instilled into the eyes as weak solution in the treatment of conjunctivitis. An alcoholic extract prepared from root bark, stem, or dried leaves is taken for the treatment of an inflammatory condition known as “Calabar swelling.”

Constituents — *Uvaria* elaborate a complex mixture of alkaloids, flavonoids, and tannins.^{1055,1056} The species also contains C-benzylated monoterpenes, dihydrochalcones, and cyclohexene epoxides.^{1057–1059}

Pharmacological Studies — *Uvaria* flavonoids have been shown to possess significant antimicrobial activity against *Staphylococcus aureus*, *Bacillus subtilis*, and *Mycobacterium smegmatis*, and activities of some of the isolates and their derivatives were found to be comparable to those of the clinical antibiotic streptomycin sulfate.¹⁰⁶⁰ *Uvaria* extracts have antimalarial, antidiabetic, and strong antioxidant properties.

VERNONIA AMYGDALINA



Botanical Name — *Vernonia amygdalina* Del.

Synonyms — *Bracheilema paniculatum* R.Br., *Cacalia amygdalina* Kuntze., *Decaneurum amygdalinum* DC., *Cheliusia abyssinica* Sch.Bip. ex Walp.

Family — Compositae

Common Name — Bitter leaf

African Names — Ashanti: mponasere; Bini: oriwo; Ewe: krepi agbo, avenya (Togo); Fanti: bowen; Fulani: siwakewi, dakuna (Eguinea); Ga: akpa gbo; Hausa: shiwaka; Igbo: olugbu; Malinke: kosa finna; Mende: njenyani; Twi: awonwene; Wolof: ndumburghai; Yoruba: ewuro, e jije

Description — *Vernonia amygdalina* is a shrub or small tree up to 5 m high. The leaves (15 × 5 cm) are simple and entire (or minutely toothed), obovate-oblongate, finely glandular below, and displaying few lateral nerves. The flowers occur in copious corymbose panicles and are white, fragrant, and usually bee infested. The species can be easily differentiated from the wild-growing *V. colorata* by the hairy leaves of the latter.¹¹⁴⁷

Habitat and Distribution — The plant grows in coastal savanna, but it is often cultivated in many parts of the continent as an edible vegetable. It is distributed from Sudan in the north to southern Africa.

Ethnomedicinal Uses — The leaves are reputed to be effective remedies for gastrointestinal disorders and as a general tonic. An aqueous decoction of the leaves has been used for the treatment of fevers and diabetes. The dried leaves are chewed for the same purpose and used by pregnant women to check nausea. The fresh leaves are, however, believed to be abortifacient. The bitterness of the leaves is usually reduced by boiling and soaking in water followed by several washings with fresh water. The peeled stem is used for cleaning the teeth, and the bark is administered for venereal diseases and for diarrhea. The plant is added in very minute quantities in several remedies, but it is not clear whether it is used to impart a bitter taste to the medication or is included for therapeutic purposes. The leaves are ingredients in purgative enemas, diuretic mixtures, anthelmintic preparations, and topical lotions for parasitic skin diseases. The bitterness of the leaves is often exploited by nursing mothers to assist in weaning babies by rubbing the juice on their breasts. Soup prepared with washed leaves is believed to improve lactation. It is used during labor to facilitate childbirth. It is used with the leaves of *Psidium guajava* for the treatment of hypertension and kidney problems. In Rwanda, it is added to local sorghum beer, *ikigage*, to increase the potency and for medicinal purposes.

Constituents — *Vernonia* contains saponins, cardiac glycosides, flavonoids, and sesquiterpene lactones.¹⁰⁶¹ The major constituents include the saponin vernonin, the sesquiterpenes vernoleptin and vernodalin, and the ubiquitous flavonoid kaempferol.

Pharmacological Studies — *Vernonin* has been shown to exert hypotensive activity and mild cardiotoxic effects when injected in dogs. A leaf extract of the plant reduced the rate and force of contraction of the isolated frog heart and in cats caused a marked fall in blood pressure, as well as reduction in heart rate; it also caused a strong stimulation of the isolated rabbit intestine.¹⁰⁶² The sesquiterpene lactones have *in vitro* cytotoxic activity against KB tumor cells and Wilms's myeloma.¹⁰⁶³ The extract of the leaves has broad-spectrum antimicrobial activity and has been shown to induce abortion in goats. The methyl alcohol extract of the leaves, when administered to 12–13 pregnant mice, caused abortion within 24 h of the last dose in a 3-day regimen.¹⁰⁶⁴ Toyang and Verpoorte have published a good review that summarized the various uses, phytochemistry, and pharmacological activities of *Vernonia* species.¹⁰⁶⁵

The major activities found in many laboratory and clinical studies of *Vernonia amygdalina* include antimalarial, antidiabetic, antioxidant, antihypercholesterolemic, and anthelmintic activities and uterine contractility, immune boosting in HIV infections, and anti-inflammatory properties. In a clinical outcome study at InterCEDD (Nsukka, Nigeria, 1992–1993) of 12 ambulatory volunteers with severe hemorrhoids, a weak infusion of dried *V. amygdalina* roots and *Garcinia kola* seeds completely shrunk the acute inflammation, and a maintenance taken for 8 weeks prevented the recurrence of piles for several months. A controlled clinical study on the use of *V. amygdalina* roots will be necessary to evaluate its efficacy in the management of acute severe hemorrhoids.

Toxicity — *Vernonia amygdalina* is consumed throughout West and Central Africa as a vegetable and is generally considered nontoxic, but excessive consumption of the leaves is purgative. In a chronic toxicity study, rats were fed with up to 75% (w/w) powdered leaves mixed with grower mash for 65 days, and at the end of the study the only gross change observed was the lightening of

the skin of the rats in the treatment group versus the control group.¹⁰⁶⁶ The LD₅₀ of the related species *V. colorata* in mice is about 10 g/kg.

VITELLARIA PARADOXA — SHEA BUTTER TREE

Botanical Name — *Vitellaria paradoxa* C.F.Gaertn.

Synonyms — *Butyrospermum paradoxum* (Gaertn. F) Hepper, *B. parkii* (G. don) (Kotschy).

Family — Sapotaceae

Common Name — Shea butter tree

African Names — Ewe: yo, yokuti; Hausa: kadanya; Igbo: osisi, ori, okwuma; Nupe: kochi; Twi: kra-nku, nku; Wolof: karate; Yoruba: emi, emi-egidi

Description — *Vitellaria paradoxa* is a small tree that grows up to 14 m high. It has dark gray bark that is rough and fissured and exudes white latex when cut. It is easily confused with *Lophira alata*. The leathery leaves (22.5 × 8.5 cm) are borne in a cluster at the ends of the twigs. They are rounded at both ends, although the base is sometimes wedge shaped. The young leaves are densely hairy, but the older ones are sparsely hairy, becoming smooth with age. There are many lateral veins that spread out almost at right angles to the margins. It produces fragrant flowers, which appear in clusters at the ends of leafless twigs. They are whitish in color, and sepals are covered with pinkish hairs.

The fruits are yellow in color, ellipsoid, and 5 cm long and 2.5 cm broad. They usually contain one oval-shaped seed, but at times two or three such seeds may be contained in a fruit. The seeds are about 3 cm long, with a hard, bony seed coat and a shield-shaped scar, which is nearly as long and as wide as the seed.

Habitat and Distribution — It is common in the savanna areas of the continent. It is a major crop in Sudan, Senegal, Ghana, Nigeria, Niger, and Chad.

Ethnomedicinal Uses — The fat (shea butter) is used as an ointment for rheumatic pains and boils. A decoction from the bark is used to facilitate child delivery and ease labor pains. The leaf extract is dispensed for headaches and as an eye bath.²⁶⁴ The seed decoction is used as a stimulant and carminative.

Constituents — The seeds contain an edible fat (shea butter), derived mainly from stearic acid and oleic acid, that is used for a variety of purposes in Africa. The chemical study of the seeds has revealed that they contain mostly palmitic, stearic, oleic, and linoleic acids, as steardioleins, oleodistearins and palmitostearin, trioleins, and possibly oleopalmitostearin.¹⁰⁶⁷ Mital has studied the physicochemical properties of shea butter and reported that it melts at 37.8°C, and when heated above 38.5°C, it is transformed to a more stable form, which takes 4 days to revert to the unstable form. The melting point could be raised by the addition of either beeswax or hard paraffin.^{1068,1069}

Pharmacological Studies and Uses — Shea butter is used for a variety of health purposes, especially for skin care. It has been incorporated into many topical products and cosmetics for the reduction of wrinkles, blemish reduction, treatment of stretch marks or hemorrhoids, as an antihistamine, and as a vehicle for intradermal application of active pharmaceutical agents intended for the treatment of subcutaneous diseases.

Commerce — The shea tree grows naturally in West Africa, and it is a slow grower, taking up to 20 years to bear its first fruits. The total volume of the West African trade in shea butter was about US\$1 million in 2012. The value chain for this product indicates that much of the processing and value addition is done in Europe and the United States. The market value for the refined product is quite good, with the selling price as follows: 1 pound naturally refined = \$6.95; bulk purchases of up to 1760 pounds = US\$3484 (\$1.98/pound). The products are graded from A to F depending on the quality as determined by laboratory analysis of the triglycerides and fatty acid fraction, microorganism load, vitamins A and E, melting point, and physical examination, including cleanliness and moisture content.

VOACANGA AFRICANA

Botanical Name — *Voacanga africana* Stapf. et Eliot

Synonyms — *Voacanga africana* Stapf. ex Eliot, *Voacanga glabra* K. Schum., *Voacanga magnifolia* Wernham, *Voacanga eketensis* Wernham, *V. talbotti* Wernham, *V. glaberrima* Wernham.

Family — Apocynaceae

African Names — Hausa: kokiya (*V. thourasii*); Igbo: pete-pete; Swahili: kironyasi (*V. obtusa*); Yoruba: ako-dodo

Description — *Voacanga africana* is a small tree or shrub, reaching 6 m in height with a low, widely spreading crown. The leaves are opposite obovate and acuminate. They are dark green and glossy above, greenish-green below, and usually stalkless. The flowers are white and borne in axillary or terminal loosely branched glabrous inflorescence. The fruits occur mainly in pairs and are spherical, mottled green with seeds wrapped in yellow pulp. The plant can be distinguished from the closely related species *V. thourasii* Roem. & Schult. (syn. *Annularia natalensis* Hochst., *Tabernaemontana thourasii* Pal., *Voacanga obtusa* Schum.) by the smaller size and larger flowers of *V. thourasii*, as well as the oblanceolate leaves with distinct stalks and rounded apex in the latter.²⁸

Habitat and Distribution — The plant is found in the understory of forests. It is distributed from Senegal to Sudan and south to Angola and Zaire. *V. thourasii* grows in swampy forests and well-watered stream sides of savanna regions.

Ethnomedicinal Uses — A decoction of the stem and root is used in the treatment of mental disorders. The latex is applied to carious teeth. The decoction of the bark is considered an analgesic and is added to embrocation mixtures used as a paste during fracture repair. In southeastern Nigeria, the plant is featured in many healing rituals.

Constituents — The roots and stem of the stem bark contain several closely related indole alkaloids, of which voacamine, voacangine, and vobasine are the principal alkaloids. Other compounds found in the plant include voacristine, voamidine, and voacarine. Voaphiline and vobtusine occur in the leaves, and tabersonine is a constituent of the seeds. The seeds and root bark have yielded the aspidosperma-aspidosperma-type bisindole alkaloids and the iboga-vobasine-type bisindoles.¹⁰⁷⁰

Pharmacological Studies — *Voacanga* alkaloids have been shown to possess cardiotonic, sympatholytic, and hypotensive properties.⁷⁸ A dose of 100 µg of voacamine sulfate has an estimated equivalence of 0.25 units of standardized digitalis in isolated rabbit auricles.⁷⁸ The compound does not belong to the same class as the cardiac glycosides cardiotonic proteins and has no cumulative action but does exert a direct myotonic effect on the cardiac fiber.¹⁰⁷¹ It is well tolerated as a cardiotonic in clinical application because it is devoid of the toxicity associated with digitalis compounds. Its duration of action is also longer; it does not appear to affect the heart rate much. Voacangine has an analgesic and local anesthetic action.⁷⁸

An alkaloid (TN) from *Voacanga* fruit has been tested for the cytoprotective, antisecretory, and ulcer-healing actions.¹⁰⁷² Oral administration of TN (50–100 mg/kg) dose dependently prevented ulcer formation by HCl/ethanol (36–75%), absolute ethanol (43–75%), HCl-ethanol/indomethacin (58–84%), pylorus ligation (31–100%), cold restraint stress (68–100%), and histamine (49–100%). The inhibitory effect at 50 and 100 mg/kg against HCl/ethanol was not suppressed by pretreatment with indomethacin (20 mg/kg i.p.). TN reduced Shay-ligated gastric acid secretion from 77 mEq/l in the controls to 46 and 25 mEq/l for the 50- and 100-mg/kg doses. Augmented histamine-induced gastric acid secretion was reduced from 84 mEq/l in the controls to 45 and 21 mEq/l for the two doses of TN, respectively, with total inhibition of gastric and duodenal ulcers by the 50-mg/kg dose. The healing rate of chronic acetic acid-induced ulcers was 62% and 83%, respectively, for the doses of 50 and 100 mg/kg of TN compared with the controls. TN has gastric antisecretory effects similar to histamine receptor blockers. It has been suggested that the cytoprotective and ulcer-healing properties of the isolated compound are related to its ability to strengthen gastric mucosal defenses through enhanced gastric mucus production.¹⁰⁷³

Voacanga and its alkaloids are used in street pharmacy in Europe and Asia in expectation of their hallucinogenic/aphrodisiac effects. The *Voacanga* alkaloids and those from related species (ibogaine-type indoles) are believed to be nootropic. Pretreatment with these nootropic substances, including vincamine, has been shown to improve performance in animal models of cognitive dysfunction. They may affect various cerebral enzymes as well as having direct vasodilatory effects. Such compounds (ibogan type), coronaridine, ibogaine, ibogamine, iboxygaine, voacangine, and voacristine exhibit mostly a central stimulant effect. Iboxygaine causes psychomotor effects. Ibogamine, ibogaine, and iboxygaine are tremorigenic; coronaridine and voacangine seem not. Ibogaine is an antagonist to reserpine. Ibogaine is more effective in counteracting electroshock than voacangine; both these alkaloids lower body temperature. Coronaridine and voacangine both seem to have local anaesthetic activity. Ibogaine is a “hallucinogenic” and antifatigue agent.¹⁰⁷³

Toxicity — Voacamine can cause hypertension due to peripheral vasoconstriction in high doses, and it is also a CNS depressant. The lethal doses in guinea pig by direct infusion into the jugular vein are 313 mg/kg for voacamine sulfate and 348 mg/kg for voacangine sulfate, as compared to 2.5 mg/kg for digitalin and 0.9 mg/kg for strophanthin. High doses of voacangine produce convulsions and asphyxia. The LD₅₀ of voacangine by intravenous injection in mice is 41–42 mg/kg.¹⁰⁷⁴

WITHANIA SOMNIFERA



Botanical Name — *Withania somnifera* (Linn.) Dunal

Synonyms — *Physalis somnifera* L., *Withania microphysalis* Suess.

Family — Solanaceae

African Names — Masai: ol asajet; Nyamwezi: kuvia; Sotho: bofepha, moferangopa, mosalamarupi; Swati: vinhepi; Xhosa: ubuvuma; Zulu: umuvimba

Description — It is an erect, much-branched undershrub, growing up to 2 m high with distinctively hairy stems. The leaves are simple, about 10 cm long, elliptic to broadly ovate-lanceolate, with entire or wavy margins. The flowers are small, about 1 cm long, greenish or yellow, occurring in short axillary clusters. It produces red globose fruits, about 6 mm in diameter, enclosed in the inflated and membranous calyx.

Habitat and Distribution — It grows in the drier tropical regions. It is distributed from Liberia to Nigeria and in South Africa and the southeastern islands.

Ethnomedicinal Uses — In West African folk medicine, both roots and leaves are used internally, and the freshly pounded leaves (also used internally) are used against fever, chills, and rheumatism, among several other uses.²⁶⁷ In southern Africa, the Sotho use the plant as an anthelmintic and as a ritual plant against witchcraft. The Zulu administer an enema of the decorticated root for the treatment of hyperpyrexia in infants. The Xhosa and the Pedi use the plant to disinfect meat, particularly if suspected to be infected with anthrax. A decoction of the root and leaf is used by the Swati for the treatment of eruptive diseases such as smallpox.⁷⁹ The plant is reported to be used in southern Africa in the treatment of asthma and bronchial diseases and syphilis and other venereal infections, as a remedy for “blach gall-sickness,” and as a general antiseptic for wound dressing.⁷⁹

Constituents — The plant contains alkaloids (e.g., withanine) and a distinctive group of phytoosteroids called withanolides. Withaferin A, isolated in 1965 by Lavie et al., is the prototype of this group of chemotaxonomically important phytoosteroids.¹¹⁵⁰ Since then, a number of related withanolides have been isolated, including some naturally occurring chlorinated derivatives.^{1151,1152} The glycosylated derivatives have also been isolated, for example, sitoinside IX (withaferin A-C27-O- β -D-glucoside) and sitoinside X (6'-O-palmitoylwithaferin-A-C27-O- β -D-glucoside), which occur in the root of several varieties of *W. somnifera*.¹⁰⁷⁵ The plant also contains volatile oil, tannin, and fatty acids.

Pharmacological Studies — In India, the plant is well known in folk medicine as a sedative, general tonic, and antihypertensive agent.¹⁰⁷⁶ The withanolides possess different effects on the immune systems. Withaferin A, for example, produced suppression of adjuvant-induced arthritis in rats and locally induced graft- (lymphocytes) versus-host reactions in chicks,¹⁰⁷⁷ as well as depletion of murine splenic cells *in vitro* in the presence or absence of mitogenic stimulant.¹⁰⁷⁸ Similar immunostimulant activities have been reported for other structurally related withanolides.^{1079,1080}

Aqueous extract of the roots of *W. somnifera* has, however, been reported to have an immunostimulatory effect,¹⁰⁸¹ this report appears contradictory to the published immunodepressant effect cited previously. The likely explanation is that the drug, which is employed as an adaptogenic agent, possesses components with both stimulatory and depressant action on the immune system. The aqueous suspension of the root has been shown to abolish the neutropenia induced by a single dose of cyclophosphamide (200 mg/kg s.c.), and in neutropenic mice infected with *Staphylococcus aureus*, pretreatment with *W. somnifera* reduced the mortality due to sepsis from 75% in the control group to 50%. The treated animals developed significant leukocytosis and neutrophilia and demonstrated significant inhibition of leukopenia and neutropenia due to cyclophosphamide-induced myelosuppression. The extract was found to be effective as an immunostimulant in surgically induced immunosuppression in mice.

Ghosal et al. reported the isolation of two withanolide glycosides, sitoinsides IX and X, as the constituents responsible for the immunostimulant activity of the plant.¹⁰⁸¹ At a dose of 100–400 μ g/mouse, the two compounds produced statistically significant mobilization and activation of peritoneal macrophages, phagocytosis, and increased activity of lysosomal enzymes secreted by the activated macrophages. The two compounds at a dose of 50–200 mg/kg p.o. also produced significant antistress activity in albino mice and rats and augmented learning acquisition and memory retention in both young and old rats.¹⁰⁸¹

Withania also showed a potent analgesic and antipyretic effect with the absence of gastric damage at different dose levels in experimental rats, and it compared favorably with the nonsteroidal anti-inflammatory drug (NSAID) indomethacin. Its anti-inflammatory properties have been evaluated by measuring the paw volume and serum lysosomal enzyme activities in monosodium urate crystal-induced rats.¹⁰⁸² It is effective in treating obsessive-compulsive disorder in experimental animals, and the activity compares favorably with standard anxiolytic drugs such as fluoxetine, ritanserin, and parachlorophenylalanine.¹⁰⁸³

Clinical Properties — *Withania somnifera* is employed in Indian Ayurvedic medicine to attenuate cerebral function deficits in the geriatric population, to augment the faculty of learning and memory retention in normal individuals, and to provide nonspecific host defense.^{570,1084} It has been employed as a hypnotic in clinical cases of emphysema, alcoholism, and pulmonary tuberculosis.¹⁰⁸⁵ *Withania* is used in clinical medicine as an antidepressant, anti-inflammatory, antiaging medication to support brain function; for Parkinson's disease; as a cardiogenic; and as a general tonic.

It has been used for the treatment of male infertility in India. In a clinical report of the treatment of infertile men ($n = 75$), *Withania* recovered the seminal plasma levels of antioxidant enzymes and vitamins A, C, and E and corrected fructose. The treatment with *W. somnifera* effectively reduced oxidative stress, as assessed by decreased levels of various oxidants and improved level of diverse antioxidants. Moreover, the levels of testosterone (T), luteinizing hormone (LH), follicle stimulating hormone (FSH), and prolactin (PRL), good indicators of semen quality, were also reversed in infertile subjects after treatment with the herbal preparation. *Withania somnifera* inhibited lipid peroxidation and protein carbonyl content and improved sperm count and motility.¹⁰⁸⁶

Toxicity — No serious effects or toxicity have been attributed to the consumption of *Withania*. The plant is regarded in India as a general tonic and a casual adaptogen, with ginseng-like activities. In Sri Lanka, an extract of the plant has been reported to have caused marked lesions in feeding experiments with rats.¹⁰⁸⁷

XYLOPIA AETHIOPICA

Botanical Name — *Xylopi aethiopica* (Dunal) A. Rich.

Synonyms — *Annona aethiopica* Dunal., *Xylopi emenii* Engl.

Family — Annonaceae

Common Name — Ethiopian pepper

African Names — Arabic: kyimba; Bini: unien; Hausa: kimba; Igbo: uda; Nupe: tsunfyanyi; Yoruba: erunje; Efik: atta; Ibibio: ata

Description — *Xylopi* is an evergreen, aromatic tree growing up to 20 m high, 50 cm in diameter, with a straight bole. The bark is grayish brown to reddish, fairly smooth but with a network of fissures. The slash is reddish brown and fibrous beneath; the crown is much branched, with the branches and branchlets having numerous white lenticels. The leaves are broad (5–15 cm long and 2.5–6 cm wide), acuminate, elliptic, simple, with stipules absent; the margins are entire, coriaceous, with the midrib very broad at the base and slightly impressed above. The flowers are greenish white, solitary or in small clusters of 3–5. There are 6 petals, in two whorls, cream, with outer petals linear, 2.5–5 mm long, thick, gradually tapering to the apex, covered with rust-colored hairs, and the inner petals are shorter and narrower. The fruits are peppery and occur as monocarp; they are cylindrical, up to 9 cm long, reddish at first, eventually blackish, and with 1–8 orange-red to black cylindrical seeds.⁹

Habitat and Distribution — *Xylopi aethiopica* is native to the lowland rain forest and moist fringe forests in the savanna zones of Africa. It is distributed from Senegal to Zaire and has been located in Gambia, Angola, Guinea, Sierra Leone, Liberia, Ivory Coast, Togo, Benin, Nigeria, Gabon, Zaire, Sudan, Uganda, Tanzania, Zambia, and Mozambique.

