دانشگاه علوم پزشکی و
خدمات بهداشتی درمانی ایران

مؤسسه مطالعات تاریخ پزشکی طب اسلامی و سنتی
تابستان ۱۳۹۶

کتاب

داروهاي معدني

در طب سنتي

Mineral Drugs used in Ayurveda and Unani Medicine

دوره‌ٔ سوم

مشخصات کتاب :

نام کتاب : داروهای معدنی در طب سنتی

Mineral Drugs usedin Ayurveda and Unani Medicine

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تاریخ تألیف : ۲۰۰۸ میلادی

نسخه مادر : کتاب موجود در کتابخانه مؤسسه مطالعات تاریخ پزشکی طب اسلامی و مکمل

دیباچه : دکتر محمد مهدی اصفهانی

ناشر : مؤسسه مطالعات تاریخ پزشکی، طب اسلامی و مکمل دانشگاه علوم پزشکی ایران با تشکر از همکاری های ارزنده آقای دکتر امیرمهدی طالب

تاریخ نشر : اردیبهشت ماه ۱۳۸۸

شماره نشر : ۶۵ دوره سوم

شماره انفرادی کتب : ۱۲۱

نوبت نشر : یکم

شمارگان : ۱۰۰ نسخه

بالتج بالمغشه :

بسمه تعالی

سخن کوتاه درباره کتاب داروهای معدنی در طب سنتی

کتاب حاضر مجموعه ای ارزشمند از اطلاعات علمی درباره داروهای معدنی است که در طب سنتی هند (طب آیورودا) و طب سنتی ما (که متاسفانه در هندوستان بلحاظ برخی ریشه های سیاسی تاریخی هنوز طب یونانی نامیده می شود) مورد استفاده قرار می گیرد.

در این کتاب طبقه بندی و فرمولاسیون داروهای معدنی، تهیه کشته جات در طب آیورودا و کشته جات در طب سنتی ما (طب یونانی) ، استانداردهای فیزیکوشیمیائی داروهای بامنشأ کانی ، نمونه تحقیقات انجام شده طی ۵۰ سال فعالیت های علمی دانشگاه همدرد و تشکیلات وابسته به آن و پیش بینی آینده کاربرد داروهای معدنی در دو شاخه طب سنتی یاد شده و بالاخره ضمائم ارزشمندی که برای محققین دسترسی به اطلاعات موجود در کتاب را تسهیل می کند ملاحظه می شود.

نویسندگان این کتاب vohora از دپارتمان مواد شناسی و سم شناسی دانشگاه همدرد دهلی نو و محمد اطهر از دپارتمان در ماتولوژی دانشگاه کلمبیای نیویورک می باشند. بنظر رسید اینک که با فعالیت های آموزشی در مقطع Ph.D در دو رشته طب سنتی و داروسازی سنتی دسترسی به منابع متنوع و بخصوص مبتنی بر شواهد علمی – تجربی بیشتر احساس می شود تکثیر این کتاب در شمارگان محدود گامی در جهت غنابخشیدن به منابع کتابخانه ای باشد./

Mineral Drugs

Used in Ayurveda and Unani Medicine

FOREWORD

The important role played by trace metals like copper, zinc and selenium has only recently been highlighted in the allopathic system of medicine both for prevention and for treatment of disease. However, mineral drugs have been in use for many generations in the Ayurvedic and Unani systems of medicine. It is entirely appropriate and very timely, at a time when holistic health care is gaining more importance both nationally and globally that Dr. S.B. Vohora and Dr. M. Athar have written this exhaustive treatise on "Mineral Drugs used in Ayurveda and Unani Medicine". The authors are to be congratulated for collecting the vast compendium of knowledge available and bringing it out in a clear, simple and focussed manner. There is at the moment no other comprehensive book on minerals used in Ayurveda and Unani medicine which captures all aspects of use of these minerals. This book methodologically goes through the methods of preparation, the pharmacological and thereapeutic uses, the dose of the bhasmas used and other details, wherever available in standardized format. Support is provided to the text in the form of one hundred and twenty four texts quoted in the book. A very useful and practical addition to the book delineates which bhasmas are available on the market, for what use and the pharmaceutical house which produces it.

The sheer quantum of information available is very impressive and this is complemented by the insights provided by the authors in the concluding section on future prospects. The book would be of immense value of research workers in all systems of medicine, to teachers and scholars in the traditional system of medicine. Ayurveda and the Unani system of medicine – to the government, just at the moment preparing the Eleventh Five Year Plan, to international and reserved agencies supporting research in these fields and to individual research workers. A tremendous amount of valuable knowledge has been gathered together in one book – for this the authors are to be congratulated.

New Delhi

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and
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PREFACE

Principal Indian systems of medicine (Ayurveda, Siddha and Unani-Tibb) use natural products (plants, animals and minerals) as drugs. The medicinal plants have received considerable attention of the scientific community as also of the general public. Several institutions and government funding agencies are involved in this activity. The other two categories of natural products have not received the requisite attention. Even the documentation of claims for mineral origin drugs is inadequate. Original Sanskrit/ Arabic/Persian sources are not easily accessible to most Indian practitioners, academicians and researchers necessitating a comprehensive book. The present volume is intended to fulfill this need. It covers all aspects of the subject: historical aspects, classification, single drugs, compound formulations, calcined metal preparations (*Bhasmas* and *Kushtas*), standardization and a review of research carried out in this area during the last 50 years. There is global interest in alternative therapies and trace elements. Many useful leads suggest that: (a) too much apprehension about mineral/metallic drugs may not be justified and (b) there is immense potential of development of drugs from this relatively untapped source.

This book was written with the support from a project awarded to one of the authors (SBV) by the Department of Science and Technology, Government of India, New Delhi. Many persons helped in this venture through valuable advice, useful information, publications, photographs and facilities. We are specially indebted to Ms Sadia Rashid, President, Hamdard Foundation, Karachi, Pakistan, Dr SK Sharma, Advisor (Ayurveda), Department of Indian Systems of Medicine, Dr GS Lavekar, Director, Central Council for Research in Ayurveda and Siddha, Dr M Khalid Siddiqui, Director, Central Council for Research in Unani Medicine, Dr EA Khan, Head, Department of Medical Elementology and Toxicology , Jamia Hamdard, New Delhi and Dr BK Shrikhande, Director, Baidyanath Research Foundation, Nagpur. Our students deserve special appreciation for contributing to this volume from their M Pharm (Pharmacology) and Ph D (Toxicology) theses: M/s Kulbhushan Ganotra (1992), Ayesha Nadeem (1999), Sonia Bajaj (1999), Rumana Siddiqui (2000), Gyan Vikash Mishra (2000) and Zahoor Ahmad Shah (2001). Thanks are due to Ms Neda Ashraf for excellent secretarial assistance.

S.B. Vohora
Mohammad Athar

New Delhi

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INTRODUCTION

1.1 NEED FOR STUDIES ON MINERAL ORIGIN DRUGS USED IN INDIAN SYSTEMS OF MEDICINE

There are three principal Indian systems of medicine:

(*i*) Ayurveda
(*ii*) Siddha
(*iii*) Unani-Tibb

All of these systems use natural products (plants, animals and minerals) as drugs. The medicinal plants have received considerable attention of the scientific community as also of the general public. Several institutions and government funding agencies are involved in this activity. The other two categories of natural products viz. animal and mineral-origin drugs have not received requisite attention. This ignored area deserves more scientific attention.

1.2 GLOBAL INTEREST IN ELEMENTS

Study of the role of elements in health and disease has now become a subject of global interest. A lot of work on the essential and toxic functions of major, trace and ultra-trace elements has been done worldwide in the last two to three decades. This has generated tremendous scientific data on the role of elements in human health and disease[1-5]. While the importance of trace elements has gained acceptance in modern medicine only recently, the theory of elements (balanced state representing health and imbalance of constituent elements indicating disease) forms the basis of the Indian systems of medicine since ancient times. Some pioneering work was done at the Institute of History of Medicine and Medical Research and Jamia Hamdard, New Delhi leading to a synthesis of traditional philosophical concepts and modern scientific knowledge with the emergence of Medical Elementology as a new discipline in science[6-9]. It is felt that studies on traditional mineral preparations used in Ayurveda and Unani-Tibb might be very rewarding as at present only meager scientific information is available on the subject.

1.3 MYTH OF GOOD AND BAD ELEMENTS

Ayurveda and Unani-Tibb use even such metals (in calcined forms) for therapy, which are otherwise considered toxic and not used internally in modern medicine eg Arsenic, Mercury, Silver, Lead etc. The toxic effects of heavy metals are well documented. There is a vast body of scientific data on adverse

effects of these metals as also on pollution and growing concern about their ill effects on environment and human health. This, however, gives a one-sided picture as a large number of scientific papers on toxic aspects have overshadowed their essential and/ or therapeutic applications. The bias makes us forget that starting with monocellular microorganisms through plant and animal world up to man, all living species are absolutely dependent on metal salts in their food in order to maintain their life and reproductive capacity. The reason for this can be found in evolutionary development. The first living cell probably developed in a *primeval soup*, which contained, in dissolved state, all elements present in the earth's crust at that period[10]. Fortunately the trend is changing with the discovery of essential functions of even such metals/ metalloids, which were earlier known only for their toxic effects. Two examples are discussed below:

Selenium

This ultra-trace element (total content in human body < 10-20 mg) was known for centuries for its toxic effects only. Epidemiological evidence from China about Keshan's disease and Kaschin-Beck disease changed our outlook on this element. Keshan's disease, which is a cardiomyopathy, affected a total population of about 50 million people. Intensive collaborative research between Chinese, German and American scientists resulted in recognition of extremely low blood Selenium levels in affected population vs healthy subjects. Further encouraging positive results were obtained by mass scale supplementation of the population with Selenium. Similarly Kaschin-Beck disease, a very painful disabling osteoarthropathy, was also attributed to Selenium deficiency[11,12]. Srivastava and Gupta[13] reviewed the role of Selenium in health and disease. This element is an essential component of glutathione peroxidase and has earned good reputation as an antioxidant comparable to Vitamin E. It is now well established that Selenium is required in micro doses for normal physiological function and it prevents many pathological conditions. It may, however, cause toxic manifestations at higher level of intake.

Arsenic

This element, which was considered a *King of Poisons* and used only for homicidal and suicidal purpose, is now known to be a possibly essential element. The evidence for its essentiality in man is, however, not unequivocal. When total Arsenic-free diets were given to experimental and farm animals (rats, minipigs, chicken and goats), it resulted in growth depression, abnormalities in skin, reproductive function and lactation[14,15]. Considerable work has been done on this metalloid in Germany including two International Symposia[16,17] which showed that too much arsenophobia is irrational. In these meeting even such questions were asked: Whether we are getting enough Arsenic in diet?

1.4 THIS MONOGRAPH

At present even the documentation of claims for animal and mineral origin drugs is inadequate. Original Sanskrit, Arabic and Persian sources are not easily accessible. Our earlier publication[18] was devoted to Animal origin Drugs used in Unani medicine. It embodied classified information on these drugs with therapeutic indices. Available information on Mineral origin drugs is insufficient. It is given mostly as a minor section in books with Medicinal Plants occupying the major part of contents[19-25] necessitating a comprehensive compendium in English language. A dispassionate approach on metal drugs is urgently needed to:

(*a*) Unearth useful remedies for varied human ailments.

(*b*) Dispel doubts/ apprehensions about their efficacy and safety.

(*c*) If these drugs are found toxic/ harmful, to enforce discontinuation of their use. This book is intended to be a step towards these objectives.

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MINERAL DRUGS: HISTORICAL ASPECTS

Though bulk of the drugs used in Indian systems of medicine come from plant sources, minerals constitute an important component of traditional therapy. These have been used as : a) Single drugs/Simples and b) Compound drugs/Formulations since ancient times, both for external and internal use. A concise history of the medicinal use of mineral-original drugs is presented in Table 2.1. It dates back to the Vedic period (3000-1000BC) and extends up to the present time (Twenty first Century). No claim is, however, made for the coverage to be exhaustive.

TABLE 2.1 : HISTORY OF MEDICINAL USE OF MINERAL ORIGIN DRUGS

Period[a]	Ancient Text/Source	Mineral Drugs	References[b]
Vedic period 3000 –1000 BC	Rig Veda *Atharva Veda* *Yajur Veda* (Ayurvedic Medicine)	Many mineral-origin drugs have been described in ancient Ayurvedic texts. For example *Daivi Chikitsa*, described in *Atharva Veda*, deals with metallic preparations (including Mercurials) for: a) Preservation/ promotion of positive health and b) Treatment of various diseases. It has a mention of *Trapu Bhasma* (calcined Tin preparation). The *Vedas* describe the use of metals like Iron, Lead, Tin and Gold for good health and longevity. This indicates that metals were being reduced to *Bhasmas* and used for medicinal purposes at that time.	1, 2
1500 BC	Ebers papyrus (Egyptian Medicine)	Bitumen, Copper sulphate, Crude sodium carbonate, Iron, Lead, Magnesia, Nitre, Salt, Vermilon, Precious stones in finely divided form.	3
650 BC	Library of Sardana Palus at Asterbanipal (Assyrian and Babylonian Medicine)	List of drugs similar to that described by the Egyptians. It contains 120 stones and minerals including Bitumen and Alum	3
600 BC	Alchemy	Methods described for processing of Mercury with three-fold objectives:	1,4

Period[a]	Ancient Text/Source	Mineral Drugs	References[b]
		(a) Transmuting it to Gold (b) Prolonging human llife (c) Rejuvenation	
500–300 BC	*Charaka Samhita* (Ayurvedic Medicine)	Description of 64 minerals and metals including Gold, Silver, Iron, Iron rust, Copper, Tin, Lead, Antimony, Mercury, Sulphur, Calcium compounds, Sands, Red Ochre, Salt, Pyrites, Orpiment, Gems and Jewels. The metals were impregnated with herbal juices/ decoctions, dried in sun or shade and pulverized before internal or external use.	1,5,6
500–300 BC	*Sushruta Samhita* (Ayurvedic Medicine)	Medicinal uses of Gold, Silver, Copper, Iron, Tin, Lead, Iron rust etc has been mentioned for internal administration and that of Mercury and Sulphur for external application.	1,6
300 BC	*Artha Shastra* by Kautilya (Ayurvedic Medicine)	Though basically a text devoted to economics, it also mentions metals and gems and describes transmutation of base metals to Gold with the help of Mercury.	1
300 BC	*Pun Tsao* : a 40-volume Pharmacopoeia type book (Chinese Medicine)	*Tsou-yen* is considered the father of Chinese Alchemy. Bulk of the drugs described (240/285) are herbals. The remaining 45 drugs are of animal and mineral origin.	3
80 - 104 AD	Nagarjuna's *Rasaratnakara, Arogya Manjari and Kakasputa* (Ayurvedic Medicine)	Metals and metalloids were rarely used in ancient Ayurvedic medicine. These were largely introduced by Nagarjuna who developed the art of *Bhasma* formation and invented *Kajjali* (a compound of Mercury and Sulphur). He promoted the *Rasa* school with two main streams: one mainly alchemic (*Dhatu Vidya*) and the other chiefly therapeutic (*Rasa Chikitsa*)	3,7-9
200-300 AD	Vagbhatta's *Astanga Hridaya* and *Astanga Sangrah* (Ayurvedic Medicine)	Compilations from mutilated/ damaged texts (*Charaka and Sushruta Samhitas*). These contain several remedies of mineral/ metallic origin.	1,2
600 AD	Discorde's Materia Medica (Arab Medicine)	Alphabetically arranged list of drugs include Bitumen, Calamine, White Lead and a number of Sulphides and Sulphates.	3
800 AD	*Ras Hridaya Tantra* by Govinda Bhagvatpada (Ayurvedic Medicine)	Description of processing of Mercury for *Loha Siddhi* (transmutation to Gold) and *Deha Siddhi* (Rejuvenation and Longevity)	1

Period[a]	Ancient Text/Source	Mineral Drugs	References[b]
800 AD	*Chikitsa Kalika* by Tirtacharya (Ayurvedic Medicine)	Metallic *Bhasmas* for the treatment of diseases.	1
600-1100 AD	Discordes, Pedanias, Pliny, Merve, Rhazes and Avicenna (Greco-Arab Medicine)	Mercurials used for external application in cases of syphilis and skin disorders.	10, 11
900-1000 AD	Vranda Madhava Chakrapani (Ayurvedic Medicine)	Treatment of diseases with minerals and metallic preparations (including *Bhasmas*) described.	1
800-1200 AD	*Nighantus* (Materia Medica of Ayurvedic Medicine)	Uses of Arsenic, Antimony, Cinnabar, Copper, Gold, Iron, Lead, Zinc, Mica, Earths (eg Siegellata) and Precious stones (eg Emerald, Ruby, Sapphire) for medicinal purposes.	3
1100 AD	*Ras Ratna Samucchaya* by Vagbhatta	The topics covered in this text include source, preparation and treatment value of *Rasa* (Mercury), *Hingula* (Cinnabar), metals (Gold, Silver, Iron, Copper, Zinc, Tin, Lead, Brass), the *Maharasas* (Mica, Talc, Iron pyrites, Bitumen, Bismuth, Calamine), *Sidharnarasas* (Himalyan mineral dust/ Kampilla, Arsenic, Ammonium chloride, Ambar etc) Precious stones and Treatment of diseases. Special focus is given to treat senility, physical and sexual debility by *Rasayana* (rejuvenation) and *Vajikarna* (Enhancing virility) therapy. *Yantras* (Alchemical apparatus) and *Rassadhana Shala* (Alchemical laboratory) are also described.	7,8
850-923 AD	About 250 books authored by Rhazes. Most famous among these was *Alhavi Kabeer* (Arab Medicine)	Many mineral drugs described.	3,12
980-1037 AD	Avicenna's *Al Qanoon Fil Tibb* (Arab Medicine)	It was considered the most authoritative work and used by European Universities till as late as 1650AD. The book described 719 drugs, which include many drugs of Mineral origin. Gilding and Silvering of pills was introduced during this period.	3,11
980-1037 AD	Avicenna's *Al-Adwiyat Al-Qalbial* Tract on Cardiac Drugs (Arab Medicine)	7/63 drugs listed are Mineral drugs: Coral, Armenian Bole, Ruby, Sealing Clay ,Yellow Amber, Pearl, Ambergris, Silver and Gold.	13

Period[a]	Ancient Text/Source	Mineral Drugs	References[b]
1197-1248 AD	*Ibn-al-Baitar's Jamat-al-Mufradat* translated in English and French languages (Arab Medicine)	Bulk of the drugs described are Herbals. Only 300/2000 drugs come from of Mineral and Animal origin.	3,11
1300 AD	*Rasendra Chintamani* by Dhunduka Nath, *Rasendra Sara Sangraha* by Gopal Krisna Bhatt and *Dhatu Ratna Mala* by Devadutta (Ayurvedic Medicine)	These books give extensive description of Metal/ Mineral/ Gem-origin drugs with traditional processes.	1
1400 AD	*Sharanghdar Samhiata* (Ayurvedic Medicine)	Medicinal uses of metals and minerals like Iron, Copper, Gold, Silver, Mercury, Sulphur, Lead, Antimony Pyrites, Mica, Realgar, Orpiment, etc.	1,14,15
1500 AD	*Rasa Sanketa Kalika* by Camunda. *Rasa Pradeepipa* by Pran Nath, (Ayurvedic Medicine).	Uses of several metallic preparations described for therapeutic purposes. Toxic metals e.g. Mercury and Sulphur mixed with opium.	1,6
1500-1600 AD	*Bhavprakasha Nighantu* by Shri Bhava Mishra	Description of many metallic preparations and *Bhasmas*	16
1600 AD	*Rasa Tantra* (Ayurveda and Siddha)	Description of a large number of remedies used in North and South India	15
1600 AD	*Dhatu Kriya* and *Dhatu Manjari* (unknown author), *Yoga Ratnakara* by Bhikshu Mayur Pada, *Ayurveda Prakash* by Madhav Upadhyaya (Ayurvedic Medicine)	These works describe use of metallic preparations for *Lauha Siddhi* (transmutation to gold) and *Deha Siddhi* (Promotion of health, Treatment of diseases and Longevity).	1
1700-1800 AD	*Bhaishajya Ratnavali* by Govinda Dasa, *Brahat Rassaja Sundara* by Datta Ram Chaubey (Ayurvedic Medicine)	Use of Mercurials and Metalic preparations for treatment of diseases.	1
1771 AD	*Makhzanal Advia* (Persian) by Hussein (Unani Medicine)	Cowrie, Coral, Sponge, Sea shells, Conch and their *Kushta* preparations described with medicinal properties and uses.	17

Period[a]	Ancient Text/Source	Mineral Drugs	References[b]
1877 AD	The Materia Medica of the Hindus by Dutt (Ayurvedic Medicine)	Part I contains a detailed section on Inorganic Materia Medica. It covers information on Sulphur, Mercury, Arsenic, Orpiment, Realgar, Iron, Gold, Silver, Copper, Brass, Tin, Zinc, Lead, Galena, Mica, Alum, Borax, Lime, Salt, Soda, Ash, Diamond, Coral and Shilajit.	18
1924 AD	*Miftah-ul-Khazayin* by Kariam Baksh (Unani Medicine)	*Kushtas* of Alum and Ruby with methods of preparation, medicinal properties and therapeutic uses.	19,20
1953 AD	*Vaidya Yoga Ratnavali* (Ayurvedic Medicine)	Methods of preparing *Bhasmas* and *Sindoors* and their therapeutic uses.	21
1954 AD	Materia Medica by Nadkarni (Ayurvedic and Unani Medicine)	Volume 2 of this book has an elaborate section on 58 drugs from Mineral Kingdom.	22
1955 AD	*Kitab-ul-Advia* (Urdu) by Kabeeruddin (Unani Medicine)	Medicinal uses of Conch, Cowrie, Oyster shell, Coral and Sponges.	23
1961 AD	A Survey of Drugs by Waheed and Siddiqui (Unani Medicine)	Contains information on: a) Historical aspects on the use of Herbal, Animal and Mineral-origin drugs in ancient texts, b) Lists 39 Mineral-origin drugs, and c) Therapeutic index	3
1967 AD	*Bayaz-e-Kabeer* by Karimuddin (Unani Medicine)	*Kushtas* of Brass, Iron and Lead with methods of preparation and medcinal uses	19,24
1969 AD	Hamdard Pharmacopoeia of Eastern Medicine by Said (Unani Medicine)	*Kushtas* discussed with methods of preparation, pharmacological properties, medicinal uses and 39 Unani recipes for their tablets.	25
1981 AD	Aryan Medical Science by Sinh Jee (Ayurvedic Medicine)	Mineral/metal drugs, History, *Bhasma* formation, methods for oxidation, purification, properties, therapeutic uses for Gold, Silver, Copper, Tin, Lead Zinc, Iron, Mercury, Precious stones etc. *Yantras* (apparatuses) described in details with figures.	26
1982 AD	Indigenous Drugs of India by Chopra and associates (Ayurvedic Medicine)	Chiefly deals with Medicinal Plants but the book has a section on mineral origin drugs with description of *Bhasmas*	27
1985 AD	Encyclopedia of Indian Medicine by Rao (Ayurvedic Medicine)	Historical aspects discussed with alphabetically arranged notes on ancient physicians and their works	8

Period[a]	Ancient Text/Source	Mineral Drugs	References[b]
1986 AD	Alchemy and Metallic Medicines in Ayurveda by Dash (Ayurvedic Medicine)	It gives detailed information on Single drugs and Compound formulations containing mineral/metallic ingredients with methods of preparation and uses for the treatment of various diseases.	1
1989 AD	Medical Elementology: Practical Applications by Hamdard and Vohora	Contains 100 examples of diagnostic and therapeutic uses of mineral elements.	28
1994-1995 AD	*Rastarangini* (Hindi) by Shastri and *Sarangdhar Samhita* (English) by Murthy (Ayurvedic Medicine)	Translated versions of original Sanskrit texts give an account of the use of Mineral drugs and *Ras Shastra*.	14,29
2001 AD	National Formulary of Unani Medicine by the Department of Indian Systems of Medicine	Incorporates authentic information on herbal and metallic drugs with properties and therapeutic uses as also Glossaries of technical terms.	19

(*a*) The dates are only approximate; there being considerable variation of opinion about the dates and persons. For example the dates given for Nagarjuna I/ *Bhikshu* (100 AD) Nagarjuna II/ *Siddha* and Nagarjuna III/ *Bhadanta* (500 AD) and Vagbhatta I (100 AD), Vagbhatta II (300 AD) vary widely.

(*b*) Besides the references cited in Column 4, Charts displayed in the Museum of History of Medicine at Jamia Hamdrad were also consulted.

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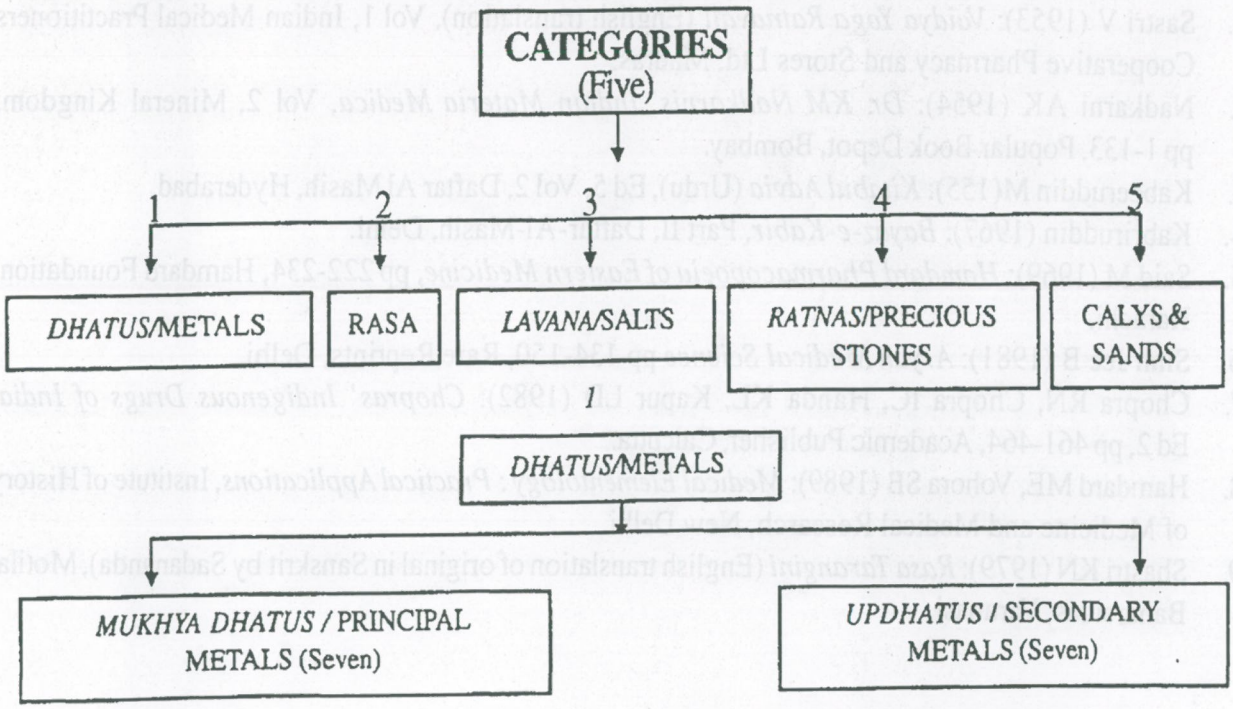
3

CLASSIFICATION

Drugs of Mineral origin, have been variously classified in the Indian systems of medicine. Many workers[1-4] described an elaborate classification of such drugs used by Ayurvedic physicians. A brief summary (with examples for different categories of mineral drugs) is presented in Table 3.1.

TABLE 3.1: CLASSIFICATION OF AYURVEDIC MINERAL DRUGS[1,4]



(i) *SUVARNA* (GOLD)
(ii) *RAUPYA* (SLIVER)
(iii) *TAMRA* (COPPER)
(iv) *BANGA* (TIN)
(v) *SISAKA* (LEAD)
(vi) *YASHADA* (ZINC)
(vii) LAUHA (IRON)

(i) *SUVARNAMAKSHIKA* (YELLOW PYRITES)
(ii) *TARAMAKSHIKA* (WHITE PYRITES)
(iii) *TUTTHA* (COPPER SULPHATE)
(iv) *KANSYA* (BRASS)
(v) *REETI* (CALCINED ZINC)
(vi) *SINDOOR* (RED OXIDE OF LEAD)
(vii) *SHILAJITA*

*Secondary metals contain the principal metals or their compounds and possess properties of the component metal to a lesser degree

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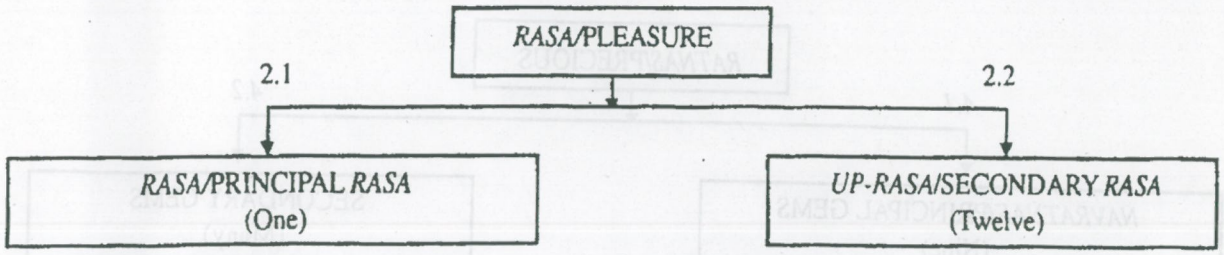


(*i*) *PARADA* (MERCURY)

(*i*) *GANDHAKA* (SULPHUR)
(*ii*) *HINGULA* (RED SULPHIDE OF MERCURY)
(*iii*) *ABHRAKA* (MICA)
(*iv*) *MANASHILA* (BISULPHIDE OF ARSENIC)
(*v*) *TALAKA* (TRISULPHIDE OF ARSENIC)
(*vi*) *TANKANA* (BORAX)
(*vii*) *RAJAVARTA* (LAPIS LAZULI)
(*viii*) *CHUMBAKA* (LOADSTONE/MAGNET)
(*ix*) *SPHATIKA* (ALUM)
(*x*) *KASISA* (IRON SULPHATE)
(*xi*) *RASAKA* (ZINC CARBONATE)
(*xii*) *BODARA* (LITHARGE)

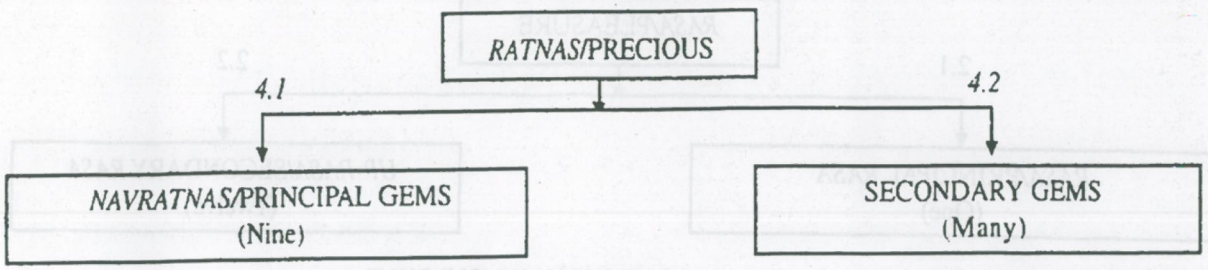
3

LAVANA/SALTS

(More than Twenty)

(*i*) *NAVASADARA* (AMMONIUM CHLORIDE)
(*ii*) *SAINDHAVA* (ROCK SALT/SODIUM CHLORIDE)
(*iii*) *PAMSHUJAKSHARA* (POTASSIUM CARBONATE)
(*iv*) *YAVAKSHARA* (SODIUM BICARBONATE)
(*v*) *SORAKA/SURYAKSHARA* (POTASSIUM NITRATE)
(*vi*) *BIT* (BLACK SALT)
(*vii*) *SAURAVCHALA* (SONCHAL SALT)
(*viii*) *SAMUDRA/KARACH* (SUN-DRIED SEA SALT)
(*ix*) *SAMBRA* (SAMBAR-LIKE SALT)
(*x*) *AUDBIDHA* (A SALINE EFFERVESENCE ON *REH* LANDS)
(*xi*) *PANSUJA* (SALT OBTAINED FROM SALINE EARTH)
(*xii*) *JANGALA* (COPPER SUB-ACETATE)
(*xiii*) *MANDURA* (HYDRATED OXIDE OF IRON)
(*xiv*) *PASHANBHEDA* (CARBONATE OF IRON AND LIME)
(*xv*) *YASHADPUSHPA* (ZINC OXIDE)
(*xvi*) *RAS-SINDURA* (MERCURY SULPHIDE)
(*xvii*) *RAS-KARPOORVA* (CORROSIVE SUBLIMATE)
(*xviii*) *SANKHAVISHA* (ARSENIOUS ACID)
(*xix*) *USHARA* (SALINE EARTH)
(*xx*) *SARAVAKSHARA* (MIXED ASHES OF SEVERAL PLANTS)
+ Many more

4



(*i*) *HEERAKA/HEERA* (DIAMOND)
(*ii*) *MANIKYA/PADMARGA* (RUBY)
(*iii*) *INDRANILA/NILA* (SAAPHIRE)
(*iv*) *GARUTMAT* (EMERALD)
(*v*) *PUSHPARAGA* (TOPAZ)
(*vi*) *GOMEDA* (ONYX)
(*vii*) *VAIDURYA* (CATS EYE)
(*viii*) *MAUKTIKA/MOTI* (PEARLS)
(*ix*) *PRAVALA/VIDRUMA* (CORALS)

(*i*) *SURYAKANTA* (SUN STONE)
(*ii*) *CHANDRAKANTA* (MOON STONE)
(*iii*) *SPHATIKA* (CRYSTAL)
(*iv*) *HARIT-SHYAMA* (TURQUOISE)
(*v*) *KANCHA* (GLASS) etc.