Ethnomedicinal Uses — The fruit of *Xylopia* is used as a soup condiment and is valued for its carminative effect and as a cough remedy. The Igbo give the soup to women after childbirth as a general tonic and to promote healing and lactation or to promote fertility in women. It is an ingredient in the preparation of a Yoruba herbal remedy, agbo. A decoction of the fruit is drunk as a remedy for stomachache and as a treatment for bronchitis, biliousness, and dysentery. The seed extract is used to eliminate roundworms.⁷⁸ A decoction of the fruits of *X. aethiopica*, leaves of *Alstonia boonei*, and *Wissadula amplissima* is used to bathe children as an anticonvulsant. A decoction of the fruits and stem bark of *Newbouldia* leaves is drunk as a remedy for amenorrhea.

External uses of the plant include a poultice for headache and neuralgia and with lemongrass as a douching solution for female hygiene. A soup prepared with the ground fruits, those of *Piper guineense*, and leaves of *Leptapsis cochleata* is taken as a remedy for dizziness.

Constituents — The fruits contain the diterpenic acid xylopic acid [15 β -acetoxy(-)16ene-19-oic acid] and its analogs kaurenoic, 15-oxo-kaurenoic acid, and kauran-16- α -ol.^{1088,1089} The plant also yields cuminal, acyclic compounds, glycosides, alkaloids, fats, oils, and a pleasant-smelling volatile oil.^{1090,1091} The volatile oil contains α - and β -piperenes, careen, cymene, α -phellandrene, limonene, terpinoline, cineole, bisabolone, linolool, terpinen-4-ol, terpineal, cuminyl alcohol, and cumminic aldehyde.¹⁰⁹²

Pharmacological Studies — The fruit extract has been shown to be antimicrobial against both Gram-positive and Gram-negative bacteria but inactive against certain strains of *Escherichia coli*, the activity mainly due to the diterpene xylopic acid,^{273,1093,1094} as well as antifungal activity.^{1095,1096}

The dried fruit extract from *Xylopia aethiopica* and vitamin C have been evaluated for their effect against γ -radiation-induced liver and kidney damage in male Wistar rats. The combination product increased the antioxidant defense systems in the liver and kidney of irradiated animals and may protect from adverse effects of whole-body radiation.¹⁰⁹⁷ Insecticidal formulations based on the essential oil of *Xylopia aethiopica* (Annonaceae) and kaolin-clay (particle size less than 50 μ m) were effective in protecting stored grains. Ingestion-contact insecticide tests have been conducted using the maize weevil *Sitophilus zeamais* (Motsch.) (Curculionidae). The activity was found to be concentration dependent, with the lethal concentration producing a 50% mortality rate (LC₅₀) at 4.35% (w/w).¹⁰⁹⁸ It also showed antifeedant activity against workers of the subterranean termite *Reticulitermes speratus*.¹⁰⁹⁹ Both the hexane extract of *Xylopia aethiopica* fruits and aqueous methanol extract of the seeds showed termite antifeedant activity. Bioassay-directed fractionation led to the isolation and identification of six ent-kaurane diterpenes in the active hexane extract. Feeding deterrent activity varied significantly with the structures when the compounds were tested at concentrations ranging from 5000 ppm (40 μ g cm⁻²) to 100 ppm (0.824 μ g cm⁻²). (-)-Kaur-16-en-19-oic acid had the strongest termite antifeedant activity among the ent-kauranes isolated.¹¹⁰⁰

The extracts of *Xylopia aethiopica* have been shown to possess significant cardiovascular and antidiuretic effects.¹¹⁰¹ The extracts were subjected to bioassay-directed phytochemical examination, which showed that the diterpene kaurenoids in the extracts were responsible for the significant systemic hypotensive and coronary vasodilatory effect accompanied with bradycardia. These effects were attributed to a calcium antagonistic mechanism. The diuretic and natriuretic effects found were similar to the effects of chlorothiazide; this suggests inhibition of Na⁺ and K⁺ reabsorption in the early portion of the distal tubule. Further experiments are needed to elaborate the exact mechanisms of the hypotensive and diuretic effects of diterpene kaurenoids.

The ocular dynamics of bolus consumption of a 300 mg total dose has been studied on visually active volunteers with a view to finding its ocular effects or complications. It was found that the aqueous extract of *X. aethiopica* was neither a miotic nor a mydriatic, but it lowered the intraocular pressure (17.48%), reduced the near point of convergence (31.1%), and increased the amplitude of accommodation (8.98%), which were positively correlated ($r = 0.95$). On the other hand, the systemic extract had no effect on the visual acuity at far and near as well as the phoria status at the appropriate distances. The convergence excess resulted in esophoria, and the increased amplitude of accommodation placed greater demand on the accommodation mechanism without any discomfort.

The nonspecific mechanism of action makes it a safer spice that can be exploited in the management of exophoria and raised intraocular pressure (glaucoma) when the efficacy of the older conventional drugs is insufficient.¹¹⁰²

ZANTHOXYLUM ZANTHOXYLOIDES



Botanical Name — *Zanthoxylum zanthoxyloides* Waterman

Synonyms — *Fagara zanthoxyloides* Lam., *F. senegalense* (DC) Chev., *Z. polygamum* Schum. *Z. senegalense* DC.

Family — Rutaceae

Common Names — Toothache bark, candlewood

African Names — Ashanti (Denkyera): yeah; Awuna (Krepi): xe; Bambara: wo, gozo ngua; Baule: kenge; Bini: ughanghan; Etsako: atufio; Ewe: xetsi, xeti; Dagati: puom; Fante: kanfu; Fulani: fasakorihi; Hausa: fasakwari, fasa kuwari; Igbo: aga; Wala: korokori; Yoruba: igi-ata, ata

Description — The genus *Zanthoxylum* consists of small trees 6 to 20 m high, with branches near the base and bearing many hooked thorns. The leaves are imparipinnate with rachis thorny underneath; the median ribs of leaflets are also thorny underneath. It bears small white flowers in loose axillary or terminal panicles.⁴³⁶ A related species, *Zanthoxylum americanum*, prickly ash, containing related but different constituents is described in the *Martindale Extra Pharmacopoeia*²⁰⁵ and by Wren.¹²³ *Fagara*, as the plant is better known, when used as chewing sticks consists only of the roots of *Zanthoxylum zanthoxyloides*. It is a shrub or tree up to 18 m high and 0.5 m in diameter. It can be distinguished by its gray trunk with large woody thorns falling later and then covered with thick corky bark. It has yellow slash above while revealing an orange color beneath. The plant is much branched; the branches and branchlets are armed with curved sharp spines that are green at the apex and lenticellate. Leaves are alternate, compound, with stipules absent; the rachis is up to 16 cm long; leaflets are 3–5 opposite or nearly opposite pairs, usually with a terminal leaflet, oblong or oblong-obovate, rarely elliptic or obovate, 4–10(–19) cm long, 1.7–5(–6.5) cm wide; with apex rounded or notched or very abruptly and shortly acuminate, base broadly cuneate, margins entire, coriaceous, smooth, shining, medium green above, dull light green below; with midrib impressed above, prominent below; sometimes with a few prickles; major lateral veins are variable in number (8–21 pairs), prominent below, and arching and anastomosing submarginally. Inflorescence axillary or terminal panicles are nearly as long as the leaves, up to 4 cm long. Flowers are unisexual, greenish white to cream white, clustered, sessile, and about 2.5 mm long. Fruit is red, ellipsoid, about 6 mm long, 5 mm in diameter, and splitting into 2; seeds are shining blue black and subglobose.^{33,1099}

Habitat and Distribution — The plant occurs in the forest savanna mosaic of the lowland rain forest and in coastal areas, where it is sometimes abundant.¹¹⁰³ The species is widespread in western tropical Africa and parts of the eastern and central regions of the continent. The plant has been located in Ghana, Senegal, Gambia, Mali, Guinea Bissau, Guinea, Ivory Coast, Nigeria, Togo, Benin, Cameroon, Zaire, and Tanzania.

Ethnomedicinal Uses — The root of fagara is employed in Nigeria and parts of West Africa as a chewing stick. A decoction of the root bark is used in Nigeria and Ghana as an analgesic for toothache, pain during childbirth, and trauma and as a vermifuge in Guinea. An embrocation of the root or stem bark is employed in sprains. It is also employed as an oral antiseptic and as wound dressing. As a tonic for general body weakness and for convalescing patients, a tablespoonful of a mixture of powdered stem bark of *Z. zanthoxyloides*, fruits of *Piper guineense*, and fruits of *Xylopia aethiopica* is mixed with pap (maize custard) and drunk every morning until the patient recovers. For the treatment of male impotence, a small quantity of the dried ground mixture of root bark with the organs of the hippopotamus, goat, and cock is eaten with corn meal pudding or warm water every morning. The plant has also been employed for the treatment of swollen legs or elephantiasis; for this purpose a decoction made from the leaves and fruits of *Xylopia aethiopica* is administered. Other uses include for spleen enlargement, sore throat, indigestion, and urinary tract infections.

Constituents — All organs of the plant contain volatile oil. The plant contains the alkaloids chelerythrine, berberine, canthinone, and fagaramide.¹¹⁰⁴ The antisickling fraction of the root extract has been shown to contain *p*-hydroxyl benzoic acid, 2-hydroxymethylbenzoic acid, vanillic acid, and similar benzoic acid derivatives.¹¹⁰⁵ Two other benzophenanthridine alkaloids, nitidine and 9-methoxychelerythrine, are also found in some African *Zanthoxylum* species.¹¹⁰⁶

Pharmacological Studies — An alcohol extract of the plant showed significant antimicrobial activity attributed to the alkaloids and the phenolic benzoic acids.¹¹⁰⁷ The benzophenanthridine alkaloids possess a number of physiological activities, including antileukemic,¹¹⁰⁸ anticancer,¹¹⁰⁹ antiviral,¹¹¹⁰ and hypotensive¹¹¹¹ actions. One of the fagara alkaloids, cathine-6-one, has been shown to possess activity against both Gram-positive and Gram-negative bacteria, including activity against *Mycobacterium smegmatis*, *Klebsiella pneumoniae*, and *Candida albicans*.¹¹¹² The root extract and the aromatic acids have been shown to reduce significantly the painful crisis of sickle-cell patients,¹¹¹³ and the crude extract is currently dispensed in Nigeria for the management of sickle-cell anemia.

The plant also possesses anti-inflammatory and antioxidant activities.

ZINGIBER OFFICINALE



Botanical Name — *Zingiber officinale* Roscoe

Synonyms — *Amomum zingiber* L., *Zingiber blancoi* Mask., *Z. majus* Rumph., *Curcuma longifolia* Wall, *Zingiber cholmondeleyi* (F.M. Bailey) K. Schum., *Zingiber sichuanense* Z.Y. Zhu, S.L. Zhang & S.X. Chen.

Family — Zingiberaceae

Common Names — Ginger, gengembre (Fr.)

African Names — Arabic: zanjabeel; Hausa: sankanjabir, citaraho; Igbo: jinja; Swahili: tan-gawizi; Yoruba: ata-Ie, jinja

Description — Ginger is the rhizome of the tropical plant *Zingiber officinale* Roscoe. Two varieties are known, the mild-tasting and often peeled West Indian variety called “Jamaican ginger” and the very pungent and usually unpeeled variety called “Nigerian” or “African ginger.” The plant is a perennial with green-purple flowers that occur in terminal spikes and resemble orchids. It has a distinctive odor and aromatic, pungent, and agreeable taste.

Habitat and Distribution — The natural habitat is the well-drained savanna and semitropics. The plant is, however, cultivated in nearly all parts of the continent. A variety similar to the West Indian mild-tasting cultivar has been successfully developed at the Root Crop Research Institute of Nigeria, Umudike-Umuahia.

Medicinal Uses — Ginger is used extensively as a culinary plant and in African folk medicine as a carminative, diuretic, and antiemetic. In China and Japan, it is one of the most common ingredients in the preparation of remedies for gastrointestinal distress, liver diseases, and hypertension.

Constituents — Ginger yields 1–3% volatile oil, which consists mainly of camphene, citral, cineol, linalool, zingiberene, bisbolene, zingiberol, zingibrenol, and methylheptenone. The plant also yields pungent phenolic principles known as gingerols and shogaols. The shogaols, which are more pungent than the gingerols, are believed to be formed by dehydration and the degradation of the gingerols during drying and extraction.^{608,1114}

Pharmacological Studies — The methanolic extracts of the rhizome of ginger showed strong positive inotropic effects on the guinea pig isolated left atria in a dose-dependent manner. The cardiotonic properties are associated with the presence of gingerols.¹¹¹⁵ Two of the constituents, (6)-gingerol and (6)-shogaol, have been shown to be cardiodepressant at low doses and cardiotonic at high doses.¹¹¹⁶ Both compounds inhibited spontaneous motor activity, produced antipyretic and analgesic effects, and prolonged hexobarbital-induced sleep in laboratory animals.

The compounds also possess strong antitussive effects that were found comparable to those of dihydrocodiene.¹¹¹⁷ (6)-Gingerol and (6)-shogaol were also shown to suppress gastric contractions. It is noteworthy that (6)-shogaol inhibited intestinal motility when administered intravenously but accentuated gastrointestinal motility after oral administration.¹¹¹⁸ Gingerols and shogaols have been shown to have demonstrable hypotensive effects.¹¹¹⁹ (6)-Shogaol induced pressor responses in the blood pressure of rats at a dose of 0.5 mg/kg i.v., which was markedly reduced by spinal destruction to the sacral cord level (unlike norepinephrine). The pressor response induced by (6)-shogaol was also reduced by hexamethonium (10 mg/kg i.v.) and phentolamine (10 ng/kg i.v.) and similar agents when the spinal cord was destroyed to the thoracic cord level, but the pressor response remained unaffected by these blockers in rats whose spinal cords were destroyed to the sacral cord level.¹¹²⁰ When (6)-shogaol (0.5 mg/kg i.v.) was administered to rats, blood pressure showed a triphasic response, which comprised a rapid fall, followed by a rise and a delayed fall. It was also observed that the rapid fall, which followed immediately after the injection of the compound, disappeared with the use of atropine and vagotomy, whereas the sequential marked rise was not affected by α -adrenoceptor blockade and calcium antagonists and ganglion blockade; only a combination of the three inhibited this pressor response. The repeated injections of (6)-shogaol caused tachyphylaxis in mesenteric and tail vascular beds and a slight tachyphylaxis in rat hindquarters.

The anti-inflammatory activity of ginger has been evaluated by many investigators.¹¹²¹ In several preclinical studies with experimental animals, ginger and some of its compounds were effective in preventing chemically induced arthritis.¹¹²² Ginger has also been evaluated against a rheumatoid

arthritis model. A hydroalcoholic extract of ginger was effective in ameliorating the collagen-induced inflammatory process and arthritis in rats. Administering ginger extract intraperitoneally for 26 consecutive days ameliorated the clinical scores, disease incidence, joint temperature, swelling, and cartilage destruction. Assessment of the biochemical indexes of the inflammation process showed that the ginger-administered cohorts had a reduction in the serum levels of IL-1b, IL-2, IL-6, TNF- α , and anti-CII antibodies in the serum. The extract (200 mg/kg/day) was observed to be better than 2 mg/kg/day of indomethacin used as a positive control. It has been suggested that cumulatively these results clearly indicate that the extract of ginger was a good alternative to non-steroidal anti-inflammatory drugs for rheumatoid arthritis, and that it mediates its protective effects by decreasing inflammation and modulating the proinflammatory cytokines.¹¹¹⁸

Laboratory studies in animals have shown that (6)-gingerol possesses significant anti-inflammatory properties.¹¹²³ It inhibits NO production, reduces inducible nitric oxide synthetase (iNOS) in LPS-stimulated J774.1 cells, suppressed the peroxynitrite-induced oxidation of dichlorodihydrofluorescein, inhibited single-strand breaks in supercoiled pTZ 18U plasmid and formation of 3-nitrotyrosine in bovine serum albumin and J774.1 cells.¹¹²⁴ A cyclic sesquiterpene, zerumbone, isolated from the related species *Zingiber zerumbet* Smith was investigated using carrageenan-induced paw edema and a cotton pellet-induced granuloma tissue formation test in mice. It was demonstrated that intraperitoneal administration of zerumbone at doses of 5, 10, 50, and 100 mg/kg produced significant dose-dependent inhibition of paw edema induced by carrageenan. It was also demonstrated that the compound at similar doses significantly suppressed granulomatous tissue formation in the cotton pellet-induced granuloma test.¹¹²⁵ Ginger and its major constituents have demonstrated remarkable chemoprotective properties against various types of cancer. It has been shown that the antiproliferative effect of steamed ginger at 120°C for 4 h was approximately 1.5- and 2-fold higher than that of dried and fresh ginger, respectively. Twenty-two components were characterised in the steamed ginger. The decreased concentration of gingerols and increased levels of shogaols contributed to the improved anticancer potential of the steamed ginger.¹¹²⁶

Other biological activities of ginger and its constituents that have been validated by laboratory studies include antihepatotoxic antiviral activities and the treatment of morphine dependence.

Clinical Properties — It has been shown in human studies that ginger suppresses gastric secretion and reduces vomiting.¹¹²⁷ Capsules containing 940 mg of the dried rhizome were shown to be superior to the antihistamine dimenhydrinate (100 mg) in preventing motion sickness.¹¹²⁸ Proprietary products containing ginger are available in China and Japan for the treatment of elevated blood pressure and degenerative heart diseases. The efficacy of ginger in reducing the pain in patients with OA has been evaluated in a randomized, double-blind, placebo-controlled, multicenter, parallel-group, 6-week period study. At the end of the study, when compared to the placebo cohorts, administering a ginger capsule (255 mg of extract drawn from 2500–4000 mg of dried ginger rhizomes) twice daily, morning and evening, reduced the pain on standing and after walking 50 feet.¹¹²⁹ Another randomized, double-blind, placebo-controlled, crossover study of 6 months duration confirmed the activity of ginger in the management of OA. It was observed that administration of ginger extract (250 mg per capsule qid) was effective as placebo during the first 3 months of the study but at the end of 6 months, 3 months after crossover, ginger showed significant superiority over the placebo group in reducing the pain and discomfort associated with OA.¹¹³⁰

Toxicity — No serious toxicity has been reported from using dry ginger, the oil, or any of its active constituents. Large doses have been reported as capable of causing CNS depression and cardiac arrhythmias.¹¹¹⁸

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Healing and the African Culture

INTRODUCTION

An African indigenous system of medicine is composed of three essential parts: the active medicinal substance, which may be plants, soil, insects, or animal parts; the spiritual forces, the gods and God; and the human spirit, which includes the healer and the patient. Although plants form the main active ingredients of the remedies dispensed by the medicine men and women, plants perform other very important functions in the healing processes. In this latter role, plants are considered as sources of vital energy, and in some sense a participatory entity, rather than a lifeless object used in healing. Traditional African medicine therefore presents an enigma to most Western-trained minds. Although modern science has validated many of the remedies used in traditional medical practice in Africa, the fundamental concept of this system of healing is far from properly understood. Our perception of the African worldview, as Sylvia Williams once remarked, is “like fragments of a mirrored glass held to the light, tracing history and its connections in a process that can shimmer. With a slight turn away from the light, however, the glass becomes, cloudy and no longer shines.”¹ This chapter presents this underexplored aspect of African traditional medicine.

It is generally accepted that any attempt to understand the fundamental conceptions of health and disease among any people must deal with the broader attitudes that they have regarding life itself. To most African communities, every object or form reflects in its existence the dualism of life: a recognition and translation of reality into its composite parts, the physical and the psychic, not as two separate entities but sections of an indivisible whole. Living is a religious act; healing, therefore, includes rituals, incantations, and medicines that will remedy both the diseased body and the sick spirit. In this arrangement, all three groups are participatory elements in the healing process. One increasingly important aspect of the African worldview is the belief that human beings cannot be separated from nature. There is, therefore, no overwhelming desire to conquer the natural world or dominate it. It is the healer’s duty to ensure a symmetrical relationship between his or her patient and the natural world. Regarding medicinal plants, as Ogbu Kalu correctly stated in a paper on this subject:²

Crucial to indigenous traditions is a religious cosmology with an awareness of the integral and whole relationship of symbolical and material life. Ritual practices of the cosmological ideas which underpins society cannot be separated from daily round of subsistence practices. ... By sacralizing nature, indigenous worldviews purvey an ideology which is at once more eco-sensitive, eco-musical and devoid of the harsh flutes of those who see nature as a challenge to be conquered, exploited and ruled. They view the environment not in terms of competing interests but as the playing field on which all other interests intersect.

Perhaps the overriding belief in African cosmology is that everything animate or inanimate has a sort of spirit or power within it—a life force that can only be properly harnessed and utilized by

the knowledgeable and the initiated. This belief has erroneously been classified as animism. The objects and animals so considered are not “worshipped” but consulted or used as instruments or means of achieving certain objectives, including healing. They are essentially inert, and the force imbued by nature in them is restricted by the physical manifestation of their existence. This force of nature is actually the very essence of the thing itself: human, beast, tree, or stone. Thunder, lightning, and other natural phenomena, usually explainable and accommodated by physical laws of modern science, are personified and given a cosmic place. Each has its own personality, which is specific, limited in definite ways, and very much like the object it inhabits or its form of manifestation. It is common to see a traditional healer talking to a tree or a stone—challenging the material obstacle of the object to appeal to the life force within, to control and use it for the benefit of his or her patient. To the traditional African, the struggle for existence between all creatures, including plants and even stones, is a very real struggle, each individual holding its place by some innate strength of personality. “On the other realm is the delicate coexistence of the living forms, inanimate forces, spirits gods, the apparently dead and the living dead.”³ Life itself is seen as inseparable from religion. The preservation, restoration, and enhancement of health necessarily involves the whole human community, the apparent dead, spirits and gods, the natural environment, and God.

To an African, there are two levels of the intellect: the “normative” or practical and the “residual” or habitual. It is the active intellect that controls cleverness, tactfulness, slyness, and learning; the residual intellect is concerned with what Jahn calls “habitual intelligence”: wisdom, active knowledge.⁴ It is therefore possible for one to be endowed with an active intellect, excel in book intelligence, and yet remain empty in the residual intellect.

The rural African, though unable to read and write, still considers his or her urban brethren and their Western neighbors as “really disarmingly naive!” and as having no intelligence. Jahn⁴ (p. 1137), recounted that when a Ruwandese woman was challenged with the following: “How can you say something so stupid? Have you been able, like them, to invent so many marvels that exceed our imagination?” she was credited with offering the following reply with a pitying smile: “Listen, my child! They have learned all that, but they understand nothing!” The “uneducated” woman was merely emphasizing the apparent ignorance of Western-oriented minds regarding the fundamental nature of the world and laws governing the relationship between things.

A healer’s power is determined not only by the number of efficacious herbs he or she knows but also by the magnitude of the healer’s understanding of the natural laws and ability to utilize them for the benefit of his or her patient and the whole community. The healer should be knowledgeable of the taboos and totems, without which the entire community will disintegrate.

The African healer therefore questions strongly any form of treatment that focuses on only the organic diseased state and ignores the spiritual side of the illness. The sterile use, per se, of different leaves, roots, fruits, barks, grasses, and various objects such as minerals, dead insects, bones, feathers, shells, eggs, powders, and the smoke from different burning objects for the cure and prevention of diseases is only an aspect of traditional African medicine. All creatures and objects are believed to possess some psychic quality. If a sick person is given a leaf infusion to drink, the person drinks it believing not only in the organic properties of the plant but also in the magical or spiritual force imbued by nature in all living things and the role of his or her ancestors, spirits, and gods in the healing processes. The patient also believes in the powers of the incantation recited by the healer and assists the healer in the designation of the ingredients of the remedies given, from mere objects into healing tools.

The art of healing is part of African religion; there is a peculiar unity of religion and life that is characteristically African. Healing in Africa is concerned with the restoration or preservation of human vitality, wholeness, and continuity. It is a religious act, perhaps superseded by only the rituals of birth, puberty, marriage, and death.

A fundamental belief that is central to all African philosophy is the belief in the existence of one supreme being, God; but, he is not viewed in the same manner as the Christian God or the Moslem

Allah, who stays aloof in heaven and orders the affairs of human beings on earth. He is not even personified; He can be neither confined in shrines and fetishes nor excluded from everyday happenings on Earth. It is considered foolish to have shrines erected to God as He is part of all creation. Man is viewed just as an immanent ray from the Supreme Being and therefore the illusory problems of death, birth, and living do not arise. "We have always been here" is a common response given by the ancestors to explain their existence on Earth. Death is not seen as an irretrievable separation from life but a mere retraction of the soul to the reservoir of power, the Supreme Being. The deceased is not considered "dead and gone" in the strict sense of the phrase. He or she is still recognized as an important member of the community with real presence, affected by the actions of the living and participating in their lives by his or her wisdom and advice. This belief that the dead are an integral part of the community is essentially responsible for the elaborate funeral rites observed by various African tribes.

Like most other human communities, the Africans have various myths concerning the origin of life on Earth. They believe that God created the earth and made man and woman from clay. He gave them the breath of life and the power of the spoken word. The actual location of the site of creation varies according to the tribe. One version, popular among the tribes of northern Africa, claims that the seat of creation is in the Nile Delta, while the Yorubas of western Nigeria trace human existence to Ile-Ife, and south of Zambezi River, the creation of man is located within the ruins of ancient Zimbabwe. There are also various legends to account for man's fall from God's grace. A common feature is that God once resided on Earth and had to shed his human form when he was annoyed by the action of a woman. A Congolese tribe has a legend that claims that the woman's continual nagging became so intolerable that God lowered her down from heaven in a basket; the Nigerian story traces the fall to the woman who annoyed God by striking the sky with her pounding stick.

The reason for the fall from grace may vary, but there is a convergence of views on the belief that God and man once lived together on Earth and communicated directly. After the fall, God changed form and shed his human personality. There is no myth of a possible return to "paradise." In African philosophy, man is trapped by his very nature to a cycle of birth, death, existence in the spirit world, and reincarnation. Each stage is seen as a phase in man's continual existence, and the need for heaven or hell does not exist. Life itself is but a breath imparted by the Supreme Being, a ray of light from a universal beam. All creation originates from the same source, and death is viewed as mere shedding of the physical form. At rebirth, one may assume any form to reenter the earth. This is the root of all being; each life on Earth is only a part of a collective consciousness. It is for this reason that killing of a fellow human being, even one's enemy, is considered taboo, which demands elaborate ceremonies and acts of expiation and self-cleansing before the killer is allowed to reintegrate fully with the rest of the community (even if the killing occurred during war).

For the source of healing power, Yoruba (Nigeria) legend has it that God sent one of his foster sons (or messenger or angel), Orunmila, to Earth to teach human beings the secret of spiritual healing, which was coded in long verses and recited as incantations. These Ifa incantations are specific for various types of diseases.

A brother of Orunmila, Osanyin, was also sent to Earth to teach people the more mundane art of herbalism. Among the Yorubas, Orunmila is the divinity for spiritual healing, while the gift of herbalism is traced to Osanyin.

HEALING, A GIFT OF THE SPIRIT

Perhaps no aspect of African culture has received so much criticism from Western-oriented minds as the practice of traditional medicine. The main objections to the therapy of the traditional healers, or "witch doctors" as they are derisively called, are based on the false assumption that African medicine relies exclusively on magic, witchcraft, and necromancy. Others charge that

traditional medicine is terribly weak in diagnosis and even weaker in pharmacology. Some have argued that, in the absence of a verifiable relationship between African medicament and disease, the medicine man or woman deceives his or her patient with mysterious incantations and dispenses fetishes in place of real pharmaceutically standardized medicine. These arguments, although originally proffered by Europeans, have since been appropriated by modern Africans, who must keep their distance from traditional medicine in their efforts to appear civilized and not to be mistaken for backward savages. The study of African ethnomedicine has therefore been limited to the analyses of countless remedies for the so-called active constituents.

The functions of the medicine man or woman are not limited to the diagnosis of diseases and the prescription of drugs. It is the medicine man or woman who provides the needed answers to the adversities imposed on the community by outside forces that are beyond the comprehension of ordinary people. These forces include curses, charms, evil spirits, aggrieved ancestors, witches, and the gods. The medicine men and women are very knowledgeable in the medicinal uses of local plants, but they employ such herbs for far more uses than for the treatment of diseases, which is all that Western medicine does. It is the medicine man or woman who provides charms and prescribes the rituals to neutralize the effects of the enemy's charms, wards off evil spirits, and intercedes between the community and the gods. He or she is also consulted for advice on misfortunes and the intractable problems encountered in ordinary life. The "native doctor" provides special medicines to protect private property, recites incantations, and offers sacrifices to appease the gods and spirits of deceased ancestors.

It is usually not enough for a medicine man or woman only to provide medicines for the cure of diseases as do Western-trained doctors; the underlying curse and cause must also be removed. A good traditional doctor is concerned not only with diseases and healing strategies but also with the provision of charms to intervene in almost all aspects of life. It is he or she who advises the village head or community leader when to embark on community purification rituals to remove the burden imposed on the community for the contravention of the society's norms and taboos. Since there are no written instructions from the gods and God, it is the healer-priest who keeps the channel between the deities and the community open.

In the law courts, the services of a medicine man or woman could be sought to obtain favorable judgment or to confuse the witnesses so that they may not be able to testify against his or her client; in football matches, charms may be employed to improve the players' performance or to invoke a magical spell on the opponent. The medicine man or woman is often consulted for rains to water the farms or to prevent rain from ruining ceremonies and festivals. His or her medicines may be needed to promote fertility of women, protect property, and ensure success in hunting or trade.

Healing in Africa is a composite activity that may not easily conform to the Western concept of health, diseases, and treatment. The ancient African medicine men were quite knowledgeable in the physical aspects of medical sciences. According to Finch, just as any discussion of the achievements of Western medicine harkens back to Hippocrates and Galen, so any discussion of African medical achievements harkens back to ancient Egypt, at least for recorded history.⁵ African physicians were well versed in many pathological syndromes. They undertook the painstaking observation regarding the causes of many ailments. They understood the origin of many complex diseases; paraplegia and paralysis were linked to spinal injuries and the traumatic origin of neurological symptoms, such as deafness, urinary incontinence, and priapism. They also recognized the significance of heart palpitations and arrhythmias and understood the acuteness of angina pectoris as a quick killer.

The African priestly healers appreciated the fundamental principles of public health and developed an admirable quarantine system for smallpox and other contagious diseases.² Centuries before Jenner, Africans had devised an effective vaccination against smallpox by taking material from the pustule of a sick person and scratching it into the skin of an unaffected person with a thorn.² There is no aspect of medicine with which ancient African healers did not show evidence of some remarkable mastery. In the *Odyssey*, Homer admitted that, "In medical knowledge, Egypt leaves the rest

of the world behind.” It is firmly accepted that the early Egyptians were Africans, and much of the glory of the advances in modern medicine belongs rightly to Africa.

It has been observed that ancient Egyptian medicine, like all African medicine, has baffled scholars because of the complete interpenetration of “magicospiritual” and “rational” elements. There have been some spirited efforts to interpret the African medical practices from a strictly Western perspective. Anything that does not fit into the limited technological worldview of the West is dubbed “superstitious.” One of the greatest problems African medicine faces now is the ubiquitous Procrustes complex, in which most people are unable to accept facts without rationalizing and twisting them to fit predigested theories, prejudices, and beliefs. Procrustes, according to Greek mythology, was the robber of Polypemon, who stretched or shortened his captives to fit one of his iron beds. Traditional African medicine is still surviving only because it works, and its adherents refuse to be swayed by the intimidating logic of those who want African medicine to be “modernized” into oblivion. It has been suggested that African traditional medicine should be separated into its composite parts, namely, the so-called rational treatment of diseases with herbs and the use of “magic” and the invocation of spirits, gods, and God in the healing processes. As indicated, it is difficult to separate the two components, and there is an ever-present danger of overcompartmentalization. The use of herbs in combination with the power of the human spirit, assistance from the gods, and other unseen forces constitutes a fundamental aspect of African ethnomedicine.

The use of the word *ethnomedicine* in describing African medicine does imply some value judgment; this is correct and deliberate since the point has to be emphasized that Western medicine is not culturally specific, and that modern orthodox medicine is the product of the synthesis or, more appropriately, the fusion of several ethnomedical systems and developments in science. African ethnomedicine is also specifically a tribal medical system; this is so because all aspects of African life, including healing, are based on strong family ties, and no other English word could describe the power of group interdependence and resilience of human spirit in unison than *tribe*.

It is the belief among most Africans that an herbal prescription from a medicine man could cure an indicated illness not necessarily because the plant has a demonstrable pharmacological activity per se, but because there is life-giving potency in every creature that the medicinal plants possess and also the acquired properties imparted to the plant through invocations, incantations, and rituals.

The majority of Africans today still depend either totally or partially on these healing methods used by their ancestors. This form of treatment, which is referred to as ethnomedicine, is, sometimes, the only kind of health care available to the rural populations. A people’s ethnomedicine represents the sum of their medical knowledge and practices based on practical experiences and observations handed down from one generation to another. The healing methods and health practices of any community are the product of various cultural heritages, which are profoundly influenced by the interplay of a complex of social, economic, and political factors. Like other aspects of culture, it is dynamic, absorbing new concepts and adapting to the winds of change. The healers may use medicines from local plants, minerals, or animal substances; prescribe special exercises, incantations, dances, or music; and use sacrifices and purifying rituals of a religious nature—all to reflect the beliefs and attitudes of their community about what causes illness and how to prevent it and about what being healthy really means.

The African traditional healer differs from the contemporary doctor trained in the ways of Western science in his or her conception of health, the causes of ill health, and the methods of treatment. The Western-trained doctor is generally analytic in methodology, concentrating efforts on units, while the native healer focuses on the whole human being and recognizes the units as parts that can never equal the sum—all treatment, therefore, is holistic. Both, however, are concerned for the improvement of the community health, and they make genuine efforts to cure and prevent diseases and maintain good health. With such a common objective, it would be desirable to have a pooling of the resources of both groups to achieve their goal, but what exists presently is, unfortunately, mutual antagonism, distrust, and contempt. It has been argued that there are many areas of

common ground in both systems that could be integrated to provide much-needed health care for the community.⁶ The World Health Organization (WHO) has indeed been engaged in programs to integrate the two systems of medicine to provide more realistic, efficient, and cheaper health care for developing countries. This integration is necessary in Africa since 70–80% of the population lives in rural areas and depends on the more readily available and cheaper facilities of traditional medicine.

It is more interesting to observe that even in urban communities most Africans still consult the native healers secretly in the quiet of night, while others consult the traditional healers for very serious or chronic illnesses that defy Western hospital treatment. What is needed is the study and analysis of traditional healing methods by the orthodox or modern doctors and the reorientation of the native medicine man or woman so that he or she realizes personal limitations and benefits from the knowledge of other cultures and civilizations. This should lead to an integrated and improved health care delivery system. While this integration will probably take time, the practitioners of the two systems must, at least for now, accord recognition to each other. The traditional healer must recognize the scientific and intellectual base of modern medicine, the precision and economy of its treatment methods, and the use of surgery when drugs alone fail. The healer must somehow learn to accommodate the idea of the role of germs in disease states and stop ascribing every ill health to vague, mysterious, supernatural forces. On the other hand, the Western-trained doctor should also concede that traditional medicine is the forerunner of modern medicine, and that it continuously nurtures modern medicine with its vast treasure of ancient remedies. This Western-trained doctor must recognize that there are areas of human existence, health, disease, and death that modern medicine has either not mastered or is unable to understand properly. It is wrong to assess the traditional healing method in compartments: isolating the rituals and religious practices from the use of herbs. The entire healing act should be accepted as a whole to avoid the danger of abstracting the belief and practices from the whole and arriving at conclusions that are quite different from the meaning they have in context.

The lack of precision is by no means restricted to traditional medicine. Much of modern medicine could be dismissed as pure magic since it has long been known that placebos, the inert substances that contain no remedy but look and taste like the medicine they are imitating, could cure up to 40% of patients treated with them. The expected cure could take place largely because of the personality of the physician, the physician's power of persuasion, and the faith of the patient in the physician's treatment. The rituals at worse could be accommodated as a highly sophisticated form of psychotherapy, and the limitations of traditional medicine should also deserve the same sympathetic excuses offered by practitioners of Western medicine when it fails. There are obvious problems in the marriage of the two systems; differences in philosophical viewpoints, methods of diagnoses, and treatment have to be resolved. These differences are real, not merely hallucinations or products of warped imagination—they can be neither ignored nor wished away with patriotic rhetoric as if they do not exist. What is needed is an unbiased arbitrator; with the material and intellectual weapons heavily tilted to the side of orthodox medicine, a good arbitrator should at least be appreciative of the approach of the native healers. Medical scientists should begin to resolve the contradiction playing on the African from the cultural conflict into which he or she has been thrown, unprepared and without warning. Scientific objectivity should not be sacrificed simply to accommodate traditional values and beliefs. The old must, of necessity and nature, give way to the new, but only if the new beliefs and practices are demonstrably better than what they replace. The latest or the most modern in science is not necessarily the most original achievement. Even when the new concepts are adopted as superior to older ideas, it would be fair to give credit to the original ideas at least. To admire the success of the present as if it had neither past nor discernible future is only to make a mockery of knowledge and to indulge in self-deceit. The modern doctor exploits the accumulated strings of knowledge left behind by earlier healers, usually native doctors, to enrich his or her armamentarium.

Outside their cultural setting, African medicinal plants play significant roles in modern medicine either as vegetable drugs or sources of active leads for drug development. Many modern pharmaceuticals and everyday herbs owe their origin to Africa. Examples include the antileukemic plant-drug *Catharanthus roseus*; *Rauvolfia vomitoria*, noted for its antihypertensive, antiarrhythmic, and antipsychotic activities; and Calabar bean *Physostigma venenosum*, the source of the glaucoma drug physostigmine, which is currently being evaluated for the treatment of Alzheimer's disease. Several other African plants are sold as phytomedicines and nutraceuticals in herb shops all over the world. Major examples include *Agathosma betulina* (buchu oil), *Aloe ferox* (aloe bitters), *Aspalanthus linearis* (rooibos tea), *Cyclopia* species (honeybush tea), *Harpagophytum procumbens* (devil's claw), *Artemisia afra* (African worm-wood), *Scilla natalensis* (inguduza), *Warburgia salutaris* (Bhaha), *Garcinia kola*, *Irvingia gabonensis*, *Moringa oleifera*, *Catha edulis*, *Tabernaethe iboga*, *Cola* species, *Coffee arabica*, and *Pygium africanum*. These plants and several other species are articles of trade in the celebrated "muti" shops. In the horticultural and perfumery industry, African plants are much prized for their aesthetic value and significance. Many scientific groups are currently exploring African flora for new compounds with pharmacological activities. Such efforts have led to the isolation of many biologically active molecules, which are in various stages of development as pharmaceuticals. Examples include the identification of indole alkaloids of *Picralima nitida* as a new chemotype in the treatment of chloroquine-resistant malaria and possibly as the first broad-spectrum antiprotozoan agent for the treatment of leishmaniasis and trypanosomiasis, and the antiviral (anti-HIV-1 and -HIV-2) agent; and of michellamine B, a novel dimeric alkaloid from *Ancistrocladus abbreviatus*.

In the area of nutraceuticals, which are food substances with therapeutic activities, several African plants are being reevaluated for their possible contributions in the maintenance of optimum health and prevention of diseases through diet.

The prime advantage of traditional medicine is that it exists as an immediate source of health care for people where they live.⁷ It may not be as "good" as what may be considered ideal, but in the absence of better alternative health care, one should at least improve what is available. Traditional medicine is most prevalent where modern medicine is absent. The "holistic" concept in traditional healing is commendable in that the patient's mind and soul as well as body are considered together during treatment. Added to its many other advantages is its relative cheapness; on average, folk medicine is cheaper than modern medicine. Proponents of folk medicine also stress that traditional healers are more accessible than Western-trained medical doctors inside their imposing hospitals. Traditional drugs are also usually made from local plants and materials, which are less costly than imported medicines.

What is more respectable, than to take care of oneself within one's own means?

Dr. Robert Bannerman (WHO)

There is also the problem of alienation of modern medical practitioners from the rural people. In traditional medicine, the relationships between patient and healer are usually close and intense, unlike in modern hospitals, where the patient is seen as a skinfold of isolated, ailing tissues and organs. It is sad to note that the more sophisticated medical science becomes, the more it is alienated from rural Africans. There is an urgent need to bring medical science down to the language of the people. The problem does not rest only with modern medicine; some peculiar practices of the African traditional healers have made the work of integrating the various healing methods difficult. In traditional African society, the native doctor is a person of immense social standing and significance; he or she is considered as the greatest gift from God, the most useful source of help and succor in an otherwise harsh environment. His or her judgment and counsel are usually accepted without question or proof. The strong belief in spiritual causation of diseases and death

has somewhat blunted his or her empirical and objective diagnosis of organic ill health. In a system where the dividing line between the two aspects of reality is so thin, elements of superstition will of course seep in; rituals that were merely symbolic lose their original significance and become endowed with magical powers not originally intended by their originators. There is ritual in the choice of the ingredients used for the preparation of the herbal potions; most Africans believe that a drug without the proper ritual observances or even without the proper divine or magical authority will be ineffective. Methods of preparing certain remedies are carefully preserved as family secrets, thus preventing cross exchange of ideas that had indeed enriched other aspects of human knowledge. It makes the training of new healers difficult, empirical, and nonsystematized.

The apparent lack of any relationship between cause and effect, between the medicine used or treatment applied and the health restored, relegates some traditional healing practices to the realm of superstition. Ezeanya wondered how one could relate the use of dried bones of monkeys and other animals tied to the neck or waist of a child liable to fits to the cure and prevention of relapses in a convulsive child.⁸ It is indeed difficult to rationalize the claimed protective action of various charms and amulets dispensed by native doctors. It is, however, not possible to dismiss such claims because the so-called fetishes do have curative powers.

The extreme poor dosage consideration is another factor that condemns traditional medical practice in Africa. A medicine has to be seen at once to be powerful to be considered effective; serious side effects abhorred in orthodox Western medicine are accepted by the African as a sure sign of efficacious treatment. If a potion is able to bring a full-grown adult down on his knees soon after administration, then the drug is seen as a "strong man's" medicine and will be highly recommended by the patient when he recovers. This perhaps explains the preference for parenteral injections among Africans. The efficacy of minute dosage form is still difficult for the native African to understand; bulk is essential for an effective and quick cure. The native healer often dispenses only one-dose medications to prevent his or her client, in need of a quick cure, from overdugging him- or herself.

The varied methods used for the preparation of the remedies make standardization and reproducibility of results extremely difficult. Apart from the "kaolin mold" dosage forms, other preparations are dependent on subjective estimation by the healer or patient for the determination of doses. Large doses are often prescribed for acute symptoms, often irrespective of differences in size, sex, and age of the patient. In their efforts to keep their ingredients secret, traditional healers often resort to mixing potent herbs with innocuous materials; their progeny are unlikely to differentiate the active component from the inert substances in the recipe handed down to them. This leads to a high incidence of both placebo dispensation and overmedication in traditional medicine. One must, however, admit that these ills are not restricted to traditional medicine alone. Professor Jores, the director of the University of Hamburg Clinic, made the point when he drew the following parallel:

Even in the field of [modern] medicine, which is striving for objectivity and scientific accuracy, the magical effect plays an uncontrollable part which is frequently overlooked. We cannot remind ourselves often enough, that at least 40 per cent of all individuals respond positively to a remedy no matter what it contains. Only in this way is the ever astonishing number of medicines explicable, as well as the fact that pharmaceutical industry can live on them. The subtle compounding of many medicaments is probably "magic" and without any objective value. It is not an exaggeration to assert that the pharmaceutical industry is really producing placebos in the grand style. (Jahn,⁴ p. 850)

These shortcomings have by no means obliterated the positive contributions of traditional healing methods in the overall health care delivery system. More than 60% of the population at present live outside the vicinity of modern hospitals and rely almost exclusively on traditional medicine men or women for their treatment. Even for the Western-oriented urban Africans, especially in chronic illnesses and in cases where the entire faculties of being and self have to be integrated to avert fatality, recourse is frequently made to the traditional healer.

It is pertinent to consider at this stage an outline of the factors that militate against a systematic study and understanding of African traditional medicine. First, there is the unfortunate coincidence of history, that the early European missionaries to Africa not only were the purveyors of their people's religious beliefs and practices but also ministered to the diseases of the body. They therefore considered the suppression of African traditional medicine as a part of their Christian mission. This mistake is indeed excusable as most native doctors combined the role of a healer and that of a spiritual director. At present the greatest challenge to traditional medicine comes from Western-trained doctors who treat traditional doctors with utmost disapproval and disdain. There is no dialogue between the two professional groups, and the desirable complementary role of the herbalist in the health care delivery system is nonexistent. Most educated Africans shy away from any contact with native healers in the open, and except in seriously diseased states, it is considered uncivilized to consult the native healers.