5

CLAYS AND SANDS

(Many)

(*i*) *KHATIKA* (CALCIUM CARBONATE)
(*ii*) *KARDAMA* (ALUMINUM SILICATE, HYDROUS)
(*iii*) *GOPICHANDAN* (ALUMINUM SILICATE, ANHYDROUS)
(*iv*) *SIKATA* (SILICA)
(*v*) *GAIRICA* (RED OCHRE) etc.

Mineral drugs have also been classified according to their physico-chemical character and the methods of processing and usage (alone or in combination with other drugs) as:

(*a*) Single Drugs
(*b*) Compound Formulations.

Bhasmas have been classified on the basis of dominent metal mineral as follows[5]:

(*a*) *Rajata* group (Silver)
(*b*) *Tamra* group (Copper)
(*c*) *Loha* group (Iron)
(*d*) *Praval* group (Shells) etc.

Often there are more than one metal/mineral ingredients in a *Bhasma*. For example *Trivang Bhasma* contains three metals viz., Lead, Tin and Zinc; hence the name.

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4

SINGLE DRUGS

Metals/minerals are not generally used as single drugs and are mostly processed (*killed/purified*) before being used for therapeutic purposes. Polypharmacy is generally practiced in the traditional medicinal systems (Ayurveda, Siddha and Unani-Tibb). Most of the Herbal, Mineral and Animal-origin drugs are used as compound formulations. Some commonly used Mineral/Metallic drugs, alongwith their pharmacological properties and medicinal uses, are listed in Table 4.1.

TABLE 4.1: SOME COMMONLY USED MINERAL ORIGIN DRUGS[1-9]

(Used as Single Drugs and as an Ingredient of Compound Formulations)

S.NO.	AYURVEDIC/UNANI/ VERNACULAR NAME	ENGLISH NAME/ CHEMICAL COMPOSITION	MEDICINAL PROPERTIES/ THERAPEUTIC USES/ REMARKS
1.	ABHRAQ/KABUBULARS	Mica/Talc/Aluminium silicate and Iron	Four varieties: *Pinaka* (White), *Naga* (Pink/Red), *Mandura* (Yellow) and *Vajra* (Black); the black variety is used in medicine. It is attributed with astringent, gastric protective, alterative, restorative, metabolic stimulant, tonic, rejuvenating, aphrodisiac and mild disinfectant propreties. It improves intellect, complexion, eye sight and lustre of hair, gives strength to the body, and is therapeutically useful in acid dyspepsia, gastritis, gastric ulcers, diarrhoea, dysentery, diabetes, urticaria, giddiness, bronchial asthma, edema, chronic fevers, anemia, general nervine and sexual debility, and for longevity. Other varieties of Mica are not therapeutically useful and may

S.NO.	AYURVEDIC/UNANI/ VERNACULAR NAME	ENGLISH NAME/ CHEMICAL COMPOSITION	MEDICINAL PROPERTIES/ THERAPEUTIC USES/ REMARKS
			even produce adverse effects eg. chest pain, anemia and skin diseases including leprosy
2.	*AQEEQ SURKH/AKIKA*	Red Agate/Silica	It is aphrodisiac and claimed to be useful in *Rakta Pitta* (bleeding from different parts of the body), urinary calculi and diseases of the teeth, gums and heart.
3.	*CHUNA/ASHAK*	Slaked Lime/ Calcium hydroxide	Antacid, irritant and caustic properties. Local application is useful in cases of inflammatory swellings, tumours, warts, distressing irritation of genital organs, syphilitic ulcers, leucorrhoea and small pox. Internally, it is used mostly in the form of lime water for the treatment of dyspepsia, acid eructations, heart burn, diarrhoea, vomiting (even black vomit associated with yellow fever and pyrosis), poisoning by mineral acids and to some extent in diabetes and consumption. Lime water may be diluted with milk or mucilage for use in children.
4.	*DARCHIKNA*	Compound of Mercury and Arsenic	Deodorizer. Useful in syphilis
5.	*GAIRIKA/GIL-I-SURKH/ TEEN-I-RUMI/ GERUMITTI*	Red Ochre/Red Earth/ Silicate of Aluminium and Iron oxide	Two varieties: *Pasana* (Hard) and *Svarna* (Soft); the latter is preferred for medicinal use. It is astringent, cooling, water absorbant, antispasmodic and depressant to the uterine muscle. It is mosly used by local application in burns, boils, urticaria, pustular eruptions, sore mouth, bleeding and itching. Internal use is rare (except as an ingredient of compound formuations) in cases of vomiting, hiccup, burning syndrome, urinary tract and venereal diseases.
6.	*GANDHAK/KIBREET*	Sulphur	Four varieties: Yellow (for internal

S.NO.	AYURVEDIC/UNANI/ VERNACULAR NAME	ENGLISH NAME/ CHEMICAL COMPOSITION	MEDICINAL PROPERTIES/ THERAPEUTIC USES/ REMARKS
			use in combination with Mercury). White (inferior to yellow variety, so preferred for external application), Red and Black (Sublime Sulphur). Sulphur has a bitter, astringent taste and a peculear strong smell. It possesses germicidal, insecticidal, parasiticidal, alterative, tonic, cholagogue, diuretic, laxative (purgative in large doses), dia phoretic, expectorant, antipyretic and blood purifying properties. It is used for external application in cases of skin diseases, as a deodorizer and disinfectant fumigant and internally for the treatment of varied ailments including skin diseases, asthma, bronchitis, anemia, habitual constipation, hemorrhoids, prolapse etc. It is *Yoga Vahin* i.e. it enhances the properties of other drugs with which it is combined (e.g. Mercury). Internal use is advised in combination with milk or in the form of sulfurated butter.
7.	*GHERU MITTI/GIL-I-ARMANI*	Armenion Bole/Silicate Aluminium, Magnesium and Iron oxide	Astringent, refrigerant, absorbant and antiseptic properties. Paste of Armenian Bole is applied for relief in cases of inflamed and swollen glands, sclerosis of blood vessels, ulcers and for soothing effect on raw surfaces. Powder with cream may be given internally for the treatment of dysentry.
8.	*GODANTI/ GODANTI HARITALA*	Gypsum/ A compound of Calcium and Sulphur (Not an Arsenic compound)	It is useful in cases of chronic bronchitis, asthma, fevers, headache (including migraine) anemia, leucorrhoea, tuberculosis and rickets.
9.	*GOPICHANDAN/ PANI-SOKTA/ SUGANDHA MITTI*	A kind of clay resembling *Multani Mitti*/ Yellow earth (containing	Cooling, absorbant and desicant properties. It is dusted on oozing ulcers and wounds and applied as a paste (formed with rose water)

S.NO.	AYURVEDIC/UNANI/ VERNACULAR NAME	ENGLISH NAME/ CHEMICAL COMPOSITION	MEDICINAL PROPERTIES/ THERAPEUTIC USES/ REMARKS
		Magnesium, Iron and Aluminium)	on the forehead to relieve headache and also for soothing effect on inflamed boils.
10.	*GOROCHNA/ HAZRUL-BAHR/ PEDARU BAZARA*	Bezoar stone/ Serpent stone/ Silicate of Magnesium and Iron	It has astringent, deobstruent and nervine tonic properties and is therapeutically useful in vomiting, diarrhoea and cholera in children, excess salivation, stomatitis and for relief in cases of painful menstruation in women
11.	*HAJR-I-MAQUATES/ CHUMBAK*	Magnet	Antispasmodic
12.	*HARTAL TABQI/ ZIRNIKH-I-SURKH/ LAL HARTAL*	Realgar/ Red Orpiment/ Red Bisulphide of Arsenic	Alterative, tonic, febrifuge, useful in cough, asthma and skin diseases. Local application provides relief in fistulous sores.
13.	*HARTAL WARQI/ ZIRNIKH-I-ZARD/ HARITALA*	Yellow Orpiment/ Yellow Trisulphide of Arsenic	Alterative, aphrodisiac, antiperiodic and rejuvenating properties. Therapeutically useful in a variety of ailments including chronic cough, sinusitis, bronchitis, asthma, chronic fever, gout, fistula, epilepsy, paralysis, skin diseases, syphilis etc.
14.	*HEERAKA/ VAJRA/ HEERA*	Diamond	Yellow variety : strengthening. Black variety : useful in many diseases. Therapeutic value claimed in gastric and urinary disorders, diabetes, anemia, edema, ascietes, asthma, tuberculosis, cancer, nervine and sexual debility, impotency etc. It promotes strength, eye sight, virility and intellect and improves complexion of the skin.
15.	*HINGUL/ SINJIRAPH*	Cinnabar/ Vermilon/ Red sulphide of Mercury	Alterative, digestive, tonic, aphrodisiac, retentive cholagogue and rejuvenating properties.
16.	*HIRA KASIS/ TUTIYA-I-SABZ/ KASISA*	Green Vitriol/ Iron Sulphide	It is attributed with astringent, tonic, hematinic and emenagogue properties and utility in anemia,

S.NO.	AYURVEDIC/UNANI/ VERNACULAR NAME	ENGLISH NAME/ CHEMICAL COMPOSITION	MEDICINAL PROPERTIES/ THERAPEUTIC USES/ REMARKS
			leucoderma, splenic disorders, prolapse of rectum and uterus, sublingual ulcers. thread worm infestation and skin diseases. Though used both externally and by internal administration. the latter may cause gastric irritation.
17.	*JAWAKHAR/YAVAKSHARA*	Salt of Tartar/ Crude Potassium carbonate	Diuretic and lysnotropic.
18.	*KHARIA MITTI/ GIL-I-MAKHTOOM/ KAIKINI MITTI/ MULTANI MITTI*	Clay/ Aluminium Silicate and Iron Oxide	Used as a dusting powder for treating oozing wounds and skin diseases.
19.	*KHARPARA/ RASAKA/ SANG-I-BASARI*	Calamine/ Zinc Carbonate and Silicate with traces of Iron	Used as dusting powder/lotion for astringent, antiseptic and soothing effect in abrasions, wounds and skin diseases. Forms an ingredient of several compound formulations for internal administration to treat chronic fevers, leucorrhoea, gonorrhoea, urinary calculi, tuberculosis, eye diseases and obstinate skin diseases including leprosy.
20.	*LAJWARD/ RAJVARTA*	Lazurite/ *Lapis lazuli*	Stomachic, digestive, antemetic, relieves hiccup, and therapeutically useful in asthma, tuberculosis, urinary disorders and diabetes.
21.	*LAKRI KA KOYALA*	Wood Charcoal/ Medicinal Charcoal	Deodorizer, adsorbant, used as poultice for wounds and ulcers and internally in cases of poisoning.
22.	*LAUHA/ HADIDA/ AHNA/ FAULAD/ LOHA*	Iron	Tonic for the stomach and intestines, dentiferous, hematinic, stimulant for liver and spleen function, aphrodisiac, general tonic and restorative properties. It is useful in a variety of diseases eg. edema, bronchial asthma, anemia, nephritis, diabetes, leucorrhoea, cardiac, hepatic and nervous disorders, and general debility.
23.	*LAVANA/ SAMUDRA/ KARACH/ NAMAK-I-KHURDAM/ NAMAK*	Common Salt/ Sea Salt/ Sodium Chloride	Antiseptic, anthelmintic, caustic, deodorizer, dietetic agent and condiment.

S.NO.	AYURVEDIC/UNANI/ VERNACULAR NAME	ENGLISH NAME/ CHEMICAL COMPOSITION	MEDICINAL PROPERTIES/ THERAPEUTIC USES/ REMARKS
24.	*MANDURAM/ZANG-I-AHANA/ KHABSUL HADEED/ LOHE KA ZANG*	Iron Rust/ Impure Oxide of Iron	Properties and uses are similar to those of Iron. It may. therefore, be substituted for Iron but its use should be avoided in cases of dyspepsia. constipation and febrile conditions.
25.	*MANIKYA/ YAQOOT SURKH/ SONA RATNA*	Ruby/ Red Carborandum	Aphrodisiac. cardiotonic stomachic digestive, metabolic stimulant. and useful for treating cases of hemorrhage impotency and tuberculosis.
26.	*MAUKTIKA/ MUKTA/ MOTI*	Pearl	Digestive stimulant, promotes virility and longevity, improves complexion and eye sight, useful in teething problems in chiidren, chronic fevers, bone, heart and respiratory diseases and tuberculosis.
27.	*NAGA/ MURDAR SANG/ USRAB/SEESHA/SUFAIDA*	Litharge/ Lead carbonate and Lead Oxide	Used externally in the form of an ointment/ plaster/ medicated oil for the treatment of bed sores, protective effect on inflamed parts, ulcers and wounds, syphilitic cancer, acne, freckles, soothing effect in prickly heat and cosmetic uses (depilatory and hair dye). Some Unani preparations of lead are claimed to possess antispasmodic, anticancer and seminal stimulant properties.
28.	*NAVASARA/ ARMINA/ NOSHADAR*	Sal Ammoniac/ Ammonium Chloride	Alterative cooling, blood purifying, expectorent, cholagogue, diuretic, and purgative properties. It relieves hepatic congestion, stimulates mucus membranes, and is useful in cases of catarrh, whooping cough and dropsy.
29.	*NILA THOTHA/ ZAK-I-SABZ/ ZAJUL-AKHSAR/ TUTTHA*	Blue Vitriol/ Copper Sulphate	Astringent, emetic, expectorant, bronchodilator, dentiferous and caustic. Useful in skin diseases, leprosy, leucoderma and for scraping of pus from chronic ulcers. It is generally used for external application in the form of an ointment or paste.
30.	*PARADA/ RASA/ SIMAB/ PARA*	Mercury/ Quick Silver	Most important metal used in Ayurveda. It is considered *Rasa* because it has the power to digest and

S.NO.	AYURVEDIC/UNANI/ VERNACULAR NAME	ENGLISH NAME/ CHEMICAL COMPOSITION	MEDICINAL PROPERTIES/ THERAPEUTIC USES/ REMARKS
			assimilate other metals and minerals e.g. Gold, Iron and Mica. Incorpo rated in several compound formulations; most reputed being *Siddh Makardhwaja*. Mercury purifies blood, increases viscosity of semen, and is attributed with tonic, aphrodisiac, retentive, antisyphlitic and anticancer properties.
31.	*PUTTY/ JIST/TUTIYA*	White Zinc/ Flowers of Zinc/ Zinc Oxide	Astringent, desicant, soothing, healing and anti-tussive properties. Therapeutically useful as an ointment or dusting powder in cases of eczema, excess sweating, bed sores, cracked nipples and other skin diseases. Also used internally for the treatment of cough, asthma and epilepsy.
32.	*RAKH*	Ash	Depilatory
33.	*RASKARPOORVA/ RASKAPOOR*	Sublimed black sulphide of Mercury with Common salt or Rock salt	Antiseptic and deodorizer properties. Claimed utility in cases of cancer and syphilis.
34.	*RAUPYA/ RAJAT/ NUQRA/ FIZZA/ CHANDI*	Silver	Tonic, stimulant, aphrodisiac, seminal stimulant and caustic properties. It is used for removal of warts, asthma, chest affections, irritable bowel syndrome, chronic diarrhoea, heartburn, menstrual problems, sexual debility, cardiac and neuropsychiatric disorders (including insanity).
35.	*SAINDHVA/ SENDHOLAN/ NAMAK-I-SANG/ KALA NAMAK*	Rock salt/ Impure Sodium Chloride	Carminative, digestive, dietetic agent and condiment.
36.	*SANG-I-JERAHAT*	Soap Stone/ Magnesium Silicate	Powerful astringent, desicant, styptic, useful in diarrhoea, dysentery, leucorrhoea, menorrhagia and gonorrhoea.
37.	*SANG-I-RASIKH*	Calcium sulphate	Uterine muscle depressant
38.	*SANG-I-YAHOOD/BADARASMA*	Fossil Encrinite/ Silicate of Lime	Cooling, demulcent, diuretic, and antiemetic properties. Therapeutic claims include utility in renal calculi, dysuria, anuria, gonorrhoea and by

S.NO.	AYURVEDIC/UNANI/ VERNACULAR NAME	ENGLISH NAME/ CHEMICAL COMPOSITION	MEDICINAL PROPERTIES/ THERAPEUTIC USES/ REMARKS
			local application in cases of itching, ringworm and vesicular eruptions.
39.	*SANG-I-YASARA*	Zade	Useful for the treatment of colic, burning micturation, urinary calculi and heart diseases.
40.	*SANGRAF*	Compound of Mercury and Sulphur	Retentive. Useful in syphilis
41.	*SANG-I-JERAHAT/ SANG MAKRAN*	Albaster/ Plaster of Paris/ Hydrated Calcium Sulphate and inflammation of ears.	Antacid, cooling, astringent and healing properties. Useful in fractures
42.	*SANKH VISHA/ SAMMULFAR*	Arsenic	Antiemetic, stomachic, blood purifying, tonic for the heart, nervous and respiratory systems, spleen and sexual function. Used for the treatment of syphilis.
43.	*SHILAJIT/ HAJR-UL- MUSA/ MOMIAI FAQRUL YAHUD*	Asphalt/ Mineral Pitch	Four vareties: Red/ Gold, White/ Silver, Blue/ Copper, and Brown/ Iron. The latter is considered best for therapeutic usc . It is a reputed drug for the treatment of many diseases including diabetes, jaundice, splenic enlargement, urino- genital disorders, sexual debility, renal and gall stones, piles, bronchitis, asthma, neuropsychiatric dorders, menstrual problems, leprosy, eczema, tuberculosis etc. It increases urea and sc should be avoided in patients with uric acid calculi.
44.	*SHORA QALMI/ TEZAB SHORA / ABKAR*	Salt Petre/ Pure Potassium Nitrate	Diuretic, Lysnotsopic and caustic
45.	*SHUDAKSHARA/ SUDHA*	Quick Lime / Calx/ Calcium Oxide	Paste is used for removal of warts and ulcers
46.	*SINDURA / RAKTNAGA*	Red Oxide of Lead	Disinfectant and healing properties. Paste/ Ointment (prepared with *Ghee* or Bee's wax) is applied locally to treat chronic ulcers, eczema, eryseplas, herpes, scabis and also to fascilitate joining of fractured bones

S.NO.	AYURVEDIC/UNANI/ VERNACULAR NAME	ENGLISH NAME/ CHEMICAL COMPOSITION	MEDICINAL PROPERTIES/ THERAPEUTIC USES/ REMARKS
47.	*SPHATIKA/ SHIBB-I-YAMANI/ PHITKARI*	Alum	Astringent, hemostatic, detergent, dentiferous, emetic, caustic and antipyretic properties. Therapeutically used to treat bleeding gums and teeth, stomatitis, ulcers, scabies, eryseplas, sclerosed blood vessels, venereal diseases and hemorrhages. Claimed benefit in cases of malaria.
48.	*SUHAGA/ TINKAR*	Borax	Carminative, digestive, stomachic, antispasmodic and anticonvulsant properties.
49.	*SURMA/ ANJANA*	Antimony	Eye cosmetic/ tonic. Useful in cases of inflamed eyes and cataract.
50.	*SURYAKANTA/ SURYAMANI/ VAHNI GARBHA/ JVALANOPALA*	Sun stone	Antiphlegmatic, strengthening, rejuvenating, and brain tonic properties
51.	*SUVARNAMAKSHIKA/ SONAMUKHI/ RAUPYAMAKSHIKA*	Copper Pyrites/ Iron pyrites/ Compound of Copper, Iron and Sulphur. When iron content is more,it is the *Raupya Makshika* variety.	Antiphlegmatic, strengthening, antianemic and rejuvenating properties. Useful in cases of anemia, piles, obstinate skin diseases (including leprosy), jaundice, and tuberculosis.
52.	*SVARNA/ TILA*	Gold	General tonic, hepatotonic, cardiostimulant, nervine tonic, aphrodisiac, detoxicant, anti-infective, rejuvenating and antiaging properties. It is considered a valuable medicine in Ayurveda and Unani Tibb for a variety of ailments affecting all systems of the human body including infectious diseases, general, nervine and sexual debility, respiratory diseases, looseness of bowels, epigastric pain, loss of memory, leucoderma, impotency, tuberculosis and cancer.
53.	*TAMRA/ NUHAS/ TAMBA*	Copper	Astringent, antiseptic, antispasmodic, and antianemic properties. Therapeutically useful in cases of chronic diarrhoea, cholera, liver disease, colic, gastritis, anemia,

S.NO.	AYURVEDIC/UNANI/ VERNACULAR NAME	ENGLISH NAME/ CHEMICAL COMPOSITION	MEDICINAL PROPERTIES/ THERAPEUTIC USES/ REMARKS
			asthma, bronchitis, tuberculosis and obstinate skin diseases (including leprosy).
54.	*VANGA/ QALAI*	Tin	Digestive and retentive. Useful in urinary disorders, diabetes, cases of premature ejaculation and for improving complexion of skin and viscosity of semen.
55.	*VILAYATI CHUNA/ GIL-I-SAFED*	Chalk/ Marble/ Calcium Carbonate	Antiphlegmatic, antibilious, cholagogue, useful in burns and piles.
56.	*YAQOOT/ AFSAR/ YAQOOT ZARD*	Topaz	Cardiotonic useful in weakness of heart/palpitation.
57.	*YASHADA/ JASTA*	Zinc	Very useful in eye diseases (both internally and externally in the form of collyrium). Claimed utility in a variety of diseases including diabetes, anemia, cough and cold, bronchial asthma, liver, heart and skin disorders.
58.	*ZAMRUD/ TARKSYA/ HARID RATNA*	Emerald	Useful in chronic fevers, anemia, vomiting, asthma, edema and piles.

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5

COMPOUND FORMULATIONS

Compound formulations, used in Aurveda and Unani-Tibb may be broadly classified into the following categories:

1. CALCINED MINERAL PREPARATIONS

1.1 Ayurvedic *Bhasmas*

1.2 Unani *Kushtas*

The present monograph is particularly focussed on this category (Please see Chapters 7 and 8).

2. OTHER COMPOUND DRUGS

Some examples are listed below:

2.1 *Anjan/Surma/Kuhl*

Traditional ophthalmic drugs and eye cosmetics (Table 5.1).

Inspite of the strong of the astringent action of Pb compounds, the Ayurvedic physicians could make intelligent use of this toxic metal for the treatment of inflammatory conditions of the delicate tissue of eye lids and for beautifying eyes. Another metal used as an eye cosmetic and ophthalmic medicine is Sb. It is believed that Ayurvedic *Shodhna* techniques purify/detoxicity Pb and Sb and make them suitable for therapeutic use.

2.2 *Parpati*[2-4]

Disc-shaped mercurial preparations containing Iron, Gold, Copper and Sulphur. The name of these *Rasa* preparations is derived from the method by which flakes of the compound are obtained. Some examples are *Bola Parpati, Loha Parpati, Rasa Parpati, Panchamrit Parpati, Suvarna Parpati, Sweta Parpati, Vijaya Parpati* etc. Descriptions of *Parapati Kalpana* (eg *Rasa Parpati*) are available in Ayurvedic texts since the period of Chakradatta (11th Century AD).

2.3 *Mandura*[2]

These compound preparations contain *Mandura* (Iron dust) alongwith other drugs. *Mandura* are dark in colour with a strong smell of *Gomutra* (cow urine). These should be protected from moisture. Examples: *Punarnavadi Mandura* and *Mandura Vataka.*

2.4 *Lauha*[2]

Lauha Bhasma is the chief ingredient of these medicines. These are in fine powder form, need protection from moisture and have a long shelf life (2 years). *Lauhas*, containing Mercury or its compounds, keep potency indefinitely. Example: *Chandani Lauha, Dhatri Lauha, Pippalyadi Lauha, Pradari Lauha, Putapakva Visamajvarantaka Lauha, Rohitaka Lauha, Sapfamrta Lauha, Sarvajavahara Lauha, Vidanga Lauha, Vidangadi Lauha* and *Yakradari Lauha.*

2.5 *Rasa*

Rasa means pleasure: Their presence in compounds is said to give great satisfaction to the Ayurvedic physicians/ *Vaids*. (Table 5.2)

2.6 *Makardhwaja*

Reputed mercury preparation used in Ayurveda (Discussed with *Ayurvedic Bhasmas* in Chapter 7).

2.7 *Arogyawardhini*

A formulation containing Mercury, Sulphur, Iron, Copper, Mica, Mineral pitch and some Herbs[4,5].

2.8 *Tabasheer*

Though of plant origin, chemically it is a mixture of Silicates and Alkaline Earths[6,7]

TABLE 5.1 : TRADITIONAL OPHTHALMIC DRUGS AND EYE COSMETICS (*ANJAN/ KUHL/ SURMA*)[1,9-14]

S.No.	AYURVEDIC/ UNANI NAME	PRINCIPAL MINERAL INGREDIENT(S)	USES
1.	*KUHL BAYAZ*	Roasted Alum Zinc Oxide Amonium Chloride	(*i*) Opacity (*ii*) Ptergium (*iii*) Xerophthalmia
2.	*KUHL CHIKNI DAWA*	Copper sulphate	(*i*) Cataract (*ii*) Opacity (*iii*) Xerophthalmia
3.	*KHUL GUL KAND*	Roasted Alum	(*i*) Ptergium (*ii*) Sore eyes (*iii*) Xerophthalmia (*iv*) Opacity
4.	*KUHL-JARAB-UL-AJFAN*	Ammonium chloride	(*i*) Conjunctivitis (*ii*) Trachoma
5.	*KUHL-UL-JAWAHAR*	Antimony Sulphide Silver Oxide Copper Oxide Ground Oyster Shell Ground Red Agate Pure Camphor Coral Ruby	(*i*) Eye tonic/ Improves eye sight (*ii*) Prophylactic for eye diseases (*iii*) Helps retention of good eye-sight till the advent of old age

6.	*KUHL ROSHNIA*	Silver Oxide Armenian Salt Copper Oxide Lake Salt	(*i*) Eye tonic (*ii*) Opacity (*iii*) Ptergium (*iv*) Cataract
7.	*KUHL SADAF*	Oyester Shell Roasted Alum	(*i*) Improves eye sight (*ii*) Conjunctivitis (*iii*) Xerophthalmia
8.	*KUHL SHIFA*	Antimony Sulphide Oyester Shell	(*i*) Eye tonic (*ii*) Dim vision (*iii*) Ptergium (*iv*) Xerophthalmia (*v*) Opacity (*vi*) Cataract
9.	*SAUVIRANJANA*	Galena/ Lead Sulphate	(*i*) Improves eye sight (*ii*) Myopia (*iii*) Metropia (*iv*) Conjunctivitis (*v*) Cataract (*vi*) Glaucoma (*vii*) Opacity
10.	*SROTONJANA*	Antimony Sulphate	As for *Sauviranjana*

Note:

(*a*) Some of the recipes contain many herbal ingredients.
(*b*) These drugs are used as very fine powders ensured by sieving through cloth.
(*c*) The drugs are applied to the eye (once or twice daily) using a collyrium stick. The latter should preferably be made of Silver.

TABLE 5.2 : *RASAS* USED IN AYURVEDA[2,13-15]

S.NO.	*RASA*	PRINCIPAL METAL/ MINERAL INGREDIENT(S)	THERAPEUTIC USES
1.	*AGNIKUMARA RASA*	Mica/ Lime	(*a*) Chronic Diarrhoea (*b*) Indigestion (*c*) Splenic Enlargement
2.	*AMLAPITTANTAKA RASA*	Mercury/Mica Iron	Hyperacidity
3.	*AMRITKALPA RASA*	Borax	(*a*) Anorexia (*b*) Dyspepsia (*c*) Indigestion
4.	*ANAND BHAIRAV RASA*	Mercury , Borax	(*a*) High fever due to vitiated *Doshas* (*b*) Infective diarrhea (*c*) Rheumatoid arthritis (*d*) Urinary diseases including calculi

5.	*ASVAKANCUKI RASA*	Mercury, Borax Sulphur	(*a*) Abdominal distension (*b*) Asthma (*c*) Constipation (*d*) Cough (*e*) Fever
6.	*BRHAT GARBHA CINTAMANI RASA*	Mercury, Sulphur, Gold, Silver, Iron, Arsenic, Tin, Mica	(*a*) Leucorrhoea (*b*) Pregnancy problems: burning sensation fever (*c*) Puerperal disease
7.	*BARAHAT KASTURI BHAIRAV RASA*	Mercury, Sulphur, Iron, Mica, Lead, Borax	(*a*) Dyspepsia (*b*) Gastric ailments (*c*) Indigestion (*d*) Malabsorption syndrome (*e*) Piles
8.	*BRAHAT VATA CINTAMANI RASA*	*Bhasmas* of Gold, Silver, Mica, Iron, Pearls, Mercury	(*a*) Confusion (*b*) Delirium (*c*) *Vata-Pitta* diseases
9.	*CHADESVARA RASA*	Arsenic	Chronic and Remitant fevers
10.	*CHADRAMRITA RASA*	Borax	(*a*) Diarrhoea (*b*) Cough (*c*) Chronic Bronchitis
11.	*CHANDRAKALA RASA*	Mercury, Copper, Mica, Sulphur	(*a*) Burning sensation (Internal or external) (*b*) Confision (*c*) Dysuria (*d*) Fever (*e*) Menorrhagia
12.	*CHATUR BHUJA RASA*	Mercury, Gold, Arsenic	(*a*) Anemia (*b*) Asthma (*c*) Dyspepsia (*d*) Eryseplas (*e*) General debility (*f*) Hiccup (*g*) Mania (*h*) Pthisis (*i*) Rigid neck (*j*) Skin disease (*k*) Tissue loss (*l*) Urinary diseases etc.
13.	*CHATUR MUKTA RASA*	Mercury, Sulphur, Iron, Mica	As for *Chatur Bhuja Rasa*
14.	*DARUBRAHMA RASA*	Arsenic	(*a*) Remitant Fevers

			(*b*) Shivering (*c*) Incoherent speech and Wandering (*d*) Difficult Breathing
15.	*EKANGAVIRA RASA*	Mercury, Iron, Sulphur, Tin, Lead, Copper, Mica	(*a*) Brachial neuralgia (*b*) Facial paralysis (*c*) Neurological disorders (*d*) Paralysis (*e*) Psychosis (*f*) Tetanic convulsions
16.	*GAGAN SUNDARA RASA*	Mica, Sulphur, Mercury, Borax	(*a*) Colic (*b*) Diarrhoea with fever (*c*) Dyspepsia (*d*) Hemorrhage etc.
17.	*GALITAKA KUSTHARI RASA*	Mica	(*a*) Leprosy (*b*) Ulceration of fingers and toes
18.	*GARBH VILASA RASA*	Copper	Bowel complaints/ Indigestion during Pregnancy
19.	*GRAHNIKAPITA RASA*	Copper	(*a*) Chronic Bowel Complaints (*b*) Tuberculosis
20.	*GULMA KALAPANA RASA*	Copper	Hepatic and Splenic Enlargement
21.	*HRIDAYARNAVA RASA*	Copper	Heart Disease
22.	*ICCHABHEDI RASA*	Mercury, Sulphur, Borax	(*a*) Dyspepsia (*b*) Gastric diseases
23.	*JAYAMANGALA RASA*	Gold	(*a*) Chronic Fevers (*b*) Powerful Tonic/ Alterative (*c*) Adjunct with other drugs in many diseases.
24.	*JVARASANI RASA*	Mica	(*a*) Chronic Fevers (*b*) Splenic Enlargement
25.	*KALAGNI RUDRA RASA*	Iron	(*a*) Eryseplas (*b*) Carbuncles (*c*) Boils
26.	*KAPHAKETU RASA*	Borax, Conch	(*a*) Asthma (*b*) Cough (*c*) Dental ailment (*d*) Difficulty in swallowing (*e*) Ear diseases (*f*) Eye diseases (*g*) Throat diseases

27.	*KARPURA RASA*	Mercury, Pearls	(*a*) Infective diarrhoea (*b*) Diarrhoea with fever (*c*) Hemorrhage
28.	*KRIMIMUDGARA RASA*	Mercury, Sulphur	(*a*) Ascariasis (*b*) Dyspepsia
29.	*KUMARAKALYANA RASA*	Mercury, Gold. Iron, Mica, Pearl	(*a*) Asthma (*b*) Cough (*c*) Diarrhoea (*d*) Emaciation (*e*) Infant disease (*f*) Rickets (*g*) Psychotic syndrome (*h*) Rickets
30.	*LAGHU MALINI VASANTA RASA*	Mercury, Sulphur	(*a*) Bleeding piles (*b*) Chronic fever (*c*) Diarhhoea (*d*) Eye disease (*e*) Hemorraghage (*f*) Leucorrhoea (*g*) Pregrancy disorder *h*) *Rakta Pitta* (*i*) Tissue wasting
31.	*LAGHVANANDA RASA*	Mercury, Iron, Sulphur, Mica	(*a*) Anemia (*b*) Confusion (*c*) Dyspepsia (*d*) Fever (*e*) Luecorrhoea (*f*) Lump in abdomen *g*) *Vata/Kapha* disease
32.	*LAKSHMI NARAYANA RASA*	Sulphur, Borax, Mercury, Mica, Rock salt	(*a*) Colic (*b*) Dysentry (*c*) Enterotoxic diarrhoea (*d*) Fever (*e*) Gastroentertis (*f*) Labour pain (*g*) Malabsorption syndrome *h*) *Vata* disease
33.	*LOKANTHA RASA*	Mercury, Sulphur, Mica, Iron, Copper	(*a*) Abdominal lump (*b*) Inflammation (*c*) Liver and spleen disease
34.	*LAKSHMI VILASA RASA*	Mica, Mercury, Sulphur	(*a*) Anal fistula (*b*) Cough (*c*) Diarhhoea (*d*) Difficulty in swallowing (*e*) Dryness in throat (*f*) Leprosy (*g*) Obesity

			(*h*) Piles (*i*) Rheumatism (*j*) Sinus (*k*) Tissue loss (*l*) Tuberculosis etc.
35.	*MAHAGANDHA RASA*	Mercury	Acute diarrhoea in children
36.	*MAHALAKSHMI BILASA RASA*	Mica	(*a*) Tonic/ Alterative (*b*) Aphrodisiac (*c*) General Debility (*d*) Impotence
37.	*MANIKYA RASA*	Mercury	(*a*) Aphrodisiac (*b*) Oligospermia/Infertility
38.	*MEHAMUGARA RASA*	Iron	(*a*) Urinary Diseases (*b*) Gonorrhoea (*c*) Chronic Fevers (*d*) Jaundice
39.	*MRIGANKA RASA*	Gold	Tuberculosis
40.	*MUKTAPANCHAMRTA RASA*	Pearls, Coral, Conch, Tin	(*a*) Chronic fever (*b*) Cough (*c*) Debility (*d*) Tuberculosis
41.	*NAGA VALLABHA RASA*	Borax, Mercury	(*a*) Cough (*b*) Debility (*c*) Urinary disorder (*d*) *Vata* disease
42.	*NAVARATNA RAJAMRGANKA RASA*	Mercury, Sulphur, Silver, Gold, Iron, Lead, Diamond, Coral, Ruby	(*a*) Anemia (*b*) Aphrodisiac (*c*) Asthma (*d*) Cough (*e*) Dyspepsia (*f*) Epilepsy (*g*) Fever (*h*) Inflammation (*i*) Malabsorption syndrome (*j*) Rejuvenating (*k*) Tissue loss etc
43.	*NITYANANDA RASA*	Brass	Hydrocele
44.	*PANDU SUDANA RASA*	Mercury	Jaundice
45.	*PITTANKA RASA*	Pearls	(*a*) Jaundice (*b*) Chronic Bronchitis
46.	*POTTALI HEMGARBHA RASA*	Gold	Similar to *Mriganka Rasa*

47.	*RAJAMRIGANKA RASA*	Mercury	(*a*) Chronic Bronchitis (*b*) Tuberculosis (*c*) Fevers
48.	*RAS KARPOORVA*	Mercury	(*a*) Diarrhoea/Dysentry (*b*) Cholera (*c*) Syphilis (*d*) Cancer
49.	*RAS SINDOORA*	Mercury	(*a*) Corrects derangement of humours (*b*) Tonic (*c*) Improvement of Complexion (*d*) Improvement of Eye Sight
50.	*RATANGARBHA POTTALI RASA*	Gold	Similar to *Mriganka Rasa*
51.	*RATANGIRI RASA*	Diamond	(*a*) Alterative (*b*) Tonic
52.	*SARVANG SUNDARA RASA*	Diamond	(*a*) Alterative (*b*) Tonic
53.	*SHADGUNA BALI JARITA RASA*	Mercury	Properties similar to *Ras Sindoora* but this preparation is considered superior.
54.	*SIDDHA PRANESVARA RASA*	Mercury, Mica, Sulphur	(*a*) Diarrhoea with fever (*b*) Anodenal ulcer (*c*) Dyspepsia (*d*) Malabsorption syndrome (*e*) Pain
55.	*SITABHANJI RASA*	Copper	(*a*) Intermitant Fever (*b*) Shivering Fits (*c*) Burning and feeling of heat in skin.
56.	*SUCIKABHARANA RASA*	Mercury, Sulphur, Lead	Fever with delirium
57.	*SURYAVARTA RASA*	Copper	Asthma
58.	*SVACHHANDA BHAIRA RASA*	Copper	Fever with Cerebral symptoms
59.	*SVARNABHUPATI RASA*	Mercury, Sulphur, Copper, Mica, Iron, Gold, Silver	(*a*) Abdominal lump (*b*) Anemia (*c*) Asthma (*d*) Calculi (*e*) Cough (*f*) Fever (*g*) Indigestion (*h*) Inflammation (*i*) Jaundice

			(*j*) Malabsorption syndrome (*k*) Neurological disorders (*l*) Paraplegia (*m*) Tetanic convulsions etc.
60.	*SVAS KUTHARA RASA*	Arsenic	(*a*) Asthma (*b*) Remitant Fever (*c*) Coma (*d*) Hemicrania
61.	*TALKESARI RASA*	Arsenic	Chronic Skin Diseases
62.	*TRAILOKYA CHINTAMANI RASA*	Diamond, Pearls, Gold, Iron	(*a*) Alterative (*b*) Tonic (*c*) Adjunct with other drugs in many diseases.
63.	*TRINETRA RASA*	Tin	Painful Micturition
64.	*VAJRAKAPITA RASA*	Mercury	Chronic Diarrhoea
65.	*VANGESVARA RASA*	Tin	(*a*) Diabetes (*b*) Urinary Diseases
66.	*VASANTA KUSUMAKAR RASA*	Pearls	(*a*) Alterative (*b*) Tonic (*c*) Gonorrhoea (*d*) Spermatorrhoea
67.	*VASANTA MALTI RASA*	Zinc	(*a*) Chronic Fevers (*b*) Leucorrhoea (*c*) Gonorrhoea (*d*) Syphilis
68.	*VATAKULANTAKA RASA*	Arsenic, Mercury, Sulphur	(*a*) Epilepsy (*b*) Neurological disorder (*c*) Syncope (*d*) *Vata* disease
69.	*VATARKANTAKA RASA*	Mercury, Sulphur, Iron, Mica, Arsenic, Shilajit	(*a*) Neurological disorder (*b*) *Vata* diseases
70.	*VATARI RASA*	Mercury, Sulphur	(*a*) Neurological disorder (*b*) *Vata* diseas
71.	*VATA VIDHWAMSANA RASA*	Mercury, Sulphur, Lead, Tin, Iron, Copper, Mica	(*a*) Delirium with fever (*b*) Malabsorption syndrome (*c*) Neurological disorder (*d*) *Vata/Kapha* disease

72.	*VETALA RASA*	Arsenic	Remitant Fever with affection of the Brain
73.	*VIDYADHARA RASA*	Arsenic	(*a*) Splenic Enlargement (*b*) Hepatic Enlargement
74.	*VRIHAT SOMANATHA RASA*	Iron	(*a*) Diabetes (*b*) Urinary Disorders (*c*) Gynecological Disorders
75.	*VRIHAT VANGESVARA RASA*	Iron	(*a*) Diabetes (*b*) Urinary Diseases.

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6

CALCINED MINERAL PREPARATIONS: PHILOSOPHY AND PRESENT STATUS

Indian systems of medicine use calcined metal preparations for therapeutic effects: *Bhasmas* in Ayurveda, *Kushtas* in Unani-Tibb and *Parpams* in Siddha medicine. Calcination involves ashing of the metal using specialized techniques. *Bhasma* means ash or burnt completely. *Kushta* means to kill. It is believed that the metal is killed by burning. The techniques involve incorporation of other herbo-mineral ingredients during the ashing process. The traditional physicians (*Hakims* and *Vaids*) believe that the 'soul' of the plant/ herbal juices is incorporated into the 'body' of the metal. This changes the properties of the toxic metal making its therapeutically effective and safe[1,2].

PURIFICATION AND DETOXIFICATION PROCESSES

Ayurvedic literature stresses that the metals/ minerals be subjected to *Samskaras* or processing before being used for medicinal purpose. These processes are designed to enhance the desirable qualities and overcome the toxic effects. The *Samskaras* involve the following steps[3]:

(*a*) *Shodhna* (Purification or Detoxification)
(*b*) *Marna* (Oxidation/ Calcination)
(*c*) *Bhaishajya Kalpana* (Formulation of Dosage form)

While *Shodhna* 'purifies' (detoxifies?) the metal, by *Marna*, it looses its original identity (as toxic metal) and gets converted to a fine powder. The latter are chemically oxides or sulphides. The idea appears to be to convert the metal to such form, which can be acted upon by the gastro-intestinal juices and thus rendered absorbable. These preparations are absorbed very slowly and in this way only micro-concentrations of the metal enter the systemic circulation and tissues[4]. Physicians proficient in *Shodhna* and *Marna* processes were held in great esteem and acquired great fame as clinicians. As many as eighteen Sanskars for different metals have been described in Ayurvedic text[5]. The corresponding techniques, used in Unani-Tibb, are similar to those of Ayurveda. These are listed below[6]:

Ghasi-e-Adviyah (Purification)

(*a*) *Tasfiya* (Cleaning)
(*b*) *Tadbir-e-Adviyah* (Detoxification)

(*c*) *Daq-wa-Sahaq* (Pounding and Grinding)
(*d*) *Ehraq-e-Adviyah* (Burning)
(*e*) *Tasveel-e-Adviyah* (Sieving)

The drugs treated by purification and cleaning processes are called *Maghsool* and those subjected to the detoxification process are suffixed with the term *Musaffa*. The number of physicians using mineral origin remedies is not large because the metals, if not properly prepared for therapeutic use, do more harm than good. Only those, who are expert in this practice, inspire confidence in their patients. It is emphasized that the above mentioned traditional processes of 'purification' and detoxification should carefully remove impurities or deleterious properties of the metals/ minerals. If this is not done, these drugs may induce morbid symptoms/diseases. The metals are mostly purified by:

(*i*) Repeated ashing in sealed containers
(*ii*) Plunging in certain fluids e.g. oil, whey, cow's urine, herbal juices etc., and
(*iii*) Fine pulverization[7].

These processes are claimed to change the properties of the toxic metal and make it medicinally useful and safe. These claims have largely NOT been investigated except for some recent studies from the Department of Medical Elementology and Toxicology, Jamia Hamdard, New Delhi, some earlier reports from the Department of Ras Shastra, Banaras Hindu University, Varanasi and other centers (please see Chapter 10).

ADVANTAGES OF CALCINED PREPARATIONS[8-11]

Some of the claimed advantages of calcined mineral preparations are:

(*i*) Deep Penetration
(*ii*) Rapid Action
(*iii*) Efficacy in Minute Quantities (Plant drugs usually require large doses)
(*iv*) Long shelf Life
(*v*) No Adverse Interactions with Plant Drugs
(*vi*) Usefulness in Obstinate and Incurable Diseases
(*vii*) Wide spectrum of Therapeutic Indications for tonic, rejuvenating and curative purposes.
(*viii*) Lack of side effects (if properly made).

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7

AYURVEDIC BHASMAS

1. GENERAL METHOD OF PREPARATION

Bhasma is an ash obtained through incineration using specialized Ayurvedic techniques. The general method of *Bhasma* preparation is as follows:[1-3]

(*i*) Selection of Genuine Drug: Ayurvedic texts give extensive description of the physical properties of good drugs to enable selection of proper drug for preparing *Bhasma*:

(*ii*) Moulding the hard metal into thin leaves and powdering them.

(*iii*) Trituration with *Chetana Dravya* (Live Fluid): The latter comes from plant or animal sources. This helps in *Shodhana* (Purification). While a great stress has been said for the process of *Shodhna* in Ayurveda, Chopra and coworkers[2] stated that the methods used may, in many instances, rather introduce impurities from extraneous sources instead of 'purifying' the metal. These aspects warrant scientific investigations with a dispassionate approach.

(*iv*) *Marna* (Incineration): This is done in sealed containers subjected to heat in a pit of specified dimension containing a specified number of cow dung cakes (*Puttam*). The *Puta* are described under different names eg. *Maha Puta, Gaja Puta, Varah Puta, Kukkuta Puta, Kapota Puta* and *Bhanda Puta* depending on the size of the pit and the number of cow dung cakes used. These indicate the amount of heat required and the period of burning for different *Bhasmas*.

(*v*) *Amritkarna* (Giving the *Bhasma* an ambrosial form): This is done to avoid adverse side effects following its administration.

2. QUALITY CONTROL[1,4-6]

Metals/minerals, when brought to *Bhasma* form, are transformed into a microfined colloidal state. This is intended to facilitate its easy absorption and when the tissues do not require it, its easy excretion from the body. Ayurvedic texts describe the following tests for evaluating the quality. A good quality *Bhasma* should fulfill the following criteria.

(*i*) *Nishchandratwa:* Completely free of the original metallic luster. Scientific studies for detection of free metal in Ayurvedic *Bhasmas* are available including a quick spot test.

(*ii*) *Rekhapoornatwa* : When spread between the index finger and thumb, it should be so fine as to get easily into the lines and crevices of the fingers.

(*iii*) *Varitartwa* : It should float on the surface of still water.

(*iv*) *Nirutthatwa* on the test with Silver : The *Bhasma* must not get fixed on the Silver rod by heating.

(*v*) *Apunarbhawatwa* : If mixed with *Mitrapanchaka* (Black sugar, borax. *Abrus precatorius*, honey and ghee in equal quantity) and subjected to fire, the *Bhasma* must not revert into its original state.

Please also see Chapter 9 on Physico-chemical Standards for more information on the quality control of *Bhasma*.

7.1 ABHRAKA BHASMA

1. METHODS OF PREPARATION[2,7-12]

1.1 Selection of Material : Mica selected should be of such quality of which layers can be easily separated by knife. *Dhanyabhra*, a purified form of Mica, is used for preparing *Bhasma*. Seven commercial varieties are available. *Vajra Abhraka*, prepared from Biotite, is used medicinally. *Shweta Abhraka*, prepared from Muscovite, has not been mentioned in Ayurvedic literature for therapeutic use.[11]

1.2 Purification : This is done by specialized Ayurvedic techniques as follows:

(*a*) Selected mica is boiled in a docoction of *Triphala* (fruits of three myrobalans : *Phyllanthus emblica, Terminalia chebula* and *Terminalia belerica*) for a long time.

(*b*) This is followed by roasting or calcinations over fire and alternately soaking in lemon juice till the scales are separated.

(*c*) The scales, so obtained, are mixed with a paste made of *Amaranthus polygamus* and dried.

(*d*) Alternatively, the material can first be heated and washed in milk followed by soaking of plates in the juice of *A. polygamus* and *Kanji* for 8 *Yamas* (24 hours).

(*e*) The talc is then reduced to powder by keeping it in a cloth and rubbing with paddy.

The fine powder, collected through this procedure, is called *Dhanyabhra*. It is a very fine but hard black-coloured powder of saline earthy taste.

1.3 *Amritkarna* : The *Bhasma* is further purified by mixing with cow's urine or latex of *Calotropis gigantea* and subjected to heat in a closed crucible. To render *Bhasma* completely free of side effects and make it more effective, it is subjected to *Amritkarna* process. The latter involves mixing of *Bhasma* with the decoction of *Triphala* (15 parts) and cow's ghee (8 parts) and boiling in an iron pan for 3 days till the ghee and decoction get dried up and well mixed with *Abhraka Bhasma*.

1.4 Preparation of *Bhasma* : One part *Dhanyabhra* and two parts of *Borax* are heated together and triturated with milk. *Abhraka Bhasma* is formed following evaporation of this mixture.

1.5 Putas : Repeated ashing and pulverization/ number of *Putas* determines the quality of the final product and its medicinal efficacy:

(*a*) Three *Putas* : Mica gets 'killed' i.e. becomes *Bhasma* and becomes fit to be used for medicinal purpose.

(*b*) Ten *Putas* : The material becomes *Nishchandra* i.e. free of metallic lusture.

(*c*) Eighteen *Putas* : *Bhasma* can cure the diseases caused by *Vata Dosha*.

(*d*) Thirty six *Putas* : *Bhasma* can remove *Pitta Dosha*.

(*e*) Fifty four *Putas* : *Bhasma* can be used for diseases caused by *Kapha Dosha*.

(*f*) One hundred *Putas* : *Bhasma* can cure different type of diseases.

(*g*) One thousand *Putas* : *Sahasraputa Abhra* : This is of highest quality and efficacy.

2. CHEMICAL COMPOSITION[4,7,14]

Dhanyabhra or talc powder contains silicate of iron, magnesium and aluminium. Chopra and coworkers[2] analysed a sample of *Abhraka Bhasma*, manufactured by M/s Kalaptaru Ayurvedic Works, Calcutta and reported the following composition:

TABLE 7.1 : CHEMICAL COMPOSITION OF *ABHRAKA BHASMA*[7]

	Percentage
Silica (SiO_2)	36.01
Ferric oxde (Fe_2O_3)	12.78
Alumina (Al_2O_3)	27.57
Lime (CaO)	5.03
Magnesia (MgO)	1.92
Potash (K_2O)	13.17
Soda (Na_2O)	3.06
Chlorides	0.09
Sulphates	nil
Phosphates	very faint trace
Nitrates	nil
Moisture	0.37
Total:	**100.00**

3. PHARMACOLOGICAL PROPERTIES[4,7,10,11]

(*a*) Alterative
(*b*) Antacid
(*c*) Antidiabetic
(*d*) Aphrodisiac
(*e*) Astringent
(*f*) General tonic/Restorative
(*g*) Hematinic
(*i*) Mild disinfectant
(*j*) Nervine tonic
(*k*) Protective to gastric mucosa and liver etc

4. THERAPEUTIC USES[4,7,10,11,15-17]

Claimed utility in a variety of ailments. It is mostly used: (*a*) In combinationwith iron which enhances its efficacy and (*b*) As a constituent of various *Rasas* e.g. *Agnikumara Rasa, Gulitakushthari Rasa, Jvarasani Rasa, Maha Lakshmi Bilasa Rasa, Sulochanamrit Abhra Rasa, Vidya Dhara Rasa* and *Arjunabhra* (in combination with the bark of *Terminalia arjuna*), *Sringarabhra* (containing a number of medicinal plants) and *Nawajas* (in combination with *Bhasmas* of Tin, Zinc, Iron, Calcium and *Shilajit*).

(*a*) Acid dyspepsia

(*b*) Anemia

(*c*) Bronchitis

(*d*) Chronic diarrhoea & dysentery

(*e*) Chronic fever

(*f*) Cough

(*g*) Diabetes

(*h*) Enlarged spleen

(*i*) Eye diseases

(*j*) Gastric ulcers

(*k*) Hepatitis

(*l*) Impotence

(*m*) Jaundice

(*n*) Leprosy

(*o*) Obesity

(*p*) Oedema

(*q*) Phthisis

(*r*) Poisoning

(*s*) Respiratory tract infections

(*t*) Tuberculosis etc.

Since *Abhraka Bhasma* is seldom prescribed alone, its curative value as been questioned for some diseases. Chopta and coworkers[7] tried this drug in a number of diabetes patients and found no significant effect on blood sugar level in treated subjects.

5. DOSE[2]

125-375 mg with honey, *ghee* (clarified butter), *Triphala*, or ginger juice.

7.2 *AKIK BHASMA*

1. METHOD OF PREPARATION[18]

Purifed *Akik* (Agate) is processed in *Arq Gulab* (*Aqua Rosa damascena*) and cow milk following the method described in *Ayurved Sar Sangrah*[21].

2. PHARMACOLOGICAL PROPERTIES AND THERAPUETIC USES[18]

(*a*) Antacid
(*b*) Asthma
(*c*) Brain tonic
(*d*) Bronchitis
(*e*) Calcium deficiency
(*f*) Cardiotonic
(*g*) General tonic
(*h*) Hemostatic
(*i*) Renal stones
(*j*) Restores vigour and strength
(*k*) Splenic enlargement
(*l*) *Vata-Pitta Dosha* etc.

3. DOSE[18]

250-500 mg twice a day with honey or milk.

7.3 *GODANTI BHASMA*

1. METHOD OF PREPARATION[2,8]

1.1. Purification : This is done by washing with adequate quantity of warm water.

1.2. Preparation of *Bhasma* : Purified powder of *Godanti Haritala* is triturated with the juice of *Aloe barbadensis* for one day. The paste, so formed, is dried in sun and calcined by *Gajputa* technique i.e. subjected to heat in a pit (one cubic yard) filled with cow dung cakes.

1.3. *Putas* : The process should be repeated three times.

2. CHEMICAL COMPOSITION[8,11]

Godanti or *Godanti Harital* is chemically hydrated calcium sulphate. Ashing results in evaporation of water and formation of oxides and sulphides of calcium.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2,8,11,17,19]

It possesses cooling, astringent, antacid and anti-inflammatory properties and medicinally useful in following diseases:

(*a*) Anemia
(*b*) Chronic fevers (specially those fevers which are caused by *Pitta Dosha*).
(*c*) Cough
(*d*) Headache (including Migraine)
(*e*) Jaundice
(*f*) Leucorrhoea
(*g*) Menorrhogia
(*h*) Respiratory ailments (including Chronic Bronchitis and Asthma)
(*i*) Rickets in children.
(*j*) Tuberculosis etc.

4. DOSE[2]

500 mg twice daily with honey, *ghee* (clarified butter), sugar or *Tulsi* (*Ocimum sanctum* leaves).

7.4 HAJRUL YAHUD BHASMA

1. METHOD OF PREPARATION[3,18]

Purified *Hajrul Yahud* (Jew's stone) is processed in *Muli svarasa* (*Raphanus sativus* juice) using iron pestle and mortar for trituration. *Bhavana* should be given three times. Calcination is done by subjecting to heat using *Ardha Gajaputa* technique.

2. PHARMACOLOGICAL PROPERTIES AND THERAPUETIC USES[3,18]

(*a*) Diuretic
(*b*) Renal calculi
(*c*) Urinary diseases

3. DOSE[3,18]

250-500 mg thrice daily with coconut water or *Gulukand* (rose petals preserved in sugar).

7.5 HARITALA BHASMA

1. METHODS OF PREPARATION[2,8,10,11]

1.1 Purification : *Haritala* (Orpiment) is purified for internal administration by successive boiling in *Kanjika*, the juice of *Benincasa cerifolia* (*Kushmanda*) fruits, Sessamum oil and a decoction of *Triphala*.

The boiling is done for 3 hours in each fluid. Some physicians boil the orpiment in a mixture of these fluids to save time. Thereafter the pieces of yellow Arsenic are washed with warm water, dried in sun and pulverized.

1.2 Preparation of *Bhasma* : Orpiment is pulverized and made into a ball with the juice of *Boerhaavia diffusa* (*Punarnava*). It is then placed in the centre of a pot full of the ashes of this plant. Thereafter, the pot is covered with a lid, sealed with clay and subjected to heat over a fire for 24 hours. After cooling, the ball of roasted orpiment is taken out and reduced to powder. In another method, equal parts of purified orpiment and *Yavaksaara* (Impure Potassium carbonate) are rubbed together with the juice of *Vitex negundo* (*Nirgundi*) and the mixture is roasted in a closed crucible. The final product is a white camphor-like substance.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2,8,10,11,17]

It possesses anti-tussive, febrifuge, depilatory, tonic, emmenagogue, strengthening, beutifying, rejuvenating and anti-aging properties and is used either alone or in combination with other drugs (e.g. Mercury, Aconite, *Calotropis gigantea, Achyranthes aspera, Moringa pterigosperma* etc.) for the treatment of following diseases:

(*a*) Anemia
(*b*) Asthma
(*c*) Blood diseases
(*d*) Bronchitis

(*e*) Cough
(*f*) Dropsy
(*g*) Epilepsy
(*h*) Facial paralysis
(*i*) Fevers (including Chronic fevers affecting the Brain)
(*j*) Gonorrhoea
(*k*) Gouty Arthritis
(*l*) Hemiplegia
(*m*) Leprosy
(*n*) Paraplegia
(*o*) Phthiasis
(*p*) Psoriasis and other Skin diseases
(*q*) Splenic Enlargement
(*r*) Useful for giving Beauty and Strength to the body and Prolonging life span.

It forms an ingredient of *Vetala Rasa, Vidya Dhara Rasa, Talkesari Rasa* and *Maha Lakshmi Bilasa Rasa.*

3. DOSE[2]

31.25-125 mg with honey or butter.

4. ADVERSE EFFECTS[8]

If orpiment is not properly purified and subjected to adequate *marna* process, it may produce adverse effects of Arsenic e.g. burning sensation in body, trembling, pain, skin disorders, diarrhoea, vomiting etc.

7.6 *JAHARMOHRA BHASMA*

1. METHOD OF PREPARATION[3]

Purified *Jaharmohra* (Bezoar stone) is processed by through trituration with sufficient quantity of *Arjunatvak Kvatha* (*Terminalia arjuna*, bark extract) and *Vatajatankura Kvatha* and subjected to calcinations process using *Varahaputa* technique.

2. PHARMACOLOGICAL PROPERTIES AND THERAPUETIC USES[3]

(a) Asthma
(*b*) Cough
(*c*) Heart disease
(*d*) Hemorrhage
(*e*) Piles etc.

3. DOSE[3]

250 mg with *Manjistha Kvatha* (*Rubia cordifolia*) extract.

7.7 JAHARMOHRA KHATAI BHASMA

1. METHOD OF PREPARATION[18]

Purified *Jaharmohra* (Bezoar stone) is processed by the method described in *Ayurved Sar Sangrah*[21]

2. PHARMACOLOGICAL PROPERTIES AND THERAPUETIC USES[18]

(a) Brain tonic
(b) Cardiac tonic
(c) Diarrhoea
(d) Fever
(e) Indigestion
(f) Prophylactic during infectious diseases
(g) Rickets
(h) Vomiting etc.

3. DOSE[18]

Adults: upto 250 mg	Thrice a day with honey or *Gulukand*
Children: 65-125 mg	(rose petals preserved in sugar)

7.8 KAJJALI BHASMA

1. SYNONYM : *Krishna Bhasma*

Ayurvedic texts describe four types *Bhasmas* of Mercury : (*i*) *Krishna* (Black), (*ii*) *Sveta* (White), (*iii*) *Pita* (Yellow) and iv *Rakta* (Red) *Bhasmas*; the black variety is *Kajjali*[11].

2. METHODS OF PREPARATION[8,20,21]

2.1 Purification of Mercury : According to Dash[8], eighteen *Samskaras* (Processing) are needed for the purification of Mercury. Some ancient Ayurvedic texts viz. *Ras Padhati* and *Rudryanal*, however, state that only eight *Samskaras* suffice for *Deha Siddhi* of this metal for internal administration: These are:

(*i*)	*Swedna*	(Fermentation)
(*ii*)	*Mardana*	(Hot Trituration)
(*iii*)	*Murchana*	(Loss of natural physico-chemical properties of the metal)
(*iv*)	*Utthapana*	(Revival of natural physico-chemical properties)
(*v*)	*Patana*	(Sublimation/ Distillation etc.)
(*vi*)	*Bodhana*	(Revival of Potency)
(*vii*)	*Niyaman*	(Regulation of Physical properties)
(*viii*)	*Pradipna*	(Burning with Alum, Borax, Iron sulphate, Rock salt, and some Herbal drugs e.g. *Brassica nigra, Moringa oleifera, Piper longum* etc.)

Some simpler processes for purification of Mercury have also been described. One such method involves collection of Mercury from *Hingula* (Cinnabar). The latter is dried, distilled, cooked with *Kanji* (A kind of Vinegar) for 6 hours and washed with hot water before being used for the preparation of *Kajjali*.

2.2 Purification of Sulphur : The metal is melted with equal quantity of *Ghee* (Clarified Butter) in a stainless steel pot and cooked on mild fire. Another stainless steel pot filled upto 2/3 of its capacity with cow's milk. Melted sulphur is poured into the second pot through a clean cloth. Sulphur gets solidified with milk. It is removed from milk, washed with warm water and dried. The process should be repeated three times.

2.3 Preparation of *Bhasma* : Four tolas (48 gm) each of purified Mercury and Sulphur are triturated using pestle and mortar. Sprinkling of a few drops of water during trituration prevents spilling. Gradually the white colour of Mercury and the yellow colour of Sulphur disappears to yield a jet black fine powder (*Kajjali*). The latter is then triturated with the latex of *Calotropis gigantea*. The mixture is then subjected to heat in a solid open mouthed pan placed on mild fire and stirred gently using Banyan twigs. The process is continued for the whole day. The *Kajjali* is now ready for medicinal use.

2.4 Testing : The suitability of *Kajjali* for therapeutic purposes is tested as follows: Some particles of *Kajjali* are placed over Gold and rubbed by adding a drop of lemon juice. If Mercury particles remain separate from Sulphur particles. a white line (resembling Silver) is detected over Gold. This may not be discernible by naked eye. The powder should be free of grit and light enough to float on the surface of water.

3. CHEMICAL COMPOSITION

Kajjali is chemically black sulphide of Mercury[10]. Analysis by AAS revealed 40.5% Mercury content in the *Bhasma*[20].

4. PHARMACOLOGICAL PROPRETIES AND THERAPEUTIC USES[8,20,21]

Though used both externally and internally, internal use is seldom alone. *Kajjali* is generally used for internal administration as a recipe in combination with other drugs e.g. as *Ras Parpati*. It possesses digestive, antibilious, febrifuge, aphrodisiac, tonic and rejuvenating properties and is therapeutically useful in jaundice, fevers, diarrhoea, indigestion, obesity, general and sexual debility, leprosy, tuberculosis and sprue.

5 DOSE[8,21]

1-2 Ratti (125-250 mg). Elaborate precautions/ dietary regulations have been advocated for patients taking Mercury preparations in Ayurvedic texts.

7.9 *KANTA BHASMA*

1. METHOD OF PREPARATION[22]

Kanta (Load stone/Magnetic ore of Iron) is ground for a day with each of the following liquids: (*i*) Lime juice, (*ii*) Sour *Kanji*, and (*iii*) Sour butter milk. The material is dried, mixed with equal quantity of Cinnabar and ground with Cow's urine for a day. The dried material is mixed with 1/20 parts by weight of fresh Cinnabar. After 10 *Putas*, it is ground with a decoction of Myrobalans and calcined again. The process is repeated 40 times using the above mentioned liquids and 1/20 parts of Cinnabar. The calx is dark purple in colour. A total of 400 cow dung cakes are considered adequate to calcin 22.5 Kg of material.

2. PHARMACOLOGICAL PROPERTIES AND THERAPUETIC USES[22]

(*a*) Anemia
(*b*) Jaundice
(*c*) Oedema
(*d*) Restorative etc.

3. DOSE[22]

200-400 mg twice daily with honey.

7.10 *KAPARDIKA BHASMA*

1. SYNONYM : *Vartika Bhasma*

2. METHODS OF PREPARATION[2,8,23,24]

2.1 Selection of Material : *Kapardika* is the outer hard shell of Cowrie (*Cypraea moneta*) collected from the Indian seas. Cowrie shells are of three types: white, yellow and brown. Ayurvedic texts describe the various types with indication of characters for medicinally useful variety. Yellow cowrie shell (approx. weight 10-15 gm) has been recommended for therapeutic purpose.