THE RESTLESS SPIRITS

Disease and early death are not usually ascribed to chance; organic deterioration and decay are recognized, but external forces are blamed for most afflictions. Diagnosis is a twofold event: The organic cause of the sickness has to be established by careful examination and questioning by the healers; this is complementary to a divination of the spiritual reason for the sickness. Mbiti⁹ elaborated on this by stating that even if it is explained to a patient that he has malaria because a mosquito carrying malaria parasites has bitten him, he will still want to know why that mosquito bit him and not another person. The only satisfactory answer, he argued, is that someone has caused (or "sent"), by means of magical manipulations, the mosquito to bite a particular individual. Or, the bite is a punishment from God for breaking one of the taboos or societal norms or a brush from an aggrieved deceased relative. Hence, the classical African healer's questions, "Why you? Why now?" reflects the African perception of disease and death. In most African societies, however, "What caused it?" or "How was it caused?" is in fact more important than "Who caused it?" This is because disease and misfortune in life are traced to a disharmony or conflict in the spiritual–corporeal dualism of the African self. In most cases, the wrath of the spirits of deceased relatives and ancestors is often blamed. Life and death are aspects of a cyclic continuum; the dead are not really dead. It is indeed true that the souls of our fathers hover around us:⁷

In and out, wherever we go. ... It is true. They are ever present with us; the dead are not dead, they are ever near us. Approving or disapproving all our actions, they chide us when we go wrong; bless and sustain us for good deeds done. (From "I Am an African" by G. M. SetiJoana, in Nemece)

The spirits are usually blamed for most misfortunes and diseases; seldom are living people blamed for diseases. Good health and wealth are therefore an index of a correct relationship between the individual and the individual's ancestors, the balance of the whole self and one's environment. It is therefore considered futile to treat a patient with herbs without first appeasing the gods and ancestors. If a taboo or society norm has been contravened, then an open confession is usually demanded. In either case, the necessary sacrifices and herbal medications are prescribed to alleviate the physical symptoms of the sickness. Oracles are consulted often in sickness and to settle controversial issues; such consultation usually precedes most herbal treatments.

Instances abound of someone found responsible for the illness, either by poisoning or by magic, and in such cases the problem is twofold: first to restore good health and second to fight the person's enemies with even stronger magic. This situation sometimes leads to a chain of revenges and expected deaths. In some parts of Africa, corpses are buried with knives placed on their hands with definite instructions to seek revenge on the family responsible for the death. It is interesting to note

that in spite of the influence of Western civilization, many Africans seek recourse to spiritual diagnosis for any serious or chronic illness, irrespective of the social status held or the religion professed by the individual. The priests, diviners, medicine men, and herbalists are thus an integral part of the cultural history of the African.

There are essentially two forms of divination: first, the minor visit to a seer to establish the causes of certain misfortunes, to discover the incarnate spirit of a newborn, or to adjudicate between disputants; and second, the more serious recourse to a powerful oracle or juju shrine for a definitive solution to unanswered questions of a momentous nature in the society. In the latter situation the direct manifestation of the wrath of the deity is expected within a few days and at most within a year. Thus, to survive the full year after such a visit usually calls for celebrations and jubilation. The punishment for the guilt varies according to the oracle consulted; for the Igbo deity Amadioha, for example, death is the outcome, and the deity usually leaves a black mark on the victim's forehead. Thunder and lightning or a swarm of bees heralds such deaths. The property of the deceased is claimed by the high priests and members of the Amadioha cult. The wrath of Amadioha, the god that symbolizes the collective will of the society, is so strong that it can be appeased only by transferring the curse to a sacrificial live goat, which is then let loose outside the community gates. Is this not similar to the instructions in the Old Testament recorded in Leviticus 16, "And the Lord said to Moses—Aaron shall lay both his hands upon the head of the live goat, and confess over him all the iniquities of the children of Israel, and all their transgressions, even all their sins; and he shall put them upon the head of the goat, and shall send him away by the hand of an appointed man into the wilderness"?

The ritual cleansing required for Amadioha is very tasking and costly. Igwe-ka-ala prefers to disgrace his victims quietly until they are forced to confess. Some diseases are, of course, believed to be caused by the direct act of witchcraft, magic, amulets, or charms. And, some are caused by contravening some norms. In such cases, the patient is tormented both by his or her physical illness and the guilt of his or her wrongdoing. "Magun," among the Yorubas, is a death-inviting preparation that selectively kills only those who covet the property and wives of others.

If somebody is a victim of "somersault Magun," for example, he becomes frightened of heights and may die from his own fears and beliefs rather than by the effect of the charm. A cure for or prevention of the many types of Magun should of course be of a dual nature: the physical or organic treatment with herbs and the psychic purging of guilt, followed by autosuggestion on how to resist the temptation of coveting another man's wife. It is usually more expedient to blame the Magun on some evil-minded enemy rather than to accept the guilt and make amends.

The practice of medicine by African healers not only is directed toward the restoration of health by the application of drugs but also is aimed at the control of unseen powers of all kinds. Disease is only an external manifestation of inner disequilibrium or physical discord, a sign of a lost battle in the delicate balancing act of appeasing the benevolent spirits and neighbors and keeping malevolent spirits and enemies in good check. In a traditional setting, morality is of nonsupernatural origin. Thus, what is morally good is that which brings happiness (note, not pleasure), decency, dignity, respect, and contentment, and what is morally bad can bring only misery, misfortune, and disgrace. Doing good is not necessarily to please God, but God and the lesser gods are pleased with a morally acceptable act because it is good, and they condemn bad acts because they are bad per se. In other words, in sharp contrast with the Western and Christian belief, humans are created pure and good and can corrupt themselves only by their style of living; they are not created with a sinful soul so that they have to be saved from a previously earned punishment—or original sin inherited from mythical first ancestors, Adam and Eve.

There are, of course, scores of diseases that have no spiritual causes: Insect bites, venereal diseases, yaws, colic, jiggers, malaria, and arthritis are not ascribed to supernatural forces because of familiarity and ease of observing cause and treatment. The essential point here is that there is a need to resist the strong urge to separate African ethnomedicine into classical medicine and religion. There is a bit of the supernatural in every mode of life; the gods, the spirits, and the ancestors form

an integral part of African life. In sickness, the situation is more a case of the grass suffering as elephants fight. This explains why there is little thought of physical preventive medicine or prophylaxis. How can one prevent an event, an activity, or a situation beyond the control of human forces? At best, the African performs all the sacrifices, rituals, and death rites demanded and resigns him- or herself to the gods, his or her ancestors, and God. It is wrong to ascribe this belief to some 'creeping metaphysical pessimism,' or a fatalistic resignation to fate and predestination, or a metaphysical excuse for a culture of defeatism. The African merely acknowledges a limitation to human ability to determine the order of things.

SPIRIT POSSESSION

In nearly all African communities, some diseases are attributed to effects of spirit possession. Such sicknesses are manifested in different forms, depending on the type of spirit involved. This type of spirit possession should not be confused with the type observed with several priestly healers, who need to make contact with spirits of the departed lineage members and the deities to solicit their help in the healing process. In East and Central Africa, it is the *mbyi* (pi. *Wabuyi*) that are expected, through such possession, to relay the decisions of the spirits at times of calamity and to determine the origin of serious illness.

Such positive spirit possession could be used for the improvement of fertility, increase in harvest, and the induction of rain. The Nsenga people of East Africa, for example, have a spirit medium, the *enevula*, that is possessed by the *Ngwesa* spirit that controls rain, while the *Chiuta* spirit possession gives the medium power to uncover sorcerers and other forms of divination.

It should be noted that spirits of children and sorcerers are not usually honored or expected to possess anybody. It is believed that the spirits of children did not reside on Earth long enough to develop an interest in its well-being, and those of sorcerers exhibited their lack of interest in the strength and continuity of the community by their evil deeds. Furthermore, spirits are connective links between the living and departed members of the community, and possession by the spirits of relatively young children serves no useful purpose.

Makhwango, *Mashawe*, and *Malombo* are some of the generic names used in parts of southern Africa (the Ngoni-, Nsenga-, and Swahili-speaking peoples) for spirit possession by deities.¹⁰ The symptoms or collection of symptoms are easily recognized; treatment is usually sought from the *Waganga* (traditional healers), with experience appropriate for such illness. It is considered futile to treat an illness due to spirit possession with herbs alone.

SYMBOLS AND ARTIFACTS IN AFRICAN ETHNOMEDICINE

One of the most often misunderstood aspects of the practice of traditional medicine in Africa is the use of symbols, artifacts, and rituals in healing and as part of the healer's paraphernalia. The artifacts are simple material objects, whether animate or inanimate, that through consecration or invocation have become activated as ritual objects or serve as symbolic representatives of an actual phenomenon. It is the transcendence of their physical form to become subjects rather than objects that informs their use in rituals.

According to Aniakor,¹¹ (quoting Robert Armstrong in parts), they have become special by virtue of the fact that, through invocation, they serve as power centers or channels of power. Ordinarily, they have no power, or at least not of the magnitude imbued to it by invocation. Instead of being things, they acquire a transcendent status to become forces or powers of presence.

It can never be overemphasized that the powers bestowed on these artifacts have to be willed or invoked by humans in the first instance. Anything can be used as an artifact: statuary objects

or simple natural objects such as wood, stones, feathers, bones, or pebbles. It is by activation that they can have any utility or use as curatives in traditional medicine. It is absolutely wrong to interpret their use to mean that the African healer believes that such objects have powers of their own, although they can ordinarily serve as mediums of natural forces in their normal existence and by their nature.

Shrines are also created or recognized as centers of worship, and the symbols and artifacts resident in such shrines serve only as points of fixation rather than fetishes as such. These shrines serve almost the same purpose as the Christian churches or the Moslem mosques. The totems and carved statues serve the same purpose as the Christian emblems, and once the objects acquire their new status, they are venerated and treated with utmost respect. However, should they lose that status, the objects no longer command respect. Among the Igbos, for example, a man could have an Ikenga made for him as the symbol of his strength but will not hesitate to discard the wood if he finds it useless. In a similar vein, the genealogy pots kept in sacred groves are bought from the market, but when they have been consecrated and made to be symbolic representatives of members of the kindred group, it becomes a very serious offense to break one.

It is this form of symbolic representation that accommodates the role of masquerades and tribal masks in African culture. Ancestral spirits and benevolent deities are sometimes represented by masquerades, and as soon as a person adorns the garb of the masquerades, even his or her friends will treat him or her with respect, even awe.

The use of certain animal parts as ingredients for the preparation of remedies may not necessarily be for any functional organic role but for their symbolic manifestation or as consecrated objects.

It is important to stress that, until a thing is designated, as will be discussed further, the artist has relative freedom to present the object as he or she deems fit. But, once it is designated, the form or style becomes immutable. The symbol selected must as far as possible be representative of the character it is supposed to depict. An effigy of Gu, god of arms and war, of the Fon (Dahomey) can be cast only in iron. It would be considered foolish, even insulting, to have a softwood mask so designated. The divinity cult of Ifa uses an iron staff, Oshun, deity and has to be of a particular form. The bronze plaque used for the Amufi ceremony in Benin is made to specifications. A carving made to depict an Oba, Obi, or Eze must show aspects of the ruler's regalia. It would not be enough to have just any carved face and give it a royal name. The Ashanti wooden dolls (Akuada), carried on the back by women who desire babies, are usually made to precise sizes (ca. 14–16 in.), with highly stylized bodies and large flattened heads. The power and authority of the Mende mask, Bundu-doble, from Sierra Leone, can only be expressed in the effigy recognized among the Poro society as a symbol of the society's protective deity. The Kono initiation bearded mask, Nianu, from the N'zerekore sacred forest of Guinea, has to depict the fearful image intended since it may not be seen by women and children.

INCANTATIONS AND THE MAGIC POWER OF THE WORD

An important component of African traditional medicine is the use of incantation as a tool in the healing process. Whereas the American Indians and some Asian peoples use powerful psychotropic drugs such as peyote or mescaline to enjoy some measure of religious ecstasy, the African priest utilizes incantations and invocations to raise the consciousness of the human mind.

Incantation exploits the power of the spoken word, the vibratory fiber of existence as denoted by rhythm, and the participatory role of designated images. The components of an incantation are word, rhythm, and imagery. The power of the spoken word gives meaning, status, and designation to "things." It is the word employed during invocation that confers life force, power, and identity to the many fetishes used in traditional medicine. The word *Umendu*, *Nommo*, or *Ish* is both water and fire, the breath of life—without the word, material objects have little power of their own.

The word is before every other thing; in its fluid forms, it constitutes the material that fills the oceans and sacred rivers and provides the soluble base for animal erythrocytes, including those of humans. As fire, it erupts in volcanoes and gives teeth to lightning and thunder. The word in its simplest conception is a force, effective and yet dormant until uttered. "Thought," no matter how ferocious, can never equal the force of the spoken word; the word is life. Once expressed, human thought becomes a reality, effective and binding. According to Jahn, "If there is no word, all forces would be frozen, there would be no procreation, no change, no life"¹⁴ (p. 855). A child that has not been "named," consecrated, and the incarnate spirit determined is considered a mere "thing," like a corpse without life; if it dies before its designation with the word, it is not even mourned.

The bible credits the creation of the world to the spoken word of God. He did not just will it; he expressed it. The word was the life imparted on the earth. It is the force of the word that differentiates us from animals, and it is the relativity in the force in each human's word that differentiates him or her from other men or women. The word precedes all other things. The beginning of the gospel according to St. John states:

In the beginning was the Word, and the Word was with God, and the Word was God.

The same was in the beginning with God. All things were made by it and without it was not anything made that was made.

The word is spoken, yet it is not speech; there is nothing like an inconsequential word; there is no "harmless" or noncommittal word; every word is binding on the person who uses it. It is this power of the word that is invoked during incantations, not as monosyllabic pronouncement, but often as repetitive order and usually combined with the power of the rhythm.

Rhythm is to the word what clothes are to a person. As fine clothes could make an otherwise ordinary person look distinguished, with all the airs expected of these new looks, so will good rhythm turn an otherwise weak invocation into a powerful force. This analogy is, however, a very weak one; since rhythm is a necessary aspect in rendering words, it is only in theory that the two components can be separated. Rhythm is indispensable to the word; these two components of incantation are inseparably interwoven. It is the word that has the force, yet it is rhythm that activates the word, potentiates it to its fullest magnitude; rhythm is the procreative component of incantation.

Perhaps the best articulation of the significance of rhythm in African culture is that given by Senghor; in his article "*L' esprit de la civilisation ou les lois de la culture negro-africaine*," the venerated African statesman and poet wrote:

Rhythm is the architecture of being, the inner dynamic that gives it form, the pure expression of the life force. Rhythm is the vibratory shock, the force which, through our sense, grips us at the root of our being. It is expressed through corporeal and sensual means; through lines, surfaces, colours, and volumes in architecture, sculpture or painting; through accents in poetry and music, through movements in the dance. But, doing this, rhythm turns all these concrete things towards the light of the spirit. In the degree to which rhythm is sensuously embodied, it illuminates the spirit.¹²

He continued further in the same work to say that only rhythm gives the word its effective fullness; it is the word of God, that is, the rhythmic word, that created the world. For the rhythmic word to become manifest, it may have to acquire form, in the nature of designation of things. It may find expression in music or dance or in the permanency of carved objects. An incantation could give form to a corporeal existence through the mimicking movement of the body. A hiss of the great snake, for example, could be rendered more potent by twisting the body during dance to resemble the curves of the serpent.

The word could take shape in images, which could be masks, iron, gold, tree, bone, stone, in fact anything that serves as a vehicle for the intromission of the force of the rhythmic word. As has been

stated previously, this kind of object, on its own, is almost useless but for the physical properties of its organic or inorganic matter. Once it has been designated as an image, it acquires a new status. If it is a piece of wood, it remains a piece of wood, no matter how exquisite it may look, no matter how much it resembles the image of a kindred spirit, until the power of the word is intromitted into it. Once the priest says, "Let this wood become Iqwekala, the god of lightning and thunder, or the Oba Oloke the first," it assumes its new role. It becomes a privileged wood and is venerated by all the initiated. It could also be likened to the respect accorded to a mere piece of cloth in civilized nations as soon as it is painted in that country's national colors.

Incantation, therefore, gives materials used in traditional medicine added meaning and value, much more than their basic physical properties will allow. Incantation is thus useful in two ways: First, it enables the healer to invoke the powers of the rhythmic word, giving it as much intensity as he or she desires by repetition; and second, it uses the powers of designated votive images in healing.

TABOO AND TOTEMS

Apart from the use of charms and fetishes, the most common feature of traditional African life as it relates to the practice of medicine is the imposition of certain "taboos" and the adoption of totems. This practice is as much socially functional as it is religious, and as made explicit further in the chapter, both concepts are necessary for the proper understanding of the African attitude regarding life.

The word *taboo* is Polynesian and has about the same meaning as *sacer* (Greek), *Kadesh* (Hebrew), and *Nso* (Igbo, Nigeria); there is no English equivalent, and the modern usage of the original Polynesian word is sometimes misleading. In its proper sense, it is a term used to describe certain objects or creatures or even actions that are prohibited, unapproachable, and dreaded. It may variously be used to denote the "consecrated," sacred, or divine, but with an implicit element of being profane, dangerous, forbidden, and uncanny. According to the Chambers (mini) dictionary,¹³ taboo is (something) forbidden for religious reasons or not approved by social custom. Taboo is considered necessary by most African cultures as a tool to restrict excessive individual freedom from interfering with the orderly development of the community. It is difficult not to disagree with Sigmund Freud's conclusion that "Taboo prohibitions have no grounds and are of unknown origin."¹⁴ The pronouncements of taboo are traceable to the leadership of the community: council of elders, guild of medicine men, or the chief. Taboo is distinct from ordinary law since it derives its power from the community spirit. The consent of all the custodians of the community's fetishes and shrines is usually obtained before a taboo is imposed. Common law is concerned with the regulation of the relationship between individuals, while taboos are restrictions derived from the local interpretation of the immutable laws of nature, which govern the orderliness of life. It is also not correct, as Freud remarked, that these prohibitions are mainly directed against liberty of enjoyment and against freedom of movement and communication. The prohibitions are strictly aimed at abstinence and renunciations that affect the continued existence of the community, except in a few instances for which the taboo is merely ceremonial in nature.

The main objects of taboo are in agreement essentially with the outline provided by Freud:¹⁴

1. Protection of the weak, especially women and children, from the influence of chiefs, priests, sorcerers, and the like;
2. Provision against the dangers incurred by handling or coming in contact with corpses, by eating certain foods, and the like;
3. Prevention of interference in the principal acts of life, such as birth, initiation, marriage, and the like;
4. Securing the living community against the wrath or power of the gods and spirits; and
5. Protection of important persons and institutions against harm.

There are various taboo restrictions observed in different parts of Africa, and each tribe has its own set of taboos imposed without any relationship to the prohibitions imposed by their neighbors. Details of such restrictions are available in many specialized texts in anthropology. The following are among the major and common taboos:

1. Incest: Sex is strictly prohibited between children of the same parents, cousins (usually up to the fourth generation), direct relatives of one's spouses, and members of the same kraal. Freud¹⁴ wrote on the abhorrence with which Africans treat incest in his essay on the "Horror of Incest." His assertion that "they [primitive people] are probably liable to a greater temptation to it and for that reason stand in need of fuller protection" is untenable and betrays the apparent inability of Freud and others to realize that while incest to a modern human may be a simple societal crime, to the so-called primitive people the offense is an abomination that is considered sacrilegious.
2. Killing: Taking of any human life, even that of one's enemy, is strictly prohibited. Cases of suicide are treated as murder, and the victim is punished even at death by not according him or her a proper burial. Such deaths are treated as a disgrace to the family, and the corpse is abandoned in the evil forest, unburied. Murderers are required to perform elaborate cleansing rituals and offer sacrifices to the earth principle before they can be allowed to communicate with members of the community.
3. Meat: Certain types of meat are prohibited by the entire community; some are selectively prohibited to women and children. Certain cuts or parts of meat are prohibited to a particular sex (more for females) and children. The prohibitions are often of a religious nature and have their origin in legend rather than in totemic objects.
4. Masquerades: Masquerades are an important aspect of African religion and culture. They are symbolic representations of the ancestral spirits and are therefore accorded the utmost respect. The uninitiated male and women and children in general are usually prohibited from participating in serious masquerade dances; they are also not expected to participate in or watch a masquerade being kited. During certain festivals and celebrations, ceremonial masquerades are displayed purely for entertainment, and no taboo restrictions are observed.
5. Corpses: The attitude of Africans toward corpses varies a great deal among the different tribes; there are significant differences in the burial customs and taboo prohibitions among distant towns belonging to the same tribe. The general tendency is to treat the corpse with extreme caution while performing all the necessary rituals for the soul or spirit of the deceased. During the period immediately following a man's death, his widow is not expected to engage in any domestic chores or attend to her cosmetic needs. In certain parts of Igbo land, the widow's head is shaved, and the sisters of the deceased are expected to exert the utmost pressure on the widow to ensure that their brother is "properly mourned." Some tribes demand that the woman should be seen publicly crying for her dead husband every morning for the first 4 days following his death.
6. Women: There are restrictions imposed on women during menstruation. They are believed to be "unclean" and are not expected to touch any sacred object at such periods. They are also not allowed to participate in religious ceremonies and rituals during their menstruation. The restrictions again vary among the different communities, but the overriding belief is that women in such a state will defile whatever they touch.
7. Occasional taboo: It also usual for certain taboos to be observed for limited periods only, for example, during the burial or coronation of certain kings and during important festivals. The burial and the coronation of Oba of Benin (Nigeria) requires elaborate rituals that involve restrictions on cooking on certain days and the shaving of hair as a sign of collective mourning. Minor prohibitions are imposed on persons undertaking treatment with a traditional healer. Some of the restrictions are related to dangers of food/drug interactions; for example, certain medications are not to be taken with palm oil, while others may prohibit the use of alcohol. During certain rituals, sex may be prohibited for a stipulated period.

Other taboo restrictions are imposed on farm products and the general conduct in the society over time. Most taboos that are of a religious nature are transferable; anyone who transgresses against one of the prohibitions acquires the characteristics of being prohibited: The person must

remain a taboo to the rest of the community until he or she performs the appropriate cleansing ritual. Among the Igbos, for example, it is taboo for a “free born” to marry an *Osu* (descendants from a certain guild of priests and from families offered as sacrifice to the gods) or an *Ume* (persons believed to have been reincarnated from certain dangerous deities). One can become prohibited by living in the same house with an *Osu* or having sexual intercourse with an *Osu* person, even if the affair did not yield any offspring.

Among the Zulu, it is taboo to kill, even one’s enemy. A warrior who kills an opponent is believed to stand in danger of developing a serious ailment, which will culminate in madness unless he takes immediate preventive action soon after the killing. According to Donald Morris (in his book *The Washing of the Spears*),¹⁵ the first step in the cleansing process is to rip open the fallen foe’s abdomen with a single slash of the assegai “in order to allow the spirit to escape.” Back in his quarters, the victorious warrior then has to eat and sleep apart from other men until his cleansing ceremony is complete. He is forbidden to have any relationship with his wife before and during the cleansing ritual since it is believed that the curse for the killing will be transferred to her if they have any affair before the rituals. Some accounts claim that if a warrior has intercourse with a woman not of his own kraal, she will acquire the prohibition and transfer it to the next man who has intercourse with her. The essential point is that the dangerous charge that led to the prohibition in the first place is transferable to an otherwise innocent person.