2.2 Purification and Preparation of *Bhasma* : Yellow cowrie shells are boiled with lemon juice or *Kanji* (a kind of Vinegar) for 3 hours in *Dola Yantra*, taken out and washed with hot water. *Dola Yantra* is a traditional apparatus wherein the drug is wraped in thick cloth, tied and immersed in the desired liquid contained in a pot kept over charcoal or wood fuel. The cloth *potli* is suspended through a string tied to a stick or rod kept over this pot. Only lower half of the cloth *potli* remained immersed in the liquid. After it cools down, the Cowrie shells are removed, triturated in a pestle and mortar till it is reduced to a very fine powder. The *Bhasma*, so prepared, should be stored in an air-tight glass bottle.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2,8,17,24]

Kapardika Bhasma is attributed with digestive, antacid, anti-anemic and febrifuge properties. It is used as a single drug and also as an ingredient of large number of compound formulations for the treatment of varied ailments e.g.:

(*a*) Anaemia
(*b*) Diarrhoea
(*c*) Dyspepsia
(*d*) Duodenal ulcer
(*e*) Ear Diseases e.g. Otitis Media
(*f*) Eye Diseases (including Cataract)
(*g*) Hyperacidity
(*h*) Indigestion
(*i*) Intestinal Tuberculosis
(*j*) Irritable Colon
(*k*) Menstrual Disorders (Menorrhogia, Metrorrhagia)
(*l*) Non-specific Fevers
(*m*) Splenic Enlargement etc.

4. DOSE[8]

250 mg twice daily. The *Bhasma* should be administered with hot water after

7.11 *KARPURA SHILAJIT BHASMA*

1. METHOD OF PREPARATION[22]

Karpura Shilajatu (White *Shilajit*) is washed successively in rice water and hot water. A paste is made by grinding with *Kumari svarasa* (Aloe juice). Small cakes, made from it, are subjected to calcination in a pot using cow dung cakes as fuel. A total number of 1500 cow dung cakes are required for 22.5 Kg of material.

2. PHARMACOLOGICAL PROPERTIES AND THERAPUETIC USES[22]

(*a*) Cystitis
(*b*) Diuretic
(*c*) Gonorrhoea
(*d*) Soothing for the urinary tract
(*e*) Urethritis etc

3. DOSE[22]

200-500 mg twice or thrice daily with butter or *ghee* (clarified butter). Other *Anupanas* recommended include *Aloe barbadensis, Phylanthis niruri* and sugar.

7.12 *KASISA BHASMA*

1. METHODS OF PREPARATION[2,8,17]

1.1 Selection of Material : *Kasisa* is Iron sulphate. It is available naturally and can also be prepared artificially. *Vimala* variety, described in Ayurvedic texts, is also Iron sulphate.

1.2 Purification : The material is beaten to small pieces and then impregnated and triturated to a fine powder using the juice of *Eclipta alba*. The process is repeated for 3 consecutive days and the matrial dried.

1.3 Preparation of *Bhasma* : Purified *Kasisa* is treated with lemon juice. Small cakes are prepared from the resulting paste, sun dried and calcined by putting in *Sarva Samputa* and cooking in *Vardha Puta*. The process is repeated several times till the *Bhasma* is free of sour taste. Normally seven *Putas* are needed for appropriate *Marna* of Iron sulphate. Use of *Bhasma* without adequate 'purification and killing' may produce adverse effects similar to those for impure Iron.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[2,8,17]

It possesses hematinic, emenagogue and antiulcer properties and is used therapeutically both externally (in the form of medicated ointment and oil) and internally for the treatment of following diseases:

(*a*) Amenorrhoea
(*b*) Anaemia
(*c*) Leucoderma
(*d*) Prolapse of Rectum and Uterus
(*e*) Splenic Disorders
(*f*) Ulcers etc.

3. DOSE[8]

125-250 mg daily to be taken on empty stomach with *Triphala* powder and honey.

7.13 *KUKKUTANDATWAK BHASMA*

1. METHODS OF PREPARATION[18]

Kukkutandatwak (Egg shell) processed in *Changeri Rasa* according to the method described in *Ayurved Sar Sangrah*[21].

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[18,29]

(*a*) Alterative
(*b*) Aphrodisiac
(*c*) Leucorrhoea
(*d*) Menstrual disorders
(*e*) Rickets
(*f*) Seminal defects etc.

3. DOSE[18,29]

250-500 mg twice a day with 4-6 g honey or water.

7.14 *LAUHA BHASMA*

S1. TYPES OF IRON : The following types and sub-types of Iron have been described in *Rasa Ratna Samuchchaya*[8,10,11,25,26]

Lauha (Iron)
Three varieties

Mundam (Cast or Wrought Iron)	Tikshanam (Properly Cast Iron) or Steel	Kantam (Wrought Iron)
Three sub-types	Six sub-types	Five sub-types
(*a*) *Mridu* (Glossy, does not break, easily melts)	(*a*) *Khara* (Rough, free from hair- like lines, and shows the luster of Quick Silver on breaking)	(*a*) *Brahmaka* (It makes all kinds of Iron 'to move about')
(*b*) *Kuntham* (Resists expansion on being struck with a hammer)	(*b*) *Sara* (Product of brown soil, has hair-like lines and breaks in the sides by hammering).	(*b*) *Chumbak* (Magnet)
(*c*) *Kadaram* (Breaks when struck with a hammer and has a black fracture)	(*c*) *Hrinnala* (Black in colour with seed or beak-like lines and difficult to cut.	(*c*) *Karashaka* (Magnet-like properties)
	(*d*) *Bajr Lauha* (Sky blue in colour with thin lines)	(*d*) *Dravaka* (It can melt other types of Iron instantly)
	(*e*) *Tarabatta* (Not described)	(*e*) *Romakanta* (On breaking shoots forth hair-like filaments)
	(*f*) *Kalasya or Kala* (Blue black, brilliant and heavy. It does not break even when struck with an Iron hammer)	

2. METHODS OF PREPARATION

2.1 Selection of Material[2,11] : *Kanta Lauha* is recommended for use in preparation of medicines. The following tests have been described in Ayurvedic texts to identify this type of Iron: (*a*) If water is kept in a vessel made from this type of Iron and oil poured over it, the oil should not spread, (*b*) Milk boiled in it does not overflow but rises to a high peak. *Brahmaka* and *Chumbaka* sub-types are well suited for curing diseases. *Karashaka* and *Dravaka* sub-types exhibit *Rasayana* properties for rebuilding of the lost body tissues. *Romakanta* sub-type is best suited in binding or treating with Mercury. It 'restraints' the latter (rectifies the adverse effects of Mercury?).

2.2 Purification[2,4,7,11] : Several methods of purifying Iron have been described in Ayurvedic texts:

(*a*) Beating to thin plates followed by heating and when red-hot plunging successively into oil whey, *Kanji*, Cow's urine and a decoction of *Dolichos uniflorus*. The process is repeated three times.

(*b*) About 1.5 kg of water is boiled till it is reduced to one fourth volume and into it approx. 500 gm of hot thin plates of Iron are soaked. The process is repeated seven times.

(*c*) Iron dust is macerated with a decoction of *Triphala* and cow's urine. It is then fried with *Ghee* (Clarified butter) in an earthen vessel and stirred with an Iron rod. The frying is continued till a blade of straw, when thrown over it, catches fire. The material is well pounded. The process is repeated five times.

(*d*) Thin sheets of red-hot Iron are immersed in fresh decoction of *Triphala*. The process is repeated nine times using fresh decoction every time.

(*e*) Iron is treated with coarse pieces of Sulphur in *Khalva Yantra* with some amount of *Dewadali Swaras* to facilitate good contact between the two metals. The mixture is rubbed thoroughly. The process is repeated for at least 7 days. When Sulphur powder, obtained at the end of the process, is sprinkled over fused Iron, it is kept in liquid state.

2.3 Preparation of *Bhasma* [2,7,11]:

(*a*) Purified Iron is soaked for 7 days in the juice of pomegranate (*Punica granatum*) or Jam leaves followed by drying in sun light. The material, so obtained, is roasted using 6-10 *Putas* to enable efficient reduction of the metal.

(*b*) Preparation of *Lauha Bhasma* with Mercury ensures its proper intestinal absorption. The following Ayurvedic processes are employed to obtain best quality of *Bhasma*:

(*i*) *Loha Maraka* : Dipping red-hot Iron flakes in a mixture of fresh lemon juice and *Hingula* (Cinnabar).

(*ii*) *Amrit Karna* : Equal amounts of *Lauha Bhasma* and *Ghee* (Clarified butter) are placed in an Iron pan subjected to mild heat till the fat disappears.

(*iii*) *Niruthi Karna* : Treating the *Bhasma* with a decoction of *Triphala* and sun drying or calcination in sealed mud containers followed by filtration and separation.

3. CHEMICAL COMPOSITION

Chemically *Lauha Bhasma* is a mixture of oxides of Iron[2].

Chopra and coworkers[7] analysed a sample of this *Bhasma* procured from Kalpataru Ayurvedic Works, Calcutta and reported the following composition:

TABLE 7.2 : CHEMICAL COMPOSITION OF *LAUHA BHASMA*[7]

		Content (%)
Ferric oxide	-	87.930
Ferrous oxide	-	2.890
Silica	-	7.338
Phosphorus pentoxide	-	0.338
Magnesia	-	0.083
Lime	-	0.363
Sodium chloride	-	0.455
Potash	-	0.012
Sulphuric anhydride	-	0.240
Moisture etc.	-	0.391
	Total	100.00

4. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2,5,7,10,11,16,17]

It stimulates functional activity of all organs of the body (general tonic) improves the quality of blood, improves eye sight, promotes strength, virility, complexion and intellect and possesses alterative, astringent, hematinic and restorative properties. Therapeutic utility of *Lauha Bhasma* (alone and in combination with other drugs) has been claimed in many diseases including :

(*a*) Anemias (simple and secondary anemias associated with hemorrhages, malaria, kalazar, chlorosis, hepatic worms etc.).
(*b*) Bleeding piles
(*c*) Bright's disease
(*d*) Bronchitis
(*e*) Chronic Intermitant Fever
(*f*) Consumption
(*g*) Diarrhoea
(*h*) Dropsy
(*i*) Gastric Disorders
(*j*) General Debility
(*k*) Gonorrhoea
(*l*) Heart disease
(*m*) Hectic fever
(*n*) Helminthiasis
(*o*) Hyperacidity
(*p*) Leprosy
(*q*) Leucorhoea
(*r*) Mental ailmetns
(*s*) Nephritis
(*t*) Oedema
(*u*) Splenic enlargement
(*v*) Tuberculosis
(*w*) Urinary Disorders etc.

It is a constituent of several compound preparations and *Rasas* including *Nawajas* (used for the treatment of Diabetes mellitus) and can also be used as an adjuvant to antipyretic drugs.

5. DOSE[2,17]

120-500 mg after meals with honey, *ghee* (clarified butter), powder of *Trikatu* (three spices: *Sonth, Marich, Pipal*) or *Triphala* (three fruits: *Harar, Bahera, Amla*), or *Haridra Rasa* (*Curcuma longa* juice).

7.15 *MAKSHIKA BHASMA*

1. VARIETIES[8]

1.1 Dhatu Makshika

1.2 Hema Makshika

1.3 Raupya/ Rajat Makshika (Iron Pyrite)

1.4 Svarna Makshika (Copper Pyrite)

2. METHODS OF PREPARATION[8,27]

2.1 Selection of Material : *Svarna Makshika* variety is preferred for medicinal use. It resembles Gold in appearance. *Satvapatana*, an ancient metal extraction process from minerals, may be used. Critical temperatures for extraction of *Satva* from Biotite and Chalcopyrite are 950°C and 900°C respectively.

2.2 Purification : Copper pyrite (3 parts) and Rock salt (1 part) are pulverized together and kept in an Iron pan. Lemon juice is added to this powder and the mixture is subjected to heat over fire. Constant stirring is carried out using an Iron spatula. The process is continued till the ingredients become red hot. After cooling, the powder is removed and washed with warm water. Purification is very important as use of Copper pyrite without proper purification, may lead to several adverse effects including skin reactions, indigestion, jaundice and impaired vision.

2.3 Preparation of *Bhasma* : Purified *Svarna Makshika* (3 parts) and Sulphur (1 part) are triturated together in pestle and mortar using juice of *Aloe barbadensis*. Flat and round cakes are prepared from the resulting paste. The cakes are sun dried, placed in sealed earthen containers and calcined by *Gajaputa* technique using cowdung cakes as fuel. The process is repeated at least 3 times but during the second and third *putas*, less heat is applied.

3. CHEMICAL COMPOSITION[8]

Chemically *Svarna Makshika* (Copper pyrite) is a compound of Copper, Iron and Sulphur. Ancient Ayurvedic texts mention the presence of Gold particles in this metallic ore. The Iron content is more in *Raupya Makshika* (Iron pyrite).

4. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[8,17,27,28]

It possesses anti-anemic and anti-infective properties and is claimed to be therapeutically useful in the following diseases :

(*a*) Anemia
(*b*) Anti-aging/used in geriatric practice
(*c*) Chronic fevers
(*d*) Edema
(*e*) Epilepsy
(*f*) Hoarseness of voice
(*g*) Insomnia
(*h*) Jaundice
(*i*) Leprosy
(*j*) Piles
(*k*) Skin diseases
(*l*) Sprue
(*m*) Tuberculosis
(*n*) Urinary diseases etc.

Raupya Makshika possesses similar properties but is considered to be of inferior quality.

5. DOSE[8]

125 mg to be taken twice daily with honey, ghee or milk. *Raupya Makshika* should be given in higher doses (125-250 mg twice daily with honey).

7.16 *MANDURA BHASMA*

1. METHODS OF PREPARATION[2,4,7,8,10,11,17,28]

1.1 Selection of Material : The small particles/scales of Iron which come off and are scattered when hot Iron is beaten on anvil are called *Mandura*. These are allowed to remain in contact with the earth till these become rusty and brittle. This form is considered fit for medicinal use. Fresh *Mandura* is not useful for therapeutic purposes. Ayurvedic texts state that it should be at least 50 years old and the best type of *Mandura* is 100 year old.

1.2 Purification : The material is made red hot over a flame of fire and immersed in cow's urine. The process is repeated seven times. This is followed by beating with a hammer to small pieces and then triturating in a pestle and mortar to a fine powder. Administration of *Mandura* without proper purification produces adverse effects resembling impure Iron.

1.3 Preparation of Bhasma : Purified *Mandura* is impregnated and triturated with a decoction of *Triphala*. Small cakes are made from the resulting paste, sun dried and calcined in sealed containers by *Gajputa* technique using cow dung cakes as fuel.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2,8]

Properties of *Mandura*, its methods of purification and preparation of *Bhasma* are similar to those of *Kanta Lauha* (Cast Iron) and *Lauha Bhasma*. It is claimed to be useful for the treatment of following diseases:

(*a*) Anemia (Powerful hematinic)
(*b*) Chronic Bowel Complaints (Diarrhoea, Dysentry, Dyspepsia, Intestinal worms etc).

(*c*) Hepatic and Splenic diseases including Chlorosis and Hemolytic jaundice.
(*d*) Menstrual Disorders (Dysmenorrhoea. Menorrhagia)
(*e*) Nervous System Diseases (Epilepsy, Paraplegia, Spasticity, Neuralgia etc.)
(*f*) Oedema/ Dropsy
(*g*) Renal Diseases
(*h*) Skin Diseases
(*i*) Tuberculosis etc.

It is claimed that *Mandura Bhasma* cures oedema, hepatic and splenic disorders more effectively vs *Lauha Bhasma*.

3. DOSE

1 gm twice daily with honey[8]
200 – 500 mg[17]

7.17 *MAYUR CHANDRIKA BHASMA*

1. METHODS OF PREPARATION[18]

Prepared from *Mayur Pankha* (Peacock feathers) according to the method described in *Siddha Yog Sangrah*.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[18,29]

(*a*) Antiemetic
(*b*) Antispasmidic
(*c*) Bronchial asthma
(*d*) Cough with expectoration
(*e*) Dyspnoea
(*f*) Hiccup
(*g*) Vomiting etc.

4. DOSE[18,29]

250 mg to 1 g with honey. Doses are adjusted according to the severity of disease.

7.18 *MRGA SRANGA BHASMA*

1. METHODS OF PREPARATION[2,8,18]

1.1 Purification : Deer-horns are washed with warm water to remove external impurities.

1.2 Preparation of *Bhasma* : The horns are cut into small pieces and completely burnt on fire. This is followed by thorough grinding and trituration with the latex of *Calotropis gigantea* using a pestle and mortar. Small cakes are prepared from the resultant paste, dried, and calcined in *Sarva Samputa* by *Gaja Puta* techniques. The process is repeated three times. Then the material is pulverized to a fine powder in pestle and mortar yielding the *Bhasma* which is stored in a dry, air-tight glass bottle.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[2,8,18,30]

Mrga Sranga Bhasma is considered very useful for treating:

(*a*) Asthma
(*b*) Bronchitis

(*c*) Cardiac diseases (Including Angina pectoris)
(*d*) Chronic fever
(*e*) Cough
(*f*) Dyspepsia
(*g*) Hiccup
(*h*) Hydrothorax
(*i*) Influenza
(*j*) Intercostal neuralgia
(*k*) Pleural effusions
(*l*) Pneumonia
(*m*) Rickets
(*n*) Tuberculosis etc.

3. DOSE[2,8]

125 – 250 mg to be taken twice daily (on empty stomach) with Fresh Butter, Ghee or Honey.

7.19 *MUKTA BHASMA*

1. VARIETIES[2,8]

Mukta (Pearls) are of three types: (*a*) Natural, (*b*) Cultured and (*c*) Artificial. Natural pearls are most useful for medicinal purposes.

2. METHODS OF PREPARATION[2,8,9]

2.1 Selection of Material : Cultured pearls may also be used in medicine but this variety is considered inferior and is less effective. Artificial pearls should not be used in medicine.

2.2 Purification : Natural pearls are boiled in *Dola Yantra* using the juice of *Sesbania sesban* for 3 hours.

2.4 Preparation of *Bhasma* : Purified pearls are broken into small pieces and triturated with cow's milk or rose water for 6 hours. Cakes are made from the resulting paste, sun dried and calcined by cooking in *Laghu Puta* using *Sarva Samputa Yantra*. The process is repeated for at least 3 times.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2,,17,29,30]

Mukta Bhasma is digestive, anti-infective, anti-tussive, febrifuge and promotor of virility longevity, eye sight and complexion. It is claimed to be therapeutically useful in a variety of diseases e.g.:

(*a*) Abortion
(*b*) Asthma
(*c*) Bone Diseases
(*d*) Bronchitis
(*e*) Burning syndrome
(*f*) Cardiac disease
(*g*) Chronic fevers
(*h*) Cough
(*i*) Jaundice

(*j*) Mental Disorders
(*k*) Teething trouble in children
(*l*) Tuberculosis etc.

4. DOSE[2,8]

25 - 50 mg to be taken twice daily on empty stomach with milk, cream or fresh butter.

7.20 *MUKTA SHUKTI BHASMA*

1. METHODS OF PREPARATION[2]

Mukta Shukti Bhasma is prepared from outer covering of the shell (Pearl oyster). Purified material is burnt on fire, pulverized and ground with *Kumari Svaras* (*Aloe barbadensis* juice). Small cakes, made from the resultant paste, are calcined using *Sarva Samputa Yantra* and *Gaja Puta* technique. Two *Putas* are given.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[2,4,17,30]

It possesses anti-infective, anti-inflammatory, emenagogue, digestive and febrifuge properties and is claimed to be therapeutically useful in many ailments e.g.:

(*a*) Acidity
(*b*) Arthritis
(*c*) Asthma
(*d*) Biliary disturbances
(*e*) Blood diseases
(*f*) Chronic fever
(*g*) Colic
(*h*) Conjunctivitis
(*i*) Cough
(*j*) Dysmenorrhoea
(*k*) Dyspepsia
(*l*) General weakness
(*m*) Heart disease/Weakness of heart
(*n*) Jaundice
(*o*) Mental disorders
(*p*) Musculoskeletal disorders
(*q*) Rheumatism
(*r*) Tuberculosis
(*s*) Vomiting etc.

3. DOSE[2]

250 - 500 mg with honey or lemon juice

7.21 *NAGA BHASMA*

1. METHODS OF PREPARATION[2,8,11,15,20,21,31]

1.1 Lead : *Naga/Sisaka/Sisa* (Lead) never occurs free in Nature. It is available as: (*a*) *Galena/Surma* (Lead sulphide), (*b*) *Sindura* (Red oxide of Lead) manufactured by ancient Hindoos and used by all married women on the forehead, (*c*) *Safeda* (Lead Carbonate), and (*d*) *Murdar Sang* (Litharge) has no proper Sanskrit equivalent. Generally the metal obtained by roasting Galena is used for preparing *Bhasma*.

1.2 Purification :

(*a*) Lead sulphide is roasted in a crucible and melted liquid is dropped through a hole into a vessel containing latex of *Calotropis gigantea*.

(*b*) Alternatively, the metal is heated mildly with the oil of sesame (*Sesamum orientale*), butter milk, cow's urine, *Kanji* (a type of vinegar), and a decoction of *Dolichos biflorus*, seven times in each solution. This general method of purification is followed by a special method of purification to make the Lead free from toxic effects. The metal is heated in an Iron pan till it melts and to this turmeric powder (*Curcuma longa* rhizomes) is added in a proportion of 4:1. The mixture is dropped through a hole into a vessel containing the juice of *Vitex negundo* leaves. The process is repeated seven times.

(*c*) *Shastiputa Naga Bhasma* can be prepared by adding *Manashila* (As) in *Gandhaka* (S)

1.3 Preparation of *Bhasma* :

(*a*) Purified Lead is melted in an Iron pan. To this equal amount of powder of the bark of *Ficus religiosa* is gradually added in small quantities and rubbed with the help of a strong Iron spoon till the whole metal is reduced to ash. When it gets collected in the center of the pan, it is covered with an Iron plate and subjected to intense heat till the Iron pan becomes red hot. The powder is collected after the pan cools down and washed with hot water till it becomes free from the ash of *peepal* bark. To this powder, equal quantity of *manashila* (Arsenic sulphide/Realgar) is added alongwith lemon juice and the mixture is triturated for 8 hours. Cakes are made from the resultant paste, sun dried and calcined by keeping in *Sarva Samputa* and cooking in *Laghuputa*. The process is repeated three times.

(*b*) Another method involves reduction and calcination of purified Lead with Arsenic sulphide, adding juice of betel leaves and rubbing to a fine powder.

(*c*) Other methods use ash of *Acharynthus aspera, Adhatoda vasica, Terminalia arjuna, Terminalia belerica, Punica granatum* etc. and also Mercury alongwith ash of Lead to 'kill' the metal completely.

1.4 Adverse Effects of Impure Lead: Lead, used without proper *Shodhna* and *Marana* processes, may cause several adverse effects including colic, obstinate skin reactions resembling leprosy, pain in joints, diabetes, urinary disorders, oedema, anal fistula and phantom tumour.

2. CHEMICAL COMPOSITION[20]

Analysis by AAS revealed 62.4% Lead content in *Naga Bhasma*.

3. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[2,8,5,17,20]

Naga Bhasma is attributed with digestive , tonic, aphrodisiac, retentive and rejuvenating properties. It is claimed to be therapeutically useful in following diseases:

(*a*) Acidity
(*b*) Abdominal swellings
(*c*) Colic
(*d*) Diabetes
(*e*) Diarrhoea

(*f*) Eye ailments
(*g*) Hemiplegia
(*h*) Hemorrhoids/ Piles
(*i*) Impotency
(*j*) Irritable colon
(*k*) Malabsorption syndrome
(*l*) Menorrhagia
(*m*) Oedema
(*n*) Osteoporosis
(*o*) Phantum tumour
(*p*) Piles
(*q*) Rectal Fistula
(*r*) Respiratory Diseases
(*s*) Rheumatic Arthritis
(*t*) Sprue
u) Urinary Disorders etc.

4. DOSE[2]

62.5-125mg with juice of *Curcuma longa* or *Eugenia jambolana*

7.22 PARADA BHASMAS

1. METHODS OF PREPARATION[10]

1.1 Selection of Mercury : Commercially available Mercury contains several impurities e.g. Tin, Lead, dirt, stones etc. Bright variety is like mid-day sun externally and of a bluish tinge internally. Yellowish white, purple or variegated-colour varieties should not be used in medicine.

1.2 Purification : (*a*) Mercury is rubbed with brick-powder and garlic (*Allium sativum*), tied in four folds of cloth and boiled in water over gentle fire for 3 hours in *Dola Yantra*. After cooling, it is washed in cold water and sun-dried. (*b*) Betel (*Piper betel*) leaves have also been used (instead of garlic) for rubbing with Mercury. (*c*) Mercury obtained by sublimation of Cinnabar is considered pure for internal use. Cinnabar is rubbed with lemon juice for 3 hours and then sublimed in *Urddhapatana Yantra*. The Mercury is deposited within the upper pot of the apparatus in the form of a blackish coloured powder. It is scraped, rubbed with lemon juice and boiled with water. (*d*) Mercury, with a little Sulphur over it, is placed in an earthen pot and subjected to heat on a sand-bath. The Sulphur begins to melt. Cautiously and gradually more Sulphur is added (altogether 6 times the weight of Mercury). When the whole mixture is melted and is oil-like in appearance, the pot is quickly removed from the fire and cooled for consolidation of the mass. The latter is broken, the Mercury so purified (*Shadguna Bali Jarita Rasa*) is considered best. Mercury purified by all of the above processes is fit to be used for medicinal purposes.

1.3 Preparation and Varieties of *Bhasmas* :

***1.3.1 Krisna Bhasma/ Kajjali* (Black, Sulphide of Mercury) :** Described earlier.

***1.3.2 Ras Karpoorva* (White, Perchloride of Mercury) :** (*a*) Equal parts of Mercury and Chalk are rubbed together till the globules disappear. This is followed by repeated rubbing of the mixture with *Pansu* (salt

procured from Saline Earth) and juice of *Euphorbia neriifolia*. The material is enclosed in a sealed crucible and subjected to heat in a pot full of rock salt. The perchloride of Mercury is deposited as a pure white powder under the lid of the crucible. (*b*) Another process involves rubbing together equal parts of purified Mercury, Red ochre, Brick-dust, Chalk, Alum, Rock salt, Earth collected from Ant-hill, *Kshari Lavana* (Impure sulphate of soda) and Red earth used for colouring pots. The mixture is strained through a muslin cloth, placed in an earthen pot, sealed with layers of cloth and clay and subjected to heat for 4 days. The pot is broken open and a white camphor-like deposit in the upper part of the pot is collected for use.

1.3.3 Pita Bhasma **(Yellow variety) :** Equal parts of purified Mercury and Sulphur rubbed together for 7 days using juices of *Phyllanthus neruri* and *Heliotropium indicum*, placed in a covered crucible and heated on sand bath for 12 hours.

1.3.4 Rakt Bhasma/Rasa Sindoora **(Red Variety).** Equal parts of purified Mercury and Sulphur are rubbed together with red buds of *Ficus bengalensis* for 3 successive days. This is followed by placing the mixture in a bottle and heating on sand bath for 12 hours. Red deposit, adhering below the neck of the bottle, is collected. It is in the form of dark shining scales.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[10]

Parada (Sanskrit word, literal meaning : that which protects). It is so called because it is considered to be protective against all sorts of diseases in Ayurveda through its capability of removing derangement of all the humours. It is attributed with alterative, appetizing, febrifuge, general tonic and rejuvenating properties and enters into the composition of several compound formulations, *Rasas* (e.g. *Vajrakapata Rasa, Mahagandha Rasa, Pandusudana Rasa, Rajamriganka Rasa* etc.), *Parpati* (e.g. *Rasa Parpati, Panchamrita Parpati* etc.), *Rasendragutika, Chintamani Chaturmukha, Arogyawardhini* etc.), for internal and external use in various diseases/ symptoms :

(*a*) Gastric and Hepatic ailments
(*b*) General debility
(*c*) Nervous system Diseases e.g. Insanity, Cephalgia, Deafness, Ringing in Ears, Paralysis of Tongue.
(*d*) Urinogenital and Gynecological problems
(*e*) Skin Diseases e.g. Eczema, Ring worm, Psoriasis etc. Also useful for Improving Complexion.
(*f*) Infectious Diseases
(*g*) Non-specific fevers etc.

3. REMARKS

Among the Mercury preparations, the most reputed is *Makardhwaja*. The *Parada Bhasmas*, though described in Ayurvedic texts in metallic medicines, are seldom used practically and *Pitta Bhasma* is not at all used at present time.

7.23 *PHENESMA BHASMA*[10]

Phenesma Bhasma has been mentioned by *Sushruta* as a poison alongwith *Haritala*. Some Ayurvedic physicians equate it with White Arsenic. It is doubtful that this *Bhasma* is prepared from White Arsenic because:

(*a*) It is not indigenous to India (unlike Red suphide or Realgar and Yellow sulphide or Orpiment). It was brought from Burmah, China and Persian Gulf.
(*b*) The derivation of the term *Phenesma* implies that it was obtained by roasting some Ore or Stone.

The Arsenic compound most commonly used in the Indian sub-continent is Orpiment (see *Haritala Bhasma*). White Arsenic was, however, obtained artificially by roasting Orpiment.

7.24 *PRAVALA BHASMA*

1. METHODS OF PREPARATION[2,8,9]

1.1 Selection of Material : Both stem and root of Coral are used for medicinal purpose: the former is more effective therapeutically.

1.2 Purification : Coral is crushed into small pieces, visible impurities (sand, foreign bodies) are removed, washed with warm water and sun-dried. This is followed by cooking of washed Coral in a *Dola Yantra* using the juice or decoction of *Sesbania sesban*. After cooking, the material is washed again with warm water and dried in sun.

1.3 Preparation of *Bhasma* : Purified *Pravala* is triturated with the juice of *Aloe barbadensis* in a pestle and mortar. Cakes are prepared from the resultant paste and calcined in half *Gajputa* by *Sarva samputa* technique. The process is repeated at least three times.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[2,8,29,30,34]

It is attributed with astringent, antidiarrhoeic, antidiabetic, detoxicant, diuretic, febrifuge, styptic, tonic (general, cardiac, brain and sexual) and urinary antiseptic properties and is claimed to be therapeutically useful in the following diseases:

(*a*) Asthma
(*b*) Bleeding from different parts of the body (*Rakta Pitta*)
(*c*) Bone diseases
(*d*) Bronchitis
(*e*) Chronic fevers
(*f*) Cough with expectoration
(*g*) Diabetes
(*h*) Epilepsy
(*i*) Excessive sweating
(*j*) Gastric disorders
(*k*) General debility
(*l*) Hemoptysis
(*m*) Impotence
(*n*) Insanity
(*o*) Melancholia
(*p*) Palpitation
(*q*) Piles
(*r*) Renal calculi
(*s*) Rickets
(*t*) Skin diseases
(*u*) Splenic enlargement
(*v*) Spermatorrhoe
(*w*) Surma for Eye diseas
(*x*) Tooth Powder for Improving Gums and Teeth
(*y*) Urino- genital infections etc.

7.25 *RAUPYA BHASMA*

1. SYNONYMS

Rajat Bhasma, Chandi Bhasma

2. METHODS OF PREPARATION[2,7,8,35]

2.1 Selection of Material : Pure natural Silver and Silver extracted from ores may be used. The metal should be made into thin leaves before processing.

2.2 Purification

(*a*) Silver is purified by *Nirvapana* i.e. heating over flame of fire followed by immersing seven times in each of the following liquids : til oil, butter milk, cow's urine, *Kanji* (a type of Vinegar), and decoction of *Dolichos biflorus*. The Silver leaves are heated again and immersed in the juice of *Sesbania grandifolia* leaves. The process is repeated three times.

(*b*) Silver is melted with Lead and Borax.

(*c*) Use of impure Silver may lead to adverse effects e.g. burning sensation in the body, inhibition of metabolic processes, reduced vitality, constipation and prostration in severe cases.

2.3 Preparation of *Bhasma*

(*a*) Purified Silver leaves are cut into pieces, mixed with equal quantity of purified Mercury and transformed to a fine amalgam. The latter is mixed with equal parts of purified Sulphur and purified Orpiment and triturated with the juice of *Aloe barbadensis* for the whole day. Cakes made from the resultant paste are sun dried and subjected to calcination in covered earthen plates sealed by layers of cloth and clay. This is followed by cooking in *Laghu Puta* with seven repeats. The material is then pulverized in a pestle and mortar for one hour yielding a black coloured *Bhasma*. Some other methods produce pink coloured *Bhasma*. Clean dry glass bottles are used for storage.

(*b*) The sheets of purified Silver are smeared with *Kajjli*, which is prepared by mixing two parts of Sulphur and one part of Mercury ground with the juice of Jambira (*Citrus acida*). It is then heated in *Gajaputa* (fuel pit of dimensions one cubic yard). The product thus obtained is called *Raupya Bhasma* or Reduced Silver.

(*c*) Silver leaves, purified as above, are cut into small pieces and powdered with equal quantity of Mercury. The leaves are next pounded with juice of *Citrus medica* and subjected to the process of roasting known as *Putapaka*. By repeating the process thrice, pure ashes of silver may be obtained.

(*d*) A paste is made by mixing powdered Orpiment and another paste is made by mixing powdered pomegranate (*Punica granatum*) bark, acacia (*Acacia arabica*) leaves and juice of aloe (*Aloe indica*) leaves. These two pastes are thoroughly mixed and a bolus is made with it. In the centre of this, pure refined Silver leaf is placed in the shape of a ball and the whole is covered with clay. It is then roasted and then calcined.

(*e*) Silver leaves are rubbed with Mercury and the juice of *Atrocarpus lukucha*. The resulting paste is then embeded in Sulphur and heated in a covered crucible on a sand bath. When cold, the mass is once rubbed with orpiment and acid and roasted twelve times. By this process the Silver is reduced to an ash-like substance.

(*f*) Four parts of Silver leaves are rubbed with one part of Orpiment and lemon juice and the mixture is roasted. The process is repeated 14 times and thus the Silver is completely reduced.

(*g*) Silver leaves are mixed with twice the weight of Cinnabar heated in the sublimation apparatus called *Urdhapatan Yantra*. This process is repeated 14 times. The resulting compound is a fine greyish black powder with minute shining white particles intermixed with it.

Similar methods of preparation have been described in original sources e.g. *Rasendra Sara Sangrah*[36]; *Ras Ratan Samuchaya*[25] *Ayurved Sar Sangrah*[21]; *Rasendra Chudmani*[36]. The recipes are similar but different Plant, Mineral and Animal-origin ingredients are added during the ashing process. These are shown in Table 7.3.

TABLE 7.3: ADJUNCTS USED DURING PREPARATION OF SILVER *BHASMAS* BY VARIOUS METHODS[35]

(A) PLANTS

S.No.	Scientific Name	Vernacular Name	Plant used
1.	*Acacia arabica*	Agar	Leaves
2.	*Aloe barbadensis /Aloe indica*	Gheekanwar Kumari	Juice of leaves
3.	*Atrocarpus lukucha*	Aak	Juice
4.	*Calotropis gigantea/Calotropis procera*	Madar	Latex
5.	*Citrus Limon / citrus medica* var : *acida* var: *limonum*	Nibu (Bara and Kagzi varieties)	Juice of fruits
6.	*Dolichos biflorus*	Kulatha Qalai	Plant extract
7.	*Punica granatum*	Anar	Bark
8.	*Rosa damascena* *Rosa indica*	Gulab	Flowers
9.	*Sesbania grandiflora*	Agasti Basna	Juice of leaves
10.	*Tamarindus indicus*	Imli	Fruit
11.	*Xylia xylocarpa*	Jambu	Juice

(B) MINERALS

S.No.	English Name	Vernacular Name
1.	Arsenic	Hartal (Warqi and Tabqi) varieties
2.	Borax	Tankana
3.	Lead	Sisa
4.	Mercury	Para, Parad as Hingul, Sangraf, Kajjali
5.	Sulphur	Gandhak

(C) ANIMAL ORIGIN

Whey, Cow's urine etc.

3. CHEMICAL COMPOSITION

3.1 Chopra and co-workers[7] analysed a sample of *Raupya Bhasma* obtained from M/s Kalpatau Ayurvedic works, Calcutta. Their findings are given in Table 7.4.

TABLE 7.4: CHEMICAL COMPOSITION OF *RAUPYA BHASMA*

Chemical Ingredients	Content (%)
Silver metallic	79.670
Sulphur	14.805
Ferric oxide (Fe_2O_3)	7.830
Phosphate (P_2O_5)	1.080
Silica (SiO_3)	1.160
Lime (CaO)	0.880
Potash (K_2O)	0.141
Soda (Na_2O)	0.054
Sulphuric anhydride (SO_3)	0.935
Moisture and other constituents	0.304
Total	100.000

3.2 Bhatnagar[38] conducted analytical studies on laboratory prepared and market samples of *Rajat Bhasma*. Their findings are: Ag 66.1-78.6% and S 13.2-32.3%, As: traces.

4. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[2,7,8,17,35-37,39]

Raupya Bhasma possesses appetizing, strengthening, nootropic, general, cardiac, nervine and sexual tonic, rejuvenating and anti-aging properties. It is claimed to be useful for the treatment of various diseases and also for improving complexion, eye sight and memory. Therapeutic efficacy has been described in the following diseases :

(*a*) Cardiac disease (*b*) Cough (*c*) Cholera
(*d*) Epilepsy (*e*) Eye diseases (*f*) Gastro-intestinal disorders
(*g*) Giddiness/ Confusion, (*h*) Infectious diseases (*i*) Insanity
(*j*) Jaundice (*k*) Loss of Memory and Concentration
(*l*) Mental retardation (*m*) Neuralgia (*n*) Nonspecific fevers
(*o*) Palpitation (*p*) Physical Mental and Sexual Debility
(*q*) Poisoning (*r*) Pregnancy Disorders (*s*) Splenic disorders
(*t*) Tissue loss (*u*) Tuberculosis (*v*) Urinary Diseases etc.

5. DOSE[35]

60 – 125 mg once or twice a day with honey, butter, cream, milk or fruit jam.

7.26 *RAUPYA MAKSHIKA BHASMA*

1. METHODS OF PREPARATION[18]

Prepared from purified *Raupya* (Silver), *Kulthi Quath* (*Dolichos biflorus* extract), *Til Tel* (Sesame oil), and *Ajamutra* (Goat urine) according to the method described in *Arogya Prakash*.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[18]

(*a*) Anemia (*b*) Anthelmintic (*c*) Dyspepsia
(*d*) General debility (*e*) Inflammation (*f*) Jaundice
(*g*) Renal calculi (*h*) Skin diseases (*i*) Urinary diseases
(*j*) Uterine disorders etc.

3. DOSE[18]

65-125 mg twice a day with honey or water

7.27 *SAMUDRA PHENA*

1. METHODS OF PREPARATION[2,7,8,34,38]

1.1 Selection of Material : *Samudra* (Sea) and *Phena* (Foam), though believed to be dried foam of sea water, is the calcarious shell of a marine fish (probably *Sepia officinalis*). The shell is oblong or elliptical in shape with a smooth outer surface composed of thin flat pieces arranged one over the other in a heap of thin layers separated from each other by longitudinal ridges. It can be easily scratched and pulverized. The inner surface is hard but porous. The external surface is used in medicine.

1.2 Purification : The external coating (shell) of Cuttle fish bones is carefully removed and triturated with lemon juice in a pestle and mortar to a very fine powder. The purified material is used as such for medicinal purposes, *Marna* (killing or calcination) is not necessary.

2. CHEMICAL COMPOSITION:

Chopra and associates[7] reported the following chemical composition of Cuttle fish bones :

TABLE 7.5 : CHEMICAL COMPOSITION OF *SAMUDRA PHENA*[7]

Chemical Ingredients	Content (%)
Lime (CaO)	49.725
Silica (SiO_2)	0.580
Iron (Fe_2O_3)	0.324
Alumina (Al_2O_5)	0.102
Phosphoric acid (P_2O_5)	0.048
Carbon dioxide (CO_2)	38.560
Sodium chloride (NaCl)	1.670
Potash (K_2O)	trace
Magnesia	trace
Sulphates	trace
Moisture	3.925
Organic matter	0.066
TOTAL	100.00

(Nitrogen : 0.364%)

3. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[7,8,30,34]

It is attributed with antacid, antiemetic, astringent, dentiferous and anti-inflammatory properties and is claimed to be therapeutically useful in the following diseases/ conditions :

(*a*) Ear diseases like Otitis Media
(*b*) Eye diseases
(*c*) Gonorrhoea
(*d*) Irritating Skin diseases (e.g. Ringworm and Scabies, Leprosy)
(*e*) Inflammatory conditions and Insect Bites
(*f*) Insomnia
(*g*) Renal calculi
(*h*) Tooth Powder for Improving Gum and Teeth etc.

4. DOSE

Normally used only for external application. Internal use is not recommended in Ayurveda but Chopra and coworkers[7] stated the medicine to be quite effective and better than Calcium lactate. The dose is 5-15 grains.

7.28 *SHANKHA BHASMA*

1. METHODS OF PREPARATION[2,8,30]

1.1 Purification : Conch shells are broken into pieces, washed with hot water to remove mud, sand and foreign bodies, and cooked with lemon juice in *Dola Yantra* for 12 hours. The pieces are washed again with warm water and dried.

1.2 Preparation of *Bhasma* : Purified Conch shells are sealed inside *Sarva Samputa* and subjected to calcinations by *Gajputa* technique using cow dung cakes as fuel. The seal is then broken, shell pieces removed and pulverized in a pestle and mortar. The powder, so produced, is again calcined in *Sarva Samputa* by *Gaja Puta* method. The material is removed and triturated again to a very fine powder. The latter is a stored in air-tight glass bottle.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[2,4,8,17,19,29,34,40]

Shankha Bhasma is attributed with antacid, digestive, antibilious, and febrifuge properties. It is claimed to be therapeutically useful in following diseases by external and internal use :

(*a*) Biliousness
(*b*) Blood Dyscrasias
(*c*) Colic
(*d*) Diarrhoea
(*e*) Duodenal and Gastric Ulcers
(*f*) Eye Diseases (Conch shell powder is used in cases of Cataract. *Bhasma* is not used for this purpose as it is corrosive).
(*g*) Gastroenteritis
(*h*) Hepatosplenomegaly
(*i*) Hyperacidity/ Hyperchlorhydria
(*j*) Indigestion
(*k*) Irritable Colon
(*l*) Malabsorption syndrome

(*m*) Pimples
(*n*) Poisoning
(*o*) Sprue
(*p*) Vomiting etc.

7.29 *SIDDHA MAKARDHWAJA*

1. HISTORY

Siddh Makardhwaja is a marvel drug of Ayurveda and Siddha medicine with a history of usage since ancient times. It is being used from the time of Bhavmishra, renowned Ayurvedic physician who lived in the early part of sixteenth century[11]. Description of *Makardhwaja* recipes is available in ancient texts. *Rasa Ratna Samuchaya*[24] and *Ras Tarangini*[41].

2. METHODS OF PREPARATION[7,8,42-44]

2.1 Purification : Please see under *Parada Bhasmas*

2.2 Preparation of Bhasma : Several methods have been described in Ayurvedic literature.

(*a*) Purified Mercury (8 parts) and purified Gold leaves (1 part adding the leaves one by one) are mixed together to form an amalgam. The latter is mixed with Sublime Sulphur (16 parts) and the mixture is triturated thoroughly with tender leaves and buds of *Ficus bengalensis* and the juice of *Aloe barbadensis* in a stone mortar. The process is continued for 24 hours or more till it turns into a fine, homogeneous powder without metallic luster. The resultant powder/ *Kajjali* should have no grit on lumps and should be light enough to float on the surface of water. The *Kajjali* (basic material for *Makardhwaja*) is placed in a narrow-mouthed bottle and gradually heated on a sand bath. When the temperature reaches a critical level, the bottle is filled with reddish fumes of various hues. On cooling crystals of *Makardhwaja* are found deposited on the inner surface of the bottle. These are collected by breaking the neck of the bottle and scraping off the deposit. The powder of Gold remains at the bottom of the bottle.

(*b*) *Makardhwaja* should be prepared from *Shudha Parada* (purified Hg). Internal use of *Ashudha Parada* (impure Hg) is harmful. It results in many undersirable effects and may even cause death. *Kupipakwa* method of preparation yields potent drug. This method is very popular among Ayurvedic physicians. For optimum yield, heating should be done as follows (6 hours for each phase, successively):

Mridu	(Low heat, 120-200 °C)
Madhya	(Medium heat, 200-400 °C)
Teevra	(High heat, 400-600 °C)

(*c*) Gold powder and sublimed *Makardhwaja* are mixed well and triturated for 3 days by adding the juice of *Piper betel* leaves. Thereafter Camphor and Musk (each 1/8th the quantity of *Makardhwaja*) should be added and again triturated with the juice of betel leaves. Pills (250 mg), made from the resultant paste are shade dried and stored in a glass bottle.

3. CHEMICAL COMPOSITION[2,7,42]

Chemically *Makardhwaja* is Red Sulphide of Mercury. Traces of Co, Cr, Fe, Mn and Ni are also present. Though naturally occurring *Hingul* (Cinnabar) is also Red Sulphide of Mercury. It differs from Ayurvedic *Makardhwaja* in pharmacological and therapeutic properties. These differences are difficult to explain.

4. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[7,8,29,45-47]

Siddh Makardhwaja is claimed to possess diverse pharmacological and therapeutic properties making it a panacea for the treatment of all human ailments including several obstinate and otherwise incurable diseases. It is attributed with alterative, digestive, metabolic stimulant, aphrodisiac, general and cardiac tonic, rejuvenating and longevity - promoting properties. It is claimed to be useful in following diseases/ conditions :

(*a*) Convalescent patients after acute illness
(*b*) Coma/ Collapse : A pinch (taken with Honey) is said to restore normalcy in collapsing patients.
(*c*) Debility
(*d*) Failing circulation
(*e*) Gastro-intestinal Atony
(*f*) Impaired memory
(*g*) Impotence
(*h*) Insomnia
(*i*) Mental restlessness
(*j*) Neurasthenia
(*k*) Tissue loss etc.

It is believed that Mercury ion, in high state of dilution, acts as a metabolic catalyzer by its mere presence in the intestines without ever reaching the blood stream. It elicits a stimulant action in high state of dilution and opposite effects when administered in large doses.

1. DOSE[29]

30-60mg thrice daily with honey.

7.30 *SPHATIKA BHASMA*

1. METHODS OF PREPARATION[3]

Purified *Sphatika* (Alum) is heated in a hot pan till fully dehydrated.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[3,29]

(*a*) Epistaxis
(*b*) Erysepelas
(*c*) Female genital tract disorders
(*d*) *Vata, Kapha* diseases etc.

3. DOSE[3]

125-250 mg

7.31 *SURAKSARA KASISA BHASMA*

1. METHODS OF PREPARATION[22]

Equal parts of *Suraksara* (Salt petre/Potassium nitrate) and *Kasisa* (Green vitreol/Ferrous sulphate) salts are soaked in lime juice for a day. The quantity of lime juice should be just sufficient to submerge the salt. Thorough grinding is done adding more lime juice. Small cakes, prepared from the resultant dough, are calcined using cow dung cakes as fuel. Repeated calcinations may be necessary to get *Bhasma* of proper quality. Six hundred cow dung cakes are considered sufficient for 3 kg of total material.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[22]

(*a*) Abdominal ailments
(*b*) Antidote to toxins
(*c*) Diuretic
(*d*) Liver and spleen disorders
(*e*) Urinary diseases: Anurea/Dysurea

3. DOSE[22]

200-500 mg with various *Anupanas* eg. Honey and pulverized herbs/species (Rhubarb, Cloves, Black salt, Long pepper, Chebulic myrobalans etc). Repeat doses may be necessary.

7.32 *SUVARNA MAKSHIKA BHASMA*

1. METHODS OF PREPARATION[2]

Suarna Makshika (Copper pyrite) is pulverized and sieved. The powder is purified by heating in an iron pan with *Nimbuka Svarasa* (Lemon juice) till the moisture is fully evaporated. The process takes 2-3 days to yield purified material which is pink in colour. This is followed by *Marana* by grinding well with *Eranda Taila* (*Ricinus communis* oil). Small cakes, made from the resultant mixture, are calcined using *Sarva Samputa Yantra* and *Gaja Puta* technique. The process is repeated ten times adding ¼ part *Gandhaka* (Sulphur) each time. Normally 10 *Putas* are sufficient to yield quality *Bhasma* but sometimes more *Putas* are necessary.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[2]

(*a*) Anemia
(*b*) Chronic fever
(*c*) Epilepsy
(*d*) Helminthiasis/Worm infestation
(*e*) Inflammation
(*f*) Insomnia
(*g*) Leprosy
(*h*) Piles
(*i*) Polyurea
(*j*) Scanty menstruation
(*k*) Tuberculosis etc.

3. DOSE[2]

125-250-mg with honey

7.33 *SUVARNA BHASMA*

1. METHODS OF PREPARATION[2,7,8-10,48]

1.1 Selection of Material : Gold, which is free from chemical impurities, is selected. It is beaten to very thin leaves (*Sonavarak*).

1.2 Purification : Gold leaves are taken in forceps and made red hot by exposing to the strong flame of fire. This is followed by immersion in Til oil. The process of heating and immersion in oil is repeated 7 times.

Similar treatment of the Gold leaves (heating and immersion) is carried out 7 times with each of the following liquids : Butter milk, Cow's urine, *Kanji* (a type of Vinegar) and decoction of *Dolichos biflorus*. Finally the leaves are washed with warm water and dried. Use of Gold without proper purification may reduce strength and intellect of the patient.

1.3 Preparation of *Bhasma* : Several methods are available in Ayurvedic texts:

(*a*) Purified Gold is triturated with equal quantity of Arsenic in a pestle and mortar by adding the juice or decoction of *Bauhinia variegata* for 7 days. The process is repeated for another 7 days with the juice of *Ocimum sanctum*. Thereafter small, round and flat cakes are prepared from the resultant paste and dried in sun. Next the cakes are encased inside two earthen plates, sealed with layers of cloth and clay, sun dried and subjected to calcinations by *Laghuputa* technique using cow dung cakes as fuel. After cooling the earthen plates are broken open to collect the cooked cakes. The latter are mixed with one fourth quantity of Arsenic and triturated with juice or decoction of *B. variegata* and *O. sanctum* for 7 days each. The process is repeated 8 times by increasing the fuel (number of cow dung cakes) in subsequent *Putas*. At the end of 10 *Putas*, the *Bhasma* becomes pink in colour. It is stored in a clean dry glass bottle.

(*b*) In reducing Gold one part of the purified metal and two parts of Mercury are rubbed with an acid and made into a ball. Powdered Sulphur (equal in weight of the ball) is taken, half of the Sulphur is placed in an earthen plate, the ball is placed over it and it is covered with another earthen plate. A piece of cloth is then smeared with clay and it is wrapped round the plate and dried in the sun. It is then placed on 30 pieces of dry cow dung cakes and roasted. The process is repeated 14 times.

(*c*) Gold is reduced to a fine powder by rubbing with Mercury and exposing it to heat in a covered crucible with the addition of Sulphur. Mercury (2 parts) and purified Gold Leaves (1 part) are rubbed together into a mass with Lemon juice and Sulphur (3 parts). The crucible is then covered and exposed to heat. The process of mixing Gold with Mercury and exposing the mixture so formed to heat is repeated 14 times when the Gold completely loses its apparent metallic characters. Some physicians opine that Gold should be rubbed with Mercury when roasted for the first time only and subsequent roasting should be done with Sulphur alone.

(*d*) Another process of preparing reduced Gold involves melting of the metal and equal quantity of ash of Mercury is thrown into the molten metal. After cooling, the material is pulverized and rubbed with Lemon juice and Cinnabar followed by roasting again in a covered crucible. The process is repeated several times.

(*e*) Purified Gold is melted with one-sixteenth quantity of Lead. After cooling the mixture is macerated with any sour liquid, made into discs, dried and calcined in sealed earthen plates with equal amount of Sulphur. According to *Sarangdhara Samhita*, seven such *Putas* yield *Nirutha Bhasma* of Gold.

(*f*) Gold leaves are covered on both sides with a paste of Excreta of Pigeon or Cock and dried. This is followed by calcination in sealed earthen plates with powdered Sulphur using 30 cow dung cakes as fuel. This is one *Kukkut Puta*. Nine such *Putas* are given.

2. CHEMICAL COMPOSITION

Chopra and coworkers[7] analysed a sample of *Swarna Bhasma* obtained from M/s Kalpataru Ayurvedic Works, Calcutta. Their findings are given in Table 7.6.

TABLE 7.6 : CHEMICAL COMPOSITION OF *SUVARNA BHASMA*[7]

Chemical Ingredients	Content (%)
Gold, metallic	96.760
Silica (SiO_2)	1.140
Iron (Fe_2O_3)	0.140
Lime (CaO)	0.546
Copper	Traces
Magnesia	Traces
Phosphates (P_2O_5)	0.781
Potash	0.161
NaCl	0.078
Sulphates	0.150
Moisture	0.244
Total	100.000

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2,7,8,11,49-51]

Swarna Bhasma is attributed with tonic, rejuvenating, detoxicant, complexion improving, and anti-aging properties and claimed to be of therapeutic value in following diseases:

(*a*) Anaemia
(*b*) Arthritis (prime ingredient of antiarthritic formulations RUMALAYA COMPOUND by Alarsin and RHEUMAYOG by Zandu)
(*c*) Asthma
(*d*) Bronchitis
(*e*) Cancer
(*f*) Chronic fevers
(*g*) Dyspepsia
(*h*) Epigastric pain
(*i*) Epilepsy
(*j*) General and Sexual Debility
(*k*) Hysteria
(*l*) Impotence
(*m*) Infectious Diseases
(*n*) Leucoderma
(*o*) Loose Bowels
(*p*) Loss of Memory and Concentration
(*q*) Neuropsychiatric Disorders
(*r*) Schizophrenia
(*s*) Tuberculosis etc.

4. DOSE

10–20 mg to be taken twice daily with Butter, Cream, Milk or Ghee[8].
15-62.5 mg with honey or butter[2].

7.34 *TALAKA BHASMA*

1. METHOD OF PREPARATION[22]

Talka (Yellow orpiment) is ground with the leaf juice of *Karela* (*Momordica charantia*) and dried. The dried material is mixed with the ash of the bark of Bengal kino and subjected to calcination. The final product is yellow in appearance with a blackish green tint.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[22]

(*a*) Anal fistula
(*b*) Antimicrobial
(*c*) Blood purifier
(*d*) Skin diseases including leprosy

3. DOSE[22]

100-200 mg twice daily with honey. Other *Anupanas* recommended by Ayurvedic physicians include Indian Beech tree root, Embelia fruits, calx of Asphalt and Sugar.

7.35 *TAMRA BHASMA*

1. METHODS OF PREPARATION[2,8,10]

1.1 Selection of Material : Copper is collected from the mineral ores like copper pyrites and beaten to thin plates/ leaves which can be pierced by thorns.

1.2 Purification :

(*a*) Thin plates/ leaves of Copper are heated over a flame of fire and immersed for 7 times in each of the following fluids : Oil from *Sesamum indicum*, Butter-milk, Cow's urine, *Kanji* (a type of Vinegar) and the Decoction of *Dolichos biflorus*. The Copper plates are then smeared with a paste made from Rock salt and the latex of *Calotropis gigantea*, heated over fire and immersed into the juice of *Vitex negundo*. The process is repeated 7 times.

(*b*) Copper plates may also be purified by boiling in Cow's urine for 3 hours.

1.3 Preparation of *Bhasma* : Equal quantities of purified Mercury and Sulphur are triturated to a fine black powder in a pestle and mortar with Lemon juice to yield a paste. The latter is smeared on purified Copper leaves and dried in sun. The leaves are encased in earthen plates, sealed with layers of cloth and clay, sun dried and calcined by *Gaja Puta* technique using three repeats or *Putas*. After cooling, Copper leaves are collected from the earthen plates, mixed with half the quantity of Sulphur and triturated again with Lime juice. Small, round and flat cakes are made from the resultant paste, dried in sun, and subjected to *Gaja Puta* again in sealed earthen plates. The process is repeated 3 times to yield a black coloured *Bhasma*.

1.4 Amrit Karna : Copper is very poisonous necessitating further purification or *Amrit Karna* of the *Bhasma*. The latter is triturated with Lemon juice, made into a round bolus and dried in sun. The dried bolus is put inside cut pieces of the rhizomes of *Amorphophalus companulatus* through a hole, covered with another piece of rhizome of this plant, smeared with half inch layer of mud, sun dried, and cooked by *Gaja Puta* technique. After cooling, the mud is scraped by a knife and the bolus of *Tamra Bhasma* removed from inside the rhizome carefully. Any greenish colour on the bolus indicates poisonous nature.

Such portion is rejected and the remaining bolus is pulverized to a fine powder and repeatedly washed with luke warm water till the water is completely free from any bluish or greenish tinge. The *Bhasma*, so purified, is considered free from toxicity and so fit for medicinal use.

1.5 Adverse Effects of Impure *Bhasma* : Improperly purified Copper or *Bhasma* may lead to adverse effects e.g. Nausea, Vomiting, Burning sensation, Diarrhoea, Giddiness, Fainting and Depletion of tissues.

2. CHEMICAL COMPOSITION[52,53]

Tamra Bhasma is a mixture of black sulphide of Copper, Copper oxides and Iron sulphides. Some reports indicate traces of Hg and As also.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2-4,8,17,51,54]

Tamra Bhasma is attributed with bitter, astringent, digestive, hematinic and antiaging properties with claimed utility in following diseases. It is rarely used alone and mostly administered in combination with many herbal remedies.

(*a*) Anaemia
(*b*) Arthritis
(*c*) Ascietes
(*d*) Asthma
(*e*) Bronchitis
(*f*) Chronic Rhinitis
(*g*) Colic
(*h*) Cough
(*i*) Eye diseases
(*j*) Fevers
(*k*) Flatulence/ Gastritis/ Hyperacidity
(*l*) Inflammation
(*m*) Leprosy
(*n*) Leucoderma
(*o*) Liver and Spleen diseases
(*p*) Malabsorption syndrome
(*q*) Oedema
(*r*) Peptic ulcers
(*s*) Piles
(*t*) Skin Diseases including Leprosy
u) Tuberculosis
(*v*) *Vita-Pitta* diseases etc.

4. DOSE

125 mg to be taken twice daily on empty stomach (food may be given if there is nausea) with Honey[8]
31.25 – 62.5mg with Honey, *Ghee* (clarified butter) or juice of *Tinospora cordifolia* or *Zingiber officinale*[2]

7.36 *TANKANA BHASMA*

1. METHOD OF PREPARATION[18]

Prepared from purified *Tankana* (Borax) following the method described in *Ayurved Sar Sangrah*[21].

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[18,29]

(*a*) Antacid
(*b*) Antiseptic
(*c*) Astringent
(*d*) Bronchitis
(*e*) Cough
(*f*) Diuretic
(*g*) Menstrual disorders (Amenorrhoea, Dysmenorrhoea, Menorrhagia)
(*h*) Phlegmatic complaints
(*i*) Promotes labour pains/Facilitates delivery
(*j*) Skin diseases etc.

3. DOSE[18]

125-300 mg with honey or water

7.37 *TRIVANGA BHASMA*

1. METHOD OF PREPARATION[2]

1.1 *Jarna*

Purified *Trivanga: Naga* (Lead), *Vanga* (Tin) and *Yashada* (Zinc) are heated in an iron pan. While the metals are melting, powders of *Bhang* (*Cannabis sativa*) and *Ahiphena Phal* (*Papaver somniferum* fruit peel) are sprinkled in small quantities. The mixture is constantly stirred. The process is continued till the melted *Trivanga* is reduced to powder.

1.2 *Marana*

Jarita Trivanga, so prepared, is ground with the juice of *Aloe barbadensis* for 3 hours. Flat cakes, made from the resultant dough, are thoroughly dried and subjected to calcination process using *Sarva Samputa Yantra* and *Ardha Gajaputa* technique. Seven *Putas* are needed to yield *Bhasma* of proper quality. It is pale yellow in colour.

2. CHEMICAL COMPOSITION[17,55,57]

Chemical analysis revealed the presence of several elements: Al, As, Fe, Pb, S, Si, Sn, Zn etc.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2,28,54-56]

(*a*) Diabetes
(*b*) Menorrhagia
(*c*) Urinary diseases

4. DOSE[2,29]

120-250mg twice daily with honey or butter.

7.38 *VAIKRANTA BHASMA*

1. METHOD OF PREPARATION[3]

Vaikranta (Tourmaline) is purified by processing with sufficient quantity of *Kulatha* Kvatha (*Dolichos biflorus* extract). Purified material is subjected to *Marana* process. *Gandhaka* (Sulphur) is added to purified *Vaikranta* and triturated thoroughly with lemon juice. Small thin cakes, prepared from the resultant dough, are subjected to calcination in *Sarva Samputa Yantra* using *Gaja Puta* technique.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[3]

(*a*) Anemia (*b*) Asthma (*c*) Chest wound
(*d*) Cough (*e*) Malabsorption syndrome (*f*) Piles
(*g*) Tuberculosis etc.

3. DOSE[3]

62.5 mg with honey or ghee (clarified butter)

7.39 *VAJRA BHASMA*

1. METHOD OF PREPARATION[2]

Vajra (Diamonds) are purified using *Kulatha* (*Dolichos biflorus*) or *Kodrava* (*Paspalum scrobulatum*) extracts. The *Shodhna* (purification) process is followed by *Marana* (detoxification and calcination). One part each of the following drugs is used.

(*i*) *Shuddha Hiraka* (Purified diamond)
(*ii*) *Rasa Sindura* (Mercury)
(*iii*) *Shuddha Manasila* (Purified realgar)
(*iv*) *Shuddha Gandhaka* (Purified sulphur)
(*v*) *Shuddha Haritala* (Purified orpiment)
(*vi*) *Kulatha Kvatha* (*Dolichos biflorus* extract)

The above drugs are mixed and ground thoroughly for three days. One kg cake is prepared from the resultant dough and subjected to calcination using *Sarva Samputa Yantra* and *Gaja Puta* technique. The process is repeated 14 times.

2. PHARMACOLOGICAL PROPERTIES & THERAPEUTIC USES[2]

(*a*) Abdominal diseases
(*b*) Anemia
(*c*) Eye diseases
(*d*) Inflammation
(*e*) Obesity
(*f*) Tuberculosis
(*g*) Tumours
(*h*) Urinary disorders etc.

3. DOSE[3]

8mg with honey

7.40 *VANGA BHASMA*

1. METHODS OF PREPARATION[2,7,8,10,11,48]

1.1 Selection of Material : Ayurvedic texts describe two varieties of Tin :

(*a*) *Misraka* (Sanskrit : Mixed Impure Tin): Dirty white in appearance.

(*b*) *Kshuraka* (Pure Tin): Bright white, soft, cold to touch, readily fusible, does not clink when struck. Only the *Kshuraka* variety should be used for preparing *Vanga Bhasma.*

1.2 Purification :

(*a*) Tin is purified by melting it over fire and pouring the melted fluid into the Latex of *Calotropis gigantea.*

(*b*) Molten Tin is dipped into the juice of *Vitex negundo,* mixed with Turmeric (rhizomes of *Curcuma longa*). The process is repeated three times.

(*c*) Molted Tin is soaked three times in succession in Oil, Whey, *Kanjika* (Sour Gruel), Cow's Urine and lastly in the Latex of *Calotropis gigantea.*

1.3 Preparation of *Bhasma* : Several methods are available:

(*a*) Purified Tin is melted in an earthen crucible and to it Tamarind powder and bark of *Ficus bengalensis* are added in the proportion of 4:1. The mixture is then exposed to fire. *Talaka* one tenth of its quantity is added and the mixture is again subjected to heat over fire. The process is repeated 10 times or more till the metal is reduced to *Bhasma.*

(*b*) Purified Tin is melted with *Yavakshara* (Impure Potassium Carbonate, one-fourth of the weight of Tin) and to it powdered husk of Tamarind is added. The whole mass is stirred well with an Iron rod till it is reduced to a very fine powder. The latter is washed with cold water and dried over gentle fire.

(*c*) Purified Tin is melted in an Iron pot and the following powders are added to it one by one:

(*i*) Powdered Turmeric,

(*ii*) *Cuminum cyminum*

(*iii*) *Triphla* (Fruits of three Myrobalans : *Terminalia chebula, Terminalia belerica* and *Phyllanthus emblica*),

(*iv*) *Ficus religiosa* and *Tamarindus indicum* bark.

Each powder is added only after the previous powder is thoroughly burnt.

(*d*) Purified Tin is melted in an Iron pan, to it powdered *Achyranthes aspera* (one fourth the quantity of Tin) is added gradually by constant stirring with an Iron rod or spoon. The pan is covered with an earthen plate and exposed to fire till it becomes red hot. After it cools down, the powder is taken out and triturated with the juice of *Aloe barbadensis* for a whole day. Cakes made from the resultant paste are sun dried, kept inside *Sarva Samputa Yantra* and calcined by *Gaja Puta* technique. The process is repeated 7 times.

The last mentioned method is considered best. The *Bhasma*, so obtained, is greyish white fine powder.