In certain parts of southern Nigeria, killing, even accidental loss of life by car crashes, requires elaborate rituals and abstinence. The transgressor has to be protected from the spirit of the deceased by a ritualistic washing of the hands and eyes. An important part of the cleansing ceremony is the transference of the prohibition to a sacrificial animal, which is slaughtered and buried intact. Most of the rituals associated with African religion and healing can be traced to the need to find a compromise between the performance of certain acts and the contravention of taboo. According to Freud,¹⁴ “the instinctual desire is constantly shifting in order to escape from the impasse and endeavors to find substitutes—substitute objects and substitute acts—in place of the prohibited ones.” Animals are usually slaughtered as a substitute for human sacrifice; body movements are used to depict certain acts, and related acts can be used to substitute for certain events.

Adoption of totems in the classical sense of the word is not a significant aspect of African culture. Certain animals are regarded as sacred, and others are accorded special status as objects of taboo prohibitions, but it is rare to find African communities that trace their ancestry to an animal. Totem poles are also not a common feature of African life; they do not adorn village groves and courtyards as generally believed. A form of totemism could, however, be said to exist in the form of the adoption of an emblem (object, plant, or animal) by a community or clan as a reminder of its common ancestry.

Much confusion has been generated by attempts to classify people with a shared taboo as belonging to a totemic group. Certain animals (for example, pythons, cows, and snails) are prohibited in some parts of Africa for reasons other than respect for a totem. The common reason for such taboos is religion, and in some instances the animals are considered unclean, as is the case with pigs, snails, and vultures. People may observe the same taboo restrictions regarding a particular animal without shared ancestry. The prohibitions are enacted in each case for completely different reasons. The observance of a taboo is largely dictated by the nature and significance of the prohibition; only serious taboos are inherited by marriage, and this again depends entirely on the hereditary system prevalent in a given area. For example, in the Umunakanu clan (Ehime-Mbano, Imo State, Nigeria), legend has it that there was a strict prohibition on the killing of pythons and the eating of African cows. In that locality, the serpent was allowed to move freely without hindrance in and out of people’s homes. Stories abound in which pythons had to babysit children while their mothers attended to some urgent work outside the compounds; the python would dutifully coil up and form a cyclic playing ground for the baby, hide its head within its body, and wait until the mother returned from her errand. This relationship between humans and snake went on in that locality for several years;

among the Umueleke people, however, who occupy the neighboring village and are of the same clan with people from Umunakanu, the python was not a taboo and was hunted for food. Children of Umunakanu women who married elsewhere were not required to observe the taboo, and the python did not behave so nicely toward them. Similar examples of such restricted taboos to members of the same ancestry abound all over Africa.

An example of the functional use of taboo is provided by the examination of the underlying reason for the prohibitions imposed on the fishing and eating of fish from certain rivers. Some watercourses, such as rivers, lakes, and streams, are used as shrines, and sacred groves of certain deities are housed by their banks. It is usual for taboo prohibitions to be placed on the use of such water or to fish from it. The same river or lake may not be an object of such restrictions a few kilometers away from the "totemic" clan. What is more, members of the clan are only required to move to the unprohibited area of the watercourse to use the water and its contents in any manner they may deem fit. This therefore suggests that there may be some underlying societal reason for the taboo in the first place.

Among the people of the Umuezeala-Umukabia clan (also in Ehime-Mbano), there is a taboo regarding the killing or eating of fish from an all-season stream, *Okwara Dibia*. This prohibition has been observed religiously throughout living memory. Some members of the community are believed to have been reincarnated from its very clear and sparkling spring water; moreover, *Okwara Dibia* is revered as a benevolent and powerful deity, and the fish are believed to be some of his children waiting for reincarnation into human form. He even owns a goat or two, which are allowed to roam freely in the entire village. It is interesting to observe that the same watercourse passes through a forest in the same village, and there is no prohibition on the use of water from the lower part of the brook. When one considers the fact that the prohibited spot (just less than 20 feet wide and about 10 feet long) is the only source of potable water for the entire community, then the taboo becomes a functional need, regardless of any religious or mystical significance it may hold. Simple logic demands that this water had to be protected from pollution by dead fish.

There are, of course, many taboos and totems associated with membership of animal societies. In various parts of Africa, there are people who belong to fraternities that adopt a particular animal as the symbol of their deity or believe that they possess the powers to assume the form of their patron animal at will. The common animal societies are those of the snake (python), leopard, tiger, and antelope. Devotees are believed to derive enormous benefits from the wild animals belonging to their society, and they are therefore not expected to eat the meat of such animals. Each society imposes restrictions on its members to instill fear in them and maintain discipline within their ranks.

Finally, this section concludes by reiterating the salient features of the sociological framework, beliefs, and values that inform the practice of traditional medicine in Africa:

1. One great god exists as an integral member of society, in contradistinction to the Western and Christian idea of God, staying aloof in heaven in the community of good spirits, looking down on the evil ones in hell, yet seeking to govern a mixture of sinners and the righteous on Earth.
2. There is belief in the perpetual existence of life, a cyclic continuum, in which there is a cycle of pregnancy, life, death, and a period of waiting in a universal pool of spiritual existence with a subsequent state of reincarnation, by which it is possible to change one's lot for better or for worse. The Bantu word for man, *Muntu*, includes the living and the dead, ancestors, spirits, the personal god *Chi*, and the gods.
3. There is belief in the idea that a human is created free from sin and remains so until the human becomes involved in some polluting circumstances in life, as opposed to the Jewish and Christian idea that a human is born with original sin, which is said to have been inherited from his or her ancestors, Adam and Eve.
4. Marriage is important as a criterion of social status and the ability to produce a child is a necessary factor for the continuance of marriage; there is pervasiveness and stress on ceremony and ritual in many aspects of social life and the influence of myths, taboos, and totemism in thought and action.

5. There is a tendency to stress, in all forms of art, the quality of significance as a criterion of beauty and virtue.
6. Stress or importance is attached to group life and to kinship as represented in the institutional form of the extended family system, irrespective of the differences of descent systems.
7. There is a belief in the existence and influence of lesser gods as agents of the one supreme god and in fetishes and unseen powers, witchcraft, and a variety of spirits.
8. A strong sense of rhythm is manifested not only in music and dance but also, for example, in the gait of women and the intuitive, essentially unanalytical, mode of cognition and perception of the universe.¹⁶ (Adapted from K wesi Wiredu.)

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The African Medicine Man

TRAINING OF TRADITIONAL HEALERS

The traditional medical practitioner occupies a unique role in African societies. He or she is not only a doctor but also a visionary, a seer, and often a priest. One can acquire the specialized skills of a healer by three methods: first, by training and a long period of apprenticeship; second, by divine selection and in answer to a call by a powerful spirit to be his chief priest or messenger; and third, as a family inheritance. In any case, the magical powers are acquired through ritual offerings and living in a prescribed manner, but the knowledge of efficacious herbs comes mainly from training and sometimes from revelation in dreams and trances.

When the apprentices exceed a certain number (usually four or five), formal schools are sometimes established by renowned traditional healers or by the Guild of Healers to impart the knowledge of healing to younger ones. Bep Oliver described such a training center for traditional healers near Badagry (Lagos State, Nigeria), where boys 11 to 15 years old were initiated into the healing profession after undergoing a 3-year course. As reported by Oliver:¹

The school consisted of a small, walled-in, square area. One side was covered by a low corrugated iron roof supported by a pillar in the center. In the two dark corners under this roof were the places of sacrifice, marked by large mounds with an irregular shiny surface not unlike stalagmites. They were streaked in white, turquoise, yellow and brown by the numerous offerings that had been made, and had odd pieces of eggshell and feather glued to them. ...

The center of the area, from which strangers were excluded, was partitioned off, and it was only possible to enter the passage around this centre and in which wooden figures, symbols of tribal gods, sometimes in the shape of a totem pole, had been placed. Indeed the first object of training was to enable the students to establish contact with the tribal gods by means of the prescribed ceremonies which included incantations, ritual practices, offerings, etc.

A similar school, called the Poro, exists in parts of Liberia, especially among the Mano tribe. The school is presided over by masked men who are symbolic representatives of the spirits. The schools are highly regarded; one such school was described by Harley as "an organization incorporating all the powers of church and state combined."²

The Poro centers are not necessarily restricted to the training of traditional healers, but also serve as initiation centers for puberty rites. The rites last for periods of about 3 weeks, and the male candidates are isolated for long periods in forest groves. In this ceremonial rebirth into manhood, the boys are supposed to be swallowed by the great crocodile spirit (symbolically) and as spirits to remain in the body of the amphibian until he gives birth to them at the end of the session. During this period, the boys are expected to be in communication with the spirits; all matters of sex are taboo, and abstinence is strictly enforced. In the remote past, the death penalty was imposed on any woman who made contact with a man in Poro.

An equivalent initiation school, called the Sande, exists for girls. The subjects taught in the Sande include cooking, dancing, sex education, and the art of herbalism. Symptoms, diagnosis, and treatment of common ailments with herbs are the only aspects of traditional medicine allowed in the Sande; the art of divination and any contact with spirits are forbidden.

Traditional birth attendants receive similar training in Sierra Leone, in Sande or Bundo schools. The birth attendants are graded after training to reflect the level of experience, compassion, courage in time of stress, and expertise. Initiates start as traditional birth attendants (TBAs) to midwives, then move on to Niso or Sows, and with time may attain the professional class of "Majors," Barigba or Digba. The highest class of midwives is given the title of "Too Perfect." Kargbo pointed out that the most accomplished birth attendant in the village is often the Major or Digba, and that she is very influential in women's critical life stages, such as pregnancy, childbirth, and menopause.³ The Sande schools are also managed by the Digba. Marriage and pregnancy are essential prerequisites for becoming a TBA.

Such institutes also exist in Cameroon. A typical school was described by Garnier and Fralon as consisting of a multichamber house, with medicines and poisonous and "magic" powders in the inner chamber.⁴ Also in the room were charms cut in antelope, panther, and other animal bones; stones; little statues; and animal and human remains. The priest in charge of the center has to sacrifice a chicken for each of the initiates to appease the gods and spirits before the secrets of the inner chamber are revealed to the boys. Apart from the actual training in the art and techniques of traditional healing, the initiates are drilled to withstand cold, heat, solitude, and darkness; they are expected to be brave and not easily frightened by the sight of blood.

In East and Central Africa, among the Bantu peoples, such training centers are usually located near msolo trees (*Pseudolachnostylis maprounejolia* and *Caesalpinia* species). It is also customary in most parts of Africa for the village head or traditional ruler to undergo all the initiation rituals of various healers' guilds, societies, and shrines. It would be considered extremely foolish for the ruler to appear in public to perform his duties without first performing cleansing rituals, fortifying himself with magical herbs, and reciting the appropriate incantations. The master or chief instructor of the initiation center is usually included among the counselors in a typical village palace.

The modern type of schools are known to have existed in ancient Egypt; physicians were instructed in the art of healing in the "per ankh" or "house of life," and numerous Greek philosophers, including Pythagoras, Thales, and Plato, who came to Africa to study mathematics, religion, science, and medicine, are believed to have received instructions in a per ankh.⁵ Although the universities in ancient north African cities included medicine in their curricula, the ancient priest-physicians, like their counterparts in other parts of Africa, often kept the best of their knowledge secret.

TYPES OF TRADITIONAL HEALERS

There are basically five types of traditional healers in Africa: the diviner or fortune-teller, the herbalist, the midwife and birth attendant, the surgeon, and the specialist medicine man. It is, however, not uncommon to find an individual belonging to all or several groups. There are also specialist medicine men who restrict their practice to certain types of illness.

It has been observed that among the nations of antiquity, the Egyptians were alone in the development of specialty in medicine.⁵ Early history of African medical practice showed that the diseases of each organ were under the care of a specialist; it was often the practice to have several medicine men attending to a seriously sick patient, each physician contributing the knowledge of his area of training. This was long before the West had any form of medical specialization.

There were guilds, or societies of healers, for every aspect of health; the diviners and priests were separate from the herbalists or physicians, and the surgeons constituted another specialty group unto itself. As pointed out, it was common to find a healer belonging to more than one group.

The Diviner or Fortune-Teller

Diviners and fortune-tellers are seers and priests, usually consulted for diagnosis of not only what is wrong with the patient but also why the patient was singled out from the population to be afflicted. They are usually responsible for and prescribe all the rituals associated with the community's religious worship and are respected for their powers of extrasensory perception. They are not witch doctors. The "Ifa" system of Yorubaland is an example of a highly organized system of divination, religiously connected with Orunmila, the divinity of divination. Fon and Ashanti systems in Ghana and the "Afa" systems of the Igbos (Nigeria) are also organizations of mediums and seers; they exist as close professional bodies, observing strict codes.

The instruments used during divination vary according to the community. Some fortune-tellers use magic stones that they cast against the ground; from the sounds emerging, they understand how they should act in the various circumstances on which they are consulted.⁶ They understand the language of the sound through occult powers that were conferred on them by their teacher, by means of a sort of vaccination performed with secret ointments, applied to cuts on their arms and foreheads. The stone is usually cast on the ground with the right hand, and the hand of the operator will begin to tremble at the beginning of the session. It has been claimed, in some instances, that the stone reacts to questions not by sounds but by remaining tenaciously stuck to the ground, resisting the fortune-teller's efforts to pick it up if the answer is negative, or by not opposing resistance of any kind and even "jumping up" if the answer is positive.

Some seers claim to be able to discern the unknown by interpreting the ripples in a glass of water, while others depend on the throwing of cowries, para-rubber seeds, and even coins for guidance. The use of divining rods and sticks is also common. Consultations are usually made "when there is no sun," either very early in the morning or late in the evening. The fee is usually very small. Most diviners also employ their skills to find lost objects or farm stock, to discover thieves, and sometimes to determine ownership of disputed ancestral lands.

The Herbalist

The herbalist or herborist cures mainly with plants, which he gathers fresh. When such required herbs are seasonal plants, they are collected at the appropriate times of the year and preserved in the doctor's goatskin bag. Herbalists devote much time and personal attention to the patient, thus enabling the herbalists to penetrate deeply into the physiological and psychological state of the patient and the nature of his or her particular illness. After careful diagnosis, but without expressing any opinion regarding the origin of the illness, the herbalist prescribes a regimen of drugs. It is the seer, not the herbalist, who discerns the origin of the illness. The herbalist can consult an oracle at any time during the treatment to ascertain his ability to cure the sickness—nothing is ascribed to chance. Sometimes, however, the medicine man serves as both herbalist and diviner. In some parts of Africa, if a treatment fails even after proper diagnosis, it is believed that an enemy is counteracting the treatment with a stronger "medicine."

The herbalist is like the general physician in Western medicine. He is expected to be knowledgeable in all aspects of healing, although he uses herbs for treatment. He knows the functions of various organs of the body and usually determines the nature of the patient's illness.

Enormous variation exists in the use of these plants among different tribes and even among herbalists in the same locality. The bark and the roots are the most common plant parts employed; occasionally, leaves, flowers, and fruits are used in the preparation of remedies. In East Africa, drug plants are generally referred to as *dawa ya miti*, Swahili for "medicine of the trees," or colloquially as *miti shamba*⁷ to denote the most traditional remedies.

The preparation of the plant drugs is dictated by the nature of the illness and the plant part used. The plant could be pounded or simply pressed (if soft) and the juice applied directly on the affected

part, particularly for the treatment of wounds, abscesses, and skin infections. The pressed liquid may be clarified and instilled into the eyes for the treatment of eye infections. Other methods for the preparation of drugs include roasting, burning, soaking, and chewing the plant parts.

The herbalist seldom keeps a stock of herbal preparations, except those for minor ailments; he usually relies on spiritual guidance for the selection of the correct prescription for each illness and for each sick person; drugs are usually freshly prepared in the presence of relatives of the sick person. The most common dosage form in many parts of Africa is the decoction or other liquid preparation; however, molded tablets, usually made with kaolin as the excipient, are also widely dispensed.

The drug is usually drunk for most internal diseases or applied topically for external infections. It is common to incorporate drugs with food and drink. In central Africa, the most common way to administer medicines is by enema (clyster). These enemas are blamed for many infant deaths; antidotes are difficult to formulate because of the veil of secrecy around the ingredients and methods of preparation. The enema vessels are made from suitably shaped gourds or from pieces of wood hollowed out as funnels, sometimes decorated with gold trimmings or magical signs. For infants, the mother fills her mouth with the medicine and, by means of a small tube, introduces it directly into the rectum of the child or blows with her lips to the child's anus. The advent of plastics as a household utensil has caused some traditional enema cans to be replaced by suitably shaped synthetic devices. The advantages of this mode of treatment are obvious and even more appreciated if one remembers that the toxicity of some of the herbal preparations is not well known. The knowledge of herbs is not restricted to the professional herbalist; experienced relatives and neighbors often give recommendations on useful herbs for simple ailments.

The Midwife and Birth Attendant

Occupying a prominent and special position in African ethnomedicine are the midwives and birth attendants. They know how to diagnose pregnancy and the position of the fetus. To confirm pregnancy, they administer special plants; if menstruation does not return, it is concluded that conception has really taken place. In some parts of Africa, there is a clear distinction between the traditional midwife who takes care of pregnant women and attends their delivery and the birth attendants, who simply attend to women in labor. In the scientific literature, however, this distinction is considered superfluous, and both categories are referred to as TBAs.

Midwives are usually older women who are no longer of their childbearing age and have long stopped having children of their own. Midwifery is not usually a full-time occupation since the fee is small. More important, the midwife in the communalistic setting of African society sees herself as merely contributing her skill for the general good of her society. A pregnant woman or one in labor is considered the responsibility of the entire community: "We have a new child" is how the birth of a new baby is usually announced. If the labor is difficult, the midwives massage and press on the abdomen, use traction, and work on the fetus. Sometimes, it is considered necessary to "wash the womb" by putting the hands, smeared with secret herbs, into the vagina and to administer drugs that are said to induce the fetus to develop normally and to correct its position. In certain parts of Africa, vegetable packs are applied before delivery.

A pregnant woman is attended by the midwife from early in her pregnancy. The midwife is also consulted if a birth attendant experiences difficulty with any delivery; the midwife handles all labor complications. She also treats sterility; the responsibility for a childless marriage and the sex of a child is usually placed on the woman, and the midwife is expected to provide appropriate medicine for the wife to correct either situation. As long as there is erection and ejaculation, the man is absolved from all blame in a childless marriage. Rituals are performed and the appropriate medicines dispensed to promote fertility. The lot of a childless wife in African society is indeed pitiable.

Birth by cesarean section is not common, not for want of knowledge but because it is rarely necessary to seek surgical intervention during childbirth. One of the most remarkable examples of

African surgery ever documented is the eyewitness account by a missionary doctor named Felkin³ of a cesarean section performed by a Banyoro traditional surgeon in Uganda in 1879:

The patient was a healthy-looking primipara (first pregnancy) of about twenty years of age and she lay on an inclined bed, the head of which rested against the side of the hut. She was half-intoxicated with banana wine, was quite naked and was tied down to the bed by bands of bark cloth over the thorax and thighs. Her ankles were held by a man ... while another man stood on her right steadying her abdomen ... the surgeon was standing on her left side holding the knife aloft and muttering an incantation. He then washed his hands and the patient's abdomen first with banana wine and then water. The surgeon made a quick cut upwards from just above the pubis to just below the umbilicus severing the whole abdominal wall and uterus so that amniotic fluid escaped. Some bleeding points in the abdominal wall were touched with red hot irons. The surgeon completed the uterine incision, the assistant helping by holding up the sides of the abdominal wall with his hand and hooking two fingers into the uterus. The child was removed, the cord cut, and the child was handed to an assistant.

Finch continued the story by stating that:

The surgeon squeezed the uterus until it contracted, dilated the cervix from inside with his fingers (to allow post-partum blood to escape), removed clots and the placenta from the uterus, and then sparingly used red hot irons to seal the bleeding points. A porous mat was tightly secured over the wound and the patient turned over the edge of the bed to permit drainage of any remaining fluid. The peritoneum, the abdominal wall, and the skin were approximated back together and secured with seven sharp spikes. A root paste was applied over the wound and bandage of cloth was tightly wrapped around it. Within six days, all the spikes were removed. Felkin observed the patient for 11 days and when he left, mother and child were alive and well.

Among the "Usen" clan of Bini, it was considered an extreme manifestation of weakness on the man's part for his wife to deliver a baby in the hospital. The husband of such a woman was disgraced and humiliated for "not being man enough" to obtain the appropriate medicine to enable his wife to deliver at home. The actual delivery process is like that of Western medicine, except that the prone position is not common. The umbilical cord is cut only after the release of the placenta. It has been suggested that this practice has an advantage for the newborn in that it allows it to avail itself of the residual placental blood.¹ The cut is performed with any sharp object (sticks, bamboo, etc.); more recently, razor blades and scissors have come into frequent use. The cord is knotted soon after cutting. Medication is applied immediately. The method and ingredients depend on the locality; ashes, cassava flower, cow dung, palm oil, and vegetable packs are among the common ones. The released placenta is buried in the ground; sometimes, the detached umbilical cord is worn by the baby as an amulet. This is easy to understand since the problem associated with the healing of the cord is not at all easy for a society that is not blessed with knowledge of modern antibiotics. Some tribes bury it and plant a palm tree (*nkwu alulo* in Igbo) or a banana tree above it. The plant is, as it were, dedicated to the newborn; the first fruit is cherished and is usually reserved for the family elder.

African mothers abhor feeding their babies with animal milk; there is pride in breast-feeding a baby, and children usually are breast-fed openly. Infants are breast-fed for about 2 years unless interrupted by a new pregnancy. Sex is usually not allowed while nursing.

The Surgeon

Evidence is available to show that some African surgeons attained a level of skill that is comparable, and in some respects superior, to that of Western surgeons, at least up to the twentieth century. Traumatic wounds were easily treated, and a red hot metal tip was used to cauterize bleeding points. There is a documented story of a traditional surgeon who successfully resected part of a patient's

lung to remove a penetrating arrowhead; there was an account of a man who had his abdomen ripped open by an elephant and was treated by a traditional doctor by replacing the intestines in the abdominal cavity, securing them in place with a calabash covering, and finally suturing together the overlying abdominal wall and skin.⁷ According to Thompson, not only did the patient recover, but also the patient was soon back on a road gang.⁸ Masai surgeons are reputed to treat pleurisy and pneumonitis successfully by creating a partial collapse of the lung by drilling holes into the chest of the patient.

When compared with modern orthodox medicine, one can say that not much surgery is presently practiced in traditional African medicine. Occasionally, there are amputations performed with "anesthesia," the patient often being sent to sleep with a strong narcotic concoction and the amputation done with a very sharp knife. The excision has to be achieved with the first stroke. The stump is packed with a suitable vegetable preparation, and healing usually occurs within 4 weeks. The surgeons in Bafuleroland are renowned for their precision in cutting off the upper end of the throat flap (epiglottis) for the treatment of a variety of illnesses. The cutting of the uvula is also widely practiced. Some Western doctors have indicated that uvulectomy could protect the patient from infections of the pharynx and of the respiratory system. The experts explain that the defensive function of the Weldeir lymphatic ring would be enhanced after the operation.