2. CHEMICAL COMPOSITION

Chemically *Vanga Bhasma* is oxide of Tin with some impurities[10]. Chopra and associates[7] analysed a sample of *Bhasma* manufactured by Kalpataru Ayurvedic Works, Calcutta with following findings:

TABLE 7.7: CHEMICAL COMPOSITION OF *VANGA BHASMA*[7]

Chemical Ingredients	Content (%)
Oxide of Tin (SnO_2)	82.94
Silica (SiO_2)	6.38
Iron and Alumina (Fe_2O_3, Al_2O_3)	2.96
Lime (CaO)	1.92
Magnesia (MgO)	0.69
Potash (K_2O)	2.96
Soda (Na_2O)	0.45
Chlorides	0.11
Moisture	0.89
Other constituents	0.70
Total	100.00

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2,7,9,17,48,55]

Vanga Bhasma is attributed with alterative, anti-anemic, aphrodisiac, retentive, strengthening and tonic properties. It promotes metabolism and vitality, improves complexion and helps in tissue building. Therapeutic utility has been claimed in following diseases/ conditions:

(*a*) Anemia
(*b*) Asthma
(*c*) Cough
(*d*) Debility
(*e*) Diabetes
(*f*) Gastric Ulcers
(*g*) Gonorrhoea
(*h*) Helminthiasis
(*i*) Inflammatory and Suppurative conditions of Stomach, Urethra and other body tissues.
(*j*) Jaundice
(*k*) Leucorrhoea
(*l*) Menorrhagia
(*m*) Obesity
(*n*) Painful micturition and other Urinary disorders
(*o*) Premature ejaculation
(*p*) Skin diseases
(*q*) Spermatorrhoea etc.

The *Bhasma* is used with various *Anupanas* (Vehicles) and other drugs for the treatment of above listed diseases e.g. it is used in combination with *Abhraka Bhasma* and *Shilajit* for general tonic and alterative effects.

4. DOSE[2,8,17]

125 – 250 mg to be taken twice daily with Honey, *Ghee* (Clarified butter), Milk or fresh Butter milk, or juices of *Curcuma longa* or *Tinospora cordifolia*.

7.41 *VARTIKA BHASMA*

1. METHODS OF PREPARATION[3,8,48]

1.1 Selection of Material : Cowrie (*Cypraea moneta*) shells of yellow variety, weighing 10-15 gm each are considered suitable for medicinal use.

1.2 Purification : The shells are cooked with *Kanji* (a kind of Vinegar) in *Dola Yantra* for 3 hours.

1.3 Preparation of *Bhasma* : Purified Cowrie shells are put inside *Sarva Samputa Yantra* and calcined by *Gaja Puta* technique. After cooling, the material is taken out and pulverized thoroughly in a pestle and mortar till it is reduced to a very fine powder. The *Bhasma* is stored in a dry air-tight glass bottle.

2. CHEMICAL COMPOSITION

Narayanswami and coworkers[40] analysed three samples of *Vartika Bhasma* procured from the Indian Medical Practioners Co-operative Pharmacy and Stores Ltd., Chennai and showed that it contains predominantly Calcium. Their findings are as follows:

TABLE 7.8 : CHEMICAL COMPOSITION OF *VARTIKA* AND *VARTIKA BHASMA*[40].

	CONTENT (%)		
	Calcium*	**Magnesium**	**Iron**
Raw Vartika	39.01	Nil	Nil
Purified *Vartika*	37.42	Nil	0.032
Vartika Bhasma	Sample 1 39.10 Sample 2 40.35 Sample 3 38.50	Nil Nil 2.55	0.023 0.030 0.014

* Mostly present as Calcium carbonate (93-99%), and a fraction as Calcium oxide (0.26-1.74%)

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[3,8,30,34]

It possesses anti-diarrhoeic, digestive, diuretic, expectorant and anti-infective properties and is claimed to be useful for treating the following diseases:

(*a*) Boils
(*b*) Chronic Bronchitis
(*c*) Duodenal ulcer
(*d*) Eye Diseases including Cataract
(*e*) Gastro-intestinal disorders
(*f*) Inflammation
(*g*) Intestinal Tuberculosis

(*h*) Leucoderma and other Skin diseases
(*i*) Malabsorption syndrome
(*j*) Otitis media
(*k*) Peptic ulcers
(*l*) Sprue syndrome etc.

4. DOSE[3,8]

250 mg to be taken twice daily with hot water after meals.

7.42 *YASHADA BHASMA*

1. SYNONYMS: *Jasada Bhasma*
Kharparaja Bhasma

2. METHODS OF PREPARATION[2,8,10,48]

2.1 Selection of Material : It does not occur free in Nature. Zinc is available in mines in the form of Zinc Carbonate. Other salts e.g. Zinc Silicate are also found in Zinc Ores.

2.2 Purification :

(*a*) **General Method of Purification :**
The method of purifying resembles that used for Tin. The metal should be cut into small pieces, heated over a flame and immersed for 7 times in each of the following liquids: (*i*) Sesame oil, (*ii*) Butter Milk, (*iii*) Cow's Urine, (*iv*) *Kanji* (a type of Vinegar), and (*v*) Decoction of *Dolichos biflorus*. This is followed by

(*b*) **Special Method of Purification :** The metal is placed in an Iron spoon and melted over fire. Molten zinc is poured through a hole in a plate covering a jar containing Cow's urine. The process is repeated 21 times followed by washing with warm water and drying.

2.3 Preparation of *Bhasma* : The metal is melted in an Iron pan. To this equal quantity of the powdered *Cannabis sativa* is added and Poppy pod is put in small quantities. The Zinc is rubbed in thoroughly using a strong Iron spoon. When whole of metal gets reduced to ash, another Iron plate is kept over the pan and subjected to strong heat till the pan becomes red hot. It is allowed to cool, washed with water to separate the ash and dried. The material is then triturated with the juice of *Aloe barbadensis*. Small cakes are prepared from the resultant paste, sun-dried and calcined in *Sarva Samputa Yantra* using *Gaja Puta* technique.

2.4 Adverse Effects of Impure Zinc : Use of zinc without proper *Shodhna* and *Marna* may lead to several adverse effects including Diabetes, Obstinate Skin and Urinary diseases and Phantam Tumours. Paradoxically these are some of the conditions for which *Yashada Bhasma* is used as a curative agent.

3. CHEMICAL COMPOSITION[58]

The chief ingredient of *Yasada Bhasma* is Zn (as 90% ZnO). It was found to contain traces of Al, Ca, Cu, Fe, Mg, Mn, Ni and Pb.

4. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2,7,8,10,17,48,58-60]

Yashada Bhasma is attributed with diverse pharmacological properties and is used for therapeutic purposes both by internal administration and external application in the following diseases:

(*a*) Anaemia
(*b*) Asthma
(*c*) Bronchitis
(*d*) Cholera
(*e*) Diabetes Mellitus
(*f*) Debility
(*g*) Epilepsy
(*h*) Excessive sweating
(*i*) Eye Diseases (Arrests Myopia)
(*j*) Fevers
(*k*) Hyperhiderosis
(*l*) Infantile Biliary Cirrhosis
(*m*) Irritable Colon
(*n*) Leucoderma
(*o*) Leucorrhoea
(*p*) Malabsorption syndrome
(*q*) Sprue
(*r*) Tuberculosis
(*s*) Urinary Diseases etc.

It is a component of a compound mineral preparation *Nawajas*[16]

5. DOSE[2,8]

125 – 250 mg to be taken twice daily with honey, butter, cream or juice of *Tinospora cordifolia*

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8

UNANI KUSHTAS

1. GENERAL METHOD OF PREPARATION[1,2]

Kushtas are powder form of medicinal preparations obtained by the calcination of metals, minerals and animal-origin drugs. The word *Kushta* is the part principle of *Kushtan* (Persian: to kill); it therefore means 'Killed or conquered'. It is a blend of metals, metal oxides, non-metals and their compounds or minerals. The general method of preparing *kushtas* is a follows:

(*i*) Selection of genuine metal, mineral or animal or animal-origin drug.

(*ii*) *Tafsiya-e-Advia* (Washing/Cleaning): This is done for removal of external impurities/foreign bodies.

(*iii*) *Ghasl-e-Adviyah* (Purification): There are special methods of 'purification', specified in Unani texts for each category/type of drug.

(*iv*) *Daq-wa-sahaq* (Pounding and Grinding): The 'purified' drugs are triturated in a pertle and mortar with specified juices for a specified period of time. The juice and time have been mentioned for each metal/mineral in classical literature of Unani-Tibb. This way the basic drugs are thoronghly pulverized and form a paste with the liquid used for trituration. Small cakes, of varying sizes and thickness, are made from this paste and shade-dried.

(*v*) *Tadbir-e-Adviyah* (Detoxification of Drugs): Toxic anaterial are subjected to special processes for detoxification. For example powdered *Sammul-Far* (Arsenic) is immersed in fresh *Aab-e-Leemu* (Lemon juice) and ground in China or glass pertle and mortar till the juice is completely absorbed. The process is repeated 7 times.

(*vi*) *Gil-e-Hikmat* (Calcination): Dried cakes, prepared as described above, are placed inside covered earthen plates/containers sealed by layers of cloth and clay. These are subjected to calcination by placing them in a pit between layers of cow dung cakes. The latter are then ignited. The intensity of heat is adjusted by specified number of cow dung cakes and dimensions of the pit. After calcinations the pit is allowed to cool completely. The earthen plates are taken out and the contents collected. These are subjected to triturtion with specified juices again till *Kushta* powder of proper fineness and desired quality is obtained.

(*vii*) *Tasveel-e-Adviya* (Sieving): Sieves of different mesh are used in the process of powdering basic drugs or the final product (*Kushta*).

(*viii*) Storage in dry, air-tight glass bottles.

2. QUALITY CONTROL[2]

Proper *Kushta* should have the following characteristic qualities:

(*a*) No metallic luster

(*b*) When taken between the index finger and thumb, it should be composed of so fine particles as to get easily into the lines of fingers.
(*c*) It should float on the surface of still, cold water.
(*d*) It should not revert to its original state.

8.1 KUSHTA ABHRAK SAFAID

1. METHOD OF PREPARATION[1]

1.1 Selection of Material: White variety of Mica (*Abhrak Safed*) is selected.

1.2 Purification: Mica (250gm) is pounded and placed in a cloth bag along with equal quantity of whole rice. A knot is tied at the top of the bag and then it is immersed in a small tub of water and rubbed with hands so that Mica particles came out of the bag into the water. The process is continued till all the Mica particles come out. After keeping the water undisturbed for some time, the supernatant water is decanted off and the Mica (*Abhraq Mahtab* or *Dhanab*) is collected.

1.3 Preparation of *Kushta*: Purified Mica is mixed with a solution of Salt Petre and the latex of Aloe *barbadensis*. It is then subjected to *Gil Hikmat* process using 15 Kg of cow dung cakes as fuel. On cooling, the supernatant liquid is decanted off and Mica, which settles down, is collected. It is dried and triturated again with 125ml latex of *A. barbadensis*. Tablets (10gm) are prepared from the resultant paste and subjected to calcination again by *Gil-Hikmat* process using 15 kg of cow dung cakes. The process is repeated 7 times yielding a white *Kushta* which is then sieved and stored in a dry air-tight glass bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[13]

It is attributed with anti-commutant, anti-phlegmatic, anti-tursive, toxic and aphrodisiac properties and is claimed to be therapeutically useful in the following diseases:

(*a*) Asthma (including Cardiac Asthma)
(*b*) Bronchitis
(*c*) Cough
(*d*) General Sexula Debility etc.

3. DOSE[1]

60-125mg to be taken with Honey(for Asthma and Bronchitis) and Butter or Cream (for Sexual Debility)

8.2 KUSHTA ABHRAK SIYAH

1. METHOD OF PREPARATION[1]

1.1 Selection of Material: Black variety of Mica is selected.

1.2 Purificationand Preparation of *Kushta*: The methods are similar to those described for *Kushta Abhraq Safed*. It is almond-coloured.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[19,73]

It resembles the *Kushta* prepared from white variety of mica in medicinal properties but *Kushta Abhraq Siyah* is considered more potent and effective us the *safed* (white) variety. It is claimed to be therapeutically useful in the following diseases:

(*a*) Asthma
(*b*) Bronchial Ailments
(*c*) Cough
(*d*) Diabetes
(*e*) Diarrhoea
(*f*) Facial Paralysis
(*g*) General, Nervine and Sexual Debility
(*h*) Paralysis etc.

3. DOSE[1]

60-120 mg

8.3 KUSHTA ABHRAK KALAN

1. METHOD OF PREPARATION[1]

1.1 Selection of Material: Equal parts of both white and Black variety of Mica are used for preparing the *Kushta*.

1.2 Purification: Both black and white varieties are purified by the same method as described for *Kushta Abhrak Safed*.

1.3 Preparation of *Kushta*: Purified black and white Mica (125gm each) are added to a mixture of *Shora Qalmi* (Salt Petre 60gm) and Extract of *Blumea balsamifera* plant (250ml) to yield a viscous liquor. The latter is dried and calcined by *Gil Hikmat* technique using 15 Kg cow dung cakes as fuel. One cooling, the Mica is triturated with water and when it settles down, the supernatant is decanted. The process is repeated several times till salt Petre is completely removed. The Mica is collected, dried and triturated with *B. balsamifera* extract (125ml) again. Tablets (approx 10 gm each) are prepared from the resultant paste and subjected to calcinations again by *Gil Hikmat* method using 15kg cow dung cakes. The process is repeated 7 times using in total one litre of *B. balsamifera* extract and 105kg of cow dung cakes as fuel. On cooling, the Mica tablets are taken out, powdered and sieved yielding a pink coloured *Kushta*. The latter is preserved in a day air-tight glass bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

It resembles *Kushta Abhrak Safed* in medicinal properties and therapeutic uses and is of considerable utility in following conditions.

(*a*) Aphrodisiac for Sexual Weakness
(*b*) Asthma
(*c*) Bronchitis
(*d*) General Tonic etc.

8.4 KUSHTA AQEEQ

1. METHOD OF PREPARATION[1]

Agate (100gm) is finely ground, sieved and triturated with Aqua *Rosa damascena* (*Arq Gulab*, 125ml) till the latter is fully absorbed. Tablets (apex 10gm each) are made from the resultant paste, and calcined by *Gil*

Hikmat process using 5kg of cow dung cakes in the open. After the fire has burnt it self out, the cakes are removed and triturated thoroughly in a pertle and mortar by constantly adding small quantities of Lotus seed kernel deloction (prepared by heating 25gms of kernels in 100ml of water and sieving). On cooling, Agate cakes are taken out of the urn, powdered and sieved to yield a whitish *kushta* which is stored in a bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,3,5]

Kushta Aqiq is attributed with cardio tonic stimulant and styptic properties. It is claimed to be therapeutically useful in the following diseases:

(*a*) Hemorrhages
(*b*) Polymemorrhoea and Metroerhagia
(*c*) Pulmonary Wounds
(*d*) Weakness of Heart and Palpitation

3. DOSE

6mg with *Kushta Khamira Marwarid*[1]
s50-125mg[3]

8.5 KUSHTA BAIZA-E-MURGH

1. METHOD OF PREPARATION[1]

Poast Baiza (Egg shell peels) are soaked overnight in saline water (500gm common salt dissolved in one litre water). Next morning, the peels are taken out, hand subbed and washed with water several times to ensure total removal of common salt. The peels are then dried, powdered and triturated with lemon juice (250ml). Cakes (approx. 5gm each) are made from the resultant paste, dried, and calcined 20Kg cow dung cakes as fuel. After cooling, the cakes are taken out and pulverized to a fine *kushta* powder.

2. CHEMICAL COMPOSITION

Zaidi and coworkers[6] analysed 5 market samples (from Aligarh and New Delhi) and one laboratory sample of this *Kushta*. It contains predominantly calcium, the content varied considerably in different samples (29.50, 41.60, 43.15, 43.10, 33.10 and 62.13%). Qualitative analysis revealed the presence of Chlorides, Sodium, Magnesium, Potassium and Carbonates. Potassium was detected in only 2/6 samples.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTI C USES[1,3,5]

The *kushta* is attributed with aphrodisiac, astringent, retentive and tonic properties. It is claimed to be therapeutically useful in the following diseases:

(*a*) Diabetes
(*b*) Excessive Nocturnal Emission
(*c*) Incontinence of urine
(*d*) Leucorrhoea
(*e*) Polyuria
(*f*) Premature Ejaculation
(*g*) Spermatarrhoea etc.

4. DOSE

125mg with *Jawarish Mastagi* or *Majun Supari Pak* (10gm) followed by Milk (250ml)[1]
125-500mg[3]

8.6 KUSHTA BUSUD

1. METHOD OF PREPARATION[1]

Coral roots (25gm) are triturated to fine grains and pounded in the latex of *Aloe barbadenesis* leaves (125gm). Lozenges (approx. 10gm) are make from the resultant paste, dried, and subjected to calcinations by *Gil Hikmat* technique in a pit containing 15kg of cow dung cakes as fuel. When the cow dung cakes are have burnt out, the earthenware plates are removed and the white *kushta* taken out. The latter is sieved and stored in a day glass bottle.

2. CHEMICAL COMPOSITION[7]

The *kushta* contains predominantly calcium (194mg/gm) and Magnesium (44mg/gm). Presence of minor quantities of Copper (0.25mg/gm) and Iron (0.06mg/gm) was also detected.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

Kushta Busud possesses anti-arthmatic and anti-tussive properties and is claimed to be therapeutically useful in the following diseases:

(*a*) Asthma
(*b*) Catarrh, cold
(*c*) Chronic persistent cough
(*d*) Hemoptysis
(*e*) Leucorrhoea etc.

4. DOSE

125mg to be taken with *Khamira Gaozaban Ambari* (5gm)

8.7 KUSHTA FAULAD

1. METHODS OF PREPARATION[1]

Burada Faulad (Iron dust, 100gm) is macerated with *Triphala* (fruits of 3 mysobalans: *Phyllanthas emblica, Terminalia belorica,* and *Terminalia chebula, 50 gm*) till juice of the latter is completely absorbed. Lozenges (approx 10gm each are made from the resultant paste and subjected to calcinations by *Gil Hikmat* technique using 10 kg of cow dung cakes as fuel. On coling, the cakes are removed from the urn, mixed with *Gandhak Amlasa* (Processed sulphur, 60 gm) and triturated with *Hathesundi Buti ka pani* (Extract of *Heliotropium indicum* 250ml). Tablets (approx. 10gm each) are made from the resultant mixture, placed inside a sealed earthenware vessel and calcined by *Gil Hikmat* process again using 5kg cow dung cakes as fuel. On cooling, the material is again triturated with *H. indicum* extract using 5kg cow dung cakes in a pit. The process of trituration and heating is repeated 5 times in total spending one litre of *H. indicum* extract and 25 kg of cow dung cakes. The fifth heating yields a reddish black *Kushta* which is carefully collected and stored in a air-tight glass bottle.

2. CHEMICAL COMPOSITION[7]

Iron content in *Kushta Faulad* was found to be 48.75%.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,5,8]

Kushta Faulad possesses general tonic, hematinic and hepatotonic properties. It is claimed to be therapeutically useful in the following conditions:

(*a*) Anaemia
(*b*) Convalescence
(*c*) General Debility
(*d*) Impotence (associated with Anaemia)
(*e*) Liver disorders etc.

4. DOSE[1]

60mg to be taken with 5gm of *Jawarish Jalinus* or *Dawa-ul-Misk Motadil Jawaharwala* or 10gm of Honey.

8.8 KUSHTA FAULAD SARD

1. METHODS OF PREPARATION[1,2]

(*a*) *Burada Faulad* (Iron dust, 100gm) is added to a vessel containing *Sirka* Jamun (Vinegar from *Eugenia janbolana*, one litre). The mixture is left as such for a few days. Occasional stirring may be done at long intervals. When the vinegar is totally absorbed, the Iron dust is removed, dried, triturated, sieved and stored in a bottle for medicinal use. Heating is not done, hence the name *Sard* (cold).

(*b*) Another method involves washing of Iron dust with *Arq-e-Limu Kaghzi* (Distillate of tender Lemon) followed by soaking in *Arq-e-Kakrona* (Distillate of *Blumea balsamifera*) for 30 days. The Iron dust gets dissolved. The material is dried for medicinal use; heating is not required.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,5,8]

Kushta Faulad Sard is attributed with general tonic, hematogenic, hepatotonic and stomachic properties. It is claimed to be therapeutically useful in the following diseases/conditions:

(*a*) Anemia
(*b*) General Debility
(*c*) Hypochateratic state and Hepatosis
(*d*) Liver tonic for non-phlegmatic persons
(*e*) Weakness of stomach

3. DOSE[1]

60mg[1]
125-250mg[2]
It is administered with 5gm of *Dawa-ul-Misk Motadil Sada* or *Jawarish Jalinoos*

8.9 KUSHTA GODANTI

1. METHODS OF PREPARATION[1,2]

Arsenic tri-sulphide (250gm) is ground, sieved and triturated with the juice of *Aloe barbadensis* (100ml). Tablets (approx. 10gm each) are made from the resultant paste, dried and calcined by *Gil Hikmat* technique using 5kg of cow dung cakes as fuel. When the fire is extinguished, the *Kushta* is collected carefully from earthen plates, pulverized and finely sieved. It is then stored in a dry air-tight glass bottle.

2. CHEMICAL COMPOSITION[7]

Chemical analysis of *Kushta Godanti*, according to a CCRUM report, did not show the presence of Arsenic. It contained predominantly Calcium (32mg/gm) and traces of Copper (2mg/gm), Magnesium (1.8mg/gm) and Iron (0.05mg/gm) (Plase see also *Godanti Bhasma*).

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

It is attributed with febrifuge and anti-inflammatory properties and is used for the treatment of

(*a*) Arthritis
(*b*) Non-specific fevers
(*c*) Rheumatic Diseases

4. DOSE[1]

125mg to be taken with 5gm of *Majun Susanjan* for Arthritis and Rheumatism and with a leaf of *Tulsi* (*Ocimum sanctum*) for the treatment of Febrile conditions.

8.10 KUSHTA HAJR-UL-YAHUD

1. METHODS OF PREPARATION[1,2]

Hajr-ul-Yahud (Jews stone, 100gm), broken into pieces, is added to *Muli ka pani* (juice of fresh leaves of *Raphanas sativas*, 300ml) in an earthen flask, desiccated by *Gil Hikmat* method and subjected to heat in a pit using 10kg of cow dung cakes as fuel. After cooling, the material is mixed with the juice of *R. sativas* leaves and *jawakhar* (Potassium carbonate, 25gm). Tablets (10gm each) are prepared from the resultant paste and calcined again in apit by *Gil Hikmat* process using 5kg cow dung cakes. When the fire burns itself out, the *Kushta* (a light soil-coloured powder) is carefully collected. It is then sieved and stocked in a glass bottle.

2. CHEMICAL COMPOSITION[7]

The Kushta was found to contain the following metals:

TABLE 8.1: CHEMICAL COMPOSITION OF *KUSHTA HAJR-UL YAHUD*[7]

METAL	Content mg/gm
Calcium	441
Magnesium	185
Iron	0.21
Copper	0.25

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

Kushta Hajr-ul-Yahud possesses diuretic and lithnotriptic properties. It is used for the treatment of renal and cystic calculi.

4. DOSE[1]

125mg to be taken with 3gm of *Majun Aqrab* or *Majun Hajr-ul-Yahud* or 10ml of Pineapple juice.

8.11 KUSHTA HARTAL WARQI

1. METHODS OF PREPARATION[1,9]

Arsenic sulphide (125gm) is triturated in the juice of *Calcarpa arborea* (250gm) till whole of the latter is fully absorbed. Tablets (approx 10gm) are made from the resultant paste and encased between two earthen cups. The cups are then placed in a wide-mouthed urn filled upto half with the ash of *Acharynthus aspera*.

More of this ash is added to completely cover cups containg the tablets using a total of 1.5kg of ash. The urn is subjected to fire using 5kg of cow dung cakes. When the fire burns of, the cups are removed. The *Kushta* is carefully collected, finely ground, sieved and preserved in a bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,9,11]

Kushta Hartal warqi possesses anti-arthmatic, anti-catarrhal, anti-rheumatic, depilatory, and febrifuge properties. It is claimed to be therapeutically useful in the following diseases:

(*a*) Asthma
(*b*) Catarrh
(*c*) Cough
(*d*) Diabetes
(*e*) Epilepsy
(*f*) Fevers
(*g*) Gout
(*h*) Liprosy
(*i*) Paralysis (General and Facial)
(*j*) Rheumatism and Arthritis
(*k*) Tremours etc.

3. DOSE[1]

30mg to be taken with 10gm of Honey

8.12 KUSHTA JAST

1. *SYNONYM: Kushta Shebah*

2. METHODS OF PREPARATION[1]

Safaida Jast (Zinc oxide, 60mg) is triturated with fresh juice of *Aloe barbadensis* (60ml), dried by *Gil* Hikmat process and calcined in a pit with 5Kg of cow dung cakes as fuel to yield a whitish Kushta. The latter is sieved and stored in a day air-tight bottle.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,12,13]

It is attributed with hepatoprotective and toxic properties and is claimed to be therapeutically useful for treating the following diseases:

(*a*) Diseases related to Balgam and Sofra
(*b*) Leucorrhoea
(*c*) Liver and Heart Disorders
(*d*) Spermatorrhoea
(*e*) Weak semen (the *Kushta* increases the viscosity of semen) etc.

4. DOSE[1]

6mg with butter

8.13 KUSHTA KHAR MOHRA

1. METHODS OF PREPARATION[1]

1.1 Selection of Material: *Zard Kauriyan* (Yelow variety of Cowric, *Cypraea moneta*) shells are used for medicinal purpose.

Preparation of *Kushta*: The shells (250gm) are burnt in fire and triturated with the Ab-e-Gheekawar (juice of *Aloe barbadensis*, 250 ml) till whole of the juice is fully absorbed. Tablets (10gm each) are made from the resultant paste, dried and calcined by *Gil Hikmat* process using 10Kg of cow dung cakes as fuel. When cool, the white *Kushta* is carefully collected, sieved and stored in a dry air-tight glass bottle.

2. CHEMICAL COMPOSITION[7]

Kushta Khar Mohra contains predominantly Calcium (44.42%). It also revealed the presence of Chlorides, Sulphates, Iron and Strontium.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,14]

The *Kushta* is attributed with anti-anaemic, anti-cotarrhal diaretic, expectorant, and toxic (general, cephalic and mervine) properties and is claimed to be therapeutically useful in the following diseases:

(*a*) Anaemia
(*b*) Catarrh
(*c*) Chronic Bronchitis
(*d*) Diarrhoea
(*e*) Ear Ache (Instillation with lemon juice)
(*f*) Eye Diseases (used as *Surma*)
(*g*) Leucoderma and Skin Diseases (local application with Salt Petre). Ash Mixed with Butter is good for clearing blemishes and improving the complexion of skin.
(*h*) Neural Disorders etc.

3. DOSE[1]

125mg to be taken with *Khamira Gaozaban*.

8.14 KUSHTA KHUBSUL HADID

1. METHODS OF PREPARATION[1,2]

Small cakes made from Iron oxide (250gm) are placed on red hot coals. When very hot, the cakes are transferred with a pair of tongs to a vessel containing vinegar (500ml). After some time, the cakes are removed from the Vinegar, ground and triturated with *Triphala* water (juice of the fruits of 3 myrobalans: *Phyllanthus emblica, Terminalia belerica* and *Terminalia chebula*, 250gm) till whole of the juice is completely absorbed, Tablets (approx. 10gm each) are made from the resultant paste and calcined by *Gil Hikmat* technique using 10Kg cow dong cakes as fuel. When the fire is burnt out, the tablets are taken out, triturated in a pestle and mortar with *Jakaranda Buti* (*Blumea balsmifera* 250gm), made into cakes again and heated in 10Kg cow dung. On cooling, the metallic oxide is taken out, triturated with the juice of *Aloe barbadensis* (250gm)and calcined again using 10Kg cow dung cakes. This yields a violet-coloured *Kushta*, which is collected on cooling, sieved and preserved in a bottle.

2. CHEMICAL COMPOSITION[3]

Chemical analysis revealed the presence of the following metals:

TABLE 8.2: CHEMICAL COMPOSITION OF *KUSHTA KHUBSUL HADID*[3]

METAL	*Content mg/gm*
Calcium	*4.60*
Magnesium	*5.15*
Iron	*0.35*
Copper	0.10

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,3,5]

Kushta Khubsul-Hadid is attributed with appetizing, blood purifying, hepatotonic, haematinic and general tonic properties. It is claimed to be therapeutically useful for treating the following diseases:

(*a*) Anaemia
(*b*) Hemarrohoids
(*c*) Hepatosis and Hypocholeretic state
(*d*) Indigestion/Diarrhoea
(*e*) General Debility etc.

4. DOSE[1]

125mg to be taken with 5gm of *Jawarish Jalinoos* in the morning.

8.15 KUSHTA MARJAN JAWAHARWALA

1. VARIETIES[4,7]

Two varieties have been described in Unani literature:

(*a*) *Kushta Marjan Sada*
(*b*) *Kushta Marjan Jawaharwala*

The second variety contains Gold, Silver and Precious stones in addition to other ingredients.

2. METHOD OF PREPARATION[1]

2.1 Recipe:

Munga (Coral Root)	:	20 gm
Sadaf Sodiq (Oyester Shell)	:	5 gm
Aqiq Surkh (Cornelien)	:	10 gm
Zamarud Sabz (Green Emerald)	:	10 gm
Yashb Sabz (Green Agate)	:	10 gm
Warq Nuqra (Silver Foil)	:	6 gm
Warq Tila (Gold Foil)	:	250 mg
Arq Gulab (*Aqua Rosa damascene*)	:	20 ml

2.2 Preparation of *Kushta*:

All the precious stones are ground, sieved, triturated with aqua *Rosa damascene*. Silver and Gold foils are added to the mixture and ground again till the aqua dries. Tablets (10gm each) are made from the resultant paste, dried and calcined dung cakes as fuel. When the fire burns out, a light yellow *Kushta* is produced. This is carefully collected, sieved and stored in a bottle.

3. CHEMICAL COMPOSITION

Chemical analysis revealed the presence of following metals in the varieties of *Kushta Marjan*:

TABLE 8.3: CHEMICAL COMPOSITION OF TWO VARIETIES OF *KUSHTA MARJAN*[4,7]

METAL	Content mg/gm	
	Kushta Marjan Sada	Kushta Marjan Jawaharwala
Calcium	33.0–35.4	121.80
Iron	0.06	4.54
Magnesium	40.00	18.54
Silver	Nil	10.70%
Gold	Nil	7.30–8.70%

4. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,4,5]

Kushta Marjan Jawaharwala possesses analgesic, anti-catarrhal, cardiac stimulant, cephalic tonic and memory improving properties. It is claimed to be of therapeutic value in following ailments:

(*a*) Catarrh, Cold
(*b*) Distress
(*c*) General Debility
(*d*) Headache
(*e*) Painfull conditions
(*f*) Weakness of Brain
(*g*) Weakness of Heart etc.

4. DOSE[1,4]

60-120mg with 5gm Butter

4

8.16 KUSHTA MARWARID

1. METHODS OF PREPARATION[1]

Marwarid (Pearls, 100gm) are triturated with *Arq Gulab* (*Aqua Rosa Damascena*, 200ml) in a pestle and mortar till whole of the aqua is absorbed. Tablets (approx. 10gm each) are made from the resultant paste are calcined by *Gil Hikmat* technique in a pit using 10Kg cow dung cakes as fuel. When the fire burns itself out, a whitish Kushta is produced. This is carefully collected, pulverized to a fine powder, sieved and preserved in a glass bottle.

2. CHEMICAL COMPOSITION[4]

The *Kushta* is predominantly Calcium oxide (61.20%).

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,4,14]

Kushta Marwarid is attributed with cardiac stimulant, mood elevating and general tonic properties. It is therapeutically useful by external application and internal administration for the treatment of following diseases/symptoms:

(*a*) Alopecia
(*b*) Diseases of Eyes and Gums
(*c*) General Debility
(*d*) Hepatic Disorders
(*e*) Len Corrhoea
(*f*) Leprosy
(*g*) Melancholia
(*h*) Neurasthenia
(*i*) Palpitation/Weakness of Heart
(*j*) Renal Disorders
(*k*) Spermatarrhoea etc.