Orthopedic surgery, or bonesetting, has reached a high level of excellence in traditional African medicine. The art of repairing fractures and other orthopedic injuries has attained a level of success comparable to the European or Western method of orthopedic treatment. It is therefore tempting to postulate that the skill of bonesetters was influenced by early European visitors, but a detailed analysis of their methods does not support this viewpoint. Other than the use of wooden splints to immobilize the fractures, the herbs used and the incantations recited are not customary in European medicine. A more fundamental difference is the use of a hot application of peppers and other rubefacients in African bonesetting in situations for which European doctors would prescribe cold compresses. A noteworthy feature in this form of treatment is the high rate of success; the author monitored 84 cases of fractures, rated as major by Western-trained doctors, successfully repaired without recourse to modern hospital treatment. The occurrence of abnormally shaped limbs following treatment was rare.

Traditional bonesetters are often capable of arresting the deterioration of gangrenous limbs that would normally require amputation, and patients have been withdrawn from orthodox hospitals by dissatisfied relatives and sent to traditional bonesetters, there to receive a better and faster cure. I have witnessed an extreme case of a victim of a motor accident who was treated by a qualified orthopedic surgeon, but who, not being satisfied with the crooked shape of his leg, consulted the native bonesetter. The latter examined him and properly reset his leg. What is even more significant is that after giving the patient a piece of herb to chew, the bonesetter had the poorly set bone broken again, reset the leg, and achieved a satisfactory recovery in 4 weeks. The patient did not feel any pain during the refracturing that preceded the treatment. A chicken whose left leg was also fractured at the commencement of the treatment was used to determine when the healing was completed and the time to remove the wrapped splints and clay cast.

Various traditional methods are known for applying traction to a fractured leg. Bonesetters in Manoland place patients in the loft of a house, allowing the affected leg to dangle freely with a heavy stone attached. Others are said to dig a deep pit for the purpose of exercising traction. Once the fracture has been reduced, the bones are immobilized with a tight splint.

Other forms of surgery in traditional African medicine include the following:

1. Tribal marks
2. Clitoridectomy or female circumcision
3. Removal of whitlow

4. Male circumcision
5. Piercing of earlobes
6. Extraction of carious teeth
7. Trephination
8. Cesarean section

Traditional surgeons are also capable of performing cataract operations; Thompson recorded this observation:⁸

Witch doctors of many tribes perform operations for cataracts. They squeeze the juice from the leaves of an alkaloid-containing plant directly into the eye to desensitize it, then push the cataract aside with a sharp stick. A surprising number of these cases turn out successfully'.

TREPHINATION OR CRANIOTOMY

It is perhaps necessary to discuss further the practice of trephination or craniotomy in traditional African medicine. Trephination, in which a hole is drilled through the skull without penetrating the brain membrane, is one of the oldest therapeutic procedures for which archaeological evidence exists. Trephination was recommended by Hippocrates, the father of modern medicine, for the treatment of skull fractures, epilepsy, and headache.⁹ In Africa, the practice of craniotomy dates as far back as the time of the Egyptian pharaohs, and various forms of this surgery are known in parts of North, East, and South Africa.

Two excellent accounts on the practice of trephination are the work of Margetts¹⁰ and that of Furnas et al.⁹ on the craniotomy operations in East Africa. According to Furnas et al.⁹ a craniotomist is known as *ornobari omotwe*, meaning "surgeon of skull" (plural *ababari ernetwe*), among the Kisii tribe of Kenya. The authors observed that:

The ababari were neatly dressed, often with a necktie and jacket; they were punctual, clean, and precise in their work, and they conducted their examinations, operations, and postoperative visits in a dignified manner, showing genuine concern for their patients. When a serious postoperative complication was recognized, the Ornobari would not delay in sending the patient to the hospital for treatment.

The ornobari employs various herbs and drugs to aid his surgical operation. Freshly prepared leaves are used as hemostatic agents. Special medicines in the form of powders are also used to keep out evil spirits during the surgery. The watery sap from the banana tree is used as an irrigation solution. Although the ornobari claim that the sap cools the wound, the real utility of the banana sap is to provide astringency to the cut tissues. Oily preparations, including animal fats, petroleum jelly, and butter (ghee), are used to cover the wound at the end of the operation. Effects of modernization are beginning to show in the traditional practice as some ababari use antibiotics as part of their postoperative care.

The wounds are usually left open but covered with herbal packs. Furnas et al. observed the use of boiled hair from a cow's tail placed with an eyed needle as a form of suture.⁹ The authors quoted an ornobari as saying that, "I leave the head wound open; otherwise, it will rot underneath." A detailed account of a case study of "a Kisii craniotomy" has been provided by Furnas et al. The report contained details of preparations, instrument setup, anesthetics, scalp incisions, craniotomy, and postoperative care.

The art of craniotomy is used for the treatment of acute head injury, post-traumatic symptoms, and certain types of persistent headaches. The ababari advise against craniotomy during pregnancy, while bleeding from both nose and ears, and for patients in coma.

THE SPECIALIST

There are many more traditional healers whose highly specialized skills have not been discussed here. Some are priests; others are gifted ordinary people with the secrets to cure some specific intractable diseases. In Western medicine, such healers would be referred to as “consultants,” but in traditional African medical practice, they are respected more as priests and are consulted only on the advice of a fortune-teller. Such fortune-tellers include representatives of the many river goddesses, deities, oracles, and leaders of ancient religious cults.

It is perhaps convenient to introduce at this stage the cure of repeated infantile deaths in a family. The healers involved in such cases are specialists who deal exclusively with intractable pediatric diseases, often fatal, ascribed to the child's primordial wish to die very early in life. *Abiku* in Yoruba, *elanaso* in Efik, and *ogbanje* in Igbo all refer to children condemned by fate to a cycle of early death and rebirths to the same mother. In Central Africa such “spirit-children” and surviving twins are protected with amulets made from eagle feathers, the nests of some insects, and secret plants. Achebe¹¹ and Mobolade¹² studied this phenomenon among the Igbos and Yorubas of Nigeria, respectively. These children are believed to have made a pact in their spiritual world to visit Earth briefly. Such children often subject themselves to several reincarnations only to die each time shortly after birth to torment their unsuspecting parents. With the fall in the infant mortality rate in Africa because of modernization, the demand for the services of these specialists is now greatly reduced. Another variant of the same kind of phenomenon is Di-uwa, in which young girls are believed to have been married to spirits before they were born into this world, and any attempt to marry them to mortals is usually fatal. The jealous deity usually attacks the prospective suitor or the girl herself with a serious disease or even death.

The belief in *ogbanje* is so strong among the tribes of southern Nigeria that it has been argued as an attempt to explain the high infant mortality due to sickle-cell anemia, leukemia, and even malaria. Such explanation is too simplistic to be true and does not accommodate tales of identical birthmarks and knife scars observed on branded *ogbanje* children during their brief visitations to Earth.

Other groups of specialists who constitute a blessing to the livelihood of the African are the rainmakers. A traditional African society depends on rain; both farmers and pastoralists rejoice when it rains. Rain is so important that, among the Luvedu, the queen is also their supreme rainmaker. “He who brings rain brings life,” the Zulu will say, and they speak of rainmakers as the “shepherds of heaven.” The natives of Karamoja (Uganda) who witnessed the severe drought of 1979 cannot but echo such high praises for the rainmaker. The Koma and the Udhuk venerate rainmakers as gods, offering the rainmakers gifts and homage.

The process of rainmaking is rather complicated and varies enormously from place to place. The Igbo people burn sacred herbs and call on the rain god with broomsticks; the Koma rainmakers live in caves and restrict their drinks to milk, and only drink water publicly to initiate rainmaking ceremonies. It is alleged that the Akambas formerly buried a living child as part of the ceremony for rain during severe drought. The rainmakers play a definite role in the treatment of pandemic diseases, when their rain is needed to “wash” away the plague. The most important thing is that African rainmakers are not fakirs; how they make rain, however, is yet to be understood. Rain is viewed as a sacred and phenomenal gift from God, the most explicit expression of God's goodness, providence, and love. This important herald of creation serves as a first sign (droughts and flood) of the anger of the creator. Rainmakers represent the people's contact with the blessings of time and eternity, a link between humans and the divine. The rainmakers do not rely exclusively on their spiritual powers; they are well versed in weather and environmental matters and may spend long periods of apprenticeship acquiring their knowledge.¹³ They obtain information from other rainmakers; from interpreting the clouds; by studying the habits of trees, insects, and animals; and from

the study of astronomy and the use of common sense. Rainmakers are paid to bring rain or to stop rain on big occasions and ceremonies.

It is also the specialist, rather than the surgeon, who performs autopsies. The objective of the autopsy is in some respects similar to that of Western medicine, which is to ascertain the cause of death. The specialist medicine man is most often concerned with detecting signs of witchcraft than organic damage to the body, whereas a typical traditional healer will restrict himself to interpretation of symptoms as they relate to ill health. Autopsies are reserved for patients who die from unknown causes. There was a very elaborate account of such autopsies in a report published in the *New York Journal of Medicine* cited by Davies.¹⁴ It is believed that such opening up of the human body, followed by examination, exposes the healers to considerable knowledge of anatomy and pathology.

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Medicinal Plants and Traditional Healing Methods

INTRODUCTION

Edible food plants, spices, and fruits are the dominant ingredients in many African medicinal remedies. The ordinariness of such ingredients has been a major setback in the search for novel pharmacologically active compounds from plants used in traditional medicine. Recent developments in the management of chronic illness and metabolic diseases have shown that such dietary plants, when used properly, not only prevent diseases but also reverse the degeneration in chronic and metabolic diseases. Perhaps the objective in prescribing such food plants is to direct the treatment at the cellular level, which presents a different pharmacodynamics than a chemical inhibitor/agonist approach. The acute diseases treated by herbal medicines are usually diseases of the rural poor in villages, which include diarrhea, snakebite, pneumonia, parasitic infections, tuberculosis, and complications in pregnancy, sickle-cell anemia, and rheumatic heart disease. Diseases such as diabetes, hypertension, and the various types of cancer are considered diseases of affluence, and the first line of intervention in traditional medicine is to initiate lifestyle changes followed by the administration of appropriate medicinal plants.

The African medicinal agents consist of two groups: those used for rituals, sacrifices, and other religious acts, as part of the process of treatment of diseases; and the plant extracts, herbs, seeds, roots, leaves, juices, liquids, powders, bones, minerals, and other substances that are supposed to have organic effects directly on the patient. Some of the procedures and rituals, and even the very plants used, may lack any overt value, but they are psychologically vital and, no doubt, play a great role in healing the sick and helping the afflicted.

It is also necessary to note that some of the plants can be used only in a prescribed manner and with the necessary “authority.” The “appropriate structural information” can be obtained from a medicinal plant only if the plant is handled properly and dispensed by the initiated. The role of body chemicals (the so-called endochemicals) in these healing processes can never be overemphasized. In other words, it is difficult to draw a sharp distinction between a true placebo and endochemical induction in a subjective being. This partly explains the role of several inert additives in the healing potions. Another remarkable feature in the ethnopharmacopoeia of many African tribes is the use of food substances as medicinal agents. As has been mentioned, medicines differ from food in the African setting only in the methods of preparation, whereas in modern orthodox medicine, drugs are expected to be poisonous and are differentiated from poisons in having limits set on safe dosage—exceeding these limits, one arrives at the toxic level. This relationship between medicine and poison is not well defined in traditional African therapeutics and is the underlying reason behind the poor dosage considerations indicated previously in this book.

Furthermore, the drugs are usually expected to act in a gentle manner, over a long period, unlike Western medication, which is expected to act almost instantly. It is in the attempt to acquire the drama associated with Western medicine that contemporary traditional doctors give toxic plants to

cure the patient faster. A basic African tenet in the administration of drugs in traditional medical practice is that it is the body and God that are expected to heal the patient and not drugs; therefore, the dispensation of toxic herbs is a recent innovation. The major plants used as ingredients for the treatment of the most prevalent diseases in Africa are listed in the discussions that follow. The difference between the plants in this section and the ethnomedical data in Chapter 2 is that plants are discussed here within the context of treatment modalities, and they are rarely prescribed alone.

DIAGNOSIS

The common ailments are easily recognized and treated successfully without much ado. Simple symptoms are related to diseases, and patients can sometimes make their own diagnosis, alone or with the help of neighbors. A local medicine man or a neighbor, knowledgeable in herbs, will prescribe herbs based on the symptomatology of the disease. In such cases, only mild drugs are dispensed, and recovery is expected within a day or two.

If the illness persists, the patient's recourse is to the diviner or fortune-teller, who very likely decides that either an evil deity or the spirit of a deceased relative is responsible. The aim here is to discover the cause of the illness, prescribe the appropriate rituals, and proceed with the needed treatment of the disease. The method the diviner uses to achieve this is as varied and arcane as one's imagination permits, but fundamental to all these is the experience of the diviner himself. He or she bases the decision on information gathered from the patient, previous knowledge of the client, and even public opinion. In cases of doubt, the healer consults the oracle, makes sacrifices, and performs rituals to solicit the right answer from the spirits. The methods may be vague, but they are undoubtedly a very good diagnosticians.

Some of the factors that can cause disease are (1) sorcery, (2) breach of taboo, (3) spirit intrusion, (4) diseased object, (5) ghosts of the dead, and (6) acts of God and gods. The patients collaborate with the diviner in determining the cause of their sickness. It is usual for a diviner to ask a patient quite frankly what taboo the patient has broken, who his or her personal enemies are, and which gods the patient has failed to thank for favors granted. Sometimes, a witch may be responsible for the sickness, and the witch has to be exposed for an effective treatment to be possible. In some cases, the diviner may decide beforehand who can best be spared from the community and so conduct his divination and ritual so that some poor old man or woman will be declared guilty and so be caught and killed. The accused has a right to opt for a trial by ordeal. Public opinion and rumors help the diviner to catch the right person. According to Harley,¹ this is a situation where diagnosis of the disease extends into the realm of justice, as interpreted by the community as a whole. The healing act, therefore, becomes a societal cleansing exercise, a moral regeneration to sustain the community's ethics and beliefs.

Precision and accuracy are demanded as much in the treatment of psychiatric cases as in cases of fractures and other traumatic injuries. The medicine man can spend several hours pondering the nature of damage and the appropriate remedy. Proper diagnosis is the key to most traditional treatments. The various treatments discussed in this chapter may not apply in all cases since no two ailments are exactly the same to an African medicine man. Each patient is treated as a unique case.

Symptoms of Diseases

1. **Behavioral Changes:** It is generally accepted that many diseases and conditions lead to changes in behavior. The first questions asked relate to the patient's eating habits: Has the patient been drinking? Eaten a mushroom? Taken any drugs? and other questions. If the behavioral change is secondary (i.e., after sickness), then the patient is believed to be depressed from the illness and is not taken seriously. If the behavioral changes are sporadic and of a dramatic nature, then the healer has to

determine whether they are due to spirit intrusion. Because it is easy to propitiate these spirits and have things return to normal, if the changes persist and progress to irritability, lack of coordination, aggression, or other manic behavior, then the patient is treated for insanity. The cure can be effected in most cases only before the patient exhibits his or her insanity in marketplaces, hence the common question, “Opuola ahia?” (“Has he entered the market?”)

2. **Fever:** Abnormal elevation of body temperature is not considered a disease in itself. It has to be persistent or recurrent to be serious. The healer has to eliminate the possibility of the fever being due to injuries or trauma. The healer will examine the bowel and probe for pains in different parts of the body. Fevers are believed to be due to malaria, arthritis, and infection. Fevers due to colds are not considered serious enough to consult a herbalist—everybody tolerates the flu and waits for it to pass away.
3. **Jaundice:** In Africa, signs of jaundice are observed in the whites of the eyes, urine, and the fingers. The yellow color is due to accumulation of a substance called bilirubin, produced by the breakdown of red blood cells. In normal circumstances, the liver transforms bilirubin into an excretable form, which the body expels through the urine and feces. Jaundice associated with fever is taken seriously and is indicative of hepatitis.
4. **Seizure:** Convulsions are treated seriously in African medicine and are vaguely associated with heat storage and distribution. Jerking or twitching, stiffening, and lapses in awareness due to abnormal electrical discharges in the brain are considered by the native healers to have a spiritual causation.
5. **Diarrhea:** Frequent bowel movement (stools) or loosening of the consistency of the stool to soft, liquid, or even watery feces indicates a sick bowel. If the stooling is excessive or too frequent, then *Otoro* (Igbo, Nigeria) is diagnosed; *Otoro* it is often fatal. It can have a spiritual causation or be a result of poisoning. Presence of blood in the stool is considered even more serious since this could be due to dysentery, internal injuries, or witchcraft. Eating of unripe fruits (especially mangoes) and the first harvest of vegetables are believed to precipitate diarrhea and even dysentery.
6. **Bleeding:** A break in a blood vessel from a large artery or a tiny capillary is a sign of a potentially dangerous condition. External bleeding is easily recognized and evaluated. Minor cuts and hematomas are arrested with leaves and are not usually probed further for any associated illness or cause. Internal bleeding, either into a muscle or into the various organs, can be diagnosed accurately from careful examination of the urine, sputum, and feces and from palpating the relevant organ; once diagnosed, the correct medication is prescribed. The color of the blood is also carefully examined to determine if it is dark or bright red. The seriousness of prolonged minor or severe bleeding is well understood by the healers, and the condition is treated as life threatening.

Bleeding from the nose or nosebleed is attributed to overexposure to the sun, delayed symptoms from traumatic head injury, concussion, and nasal injury.

Bleeding from the mouth, gums, and teeth is due mainly to bad oral hygiene and improper feeding. Chew sticks with bacteriostatic properties are prescribed.

Bleeding from vagina, if not during the normal menstrual period, is considered very serious. If an unmarried girl is bleeding, then abortion is suspected; married women sometimes miscarry.

Blood in the urine indicates serious disease in the bladder: *akpa mamiri*, infection of the urinary tract, and certain worm infestations. If not curable, then external inputs are investigated (e.g., illicit sexual intercourse, sorcery, etc.).

Coughing and vomiting blood are signs of trouble with the chest or stomach. Tuberculosis and ulcers are often associated with bleeding. Most inexperienced doctors usually refer patients coughing or vomiting blood to hospitals for intensive care.

7. **Breathing Difficulty:** The breath of life, *umendu*, is indeed the most vital ingredient in the life process. Difficulty in breathing is distressing, a frightening symptom of many major diseases. In Igbo medicine, this condition is associated with weakness in the heart rather than the air passage. Treatment often depends on the underlying cause, which is not always organic.
8. **Swelling:** If the swelling is minor and localized, then the disease is considered to be of organic origin and treated as simple inflammation. More generalized swellings are due to fluid retention or edema, and the healer often probes the patient and conducts physical examinations to determine the afflicted part of the body and the extent of damage. There are nonspecific generalized swellings associated with poisoning, evil spirits, and sorcery. Bloodletting, using a horn open on both ends or suitably shaped cups, is the usual method for treating chronic edema.

9. **Weakness:** It is important to differentiate between laziness, which is a cultivated habit, and generalized weakness due to malaria or other diseases not yet manifesting recognizable symptoms.
10. **Rash:** Skin eruptions are taken seriously. They may be interpreted as indicative of measles or other contagious diseases. They may also result from allergy to plants or accidental entry into bewitched forests. People were also believed to inflict rashes—smallpox (*Ikpena*) or chicken pox (*Kitikpa*)—on their enemies or rivals. The healer usually determines whether the rash itches, hurts, or burns; whether it has spread or is limited to one area; whether there was a change in diet or contact with unfamiliar substances; whether there was any contact with someone with a similar affliction; and when the victim last entered a forest previous to the attack and which forest.
11. **Pain:** Experienced healers often relate the various types of pain to specific diseases. The constant or intermittent pain has to be differentiated from the sharp or dull, stabbing or cramping, steady or pounding, and moving or localized. The healer asks many questions and probes the patient to determine the exact nature of the pain and correct diagnosis. The healer has to decide whether to treat the pain by external applications and massage or with oral mixtures.

The main diseases treated by the traditional healers are discussed next. Some of the herbs listed under the diseases are not included in the catalog in Chapter 2 since they are considered minor ingredients for the preparation of remedies.

MALARIA

Malaria remains by far the most common disease suffered by the African. Some traditional healers classify all fevers together, but an expert herbalist easily distinguishes the various types and recommends appropriate treatment. There is often no distinction between the various forms of malarial fever; both the tertian and quartan fevers are treated alike. The prescription of antimalarial drugs is not usually restricted to professional herbalists; in serious cases, however, people with some knowledge of herbs often volunteer their services when malaria occurs in the community. Cases of drug-resistant malaria (both herbal and allopathic) are referred to the professional herbalists.

Many plant genera were used either alone or in combination for the treatment of malaria. The plants are mainly of the families Rubiaceae and Apocynaceae and a few from the families Bombaceae, Loganaceae, Rutaceae, Solanaceae, Meliaceae, and Gramineae. Malaria medicines vary enormously from one community to the other, in both the choice of plants and the method of preparation.

Complementary to oral therapy is steam treatment; the patient is covered with a thick blanket or cloth and subjected to the vapors from a steaming pot of herbs (ingredients of this hot pot include the leaves of neem, lemongrass, paw-paw (*Carica papaya*), mango, and guava). Burns and blisters are prevented by surrounding the hot pot with short pieces of water-soaked wood; very frail patients are allowed to raise their heads above the blanket to avoid suffocation. The treatment works, and I have not observed any case of suffocation or severe burns from this method of treatment.

The leaves of some of these plants are sometimes used for the preparation of “teas”; typical fever teas are made from lemongrass (*Cymbopogon citratus*), lime (*Citrus aurantifolia*), and sometimes guava leaves. This form of treatment is usually recommended for mild attacks of malaria.

ARTHRITIS AND INFLAMMATORY DISORDERS

The items in the prescription list of antiarthritic drugs, in both traditional and Western orthodox medicine, are indeed legion and sometimes quite exotic. In orthodox Western medicine, the folk treatment ranges from sips of the innocuous honey to sophisticated medications such as intra-articular injections of cortisones. The list also includes white ribbons tied round the afflicted parts of the body, apple cider, spring water, gold, roasted potatoes, vinegar, aspirin, indomethacin, and

various herbal preparations. The use of these drugs is often empirical, and only a few are actually beneficial to the patient. It has earlier been noted that these items and others currently recommended by medical practitioners lack any scientifically accepted basis for their use.² The etiology of the arthritic process is not even properly understood. It is believed that rheumatoid arthritis is partly an immune complex disease since the rheumatoid factor has been shown to be an autoantibody to immunoglobulin G, with which it circulates as a complex in body fluids, and this explains the efficacy of immunosuppressive agents such as corticosteroids, antifolates, and alkylating agents for the treatment of arthritis.³ Similarly, the role of prostaglandin in the inflammation process can be used to rationalize the prescription of known prostaglandin synthetase inhibitors for the treatment of arthritis and other inflammatory conditions.

The available drugs often fail to provide the desired relief, and some have serious side effects; hence, the search for new and better antiarthritic agents is a subject of continuing research in many laboratories. Many plant-based drugs have competed favorably with synthetic compounds as potential antiarthritic agents; common examples are preparations from licorice, annonas, ginger, and colchicum.

In African ethnomedicine, various herbal drugs are prescribed by herbalists for the treatment of a group of illnesses lumped together as “romantism” (corruption of rheumatism). These are conditions associated with the diseases of the joints, tendons, muscles, or bones. Rheumatism in traditional medicine is believed to be caused by exposure to damp environments, particularly swampy farms. Arthritis is usually blamed on the gods or evil spirits or is considered a sign of visitation by unappeased deceased relatives. Sometimes, when the onset of the inflammatory conditions follows a bout with malarial fever, the disease, known as “go-slow,” is accepted as being of pathological origin and treated with herbs only.

Irrespective of the underlying cause of the ailment, the prescriptions usually include one or more herbs, and when necessary, a sacrifice is made to appease the responsible spirit, gods, witch, or other supernatural forces. Most native doctors proscribe the use of alcohol and palm oil soup during treatment.

SEXUALLY TRANSMITTED DISEASES AND AIDS

The vaginal cavity in normal healthy women is inhabited by a number of microorganisms that exist in a dynamic microenvironment. Any disturbance to this ecosystem leads to a number of infectious conditions and diseases. Sexual contact is the most common but not the only means of transmission of these infections. Gonorrhoea, syphilis, acquired immunodeficiency syndrome (AIDS), genital herpes, genital warts, chlamydial genital infections, trichomoniasis, vaginitis and vulvovaginitis are some of the sexually transmitted infections (STIs). It has been established that sexually transmitted diseases (STDs) or venereal diseases (both ulcerative and non-ulcerative) increase the risk of transmission of other infections, including AIDS because of changes in the normal vaginal epithelium.⁴ The diseases are caused by a variety of pathogens including bacteria (*Neisseria gonorrhoea*, *Treponema pallidum*, *Haemophilus ducreyi*, *Gardnerella vaginalis*), viruses (herpes simplex virus, human papilloma virus (HPV) and human immunodeficiency virus (HIV), Chlamydia (*Chlamydia trachomatis*), and parasites (*Trichomonas vaginalis*, *Giardia lamblia*).⁵

Traditional healers are very knowledgeable in the treatment of such diseases. It is uncertain whether their remedies are entirely derived from traditional knowledge or from an adaptive response to a disease that was largely unknown to medicine three decades ago. A large number of plants are known to be used in traditional medicine for the symptomatic treatment of sexually transmitted diseases, including AIDS.⁶ Some of the plants have been included in the Catalogue of Major African Medicinal Plants (Chapter 2) and in individual monographs in Chapter 3 of this book. Many of them have been shown by laboratory and clinical studies to possess activity against the causative organisms.^{7,8}

Herbal Products for Treatment of HIV/AIDS

Inhibitors of HIV Reverse Transcriptase (RT)

Medicinal plants have been used for the treatment of AIDS without any scientific evidence in traditional systems of medicine. Modern isolation and bioassay techniques have made it possible to demonstrate the activities of such herbal remedies in the laboratory against various sexually transmitted pathogens, and in some cases elucidate their mechanism of action. Many natural products have been shown to possess significant activity, at least *in vitro* studies, at concentrations that are comparable to the synthetic RTs.^{9,10} The compounds vary enormously in their chemical structures, they include alkaloids, flavonoids, lignans, coumarines, naphthoquinones, anthraquinones, polysaccharides and terpenes. The most important examples include the novel naphthoquinones michelamines A-C isolated from the rare tropical plant *Ancistrocladus korupensis* found Cameroon, calanolide A, isolated from *Calophyllum lanigerum*, betulinic acid from *Syzigium claviflorum*, the dibenzylbutadiene lignans from *Anogeissus acuminata*, the sulfated polysaccharides found in many sea weeds and putranjivain A from the Egyptian plant *Embelica officinalis* (*Phyllanthus embelica*). Since these medicinal plants are locally available, they offer a ready alternatives to the expensive and often inaccessible pharmaceutical RT drugs. Also, the plants are often less prone to the emergence of drug resistance.¹¹

Other Antiviral and Immuno-Modulatory Agents

The use of highly active anti-retroviral therapy (HAART) has made a remarkable impact in the management of HIV infections as evidenced by resolution of opportunistic infections and malignancies, as well as declining hospitalization and mortality rates. This suggests that potent and sustained suppression of viral replication, at least to some extent, is associated with reconstitution of the immune system even in adult patients treated at advanced stages of the disease. The combination of HAART with immune system enhancers, holds a lot of promise in the treatment of AIDS. The exact mode of action of several plant-derived antiviral agents has not yet been determined but some of them have been shown to exhibit significant activity against HIV, a virus associated with AIDS.

The plants in this category contain compounds that either interfere directly in various stages in the replication cycle of HIV or strengthen the patients' immune system against the devastating effect of the infection. The list includes substances that exhibit the following inhibitory activities against HIV: protease inhibition, virus adsorption, glycosylation, virus-cell fusion, assembly/ release, translation, integration, etc. Some of the active compounds from these plants are well known and have been studied under clinical setting, include castanospermine, glycyrrhizin, papaverine, trichosanthin, aceramannan, and N-butyl-1-deoxynojirimycin.

Most of the plants used in the traditional treatment of AIDS are used in poly-herbal formulations. A typical example is the combination of a mixture of *Astragalus membraceous*, *Tinospora cordifolia*, *Glycyrrhiza glabra*, *Aloe barbadensis*, *Andrographis paniculata*, *Garcinia kola*, and *Moringa oleifera* leaf extract. The mixture, like most plant extracts, may be capable of non-specific stimulation of the immunological defense mechanisms. Although there is no large clinical outcome studies or any report of double-blind placebo controlled evaluation of the this poly-herbal product, the wide use of this mixture suggests that it must possess some beneficial effect. It has been observed that such non-specific stimulants do not affect immunological memory cells and since their pharmacological efficacy fades comparatively quickly, they have to be administered either at intervals or continuously.¹² The product, like similar dietary supplements, may be used as an adjuvant with existing antiviral medication, with the approval of the attending physician. A similar formulation known as IM-133, which consists of a mixture of *Tinospora cordifolia* (stems, 40%, w/w),

Withania somnifera (roots, 20% w/w), *Phyllanthus emblica* (fruits, 20% w/w) and *Ocimum sanctum* (leaves 20% w/w) has been shown to be a very potent immuno-protective agent.¹³ In Uganda, the plants which were most commonly mentioned by traditional medicine practitioners include *Aloe* spp., *Erythrina abyssinica*, *Sarcocephalus latifolius*, *Psorospermum febrifugum*, *Mangifera indica* and *Warburgia salutaris*.¹⁴

Plant Derived Anti-Anemic Agents

HIV-associated anemia has been shown to be an important contributor to the morbidity and mortality of this infection.¹⁵ Anemia has deleterious effect on both functional capacity and quality of life, and has been implicated in shortened survival even by patients on antiretroviral therapy. Several studies have indicated that recovery from anaemia is associated with improved quality of life and survival, therefore, treatment of HIV infection includes addressing the underlying conditions that cause the anaemia. The target haemoglobin level is 12 g/dL for men and 11 g/dL for women. In most cases of severe anaemia transfusions have been prescribed in order to achieve rapid recovery and recombinant human erythropoietin (rHuEPO) have been used to maintain the haemoglobin concentrations. In several anecdotal reports and some observational studies, it has been possible to reverse HIV-induced anaemia and achieve erythropoietic sufficiency using herbal products.

Remarkable results have been achieved in our laboratories with such well known phytonutrients like *Moringa oleifera* and *Sorghum bicolor*. A plant extractive developed in our laboratories, called Phytoerythropoietin – K (PEP-K) has also demonstrated consistent value in the treatment of anaemia in chronic diseases. Studies are currently underway to evaluate its usefulness in HIV infection. It is believed to improve the iron-binding capacity (transferring) and the percent saturation, as well as better incorporation of iron in developing red cells.

Herbal Medicinal Products for Opportunistic Infections

HAART has contributed to a remarkable decline in HIV-associated morbidity and mortality. Clinical observations of spontaneous remission of previously untreatable opportunistic infections in subjects on HAART reflect the substantial degree of immune reconstitution, which can be achieved with this therapy. Despite the progress made in the use of these potent anti-retroviral drug regimens in the suppression of HIV-viremia, antiretroviral therapy is not able to achieve a complete reconstitution of the immune system in advanced HIV-infected patients. In fact, a complete normalization of HIV-associated immunological alterations has not been reported so far, but the observation period of subjects on potent antiretroviral therapies is still relatively short. The situation is further complicated by occurrence of “immune reconstitution syndrome” in patients in the early phases of treatment with HAART who develop tuberculosis, *M. avium* complex, and cytomegalovirus disease. In addition, drug therapy can be limited over time by side effects and emergence of drug resistance.

These considerations have evoked growing interest in the development of specific drugs for the treatment of these opportunistic infections associated with HIV/ AIDS. In developing countries, the high incidence of parasitic infections contributes significantly to the high mortality recorded among AIDS patients in developing countries. Plants have been the source of many drugs used in current use for the treatment of protozoal diseases. Evaluation of plants used in traditional medicine in Nigeria and Cameroon for the treatment of parasitic diseases lead to the identification of several compounds with potential for the treatment of malaria, leishmaniasis, trypanosomiasis and opportunistic infections caused by *Cryptosporidium parvum* and *Toxoplasma gondii*. Indole alkaloids, protoberberines, indoloquinoclidines, and pregananes are among the most promising chemotypes. Some of the active plant extracts obtained from *Picralima nitida*, *Cryptolepis sanguinolenta*, *Chasmanthera depedens* and *Dracania mannii* are candidates for possible development as

phytomedicines containing mixture of active molecules in a standardized dosage form. Most of the points raised above for malaria apply equally for other parasitic infections.

For fungal infections, the following plant medicines (among others) are used most frequently by herbalists:

- *Aframomum* spp.
- *Bridelia ferruginia*
- *Cassia alata*
- *Dracaena mannii*
- *Myristica fragrans*
- *Terminalia ivorensis*

The most widely used herbs for the treatment of tuberculosis include the following:

- *Citrullus colocynthis*
- *Costus asper*
- *Diospyrus abyssinica*
- *Echinops giganteus*
- *Kaempferia galanga*
- *Ocimum gratissimum*
- *Piper guineense*
- *Pluchea dioscoridis*
- *Plumeria rubra*
- *Siphonochilus aethiopicus*
- *Sutherlandia frutescens* subspecies *microphylla*
- *Tabernaemontana elegans*
- *Tinospora cordifolia*
- *Uvaria chamae*
- *Voacanga globosa*
- *Xylopia aethiopica*
- *Zanthoxylum zanthoxyloides*

Vaginal Formulations and Microbicides

Herbal medicinal products, including phytomedicines, have been used by women in traditional healing systems to promote health and for the management and treatment of conditions of particular interests to women, such as premenstrual syndrome (PMS), menopausal symptoms, gender-specific cancers, birth control and complications of pregnancy and child bearing.¹⁶ It is quite common in many traditional cultures for women to apply certain herbal preparations, including vaginal douche, either pre- or post-coitus for the prevention of sexual transmitted diseases and for personal hygiene. In most non-western societies, women play specialized roles in healing and are generally regarded as more knowledgeable in the use of health promoting herbs, in direct contrast to the medicine-men who are more likely to combine healing herbs with life-endangering portions. Certain aspects of traditional herbal medical practice are restricted to women. Use of herbs by non-specialists is closely linked to diet and information regarding their safe use are generally shared among women and passed on through generations as part of healthy culinary recipes.

Vaginal formulations and microbicides are products such as douches, gels or creams that women can use topically, to prevent or significantly reduce the transmission of HIV and other disease-causing organisms during sexual intercourse. Vaginal microbicides have the potential of providing a relatively cheap and effective way for women to protect themselves against HIV infection. London School of Hygiene and Tropical Medicine has estimated that introduction of a microbicide, that would reduce infection by 40%, at 30% coverage, in 73 lower-income countries, would avert

approximately 6 million HIV infections over 3 years in men, women and children. This would reduce the health care costs (excluding the cost of antiretroviral therapy) by 3.2 billion US dollars.¹⁷ Vaginal microbicides allow women to have more control in the application of the product, which would help to address social difficulties that women can face when having to negotiate condom use with their partner. A major advantage of microbicides is that women can utilize them without necessarily obtaining the consent of their partner.

In the treatment of HIV/AIDS and other sexually transmitted diseases, herbs are considered safe and effective preventive and therapeutic products. Herbal microbicides as vaginal inserts can provide better protection than standard prevention tools, since they offer ‘bidirectional’ protection (i.e. protection to both partners) and offer greater control over the risk of exposure to STDs. Traditional birth attendants (TBA) and midwives are known to administer highly specialized herbs in the form of the vaginal/uterine washes during traditional birth delivery and it has been suggested that the procedure could be adopted as low cost complementary intervention method to reduce the risk of perinatal transmission of HIV if used on HIV-positive women during childbirth (InterCEDD-BDCP Report).¹⁸ The vaginal route of administration offers additional advantage for the delivery of locally acting drugs such as antibacterial, antifungal, antiprotozoal, antiviral, labor-inducing and spermicidal agents, prostaglandins and steroids. This route of administration offers several pharmacokinetic advantages over the oral route for the delivery of hormonal contraceptives owing to the lack of drug interactions observed in the gastrointestinal tract. The vagina also has great potential for systemic delivery because of its large surface area, rich blood supply and permeability to a wide range of compounds.

The most commonly used vaginal dosage forms (VDFs) include creams, gels, tablets, capsules, pessaries, foams, ointments, films, tampons, vaginal rings and douches. In traditional African medicine, some herbal medicinal preparations are used as vaginal inserts and packs by midwives and traditional birth attendants for the treatment of local infections and uterine complications. These herbal vaginal formulations have been used for the treatment of candidiasis, trichomoniasis, bacterial and senile vaginitis.

Medicinal plants used in the preparation of herbal microbicides include:

- *Cassia alata*
- *Azadirachta indica*
- *Scutellaria baicalensis*
- *Aframomum danielli*
- *Enantia chlorantha*
- *Cryptolepis sanguinolenta*
- *Dracaena mannii*
- *Garcinia kola*
- *Combretum dulchipetalum*
- *Hoslundia opposita*
- *Chasmanthera dependens*

Herbs with anti-trichomoniasis activity include:

- *Aspilia africana*
- *Combretum dulchipetalum*
- *Enantia chlorantha*
- *Hoslundia opposita*
- *Mormodica charanta*
- *Cleitopholis patens*
- *Picralima nitida*
- *Dracaena mannii*

A proprietary product, Vagisept (by Intercedd Health Products, Enugu, Nigeria), contains a mixture of herbs used in traditional African medicine as a topical microbicide for anti-fungal and anti-viral protection. The major constituents are biflavanoids of *Garcinia kola*, extracts of *Enantia chlorantha*, *Azadirachta indica*, *Dracaena mannii* and *Hippocratea welwitschii* oil.

GASTROINTESTINAL DISORDERS

It is generally believed that an unclean “bowel” is the source of most ailments. The ability to induce a good bowel movement is usually a good sign of a powerful drug. Infantile convulsions are prevented by administering laxatives at frequent intervals. Signs of overdosage are often ignored, being taken as part of the expected course of drug activity. Malarial preparations are expected to produce good purgation and sometimes even severe emesis. A patient is likely to demand a refund if a prescribed potion failed to purge him or her, even if the malaria was cured. This obsession with purgation could account for the high use of enemas in Central Africa.

In Nigeria, “Dr. Sapara baby mixture,” “Ogbomoro,” and “Ogwu-Umuaka” (infusions of *Tetrapleura tetraptera*) are used for the treatment of infantile flatulence and “stomach gripes.” The Mano-people of Liberia employ leaves of *Ipomoea digitata* and young figs (*Ficus* spp.) boiled with washed pebbles for the same purpose. *Rauvolfia vomitoria*, ginger, lemongrass, and guava leaves are employed in parts of the West Coast for indigestion. Common colic medicines include *Afromomum* spp., exudates from various species of *Canarium*, volatile oil-containing plants, leaves of *Macaranga* spp., and *Piper umbellatum*.

The common cathartics include the roots of *Euphorbia hirta*, *Cassia* species, *Harungana* species, and *Alchornea cordifolia*. Diarrhea and dysentery are usually treated effectively by any good herbalist. The simple dietary diarrheas are said to be easily arrested by roasted fruits of *Musa sapientum*. Species of *Ficus*, *Entada*, *Gossipium*, *Maesofrya*, and *Dichrostachys* are sometimes used for the treatment of systemic diarrheas. It is noteworthy that it has been claimed that acute intestinal obstructions and serious appendicitis are managed successfully by the native healers without recourse to surgery.

SNAKEBITES

In contrast to temperate countries, most snakes in Africa are poisonous; if not properly treated, snakebite is often fatal. The survival rate is poor. In African ethnomedicine, speed is the key to successful treatment. Predictably, those who understand the treatment of snakebite guard their secrets with great care. A usual practice is to tie ligatures above and below the wound to minimize the spread of the poisoned blood. The wound is probed to remove any teeth left by the snake, and bleeding is sometimes encouraged by sucking with the mouth. Antidotes, such as *Schumanniophyton magnificum*, *Tryphostemma longifolium*, *Olex manni*, *Gymnema sylvestre*, and *Cyanoglossum geometricum* are then administered either orally or by application to the wound. An emetic is dispensed if immediate relief is not observed after treatment.

The bites of poisonous species of scorpion and spider are treated like snakebite, but fatality is rare in such cases. A noteworthy practice among most African communities is the inoculation against snakebite. Patients are inoculated with powdered heads of poisonous snakes and secret leaves through slits cut into the skin in various parts of the body. Powder is taken from each variety and mixed, so that the person is actually inoculated with polyvalent antivenom. Small doses are administered as pastes on the slits repeatedly every few days for about 3 weeks.

PSYCHIATRIC AND PSYCHOSOMATIC DISEASES

Treatment of insanity and psychosomatic disorders in orthodox Western medicine has changed considerably in the last few decades and is now very much unlike the methods of the 1950s, when patients were handcuffed or chained to hospital beds. It is no longer common to see violent patients kept under restraint by straps or bedsheets, seriously disturbed psychotics yelling in mental and spiritual torment, and others huddled in frozen silence under the influence of powerful sedatives. This improvement can be traced largely to the advent of reserpine and other *Rauwolfia* alkaloids for the management of psychiatric cases. This plant was used by the Africans—independent of its use by the Asiatic peoples for the treatment of the same illness—for insanity.

In most African societies, mental illness is seen as the clearest manifestation of the disturbed equilibrium of life. This disease can be traced to a broken taboo, a contravened societal norm, or witchcraft. It is indeed futile to prescribe herbs and tranquilizers without first making a proper diagnosis of the causative factors responsible for the illness.

A rise in the incidence of mental illness among urban Africans is becoming increasingly manifest. It has been attributed at first glance to various cultural developments. The traditional African culture is at variance with the emerging dominant culture of the city, and this fact often precipitates ambivalence in the African that could lead to some mental imbalance.

Such illnesses may originate from a conscious rejection by the “modern” African of the traditional ways and beliefs that had sustained him or her, without mentally and spiritually preparing him- or herself for the roles this new civilization may demand. This creates a situation where the urban African exists in two worlds, one with rigid rules and primordial sanctions, which keep the society in check, and the other with the promise of pleasures without the restraints of the transposed alien culture. The stress so imposed is not adequately accommodated by some people. To an African, the germ theory of disease cannot possibly account for the cause and effect of insanity in a society where life is fully integrated. There may be no observable connection between a disease and the cause to which it is ascribed, except that the cause occurred first and the disease followed, and a cure can be procured by remedying what could be considered an essentially exogenous phenomenon. Other possible sources for the development of emotional stress can easily be observed among urban Africans, but psychological factors are undoubtedly the main cause of mental illness among rural Africans.

The diviner understandably plays the most important part in the treatment of the mentally ill by scrutinizing all the evidence available before making a pronouncement on the patient. I have witnessed a therapy session in which a marijuana addict was brought before a native healer. The healer physically subdued the patient, examined the patient’s eyes, and asked when the patient crossed “the flame of wisdom.” To the astonishment of the observers, the patient gave the healer the date he started his bad habit. The healer kept the patient for about 3 months and successfully weaned him of his drug habits with herbs.

At another session, a patient was brought before a healer who specialized in healing the mentally ill. The healer took just one look at the patient and declared, “Not heaven, not earth, only Chukwu [God] can deliver a man from the burden of seven incarnations.” How right he was; the patient had a long history of insanity in his family, stretching into several generations. He was given herbs to calm him for a while; he looked normal, but the herbalist kept murmuring, “The wind cannot be contained; the leaf has to dance to the wind.” The patient had a relapse, and the insanity could not be treated by the traditional healer.

Treatments often include sacrifices, rituals, and dances. The use of herbs is only secondary to the spiritual or magical cure of insanity. There are healers who employ “sacred” music for the reorientation of the insane before proceeding to give herbal potions. The use of sacred music, incantations, and invocations can easily be mistaken for “faith healing” as practiced in the West, but it

should be noted that these methods are used only for the initial subjugation of the patient. Others achieve such subjugation by traumatic methods, such as flogging with specially made whips or beating the patient until the patient is exhausted. In most cases, flogging or beating is later combined with phytotherapy. In sacred music clinics, obedience to rhythm and orders is used to determine the extent of sanity. The ability to serve in the clinic's music band is further proof of a better state of the patient's mind. In all cases, herbs are used to supplement the spiritual healing processes. *Rauwolfia*, *Picralima*, *Voacanga*, *Parquetina*, and *Jatropha* are among the common ingredients in the medications for insanity.

Several psychosomatic disorders are traced only to the gods, evil spirits, and the magic manipulations of enemies. Such possessed individuals exhibit aberrant behaviors that can be mistaken by a layperson for insanity. Cure can be effected only after the appropriate rituals, sacrifices, and other religious acts. The herbs used for the preparation of medicine for the treatment of psychosomatic disorders are included in the catalog in Chapter 2.

Some of the plants are not necessarily used for their action on the brain but for the psychic effect on the spiritual causes of many psychosomatic disorders. Several other plants regarded as sacred are used mainly in rituals and religious ceremonies that are associated with traditional healing.

CONVULSIONS AND EPILEPSY

Drugs used for the treatment of convulsive seizures in children vary enormously from one locality to the other. A common feature is the use of heat treatment, strong embrocations, and warm fixed oils to arrest the seizures. The medicine pots for convulsions are prepared mainly with decoctions from *Calliandra porterenis*, *Tetrapleura tetraptera*, *Waltheria africana*, *Vernonia cinerea*, *Ocimum basilicum*, *Xylopia aethiopica*, and *Jatropha curcas*.