4. DOSE

30mg to be taken with 5gm *Khamira Gaozaban Ambari Jawaharwala*[1]
60-120mg

8.17 KUSHTA MIRGANG

1. METHOD OF PREPARATION[1]

1.1 Recipe:

Para Musaffa (Purified Mercury)	:	60 gm
Qalai Musaffa (Purified Tin)	:	60 gm
Gandhak Amalsar (Processed Sulphur)	:	60 gm
Naushadar Desi (Ammonium Chloride)	:	60 gm
Shora Qalmi (Salt Petre)	:	06 gm
Abrak (Mica)	:	2 square inch piece

1.2 Method of Preparation of *Kushta*:

Tin is melted in an Iron pan. Mercury is added followed by immediate removal from the fire and trituration to yield an amalgam. Now Sulphur is added resulting in the formation of a blakish powder. Salt Petre and Ammonium Chloride are triturated with this powder. The mixture is then put inside a China Clay flask that has been dired by *Gil Hikmat* method. A hole (one tenth of an inch wide) is made in the flask which is left open during submission of the material to *Gil Hikmat*. The flask is then placed on a cooker and its hole is coveredwith the piece of Mica. This flask is inserted in a bigger flask fitted with sand (4Kg) upto its neck.

It is subjected to slow heat for 2 hours. When the material is melted, the fire is increased keeping the China clay flask open at the neck. If any clogging is noted, it is removed. The material will give out smoke which ceases after 2 hours. At this piece of Kaolin and heating is continued. Thus the material is subjected to heating for a total period of 8 hours and then left undisturbed for the next 12 hours. Next day whenthe material and the sand have cooled, the flask is broken at the bottom, yielding about 60gm golden *Kushta*. The medicine sticking to the neck and shoulder of the flask is scratched out. This yields about 40gm of *Namak Mirgang*.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

It is used for Stomach and Liver ailments because of its anodyne and restorative effects.

3. DOSE[1]

60mg to be taken with *Jawarish Jalinoos*

8.18 KUSHTA MUSALLUS

1. METHODS OF PREPARATION

METHOD – A

1.1a Recipe:

Qalai (Tin)	:	10 g
Jast (Zinc)	:	10 g
Sisa (Lead)	:	10 g
Post-e-Khaskhaash (*Papaver somniferum*)	:	250 g
Roghan-e-Zard (Mustard Oil)	:	qs
Dahi (Yoghurt)	:	qs

1.2b Preparation of *Kushta:* Equal quantities of Tin, Zinc and Lead are heated together in an Iron pan and then soaked in Mustard oil. The process of heating and soaking is repeated 7 times. The metals are heated again and onto the molten material powder of *P. somniferum* is slowly sprinkled with constant stirring by an Iron road. The ash, so produced, is soaked in sour for 4 hours. Cakes are made from the resultant paste, encased in earthen discs, sealed by *Gil-e-Hikmat* technique and subjected fire using 15Kg cow dung cakes. Calcination process is repeated 5 times till a yellow coloured *Kushta* is produced.

METHOD - B

1.1b Recipe:

Qalai (Tin)	:	250 gm
Jast (Zinc)	:	250 gm
Sisa (Lead)	:	250 gm
Shora Qalmi (Salt Petre)	:	750 gm
Ab Geekawar (Juice of *Aloe barbadensis*)	:	500 gm

1.2a Preparation of *Kushta:* Equal quantities of the 3 metals are heated in an Iron pan. To the molten metals, Salt Petre is added and stirred using a Bamboo pole (24ds long), till the salt is fully consumed. Heating is continued till the metals are roasted and form oxides. After cooling, the material is triturated and heated in 3 litres of water and removed from the fire when the water boils. The material is allowed to settle down, the supernant water is decanted off and sediments are heated with 2 litres of water again but not to the boiling point. The supernant water is decanted off again and the seimented material is triturated with the juice of *A. barbadensis*. Tablets are made from the resultant paste and calcined in a pit of *Gil Hikmat* process using a total of 40Kg cow dung cakes as fuel. This yields a Khaki-coloured *Kushta*, which is ground, sieved and stored in a day air-tight glass bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,4,15,16]

Kushta Musallus is attributed with aphrodisiac, retentive and tonic properties and is claimed to be therapeutically useful in the following diseases/conditions:

(*a*) Excessive Nocturnal Emission

(*b*) Poor Semen (Less Volume, viscosity and number of viable sperms)

(*c*) Premature Ejaculation

(*d*) Sexual Weakness etc.

3. DOSE

60mg to be taken with *Majun Asad Khurma* or Butter[1]

60-125mg[4,16]

8.19 KUSHTA NUQRA

1. METHODS OF PREPARATION[1,17,19]

Chughtai[83] described more than 30 methods of preparation of *Khusta Nuqra* (KN). A typical method of preparation (Said. 1969) consist of triturating 250g of silver foil with 625ml of rose water (distillate from the petals of *Rosa damascena*) and made into 10g pellets. The latter are put in the flask and subjected to ash formation by heating in a pit using 3kg of cow dung cakes as fuel. After cooling the materials is taken out and triturated with 150ml of the juice of *Aloe barbadensis* leaves. The process of ashing is repeated seven times after triturating alternately with rose water and *A. barbadensis* juice. A whitish material scraped and finally ground after the seventh heating is KN. The methods described in an official publication of the Central Council for Research and Unani Medicine is as follows:

Warq Nuqra (silver leaves) are ground with *Sheet-e-Madar* (*Calotropis-procera*, latex) for two hours and small cakes are made from this material. The cakes are put between two earthern discs sealed with process of *Gil-e-Hikmat* and subjected to ashing using cow-dung cakes as fuel. The various ingredients used with silver during the ashing process described in various techniques are presented in Table 8.4.

TABLE 8.4. ADJUNETS USED DURING PREPARATION OF SILVER *KUSHTA* BY VARIOUS METHODS[20]

(A) PLANTS

S.No	Scientific Name	Vernacular Name	Plant used
1.	*Abrus precatorius*	Kanch Ghoogchi	Seeds, distillate
2.	*Abutilan indicum*	Kanghee Buti	Leaves
3.	*Allium ascalonicum*	Gandana	Juice of leaves
4.	*Allium cepa*	Piyaz	Juice
5.	*Amaranthus caudatus*	Chaulai	Juice of whole plant
6.	*Argemone maxicana*	Satyanashi	Flowers
7.	*Calotropis procera*	Madar	Latex
8.	*Citrus medica*	Neebu	Juice
9.	*Coriandrum sativum*	Dhanca	Leaves
10.	*Curcuma longa*	Haldi	Rhizomes
11.	*Dregea volubilis*	Nakchkni	Leaves
12.	*Ficus religiosa*	Pipal	Bark
13.	*Heliotropium indicum*	Hathi soondhi	Juice
14.	*Hyocymus niger*	Ajwain khurasani	Seeds
15.	*Jasminum arborescens*	Chameli	Buds
16.	*Lawsonia intermis*	Mehdi	Leaves
17.	*Leptadenia reticulata*	Dudhi khurd	Juice
18.	*Lycopus europaeus*	Jal Neem	Leaves
19.	*Nicotina tabacum*	Tambaku	Leaves
20.	*Ocimum sanctum*	Tulsi	Leaves

21.	*Onosma bracteatum*	Gaozaban	Leaves, Flowers
22.	*Papaver somniferum*	Afium	Sap from bark
23.	*Pegana harmala*	Hermul	Leaves
24.	*Peucedanum grande*	Baphali	Leaves
25.	*Prychotis ajowan*	Ajwain	Seeds
26.	*Punica granatum*	Anar	Fruits, Flowers
27.	*Rosa damascena*	Gulab	Flowers
28.	*Rutagra violence*	Sara	Leaves
29.	*Sphaeranthus inducus*	Mundi	Leaves
30.	*Sityrax benzoin*	Luban	Resin
31.	*Symplocos racemosa*	Lodh Pathani	Bark
32.	*Tamarindus indicus*	Imli	Fruits
33.	*Tribulus terrestris*	Gokhru	Fruits
34.	*Zingiber officinalis*	Adrak	Rhizomes

(B) MINERALS

S.No	English/Chemical Name	Vernacular Name
1.	Alum	Phitkari
2.	Ammonium chloride	Naushadar
3.	Arsenic	Para, Hartal (Tabqi, Warqi), Samml Far
4.	Mercury	Para, Sangraf Rumi
5.	Sodium chloride/common salt	Namak
6.	Sulphur	Gandhak

8.22 KUSHTA QARN-UL-AIYAL

1. METHOD OF PREPARATION[1]

1.1 Recipe:

Qarn-ul-Aiyal (Horns of Stag *Carvus elephas*)	:	250 gm
Shir-e-Madari (Latex of *Calotropis gigantea*)	:	125 ml

Preparation of *Kushta:* The stag horns are broken into pieces and burnt on coal fire. This is followed by trituration with the latex of *C. gigantea*. Lozenges (approx. 10gm each) are made from the resultant paste, subjected to *Gil Hikmat* technique in an earthen urn and calcined in a pit using 10Kg cow dung cakes as fuel. The whitish Kushta, so produced, is sieved and stocked in a glass bottle.

2. CHEMICAL COMPOSITION[7]

The Kushta revealed the presence of Calcium (11.49%), Aluminium (3.39%), Iron (1.80%) and also Potassium, Chlorides and Sulphides (only qualitative analysis was done for the last three elements/ salts).

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,5]

Kushta Qarn-ul-Aiyal possesses anti-catarrhal and analgesic properties and is claimed to be useful for the treatment of following diseases:

(*a*) Bronchitis
(*b*) Catarrh/Common Cold/Phlegmatic Cough
(*c*) Chest Pain
(*d*) Pleurisy
(*e*) Pneumonia
(*f*) Tuberculosis etc.

4. DOSE[1]

125mg to be taken with 10 gm of pure Honey or *Laooq Sipistan*

8.23 KUSHTA RAS KAPUR

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Ras Kapur (Calomel)	:	60 gm
Arq Gulab (Aqua *Rosa damascena*)	:	60 gm
Makoh Sabz ka Pani (Juice of fresh *Solanum nigrum*)	:	60 gm

1.2 Preparation of *Kushta:* Calomel is triturated gradually with small quantities of Aqua *R. damascena* till whole of the latter is absorbed. This is followed by trituration with the juice of *S. nigrum*. Small tablets are made from the resultant paste, encased between two cups, sealed with layers of cloth and clay and calcined using 14Kg cow dung cakes as fuel. When cool, the *Kushta* is taken out from the cups, pulverized, sieved and stocked in a clean dry glass bottle.

2. THERAPEUTIC USE[1]

The *Kushta* is considered very effective for the treatment of Syphilis.

4. DOSE[1]

30mg to be swallowed in a de-seeded raisin or capsule with 250ml of Milk.

8.24 KUSHTA SADAF

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Sadaf Sadiq (True Oyster Shell)	:	250 gm
Arq Gulab (Aqua *Rosa damascena*)	:	375 ml

1.2 Preparation of *Kushta:* The Oyster shells are ground, pulverized, sieved and triturated gradually with small quantities of Aqua *R. damascena* till whole of the latter is consumed. Tablets (approx. 10gm each) are made from the resultant paste, dried, and calcined by *Gil Hikmat* technique in a pit using 20Kg of cow dung cakes as fuel. This yields a whitish *Kushta* which is collected, powdered, sieved and preserved in a bottle.

2 CHEMICAL COMPOSITION[7]

Chemical analysis of *Kushta Sadaf* revealed the presence of predominantly Iron (77 mg%) and Calcium (40%). Other elements/salts detected in the *Kushta* included Bromides, Copper, Sulphur Carbonates, Oxides etc.

3 PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,14,22-24]

Oyster shells are attributed with astringent, anti-diarrhoeic, cardiotonic, dentiferons, haemostatic and vasoconstrictor properties. These are claimed to be of value for the treatment of the following diseases:

(*a*) Asthma
(*b*) Bronchitis
(*c*) Burns
(*d*) Dropsy
(*e*) Facial Marks
(*f*) Tooth powder for strengthening gums
(*g*) Uterine Disorders etc.

The *Kushta* is therapeutically used for treating the following ailments:

(*a*) Leucorrhoea
(*b*) Spermatorrhoea

4. DOSE[1]

60mg to be taken with Cream or Butter.

8.25 KUSHTA SAMM-UL-FAR

1. VARIETIES

Two varieties: (*a*) *Aatishaki* and (*b*) *Qawi* of *Kushta Sammul Far* have been described in Unani texts.

2. METHODS OF PREPARATION[1,15,16]

2.1 Recipe:

(*a*) *Kushta Sammul Far Aatishaki*

Samm-ul Far (Arsenic)	:	250 gm
Shibb-e-Yamani (Alum)	:	375 ml

(*b*) *Kushta Sammul Far Qawi*

Samm-ul-Far (Arsenic)	:	10 gm
Sheer-e-Madar (Latex of *Calotropis gigantea*)	:	200 gm
Khakistar-e-Chirchita (*Achyranthus aspera*)	:	800 gm

(*c*) Another recipe (Variety not mentioned has also been described:

Sankhia Safed (White Arsenic Oxide)	:	60 gm
Rakh Chirchita (Ash of *A. aspera*)	:	1.5 kg

2.2 Preparation of *Kushta:*

(*a*) *Kushta Samm-ul-Far Aatishaki*: Half of the alum (10gm is spread in an earthen pot and Arsenic is placed over it. It is then covered with the remaining half of Alum (10gm). The pot is covered with an earthen disc, sealed by *Gil-Hikmat* process and calcined in a pit using 5Kg cow dung cakes as fuel. When the pit is cool, the pot is opened and the *Kushta* is carefully scrapped. It is soaked in the latex of *C. gigantea*, sealed in an earthen pot and buried for 21 days. After this period, the material is taken out and heated in a pan along with ash of *A. aspera* till it becomes brittle. The *Kushta*, so formed, is scrapped from the pot, pulverized and stored in a glass bottle.

(*b*) An alternative method (variety not mentioned) is as follows: Ash of *A. aspera* (25gm) is dissolved in 500ml of water and left in it overnight. The solution is filtered next morning and Arsenic Oxide is triturated in it till whole of the water has dried. Tablets (approx, 10gm each) are made from the resultant paste, encased between two cups, sealed by *Gil_Hikmat* technique and subjected to heat allowing all of the soft clay to become dry. The sealed cups are placed in a wide-mouthed earthen urn between two layers of the ash of *A. aspera* (125gm each below and above the cups). Calcination is done on a heart using fire of 5Kg cow dung cakes. When cool, the whitish tablets are taken out from the cups, ground, sieved through fine cloth and the whitish *Kushta*, so formed, is stocked in a bottle.

3. CHEMICAL COMPOSITION

The *Aatishaki* variety was reported to contain 18.89% Arsenic and 17.35% Aluminium. Qualitative tests in addition, srevealed the presence of Potassium and Sulphates.[7]

Chemical analysis carried out by AAS at the Industrial Toxicology Research Centre showed the following Arsenic content[16] in the two varieties of *Kushta Sammul Far*.

		Arsenic (mg/gm)
Aatishaki Variety	:	174.40
Qawi Variety	:	266.90

4 PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,15,16]

It is attributed with aphrodisiac appetizing, digective, hematogogue, general and nervine tonic properties and therapeutic utility in the following diseases:

Decreased libido

(*a*) Neurasthenia

(*b*) Sexual Debility

5. DOSE

30mg to be taken with Butter or Cream followed by 250ml of Milk[1]

60-125mg[15]

8.26 KUSHTA SANG-E-JARAHAT

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Sang-e-Jarahat (Soap Stone)	:	250 gm
Kakronda Buti Sabzi (*Blumea balsamifera*)	:	250 gm

1.2 Preparation of *Kushta:* Soap stone is ground and triturated with *B. balsamifera* plant. Tablets (approx. 10gm each) are prepared from the resultant paste, submitted to *Gil Hikmat* process and heated on 7.5Kg cow dung cakes in the open air. On cooling the white *Kushta*, so formed, is ground, sieved and stocked in a bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

The *Kushta* possesses styptic and emmenagogue properties with claimed utility for the treatment of following diseases:

(*a*) Bleeding Piles

(*b*) Haemoptysis

(*c*) Haemorrhage

(*d*) Leucorrhoea

(*e*) Menorrhagia etc.

3. DOSE[1]

125mg to be taken with 250ml Milk or 10ml *Sharbat Anjabar*

8.27 KUSHTA SANG-E-SAR-E-MAHI

1. METHODS OF PREPARATION[1,14]

1.1 Recipe:

Sang-e-Sar-e-Mahi (Otolith from Fishes)	:	100 gm
Muli Ka Pani (Leaf juice of *Raphanus sativus*)	:	30 ml

1.2 Selection of Material: *Sang-e-Sar-e-Mahi* (Otolith or Stones from the head of certain fishes) is pathological product but used in Unani medicine.

1.3 Preparation of *Kushta:* The material is ground, sieved and triturated in Leaf juice of *Raphanus sativus*. Tablets (approx 10gm each) are prepared from the resultant paste, sealed by *Gil*-Hikmat process, and calcined in a pit using 20Kg cow dung cakes as fuel. After cooling the *Kushta* is taken out from the earthen cups, sieved and stored in a bottle.

2. CHEMICAL COMPOSITION[3]

Chemical analysis revealed the presence of following metels,

TABLE 8.5: CHEMICAL COMPOSITION OF *KUSHTA SANG-E-SAR-E-MAHI*[12]

METAL	Content mg/gm
Calcium	344
Iron	2.75
Copper	0.38

According to Said[1], it is silicate of Lime.

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

It is attributed with lithnotriptic properties and is claimed to be therapeutically useful in the following diseases:

(*a*) Dyspnoea and Pneumonia in children
(*b*) Reputed medicine for both Renal and Cystic calculi

4. DOSE

60mg to be taken with 5gm of *Jawarish zaruni* ambari or 10ml of *Sharbat Bazuri Motadil*[1]
250-500mg[3]

8.28 KUSHTA SANG-E-YASHAB HABIS

1. METHODS OF PREPARATION[2]

1.1 Recipe:

Sang-e-Yashab (Agate)	:	100 gm
Arq Gulab (Aqua *Rosa damascena*)	:	qs
Berg-e-Gaozaban (Leaves of *Caccinia glauca*)	:	100 gm

1.2 Preparation of *Kushta*: Agate is made red hot on fire and quenched in Aqua *R. damascena*. The process is repeated 100 times using fresh *Arq* every time. This is then encased in dong made from the leaves of *C. glauca* and calcined using 1 kg cow dung cakes as fuel. After cooling, the *Kushta* is collected, sieved and stocked in a bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,2]

The Kushta is attributed with anodyne, artringent, cardiac stimulant, mood elevating, retentive and brain tonic properties with therapeutic utility in the following diseases:

(*a*) Amnesia
(*b*) Catarrh
(*c*) Common Cold
(*d*) Palpitation/Cardiac ailments etc.

3. DOSE[1]

30-60mg

8.29 KUSHTA SANG-E-YASHAB QAWI

1. METHODS OF PREPARATION[2]

1.1 Recipe:

Sang-e-Yashab (Agate)	:	5 gm
Post-e-Berun-e-Pista (Peel of the nut of *Pistacia vera*)	:	5 gm
Mastagi (*Pistacia lentiscus*)	:	5 gm
Abresham (Silkworm cocoon, *Bombyx mori*)	:	5 gm
Dana Heel Khurd (Lesser cardamom, *Eleltaria cardamomum*)	:	5 gm
Busud (Coral root)	:	5 gm
Tabasheer (*Bambusa bambos*)	:	10 gm
Rubb-e-Seb (Apple fruit, *Malus sylvestris*)	:	qs
Warq-e-Nuqra(Silver Foil)	:	qs

1.2 Preparation of *Kushta:* All the ingredients are ground with Apple fruit, made into tablets (approx. 1gm each) and calcined using *Gil-Hikmat* process and heat of cow dung cakes in a pit.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2]

The *Kushta* possesses intestinal tonic and constipative properties with claimed therapeutic utility in Chronic Diarrhoea.

3. DOSE[1,2]

30-60mg with *Khamira Marwarid*

8.30 KUSHTA SANGRAF

1. METHODS OF PREPARATION[1,25]

1.1 Recipe:

Sanrgof Rumi (Cinnabar)	:	60 gm
Ab Shir-e-Madar (Latex of *Calotropis gigantea*)	:	60 ml
Lemon Juice	:	60 ml
Bhantal Buti (/'*cakkucaroa arvirea*)	:	60 gm
Rakh Chirchita (Ash of *Achyranthus aspera*)	:	05 kg

1.2 Preparation of *Kushta:* Cinnabar (HgS) is triturated with the latex of *C. gigantea* then and triturated with lemon juice and *C. arborea*. Tablets are made out of this mixture, encased between two earthen cups, sealed by *Gil Hikmat* process and buried inside the ash of *A. aspera* kept in an urn. It is then calcined using 5Kg cow dung cakes as fuel. The *Kushta* is collected on cooling. It is sieved and stocked in a bottle.

2. CHEMICAL COMPOSITION[25]

Analysis using ICP-MS revealed the presence of 796.7ppm (~0.8 mg/gm) Mercury in *Kushta Sangraf.*

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2]

Kushta Sangraf possesses anti-catarrhal, aphrodisiac, diagestive and tonic (general, nervine and sexual) and anti-aging properties. It is used for the treatment of following diseases:

(*a*) Catarrh
(*b*) Indigestion
(*c*) General and sexual Debility
(*d*) Tonic for the elderly persons etc.

4. DOSE[1]

60mg with 10ml Honey or Cream or Butter

8.31 KUSHTA SANKH

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Sankh (Conch Shells)	:	250 gm
Arq Gulab (Aqua *Rosa damascena*)	:	375 ml

1.2 Preparation of *Kushta:* Conch (*Turbinella rapa*) shells are ground and triturated with Aqua *R. damascena* till whole of the latter is consumed. Tablets (approx. 10gm each), made from the resultant paste, are put in an earthen ware urn, subjected to *Gil Hikmat* process and calcined in a pit using 20Kg cow dung cakes as fuel. On cooling a white *Kushta* is produced. This is carefully collected, sieved and preserved in a bottle.

2. CHEMICAL COMPOSITION[7]

Kushta Sankh contains mainly Calcium (43.70%). Qualitative analysis revealed the presence of following elements Iron, Magnesium, Silicon, Carbonate, Chloride and Phosphae.

3. THERAPEUTIC USES[1,14,22,24]

It is claimed to be therapeutically useful for treating the following diseases:

(*a*) Biliousness
(*b*) Blood Dyscrasias
(*c*) Colic
(*d*) Eye Diseases
(*e*) Hyperacidity
(*f*) Spermatorrhoea etc.

4. DOSE[1]

60mg with Cream or Butter

8.32 KUSHTA SURB

1. METHODS OF PREPARATION[1,25]

1.1 Recipe:

Surb (Lead)	:	250 gm
Shora Qalmi (Salt Petre)	:	500 gm

1.2 Preparation of *Kushta:* Lead is melted in an Iron pan. To the molten Lead, pinches of Salt Petre are slowly added with constant stirring by a Bamboo rod. When whole of the Salt Petre is consumed, the pan is taken off the fire, the contents are triturated with water in a pertle and mortar. The material is left dissolved in water and the supernatant is decanted off. In this way washing is repeated 5 times. The material is then dried and sieved through a fine cloth. Any grains remaining on the cloth are removed and the yellowish, soil-coloured *Kushta* is carefully collected and stocked in a bottle.

2. CHEMICAL COMPOSITION[25]

Chemical analysis by Atomic Absorption Spectroscopy (AAS) revealed Lead content in *Kushta Surb* to be 3059.21 ppm (~3mg/gm)..

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

Kushta Surb is attributed with aphrodisiac improver of semen quality, and tonic properties. It is claimed to be therapeutically useful in the following diseases/conditions:

(*a*) Poor Semen Quality (Low viscosity and number of viable sperms)
(*b*) Sexual Weakness
(*c*) Spermatorrhoea etc.

4. DOSE[1]

6mg with 10 gm of *Majun Arad Khurma* or *Majun Supari Pak* followed by 250ml of Milk.

8.33 KUSHTA TAMBA

1. METHODS OF PREPARATION[2]

1.1 Recipe:

Tabal Nuhas/Burada-e-Mis		
(Blue Durt, Copper Fillings or Chips)	:	10 gm
Seemab (Mercury)	:	10 gm
Sirka (Vinegar)	:	qs
Ratanjot (*Onosma echioides*)	:	250 gm

1.2 Preparation of *Kushta:* Copper fillings/chips and Mercury are triturated with Vinegar in a pestle and mortar for 6 hours. The material is then mixed with *O.* echioides to form a dough. The latter is calcined using 4Kg cow dung cakes as fuel. The *Kushta*, so produced, may be made into tablets.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2]

Kushta Tamba is attributed with strengthening, general tonic and blood purifying properties. It is claimed to be useful for the treatment of following diseases:

(*a*) General Debility
(*b*) Leucoderma
(*c*) Pityriasis alba
(*d*) Putrefaction of Blood etc.

4. DOSE[2]
15-30mg

8.34 KUSHTA TAMBA SAFED

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Tambe ka Burada (Copper Dust)	:	10 gm
Ab Karir (Juice of *Capparis decidua*)	:	500 gm
Kachia Phal (Shoot and Fruits of *Cappris decidua*)	:	5 Kg

1.2 Preparation of *Kushta:* Copper fillings are subjected to heat on coal fire and laid out on the juice of *C. decidua*. The fruits of shoots and fruits of *C. decidua* are chopped, finely ground and mixed with 10Kg of dung. Two portions of such large dung are dried. These are pierced and one square inch holes are made. Copper pilings and the mixture of *C. decidua* juice and fruits are placed between layers of cow dung pieces and the whole lot is tied with a string. The material (30Kg) is spread in a pit and the large dung pieces are placed over it. The remaining 10Kg are placed sideways and ignited. When the fire has burnt out, the dung is removed and white *Kushta* is carefully collected. This is pulverized, sieved and stocked in a bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

The *Kushta* possesses ati-catarrhal, appetizing, aphrodisiac and anti-tussive properties with claimed utility in the following diseases:

8.35 KUSHTA TAMYSAR

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Tambe ka Burada (Copper Dust)	:	10 gm
Gulabi Phitkari (Pink Alum)	:	700 gm
Khatti Buti (*Oxalis corniculata*)	:	250 gm

1.2 Preparation of *Kushta:* Pink alum is divided into four lots. One lot is subdivided into two lots and Copper Dust is sandwiched between these two sub-lots. The material is then sealed in an earthen vessel by *Gil*-Hikmat process. It is put in a pit filled half with 20Kg cow dung cakes and set on fire. When the fire burns itself out, the medicine is taken out from the earthen vessel and pounded in a mortar with water. More water is added to dissolve the ingredients. It is allowed to settle and the supernatant water is decanted off. The copper-alum mixture is now sandwiched between the second lot of Pink Alum, sealed in an earthen vessel by *Gil-Hikmat* and subjected to heat on 2Kg cow dung cakes. On cooling, the mixture is taken out, triturated again with water. The water is decanted off and the process is repeated with the third and fourth lots of Pink Alum in a similar manner.

The Alum-Copper mixture (taken out from all 4 lots) is dried and triturated with *O. corniculata*. Tablets (approx. 10gm each), made from the resultant parte, are calcined by *Gil-Hikmat* method in a pit using 20Kg cow dung cakes as fuel. A buff-cloured *Kushta* is carefully collected after cooling. It is sieved through a fine cloth and stored in a dry air-tight glass bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

The *Kushta* possesses approadisiac, anti-catarrhal, anti-rheumatic, stomachic and hepatotonic tonic and restorative properties with therapeutic utility in the following diseases:

(*a*) Catarrh
(*b*) Gout
(*c*) Indigestion
(*d*) Liver disease
(*e*) Paralysis (including Facial Paralysis)
(*f*) Rheumatism
(*g*) Sexual Debility etc.

3. DOSE[1]

30mg to be taken with 5 gm *Jawarish Jalinoos* followed by 250ml of Milk or Butter (for aphrodisiac purpose) or Honey (for other ailments)

8.36 KUSHTA TILA KALAN

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Warq Tila (Gold Foil)	:	30 gm
Para (Mercury)	:	60 gm
Gandhak Amlasar (Processed Sulphur)	:	150 gm
Arq Gulabi (Aqua *Rosa damascena*)	:	250 ml
Ab Gheekanwar (Juice of *Aloe barbadenesis*)	:	125 gm

1.2 Preparation of *Kushta:* (*i*) Gold foils are triturated with Mercury in a pestle and mortar till a butter-like amalgam is produced. (*ii*) Processed Sulphur is divided into 5 lots, (*iii*) One lot is added to the amalgam followed by trituration with Aqua *R. damascena* for 2 days. Tablets (approx. 1gm each) are made from this mixture. (*iv*) The tablets are next encased in an earthen cup with lid sealed by *Gil-Hikmat* process, dried, and subjected to heat in a pit containing 2Kg cow dung cakes as fuel. When cool, the tablets are taken out and triturated with second lot of sulphur and juice of *A.* barbadenesis till the latter dried up completely. (*v*) Tablets (approx. 1gm each) are prepared from the resultant paste, sealed between two earthen cups by *Gil-Hikmat* process and heated again in 2Kg of cow dung cakes. Next the third lot of Sulphur is added and the mixture is triturated with Aqua *R. damascena* for one day. (*vi*) The Process of trituration and heating is repeated with the fourth and fifth lots of Sulphur and the remaining *A.* barbadenesis and *R.* damascene. (*vii*) These five heating will yield a Pinkish grey *Kushta*. This is finely pulverized, sieved and stocked in a bottle.

2. CHEMICAL COMPOSITION

Wide variation was reported in Gold content in *Kushta Tila Kalan* by different studies.

REPORT	GOLD CONTENT (%)
Chopra and Associates[28]	86.14
CCRUM[4]	72-75
Bajaj[26]	47.30

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,4,5,26-28]

Kushta Tila Kalan is attributed with anti-injective, digestive, cardiac stimulant, febrifuge properties with claimed styptic, tonic for principal organs (Brain, Heart, Liver) and general tonic /therapeutic utility in the following diseases:

(*a*) Alcoholism
(*b*) Chronic Fevers
(*c*) Epilepsy
(*d*) Gastrointestinal Disturbances
(*e*) Hepatic Disease
(*f*) Impotency
(*g*) Neuro-aesthenia
(*h*) Nocturnal Emissions
(*i*) Poisoning (specially against poisoining of bacterial origin)
(*j*) Pulmonary wounds
(*k*) Tachycardia/ Papitation
(*l*) Sexual Debility etc.

4. DOSE[1]

15-30mg[4]
6mg with 5gm of *Kushta Khamira Marwarid*[1]

8.37 KUSHTA TILA MARWARIDI

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Kushta Tila Kalan	:	24 gm
Kushta Marwarid	:	18 gm

1.2 Preparation of *Kushta:* Both the *Kushta-e-jat* are mixed, triturated together and preserved in a bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

This *Kushta* possesses the pharmacological properties of the two component *Kushta-e-jat* (described earlier). It is considered of high therapeutic value for the treatment of Tuberculosis and associated General Debility.

3. DOSE[1]

30mg to be taken with 5gm of *Dawa-ul-Misk Motadil* Jawaharwala or *Khamira Abresham Arshadwala*

8.38 KUSHTA TUTIYA

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Neela Thutha Umda (Fine quality Copper Sulphate)	:	60 gm
Sufuf Rithe ka Chilka (Powdered peel of *Sapindus trifoliatus*)	:	125 gm
Kafur (Camphor)	:	25 gm

1.2 Preparation of *Kushta:* Half of the total quantity of powder of *S.* trifoliatus peel is spread in an earthen cup, covered with pieces of Copper sulphate and remaining *S. trifoliatus* powder is spread over it. The mixture is dried by application of heat or by *Gil-Hikmat* process and kept air-tight during drying. It is then calcined in a pit using 5Kg of cow dung cakes as fuel. On cooling, a greenish white *Kushta* is obtained. This *Kushta* is mixed with Camphor (one half of the quantity of *Kushta*), sealed by *Gil-Hikmat* process and calcined agasin using 5Kg cow dung cakes in a pit. The final *Kushta*, which is also greenish-white in colour, is carefully collected, sieved and stored in a dry air tight glass bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

The *Kushta* is attributed with anti-infective and healing properties. It is considered curative for syphilitic Sores.

3. DOSE[1]

6mg with Butter or Cream

8.39 KUSHTA USRUB

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Usrub (Lead)	:	5 gm
Khand (Sugar)	:	5 gm

1.2 Preparation of *Kushta:* Lead is melted in an Iron pan and to the molten metal small, sugar is slowly added in small quantities with constant stirring using wooden rod till it becomes ash when cool, the *Kushta* is carefully collected and preserved in a bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[2]

The *Kushta* is attributed with southing and sedative properties. It is claimed to be therapeutically useful for the treatment of the following diseases/conditions:

(*a*) Distress
(*b*) Fatigue

Excessive use should be avoided

3. DOSE[2]

30 mg

8.40 KUSHTA YAQOOT

1. METHODS OF PREPARATION

METHOD–A[1]

1.1a Recipe:

Yaqoot Surkh (Ruby)	:	100 gm
Arq Gulab (Aqua *Rosa damascena*)	:	750 ml

1.2a Preparation of *Kushta:* Ruby is ground, sieved and triturated with 250ml of Aqua *R. damascena*. When dry, tablets (approx. 10gm each) are made from this material, sealed in an earthen pot by *Gil-Hikmat* process, dried and calcined using 10Kg cow dung cakes as fuel. On cooling, the tablets are submitte dto trituration with 250ml Aqua *R. damascena*, *Gil-Hikmat* and calcinations using 10Kg cow dung cakes twice (a total of 3 heatings are used). This yields a pinkish *Kushta* which is pulverized, sieved and stocked in a bottle.