HELMINTHIC INFESTATION

It is not clear whether the use of anthelmintics is indeed part of the ethnomedicine of Africa. It is quite possible that the concept of treating worm infestation was learned originally from the early European traders. In African folk medicine, worm expellers are quite common, and they are usually followed with purgatives. Self-medication is prevalent, except for chronic cases for which the expert knowledge of the herbalist is sought. The plants from which anthelmintic potions are prepared include the following:

<i>Anisopappus africanus</i>	<i>Dalbergia melanoxylon</i>
<i>Antidersmia venosum</i>	<i>Deinbollia kilimandschariea</i>
<i>Aspillia mossambicensis</i>	<i>Dissotis rotundifolia</i>
<i>Bersema abyssinica</i>	<i>Dombeya praetermissima</i>
<i>Bridelia micrantha</i>	<i>Embelia schimperi</i>
<i>Calotropis procera</i>	<i>Erythrina abyssina</i>
<i>Chyrospermum radicans</i>	<i>Erythrophleum suaveolens</i>
<i>Cyathula cylindrical</i>	<i>Eucclea natalensis</i>
<i>Cylicomorpha parviflora</i>	<i>Gomophocarpus semilunatus</i>
<i>Grevia holstii</i>	<i>Plumbago zeylanica</i>
<i>Hibiscus cannabinus</i>	<i>Rhus natalensis</i>
<i>Hugonia castaneifolia</i>	<i>Rumex bequartii</i>
<i>Jasminum floribundum</i>	<i>Scorodophloeus fischeri</i>

<i>Justicia pinguior</i>	<i>Scutia dasyphyllum</i>
<i>Leonotis mollissima</i>	<i>Solanum dasyphyllum</i>
<i>Lonchorcarpus capassa</i>	<i>Syzgium guineense</i>
<i>Maesa lanceolata</i>	<i>Tacca leotoeptoloides</i>
<i>Maytenus heterophylla</i>	<i>Vangueria rotundudata</i>
<i>Mormordica foetida</i>	<i>Vernonia karaguensis</i>
<i>Myrsine africana</i>	<i>Ximenia caffra</i>
<i>Pavetta crassips</i>	<i>Zimmermannia cappilipes</i>
<i>Phyllanthus reticulatus</i>	

Gynandropsis gynandra (family Capparaceae) is used specifically for the elimination of threadworms. Tapeworms are expelled with *Clerodendron rotundifolium*, *Croton macrostachyus*, *Embelia schimperi*, *Fuerstia africana*, *Hagenia abyssinica*, *Punica granatum*, and *Rapanea rhododendroides*, followed by purgation.

Bilharzia is a menacing scourge for most of Africa; it is a serious health problem in the Sahel belt and part of East Africa. The following plants have been used with limited success for the treatment of this disease:

<i>Acalypha ciliata</i>	<i>Iboza multiflora</i>
<i>Asparagus buechananii</i>	<i>Lotus goetzi</i>
<i>Bauhinia kalantha</i>	<i>Macaranga kilimandscharica</i>
<i>Cadaba kirkii</i>	<i>Rhynchosia hirta</i>
<i>Delonix elata</i>	<i>Terminalia kaiserana</i>
<i>Dissotis rotundifolia</i>	

Drugs prepared from some of the plants listed are also dispensed for filariasis. *Delonix*, *Lotus*, and *Rynchoria* are applied externally, specifically for elephantiasis.

COUGHS

Coughs are generally believed to be due to organic causes. Tuberculosis, whooping cough (pertussis), and certain other serious coughs can, however, be ascribed to curses from the enemy. The gods, spirits, and ancestors are never held responsible for coughs. Cough remedies are usually prepared either as linctuses or as mixtures. The following plants are common ingredients used for the preparation of cough remedies:

<i>Acalypha volkensii</i>	<i>Ipomoea wightii</i>
<i>Allanblackia stuhkmanni</i>	<i>Justicia flava</i>
<i>Allophylus abyssinicus</i>	<i>Lantana camara</i>
<i>Aristolacia petersiana</i>	<i>Lobelia holstii</i>
<i>Asparagus setaceus</i>	<i>Loranthus brunneus</i>
<i>Bidens magnifolia</i>	<i>Lycium europaeum</i>
<i>Capparis tomentosa</i>	<i>Myrica kilimandsh</i>
<i>Cassia mimosoides</i>	<i>Ocimum suava</i>
<i>Catha edulis</i>	<i>Ocimum viridi</i>
<i>Cissampelos pareira</i>	<i>Oxalis corniculata</i>
<i>Combretum fragrans</i>	<i>Oxygenum spp.</i>
<i>Cyperus rotundus</i>	<i>Pentas micrantha</i>
<i>Datura metel</i>	<i>Picralima nitida</i>

<i>Dissotus speciosa</i>	<i>Piper capensis</i>
<i>Fagara usambarensis</i>	<i>Rumex usamberensis</i>
<i>Ficus capensis</i>	<i>Solanum sessilist</i>
<i>Garcinia kola</i>	<i>Struthiola thomsonii</i>
<i>Helichrysum schimperi</i>	<i>Tephrosia interrupta</i>
<i>Hibiscus fuscus</i>	<i>Toddalia asiatica</i>
<i>Hypoestes verticillaris</i>	<i>Trema orientalis</i>
<i>Hyptis pectinata</i>	<i>Vernonia spp.</i>
<i>Indigofera spicata</i>	

ABORTION

Abortion is viewed as a sacrilege and as a crime of the same seriousness as murder, sorcery, and witchcraft. Rituals and costly sacrifices are performed to appease the god of reproduction for such abuse. Most of the drugs used for the procurement of abortions were originally meant for the management of the complications of labor. Much secrecy surrounds the plants and their methods of preparation. The following plants have been employed for this purpose:

<i>Abutilon grandiflorum</i>	<i>Hagenia abyssinica</i>
<i>Albizia volkensii</i>	<i>Kalanchoe densiflora</i>
<i>Carica papaya</i> (seeds)	<i>Kigelia africana</i>
<i>Clerodendron coriaria</i>	<i>Lancenaria breviflora</i>
<i>Combretum molle</i>	<i>Mormodica foetida</i>
<i>Cordia quarensis</i>	<i>Mukia spp.</i>
<i>Cordia rotundifolium</i>	<i>Pachycarpus lineolatus</i>
<i>Curcuma longa</i>	<i>Pergularia daemia</i>
<i>Discoglyprena caloneura</i> (seeds)	<i>Pterocarpus angolensis</i>
<i>Ensete ventricosum</i>	<i>Rhamphicarpa heuglinii</i>
<i>Gloriosa superba</i>	<i>Sida cordifolia</i>
<i>Guizotia scabra</i>	<i>Vernonia amygdalina</i>
<i>Gynura spp.</i>	<i>Zizyphus abyssina</i>

For the induction of labor, *Hibiscus sabdariffa*, *Nauclea latifolia*, and *Morinda lucida* are some of the drugs used. Toxemia of pregnancy and excess accumulation of fluid are treated with *Dialium guineense*, *Hibiscus* spp., *Citrus aurantium*, or a decoction made from *Garcinia kola*, *Cocos nucifera* (milk), and palm oil. Abortion and premature labor are treated with sap of *M. sapientum*, *Cyathula prostrate*, *Oldendandia corymbosa*, *Bryophyllum pinnatum*, and *Lindacke dentata*.

STERILITY MEDICINES

Sterility is often blamed on destiny. A childless marriage is believed to be woman's fault. All rituals, sacrifices, and treatments are directed toward helping the woman. Only very rarely, usually when there is a confirmed case of impotence, is the man held responsible for a childless marriage. The woman is then allowed, secretly, very secretly, to seek another man by whom to have children for her husband. In African societies, children are the greatest gift of any home.

It is believed that polygamy was a social insurance against the high mortality rate. Even in present-day Africa, a childless marriage is a more common reason for divorce than other factors

cited in divorce proceedings in Western countries. The drugs listed next are employed alone or in a mixture with other plants or animal parts to cure sterility in the female:

<i>Acacia brevispica</i>	<i>Euphorbia tirucalli</i>
<i>Aeschynomene nyassana</i>	<i>Fuerstia africana</i>
<i>Afroseralisia kaessneri</i>	<i>Hypericum roeperanum</i>
<i>Anisotes dumosus</i>	<i>Leptoderris</i> spp.
<i>Azanza garckeana</i>	<i>Maesa lanceolata</i>
<i>Cyathula uncinulata</i>	<i>Olea hochstetter</i>
<i>Danais xanthorrhoea</i>	<i>Polygala</i> spp.
<i>Echinops amplexicaulis</i>	<i>Yitex mombassae</i>

DIABETES

It seems that the recognition of diabetes as a disease was fairly recent in most African societies. In some communities, there is no vernacular name for diabetes, and treatment is practically unknown. The few native doctors who treat this disease sometimes even rely on some evidence of glucosuria for the diagnosis, such as whether ants gather at a spot where the individual passed urine. They can manage both juvenile and maturity-onset diabetes. They have proved remarkably competent in handling insulin-dependent diabetics and cases with severe ketoses. Most of the plants listed next have been experimentally verified and are indeed potent. It is significant, therefore, that a peptide designated as P-insulin has been reported from *Momordica*, one of the plants listed.

<i>Abelmoschus esculentus</i>	<i>Indigofera tinctoria</i>
<i>Achyranthes aspera</i>	<i>Ipomoea aquatic</i>
<i>Aeginetia indica</i>	<i>Irvingia gabonensis</i>
<i>Alisma plantago</i>	<i>Lagerstroemia speciosa</i>
<i>Allium cepa</i>	<i>Leucaena leucocephalia</i>
<i>Aloe barbadensis</i>	<i>Lycium africana</i>
<i>Alstonia macrophylla</i>	<i>Medicago sativa</i>
<i>Andrographis paniculata</i>	<i>Morinda citrifolia</i>
<i>Aristolochia</i> spp.	<i>Momordica</i> spp.
<i>Balanites aegyptiaca</i>	<i>Morus</i> spp.
<i>Beta vulgaris</i>	<i>Mucuna pruriens</i>
<i>Biophytum sensitivum</i>	<i>Ocimum gratissimum</i>
<i>Brassica napiformis</i>	<i>Myrtus communis</i>
<i>Bridelia ferruginea</i>	<i>Polygonatum humile</i>
<i>Calystegia</i> spp.	<i>Psidium</i> spp.
<i>Campis grandijlora</i>	<i>Solanum</i> spp.
<i>Carica papaya</i>	<i>Sphenocentrum jollyanum</i>
<i>Catharanthus loseus</i>	<i>Stachyurus</i> spp.
<i>Cocos nucifera</i>	<i>Syzygium aromaticum</i>
<i>Citrullus lanata</i>	<i>Tamarindus indica</i>
<i>Combretum micranthum</i>	<i>Tetrapanax papyrifer</i>
<i>Costus afer</i>	<i>Tetrapleura tetraptera</i>
<i>Curcuma longa</i>	<i>Tinospora cordifolia</i>
<i>Dioscorea dumetorum</i>	<i>Vernonia amygdalina</i>
<i>Garcinia kola</i>	<i>Zingiber officinale</i>
<i>Gongronema latifolia</i>	<i>Zygophyllum cornutum</i>

In a study conducted in the Democratic Republic of Congo (Kinshasa), it was established that antioxidant nutrients found in vegetables could prevent chronic diseases, including type 2 diabetes mellitus (T2DM) and metabolic syndrome (MetS). The evaluation of 244 T2DM patients (56.6% female) 48 ± 16 years old found that cassava leaves and dried red bean intake, rich in antioxidants, were protective factors against MetS presence, while females, high socioeconomic status, and physical inactivity were independent risk factors for MetS.¹⁹

SKIN DISEASES AND CUTANEOUS INFECTIONS

Africa is blessed with a tropical environment, and skin infections are very common. Treatment of skin infections is often prescribed by laypeople who are knowledgeable in the use of herbs for skin care. Rashes and scabies are usually ascribed to bewitched farmlands, poisonous plants, and sometimes malicious magic or juju from one's enemy. Sometimes, physical causes such as worms, histamine, and fungus are recognized, and the patient is treated with herbs only. The following plants are the most frequently prescribed herbs for the treatment of skin diseases:

<i>Acalypha ornata</i>	<i>Pentas longijlora</i>
<i>Cardiospermum africana</i>	<i>Polygala erio</i>
<i>Cardiospermum halicacabum</i>	<i>Pseudovigna argentea</i>
<i>Crabbea velutina</i>	<i>Rhus vulgaris</i>
<i>Croton macrostachys</i>	<i>Rhynchosia viscosa</i>
<i>Cyphostemma spp.</i>	<i>Ricinus communis</i>
<i>Dorstenia scaphigera</i>	<i>Solanum nigrum</i>
<i>Eleusine coracana</i>	<i>Spathodea campanulata</i>
<i>Euphorbia hirta</i>	<i>Synaedenum spp.</i>
<i>Galium spp.</i>	<i>Vismia orientalis</i>
<i>Ludwigia erecta</i>	<i>Withania somnifera</i>

The traditional healers seem to appreciate the contagious nature of certain viral diseases that produce skin rashes and eruptions, such as smallpox, chicken pox, and measles. It was the practice to set aside a "sick bush" or, in some communities, a "bad bush" where such patients were treated. The "isolation center" was usually situated well away from the village, and only one person, usually someone who had already had the disease, was allowed to attend the patient; others were prohibited from the bush. The patient was expected to survive or die in this bush. It was also customary to bury people who died from unknown diseases in the bad bush. The treatment for such viral skin infection consists of giving the patient a certain prescribed diet and applying soothing topical preparations, such as oils, clay, and herbal pastes, to reduce the itching and therefore prevent scratching that could lead to superinfection. In Igboland, measles and chicken pox are also treated by applying a dye made from the fruits of various species of *Rothmania*. The dye gives a very dark pigmentation to the skin and is sometimes applied as a skin decoration.

ARROW AND ORDEAL POISONS

The dreaded arrow and ordeal poisons of Africa have provided modern medicine with some potent therapeutic agents for the fight against diseases. Notable examples are curare, used as a muscle relaxant; ouabain, which is a cardiotonic; ibogaine, used in the treatment of drug addiction; and physostigmine, prescribed for the management of glaucoma. Although these drugs are

very poisonous, their adoption by Western medicine stresses the narrowness of the dividing line between drugs that cure and poisons that kill. A reexamination of the witch doctors' potions and poisons for possible new drugs has become necessary. The ordeal and arrow poison plants are highly prized in African societies. Their composition and methods of preparation are closely guarded secrets, and in some cults, revelation of the ingredients of such poisons constitutes a vital part of the initiation ceremony.

Perhaps the most widely known traditional doctor, and by far the most notorious, is the "witch doctor." The notoriety of the witch doctors has caused immense harm to the study and understanding of African ethnomedicine. Their practices are the single most important reason for the contempt, and sometimes fear, of traditional African doctors. The witch doctor not only is a diviner of repute but also, as the name connotes, protects his clients from the harmful effects of witchcraft and sorcery. He provides most fetishes and the poisons used in native jurisprudence when the gods fail to deliver justice quickly enough. He adorns himself with colorful regalia of feathers, shells, and other paraphernalia to impress his clients and to assure them of his magical powers. It has been established that hidden among all the feathers, shells, and colored ribbons are plants with demonstrable pharmacodynamic bases of action.

The use of extracts of Calabar bean (*Physostigma venenosum*) by Efik-speaking chiefs (in the Cross River State of Nigeria) in the trial of people accused of witchcraft, sorcery, or murder is well known. The chiefs, known as Obongs, relied on palace medicine men to determine the effective dose of the potions. It is believed that the poison kills only the guilty and spares the innocent. This trial by ordeal was effective because of the nature of the chemical constituents of the plant: The alkaloids of Calabar bean when taken slowly (i.e., hesitantly by a guilty person) are absorbed into the bloodstream, and death follows before long; when gulped down quickly (as expected of the innocent), the drug soon causes emesis and is vomited before it exerts its lethal effect. In some parts of Africa, judgment is declared in favor of a disputant who is courageous enough to accept an ordeal poison whether or not the disputant lives or dies, the rationale being that a person who is prepared to go through such an ordeal must be very desperate and has already paid the highest price through demonstration of courage.

Among the Mano and Ekpelle tribes of Liberia, witches are exposed by forcing them to partake of a communal meal. The ordeal is usually executed by four naked men under the eaves of a house on a rainy day. The four men are assigned specific duties: one keeps the blacksmith bellows going to preserve the sacred fire throughout the ordeal; the second beats the sacred metal gong; another man takes care of a huge calabash of cooked rice, taking a morsel of it, dipping it into another vessel containing chicken cooked in a soup with herbs, and handing it to each person as the person comes up. The entire village, sections, or families take part in this ordeal, depending on the extent of the accusation. As in other parts of Africa, pregnant women are exempt from partaking of such meals. They may, however, give the chief medicine man a personal token or representative symbol (usually a bracelet, hairpin, or body ornament), which is dipped into the medicine and given back to the pregnant woman. There is a general sense of relief and subdued cheerfulness after the ordeal, but tension and anxiety permeate the land in the knowledge that someone will die the next day or two after the meal. It is not certain how this works, but it has been suggested that the medicine man could slip a bit of poison into any of the morsels handed out. Another method of trial by ordeal is the "hot or cold magic." A mixture made from freshly powdered roots of herbs is given to suspected witches or accused murderers a day before the ordeal. On ordeal day, two pots of water are carefully balanced on a stone cooking tripod. One of the pots is heated to the boiling point, and the other is kept cold. The accused persons are flogged lightly with palm fronds (plumes of a palm tree) dipped into the pots. An innocent person, even a child, finds both pots cold, but a guilty person is scalded by the contents of both pots. It is very difficult to understand how this works except if one accepts the metaphysical explanation of the ordeal.

ADAPTOGENS

Adaptogens are substances, usually of plant origin, that help the body to adapt to arduous environmental conditions by normalizing physiological processes in times of increased stress and could induce a state of nonspecific increase of resistance to effect internal homeostasis. Although the term has not yet been widely accepted in medicine, the properties of a typical adaptogen are well known. Brekhman and Dardymov²⁰ have, in a series of studies, reported that some plant-derived compounds, named adaptogens, show a demonstrable ability to improve the human response to physical, chemical, and psychological stress. Adaptogens can be viewed as tonics and are prescribed to enhance vitality; they are indicated when stress levels are high, during convalescence after or at difficult events in life. These drugs either reduce stress reactions in the alarm phase or retard/prevent the exhaustion phase and thus provide a certain degree of protection against long-term stress. Adaptogenic drugs are often difficult to differentiate from immunostimulators, anabolic drugs, nootropic drugs, and tonics since they also increase concentration, performance, and endurance during fatigue.

The following definition has been suggested to characterize adaptogens:²¹

- a. The adaptogenic effect is nonspecific in that the adaptogen increases resistance to a very broad spectrum of harmful factors ("stressors") of different physical, chemical, and biological natures;
- b. An adaptogen is to have a normalizing effect, that is, it counteracts or prevents disturbances brought about by stressors; and
- c. An adaptogen must be innocuous to have a broad range of therapeutic effects without causing any disturbance (other than very marginally) to the normal functioning of the organism.

It has now been established that stress and stress-related disorders are a significant cause of disease in modern times, with an estimated 75% of all illnesses modulated by stress.²² Stress has been postulated to be involved in the etiopathogenesis of a diverse variety of diseases, including from psychiatric disorders such as anxiety and depression; immunosuppression; endocrine disorders, including diabetes mellitus; male sexual dysfunction; cognitive dysfunctions; peptic ulcer; hypertension; and ulcerative colitis.²³ Apart from influencing activities of the pituitary-adrenal axis and inducing stress proteins, many adaptogens also possess immunomodulatory or anabolic activities.

A small number of plant drugs have been reported with proven antistress activities; they include *Ginseng*, *Eleutherococcus*, *Withania*, *Ocimum*, *Rhodiola*, and *Codonopsis*. Some African plants used in the traditional management of physiological stress and broad-spectrum biodynamic activities have also been shown by laboratory studies to possess adaptogenic properties. The major ones include the following:

Alchornea cordifolia
Allium sativum
Asparagus africanus
Cocos nucifera (virgin coconut oil [VCO] and tender coconut water)
Ganoderma lucidum (fungus on oil palm tree)
Garcinia kola
Mondia whitei
Morinda lucida
Moringa oleifera
Ocimum gratissimum
Trigonella foenum-graecum seeds
Withania somnifera

The molecular mechanisms of action of adaptogens have not been well mapped out, but it is believed that they are partially associated with the hypothalamic-pituitary-adrenal (HPA) axis, a

part of the stress system that also contributes to the nervous, cardiovascular, immune, gastrointestinal, and endocrine systems. The involvement of cortisol, nitric oxide, stress-activated protein kinase JNK, and forkhead box O transcription factor (DAF-16) in stress-protective effects of adaptogens have been established by several reported studies.²⁴ It has been suggested that increased tolerance to stress induced by an adaptogen is associated with its stimulation of expression of Hsp70 and particularly with Hsp72 production and release into systemic circulation, which is known as a mediator of stress response involved in reparation of proteins during physical load.²⁵ Exposure to physical or psychological acute stressors stimulates the release of endogenous Hsp72 into the blood, and this elevated Hsp72 functions to facilitate innate immunity in the presence of bacterial challenge. It is on these heat shock proteins or molecular chaperones that adaptogens exert their activities. The molecular chaperones are a group of proteins that promote correct three-dimensional folding of other proteins, prevent their aggregation, and assist in refolding of misfolded proteins, which are the main contributors to many devastating human diseases.

The selection of the African herbs listed as adaptogenic was based on their activity on the rat forced swimming test assay, dynamic and statistical load tolerance, and the broad-spectrum biological activities of the herbs against multiple disease models.

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Agasthosma ovata



Agave



Alchornea floribunda



Annona muricata



Astragalus membranaceus



Baphia nitida



Bersama abyssinica



Buchholzia coriacea



Cassia angustifolia



Cassia alexandrina 9047



Cassia alexandrina 40035



Cinchona officinalis



Cnestis ferruginea



Coleus forskohlii



Crescentia cujete



Dracaena mannii



Enantia chloranta



Gloriosa superba



Harungana madagascarensis



Hoodia gordonii



Hyptis suaveolens



Kalanchoe pinnata



Landophia dulcis Kassafollay



Morinda citrifolia



Newbouldia laevis



Pelargonium sidoides



Scutellaria barbata



Senna alata



Spathodea capanulata



Spathodea campanulata



Sphenocentrum jollyanum



Spondias mombin



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Syzygium aromaticum



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With over 50,000 distinct species in sub-Saharan Africa alone, the African continent is endowed with an enormous wealth of plant resources. While more than 25 percent of known species have been used for several centuries in traditional African medicine for the prevention and treatment of diseases, Africa remains a minor player in the global natural products market largely due to lack of practical information. This updated and expanded second edition of the **Handbook of African Medicinal Plants** provides a comprehensive review of more than 2,000 species of plants employed in indigenous African medicine, with full-color photographs and references from over 1,100 publications.

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