METHOD–B[2]

1.1b Recipe:

Yaqoot Surkh (Ruby)	:	6 gm
Busud (Coral Roots)	:	3 gm
Marjan (Coral Branch)	:	3 gm
Marwarid (Pearls)	:	1.5 gm
Warq-e-Tila (Gold foil)	:	1.5 gm
Arq Gulab (Aqua *Rosa damascena*)	:	750 ml
Arq Gulab (Aqua *Rosa damascena*)	:	qs

1.2b Preparation of *Kushta:* All the ingredients are pounded together in a pertle and mortar for 7 days and calcined as described in the first method.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,2]

Kushta Yaqoot is attributed with cardiotonic, nervine tonic and cephalic tonic properties with claimed therapeutic utility in the following diseases:

(*a*) Epilepsy
(*b*) Palpitation of Heart
(*c*) Psychosis etc.

3. DOSE

Kushta prepared by Method A is administered, in a dose of 60mg with *Khamira Marwarid*[1] and the dose for *Kushta* prepared by Method B is 15-30mg[2]

8.41 KUSHTA ZAHAR MOHRA

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Zahar Mohra (Bezoar Stone)	:	100 gm
Arq Gulab (Aqua *Rosa damascena*)	:	175 gm

1.2 Preparation of *Kushta:* Mineral Bezoar is ground, pulverized, sieved through a fine cloth followed by trituration with Aqua *R. damascena*. When whole of the latter is consumed, tablets (approx. 10gm) each are prepared, dried, sealed in an earthen vessel by *Gil-Hikmat* process and subjected to calcinations in a pit using 5Kg cow dung cakes in fuel. When the fire is burnt out, the *Kushta* which is light whitish in appearance, is carefully collected, sieved and stocked in a bottle.

2. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1]

The *Kushta* is considered anodyne and refrigerant in nature. It is claimed to relieve palpitation of the heart.

3. DOSE[1]

125 mg to be taken with 5gm of *Khamira Marwarid*

8.42 KUSHTA ZAMARRUD

1. METHODS OF PREPARATION[1]

1.1 Recipe:

Zammarrud (Emerald)	:	100 gm
Arq Gulab (Aqua *Rosa damascena*)	:	750 ml

1.2. Preparation of *Kushta:* Emeralds are broken into pieces, finely ground, sieved and triturated with 250ml of Aqua *R. damascena.* When dry, tablets (approx. 10gm each) are prepared, dried, sealed in an earthen vessel by *Gil-Hikmat* technique and calcined in a pit using 10Kg of cow dung cakes as fuel. On cooling, the tablets are taken out and the process of trituration and calcinations and calcinations is repeated twice. After 3 repeats, a light yellow *Kushta* is obtained which is sieved and stored in a dry air-tight glass bottle.

2. CHEMICAL COMPOSITION[7]

Chemical analysis of *Kushta Zamarrud* revealed the presence of following metals: Iron (33.14%), Aluminium (16.55%) and Sulphur (only qualitative analysis was carried out).

3. PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC USES[1,5]

Kushta Zamarrud is attributed with cardiotonic and hepatic tonic properties. It is claimed to be useful for the treatment of following diseases/conditions:

(*a*) Bronchitis
(*b*) Hepatic Disorders
(*c*) Heart Disease
(*d*) Polyuria etc.

4. DOSE[1]

30 mg with 5gm of *Jawarish Zaruni Amba*

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9

PHYSICO-CHEMICAL STANDARDS

The importance of standardization of Indigenous drugs (including Mineral drugs) can not be over-stressed. It is a must for acceptance of these drugs by the scientific community and international market. The Central Council for Research in Ayurveda and Siddha and the Central Council for Research in Unani Medicine have taken up this task at their Drugs Standardization Units all over India. These units have laid down certain standards for the physico-chemical characteristics of Ayurvedic *Bhasmas* and Unani *Kushta-e-jat*. Some work has also been carried by other researchers. Available information on the subject is tabulated in tables 9.1 and 9.2. Pharmacological standardization on these drugs should now be taken up because the true-identity of any drug lies in its medicinal efficacy and safety for therapeutic utility to the masses.

TABLE 9.1
PHYSICO-CHEMICAL STANDARDS OF AYURVEDIC *BHASMAS*[1,2]

S.NO.	*BHASMA*	DESCRIPTION	LOSS OF WEIGHT ON DRYING AT 105-110°C (% w/w)	ASH VALUES (% w/w)		METAL CONTENT (RANGE OR NOT MORE THAN % W/W)
				TOTAL ACID	INSOLUBLE	
1	2	3	4	5	6	7
1	**Abhraka Bhasma**	Reddish Brown and smooth *Bhasma* with a faint odour and no taste	Not more than 0.43	Not less than 98.91	41.1-63.7	Iron as Fe_2O_3 (20.09-21.60) Calcium (1.65-4.83) Sodium (1.87) Potassium (5.36) Phosphate (1.71) Magnesium (9.55) Aluminum as Al_2O_3 (3.80-18.55) Silica (36.74)
2	**Godanti Bhasma**	White and smooth with a faint odour and no taste	0.127-6.127	99.30-99.90	27.68-51.10	Iron (Traces) Calcium as $CaSO_4$ (29.88) Manganese (0.623) Sulphate (69.07-69.81) Sulphide (Traces)
3	**Haritala Bhasma**	Brown powder with a fragrant odour and saltish taste	7.69	70.36-78.25	0.617-3.091	Iron as Fe_2O_3 (11.29) Calcium (0.443-1.734) Copper as CuO (24.90) Mercury (Nil) Sulphur (10.24-37.62) Free Sulphur (0.895-5.503) Sodium (22.38) Magnesium (2.69) Arsenic as As_2O_3 (19.08-58.22) Sulphate (33.29)
4	**Kapardika Bhasma**	Fine White powder with a faint odour and astringent taste	1.12	57.11-100.00	0.212-1.154	Calcium (36.76-52.46) Calcium Oxide (64.98) Calcium Hydroxide (85.86) Calcium Carbonate (15.12) Carbonates (55.14)

1	2	3	4	5	6	7
5	**Kasisa Bhasma**	Dark Brown fine powder with a faint odour and no taste	0.059-0.283	99.45-99.86	47.60-83.84	Iron as Fe_2O_3 (79.900-94.298) Calcium (0.439) Sodium (0.155) Sulphur (2.75) Free Sulphur (Nil) Sulphate (3.30) Chloride (0.323) Silica (4.214)
6	**Loha Bhasma**	Dark Brown fine powder with a faint odour and no taste	0.122-0.240	96.80-99.70	0.101-2.803	Iron (65.00-75.00) Iron as Fe_2O_3 (96.575)
7	**Mandura Bhasma**	Dark Brown smooth powder with no odour and astringent tastE	0.40	19.08	40.53	Iron (62.70) Iron as Fe_2O_3 (59.14) Sodium (1.70) Magnesium (3.987) Chloride (4.417)
8	**Mukta Bhasma**	Fine White powder with a faint odour and no taste	0.61	54.25-56.30	1.50	Calcium (40.00-45.00) Calcium as $CaCO_3$ (99.391)
9	**Mukta Shukti Bhasma**	Fine White powder with a faint odour and no taste	0.028-0.40	84.43-99.09	0.55-1.53	Calcium (50.15-62.60) Calcium as $CaCO_3$ (96.70) Calcium Oxide (61.83) Calcium Hydroxide (81.70)
10	**Naga Bhasma**	Fine Grey powder with a faint odour and no taste	0.124	99.98 – 111.70	4.576	Iron (traces) Lead Oxide (75.63) Calcium (traces) Magnesium (traces) Carbonate (traces) Sulphur (8.93) Free Sulphur (Nil) Sulphate (13.25) Chloride (traces)

1	2	3	4	5	6	7
11.	**Panaviraldi Bhasma**	Bluish Black fine fragrant powder with a saltish taste	6.33	-----	----	Calcium (1.24) Magnesium (4.10) Iron (0.12) Sodium (5.22) Potassium (37.80) Chloride (22.10) Sulphate (5.45) Carbonate (15.62) Phosphate (0.999)
12.	**Pravala Bhasma**	Particle Size. Particles passing through Mesh number (%): 85-100 (5.30) 120-200 (25.70) 240-350 (66.80)	-----	----	-----	Calcium (36.75-38.99) Magnesium (2.42-3.55) Iron (0.013-0.035) Calcium carbonate (100.10-104.90) Calcium Oxide (0.46-1.09)
13.	**Rajata Bhasma**	Brownish Black fine powder with a faint odour and no taste	Nil	89941-99 940	9768-19 .860	Silver (52.59-59.39) Calcium (10.769) Iron as Fe_2O_3 (14.33) Free Sulphur (0.675) Aluminum (Traces) Chloride (19.900)
14.	**Shankha Bhasma Report-1**	Fine White powder with no odour and no taste	0.06	61.09-64.40	0.719-1.243	Calcium (38.400-42.178) Calcium Oxide (0.50) Iron (0.085) Magnesium (0.23) Sulphate (1.295)
	Report-2	Particle size. Particles (%) passing through Mesh number (%): 85-100 (7.70) 120-200 (8.00)	—	—	—	Calcium (39.16-40.08) Calcium Carbonate (94.33-97.21) Calcium Oxide (0.55-3.61) Iron (0.037-0.085) Magnesium (0.00-0.14)

1	2	3	4	5	6	7
15.	**Sukti Bhasma**	Particle size. Particles (%) passing through Mesh number. 85-100 (4.40) 120-200 (17.30) 240-350 (76.70)	—	—	—	Calcium (38.63-39.45) Calcium Carbonate (96.16-98.40) Calcium Oxide (0.36-0.75) Iron (0.000-0.036) Magnesium (0.00-1.07)
16.	**SuvarnaMakslika Bhasma**	Dark Brown fine powder with a faint odour and no taste	—	92.10-98.20	21.20-31.18	Calcium (1.625) Sodium (0.922) Potassium (0.370) Sulphur (3.33) Free Sulphur (1.43-6.39) Sulphate (3.00) Copper (17.20) Iron (36.00-51.96) Ferric Oxide (85.00) Ferrous Oxide (5.70) Phosphate (1.101) Silica (3.80)
17.	**Tamra Bhasma**	Fine Black powder with a faint odour and slightly astringent taste	2.128	67.17-7969	1.399 -1.660	Copper Oxide (44.45-66.13) Sulphur (2.75) Mercury (Traces) Aluminium (Traces) Iron as Fe_2O_3 (6.03) Calcium (1.649) Sulphate (4.089) Phosphate (1.429)
18.	**Trivanga Bhasma**	Fine Yellowish powder with a faint odour and no taste	0.15	99.40.9960	39.50-56.45	Sulphur (10.76) Iron as Fe_2O_3 (0.889) Tin Oxide (29.00-34.75) Lead (23.98-32.48) Zinc (19.32-34.24) Aluminum (4.70) Arsenic (2.97) Silica (0.893)

1	2	3	4	5	6	7
19.	**Vanga Bhasma**	Fine Yellowish Grey powder with a faint odour and no taste	0.25-0.56	91.980-99.243	78.960-83.575	Iron as Fe_2O_3(4.26) Calcium (3.145) Tin Oxide (63.74-91.40) Arsenic (8.77) Chloride (Traces) Sulphate (Traces)
20	**Vartika Bhasma**	Particle Size. Particles passing through Mesh number (%): 85-100 (2.70) 120-200 (13.30) 240-350 (75.90)	-----	-----	-----	Calcium (38.50-40.35) Calcium Carbonate (96.28-99.97) Calcium Oxide (0.47-1.74) Iron (0.014-0.030) Magnesium (0.00-2.55)
21	**Yashada Bhasma**	Fine Pale Yellow powder with a faint odour and no taste	0.10	99.15-99.60	0.20-7.02	Zinc (63.53-74.03) Zinc as ZnO (91.478) Iron as Fe_2O_3 (4.511-7.884) Sodium (1.170) Chloride (0.260) Silicon Oxide (1.16)

— : Not done

TABLE 9.2

PHYSICO-CHEMICAL STANDARDS OF UNANI *KUSHTA-E-JAT*[3-7]

S.NO.	*KUSHTA*	DESCRIPTION	LOSS OF WEIGHT OF DRYING AT 105°C (% w/w)	ASH VALUES (% w/w)		METAL CONTENT	
				TOTAL	ACID SOLUBLE		
1	2	3	4	5	6	7	
1	**Kushta Abhrak Safaid**	White Powder	0.09	94.30-95.40	95.20-95.70		**mg/gm**
						Calcium	1.00
						Iron	0.03
						Magnesium	0.10
2	**Kushta Abhrak Siyah**	Fine Black powder	6	94	36.04-37.00		**%**
						Calcium	70.00
						Iron	38.88
						Magnesium	82.22
						Manganese	4.22
						Nickel	8.33
						Zinc	6.66
3	**Kushta Aqeeq**	Dirty White powder	0.03	98.40-99.80	0.40-1.80		**mg/gm**
						Calcium	1.00
						Copper	0.20
						Iron	0.20
4	**Kushta Baiza-e-Murgh** Report-1	White powder with a pleasant odour	Nil	96.30-99.20	90.30-93.89		**mg/gm**
						Calcium	88.90
						Magnesium	2.72
	Report-2	Greyish white smooth powder with lime-like taste and no odour. Particle size: <88-114 mμ	—	83.42-98.60	95.00-100.00		**%**
						Calcium	29.50-62.13
						Magnesium	+

1	2	3	4	5	6	7
						Sodium + Potassium + Carbonates +
5	**Kushta Busud**	Fine White powder	0.45	67.10-71.70	90.60-91.24	**mg/gm** Calcium 194.00 Copper 0.25 Iron 0.06 Magnesium 94.00
6	**Kushta Faulad fine powder**	Blackish brown	—	—	95.00	**%** Soluble Iron at pH 1.3 0.22 Insoluble Iron at pH7.5 0.22
7	**Kushta Godanti**	Fine Grey powder	0.3-0.4	99.20-99.41	100.00	**mg/gm** Calcium 32.00 Iron 0.05 Magnesium 1.80 Copper 2.00
8	**Kushta Hajr-ul-Yahud**	Light Brown powder	------	59.56-61.14	97.50-98.00	**mg/gm** Calcium 441.00 Magnesium 185.00 Iron 0.21 Copper 0.25
9	**Kushta Khabsul Hadeed**	Dark Brown powder	0.64	98.00-100.00	99.00	**mg/gm** Calcium 4.60 Copper 0.10 Iron 0.38 Magnesium 5.15
10	**Kushta Khar Mohra**	Fine White powder	-----	94.78-95.00	93.82	**%** Calcium 44.42 Strontium 1.32

1	2	3	4	5	6	7
						Iron +
						Sulphur +
						Chloride +
						Sulphate +
11	**Kushta Marjan Sada**	Greyish White powder	—	84.98-88.95	98.80-100.00	**mg/gm** Calcium 33.00-35.40 Magnesium 40.00 Iron 0.06
12	**Kushta Marjan Jawaharwala**	Fine Pale White powder	4.00-5.00	90.35-95.50	62.90-63.60	**mg/gm** Calcium 121.80 Iron 4.54 Magnesium 18.54 Silver (not less than 10.70%) Gold (not less than 7.30-8.70%)
13	**Kushta Marwareed**	White powder with a clay-like taste and no odour	Nil	73.00-74.00	51.10-53.50	Calcium Oxide 61.20%
14	**Kushta Musallus**	Creamish Aromatic powder	0.10-0.20	98.04-98.80	—	Lead 3.79%
15	**Kushta Nuqra** Report-1	Ash coloured odourless fine powder	—	—	100.00	Silver 93.00%
	Report-2	Greyish white lusterous in appearance. When sprinkled on the surface of water, the particles settled at the bottom. Particles of different sizes were found to be as follows: 0.0825mm (65-80%) 0.165mm (7-12%) 0.25mm (7-27%)	—	—	—	% Sliver 67-96 Aluminum + Calcium + Phosphate + Chloride + Carbonate +

1	2	3	4	5	6	7	
16	**Kushta Qalai**	Dirty White powder	0.40	95.00	43.00	Tin Silica	39.48% 1.58%
17	**Kushta Qarn -ul-Aiyal**	Fine Blackish powder	0.20	97.04-97.18	94.62	% Calcium Iron Aluminum Potassium Chloride	11.49 1.80 3.39 + +
18	**Kushta Sadaf**	Fine White powder	Nil	95.59-95.72	90.67-90.68	% Calcium Iron Copper Bromide Sulphur Carbonate	39.60-40.54 77.00 1.24 2.46 + +
19	**Kushta Samm-ul-Far Atishaki**	Fine White powder	2.00	83.90-86.31	98.00-99.00	% Arsenic Aluminum Potassium Sulphate	18.89 17.35 + +
20	**Kushta Sankh**	Fine White powder	Nil	96.32-99.90	92.00-96.00	% Calcium Iron Magnesium Silicon Carbonate Chloride Phosphate	43.70 + + + + + +

1	2	3	4	5	6	7	
21.	**Kushta Sang- e -Sar- e- Mahi**	Fine Aromatic Powder	2.20	56.81-58.00	100.00	Calcium Copper Iron	**mg/mg** 344.00 0.38 2.75
22.	**Kushta Tila**	Fine Brown powder	5.00	95.00-97.16	21.60-31.00	Gold	72.00-75.00%
23.	**Kushta Zamurrud**	Fine dust coloured powder	0.20-0.23	99.50-0.23	96.14-97.93	Iron Aluminum Sulphur	**%** 33.14 16.55 +

—: Not done
+: Present, Only qualitative was analysis carried out.

Israili, compared *Kushta Nuqra*, prepared by traditional techniques described in Unani texts, with that prepared in the laboratory by chemical process. The Laboratory *Kushta* was found to be astringent and caustic and so not suitable for internal administration. The Traditional *Kushta* did not show such properties and was quite good and palatable. This indicates that the Unani techniques make *Kushta* suitable for therapeutic use by mechanisms which are not fully understood and deserve scientific attention.

Recently Ansari and coworkers[8] used Atomic Absorption Spectroscopy (AAS) for elemental analysis of some *Kushta* preparations. Such studies are intended to determine the purity of market samples to ensure standards and quality in Unani drugs. Their findings are summarized in Table 9.3.

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TABLE 9.3
ATOMIC ABSORPTION ANALYSIS OF UNANI *KUSHTAS* FOR METAL CONTENT[8]

Kushta (Metal)	Metal Content (ppm)		
	Dawakhana, Tibbia College, Aligarh	Hamdard Dawakhana Delhi	Rex Remedies Delhi
Kushta-e-Faulad (Iron)	166.0	199.5	170.5
Kushta-e-Qalai (Tin)	129.5	92.3	53.0
Kushta-e-Godanti (Calcium)	377.5	408.0	355.0
Kushta Abhrak Safed (Aluminum)	25.1	19.5	20.5

Singh and associates[9] carried out standardization studies on *Narach Rasa*, an important Ayurvedic formulation used for the treatment of *Udar Roga* (Abdominal diseases). They analysed the ingredients (Mercury, Sulphur, Borax and Plant drugs) both in crude and *Shudha* (purified) forms. A standard *Narach Rasa* was prepared by these workers using the *Shastriya* method described in ancient Ayurvedic texts. The drug, so obtained, was black in colour having an aromatic odour and pungent oily taste. It was found to contain:

Mercury	:	5.61%
Sulphur	:	11.42%
Borax	:	5.35%
Fatty Oils	:	15.42%

The TLC revealed 9 spots in the Formulation. The number of spots in plant ingredients were as follows:

Danti Beeja (Heliospermum montanum seeds)	:	5
Pippali (Pipr longum, seeds)	:	5
Maricha (Piper nigrum, seeds)	:	3
Sunthi (Zingiber offichinale, rhizomes)	:	4

From the almost similar spots and Rf values, it is possible to identify the presence of all vegetable ingredients in the formulation. Microscopic diagnostic characters of the vegetable ingredients were also recorded. Such measures help in checking the adulteration and help authentification of *Narach Rasa*.

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10

RESEARCH ON MINERAL ORIGIN DRUGS
1956 TO 2006

1. A VIRGIN FIELD

Traditional system of medicine (Ayurveda , Siddha and Unani-Tibb) use natural products: plants, animals and mineral origin drugs for therapeutics purposes. Medicinal plants which constitute bulk of the Pharmacopoeia of these systems, have captured almost the entire R & D effort and attention of Researchers, Scientific institutions (both government and private sector), University departments and the Funding agencies. The minority groups (animas and mineral origin drugs) have NOT received their due share. It is felt that more efforts are needed in this direction to:

(*a*) Explore the possibilities of novel approaches of therapy from the hidden treasures of ancient Indian medicine.

(*b*) To study the safety aspects of *Bhasmas* and *Kushtejat* with a dispassionate and balanced approach without any preconceived notions or bias towards metal based drugs.

2. THE QUESTIONS

A perusal of the claims for various *Bhasmas* and *Kushtas* revealed diverse medicinal properties in these drugs e.g. tonic (general, nervine, cardiac, sexual, hepatic), aphrodisiac, rejuvenating and anti-aging effects and utility in the treatment of many ailments including cardiac, hepatic, reproductive and neuropsychiatric disorders. This raises several questions:

- Are they good for everything ?
- How do we translate these claims to pharmacological parameters ?
- Is their therapeutic use rational and safe ? If so, how ? If not, should such deliberate exposure to heavy metals go unchecked?

These questions can be answered only after thorough scientific investigations. Obviously a stock taking of what has been done is needed. This would constitute the first step towards planning future strategy and line of action.

3. FIFTY YEARS OF RESEARCH ON TRADITIONAL METAL PREPARATIONS

Lavekar and Babbar[1] commenting on the national status of Research and Development on Ayurvedic *Bhasmas*, stated that while considerable work is being done in Ayurvedic colleges, Universities and Government laboratories, most of it is confined in MD/PhD theses. The findings are rarely published in

national and international journals which are abstracted. This appears to be true for Unani, *Kushtas* also. Because of this reason, the scientific community rarely comes to know about their findings. The information is scattered. We have attempted to collect and present the available information on the subject. No claim is made for the coverage to be exhaustive. We may have missed some important contributions. Such omissions are not intentional .The information is presented for last five decades in chronological order.

1956

Aigaonkar[2] reported that *Nawajas*, given over a course of several months, reduced glycoseuria and may even cure the disease completely in obese elderly patients of diabetes mellitus. It was accompanied by improvement in glucose tolerance and general condition of the patients. Further insulin requirement was reduced in some cases.

1958

Modi et al[3] treated 25 diabetics exclusively with *Nawajas* tablets, an Ayurvedic formulation containing *Bhasmas* of Fe, Sn. Zn. Coral, Mica, *Shilajit* and traces of Cu and S. They reported poor patient compliance and follow up results for only 9 patients. When the drug was administered at a dose of 3 tablets per day for 3-6 months, 3 patients showed improvement, status quo was maintained in 4 patients and in 2 patients, the disease showed aggravation in the glucose tolerance test.

These workers administered *Jasad Bhasma* (containing 83% Zn in oxide form) to 3 patients for periods ranging between 3 to more than 8 months. The results (improvement in 1 patient and no significant improvement in glucose tolerance in 2 patients) were inconclusive. Substantial weight gain (an undesirable feature) was noted in one case.

Motlag and Nath[4] studied the effect of Ayurvedic calcium preparations (*Mukta Bhasma, Praval Bhasma* and *Shankha Bhasma*) on the weight, growth and calcium balance in rats. The effects were compared with those produced by Calcium carbonate and Calcium lactate. Better body weights and growth rates were observed in the groups treated with *Mukta Bhasma* and *Praval Bhasma* vs the groups receiving calcium salts. A close relationship exists between the calcium balance and body weight/growth. The absolute amount of Ca retained increases with increase in body weight. *Bhasma* - treated groups exhibited better Ca retention

One of the main objections leveled against *Makardhwaja*, whose chemical composition has been reported to be identical with that of red mercuric sulphide, is its difficult absorption in the body due to its insolubility. Earlier attempts to establish its presence directly in the blood and tissues, after feeding rats with the drug for a sufficiently long time failed. This was attributed to the limitations of the analytical techniques, available at that time, to detect Hg below a certain level. Rao and coworkers[5] carried out *in vitro* studies for the effect of *Makardhwaja* on succinic oxidase, succinic dehydrogenase and cytochrome oxidase of rat liver homogenate. The test drug caused 12-14% inhibition of the succinic oxidase and succinic dehydrogenase enzymes but elicited no effect on cytochrome oxidase enzyme. Inhibition of succinic dehydrogenase suggests the presence of Hg ions, the source of which can only be *Makardhwaja*. Low degree of inhibition (12%) points to the liberation of Hg ion in micro-quantities. The actual site of action of *Makardhwaja* is succinic dehydrogenase and not cytochrome oxidase. The findings give indirect evidence for the *in vitro* solubility of *Makardhwaja* and liberation of Hg ions to cause inhibition. Thus the possibility of absorption of drug in the body can not be completely ruled out. The inhibition of enzymes could not be reversed by cysteine or glutathione.

1959

The effect of Ayurvedic Ca preparations was studied on the cardiac activity using perfused toad heart preparations.[6] The drugs studied were shown to differ in the following respects: (*a*) Time of recovery for normal activity after cardiac arrest, (*b*) Proportion of time of recovery with last two doses of the stock solution, and (*c*) After effects which continue after cardiac arrest. Flame photometric analysis of Ca preparations revealed K content (ppm) as follows: Pearls 5, Corals 9, Conch Shells 2, and Ca carbonate 3, Ca lactate 18, and Ca chloride 17.

Effect of Ayurvedic calcium preparations from pearls, corals and conch shells were studied on the blood constituents (Ca, P, proteins and alkaline phosphatase activity) were studied in albine rats and compared with those produced by calcium salts (carbonate and lactate). Plasma Ca and P levels were found to be inversely related to each other in all the groups. Highest ionic Ca x P product, considered good for the calcification of bones, was observed in the group treated with *Mukta Bhasma* which used pearls as the Ca source. Plasma alkaline phosphatase activity was found to be almost normal in the groups given pearls and corals. Higher values were observed in other groups. The blood coagulation time was found to be within a narrow range in all the groups[7].

Motlag and Nath[8] studied the effect of Ca preparations from Pearls, Corals and Conch shells and Ca salts (carbonate and lactate) on calcification of bones and teeth in infant rats. The degree of calcification, as judged from the ash content, as also from Ca and P contents, was found to be similar in all the preparations studied. No appreciable difference was observed between the soluble and insoluble sources of Ca in their effect on calcification.

Rao and Mukerji[9] studied the action of *Makardhwaja* and Hg compounds on the oxidation of ascorbic acid. It was interesting to note that red mercuric sulphide, with which *Makardhwaja* is chemically identified, showed less inhibitory action vs the traditional medicine. The inhibitory effect was shown to decrease in the order: *Makardhwaja* (94.4 – 100.0%), Red mercuric sulphide (86.2%) and Calomel (10.2%). Two other compounds studied exhibited considerable stimulatory action, Mercuric acetate (13.4%) and Mercuric chloride (28.2%). Peculiarly, this is in the order of increasing solubilities of these compounds. These results indicate that at very low solubilities, Hg compounds inhibit ascorbic acid oxidation, the inhibition decreases with increasing solubilities. At higher solubilities, there is considerable acceleration of ascorbic acid oxidation.

Rao and Agarwala[10] reported inhibitory effect of *Makardhwaja* and other Hg campounds on the catalase activity of rat liver homogenates: *Makardhwaja* (80.1%), Red mercuric sulphide (82.4%) and Mercuric chloride (97.6%). Though an increase of about 10% inhibition was found between 30 min and 120 min periods of observation, practically no difference was noted between the periods of 120 min and 180 min. Thus 120 min incubation appears to be sufficient to bring out the maximum effect of the drug. The effect of 2.5 mg of *Makardhwaja* approximately corresponds to 0.8 µg Hg ion concentration. Incubation of the drug with 0.5% HCl prior to experiments was found to increase inhibition.

Ascorbic acid is known to play an important role in the oxidation of tyrosine both *in vitro* and *in vivo*. Rao and Mukerji[11] reported inhibitory action of *Makardhwaja* and other Hg compounds on the oxidation of tyrosine by rat liver homogenates: *Makardhwaja* (22.3%), Red sulphide of Hg (16.7%), Calomel (34.4.%) and Mercuric chloride (73.5%). The effect of *Makardhwaja* on tyrosine oxidation was attributed to the inhibitory action of the coenzyme function of ascorbic acid. Possibility of its interference with the enediol grouping of ascorbic acid was suggested.

1960

Rao and associates[12] demonstrated the permeability of small intestines to *Makardhwaja* by *in vitro* experiments. The presence of Hg was detected as follows:

(*a*) *Chemical Method*: Estimation of Hg in the Tyrode solution in which pieces of small intestines were suspended.

(*b*) *Enzymatic Method*: Inhibition of catalase by Hg permeating through the intestines.

Traces of Hg were detected in the intestional wall. No Hg was detected in 8-day dialysis experiments, under similar conditions suggesting thereby that the absorption of Hg from *Makardhwaja* is by means other than passive diffusion.

Sathe and coworkers[13] reported usefulness of *Jasad Bhasma* in the treatment of 34 cases of maturity onset diabetes with short duration. Though the action of the *Bhasma* was found to be slower in comparison to sulfonylureas, but it persisted for longer duration and no side effects/reactions were noted. After a trial of the test drug for 3 years, the following observations were made:

(*a*) *Urine volume* : In normal limits within 24 hours

(*b*) *Glycosuria* (24 hrs)

		Number of Patients
Nil	:	19
Traces to 10g	:	11
More than 10g	:	04

1961

The anterior pituitary extract, through its corticotropin and somatotropin content, is known to influence the adrenocortical and glucagons activity. Gupta and coworkers[14] reported an inhibitory effect of *Trivang Bhasma* (a mixture of *Vanga*/Sn, *Naga*/Pb and *Yashada*/Zn *Bhasmas* in equal proportion) against anterior pituitary extract-induced hyperglycemia in albino rats. The drug (40mg/kg po) caused insignificant fall in fasting blood sugar of normal rats but the anti-hyperglycemic effect observed in pituitary extract-treated rats was found to be statistically significant.

Five groups of infant albino rats were fed, for 100 days, a diet identical in all respects except the Ca salt supplied. Calcium preparations from Pearls, Corals and Conch Shells and Ca salts (carbonate and lactate) were supplied individually to different groups and comparative effects on Fe utilization were studied. The hemoglobin level and RBC counts were slightly lowered in the groups receiving Pearls and Coral preparations suggesting negligible inhibitory action on Fe utilization. The values were lowered to a great extent in the remaining groups indicating pronounced inhibitory effect on Fe utilization[15].

In earlier studies Aldose, Succinic oxidase and Catalase were shown to be significantly inhibited by *Makardhwaja* but no effect was observed on glucose-6-phosphate. The results suggest absorption of the drug into the system in small quantities. Antibiotics (Terramycin, Penicillin, Dihydro-streptomycin) have been reported to influence protein and lipid contents and interfere with carbohydrate and lipid metaboiism in rats. No such action was exerted by *Makardhwaja* on the tissue constituents (Ribonucleic

acid, Desoxyribonucleic acid, Total phosphorus, Proteins, Glycogen and Lipids). It does not drastically interfere with any of the vital metabolites at the doses used[16].

Roy[17]discussed the therapeutics of *Shilajitu* covering the historical aspects varieties, chemical composition and therapeutic uses. Charaka and Sushruta prescribed it for *Rasayana*, alteratives effects and in cases of indigestion, achlorhydria and flatulence. Charaka stated that there is hardly any disease which can not be treated by *Shilajitu*. The drug, is mentioned in *Bhavaprakash, Vagbhatt's Astanghridya* and *Rasa Tantras* for promoting vigour and vitality. Four varieties have been described in Ayurvedic texts viz. Golden yellow, Silver white, Copper red and Shiny black. The last mentioned variety is considered best for therapeutic purposes.

Chemical composition (%) is as follows: Water 9.85, organic matter 36.20 and mineral matter 34.95 (containing nitrogen 1.03, lime 7.80, potash 9.87, phosphoric acid 0.16 and silica 1.35). Therapeutic uses: (*i*) Gall stones, (*ii*) Jaundice, (*iii*) Enlarged spleen, (*iv*) Dyspepsia, (*v*) Intestinal pasasites, (*vi*) Piles, (*vii*) Renal stones, (*viii*) Anuria (diuretic), (*ix*) Obesity, (*x*) Diabetes, (*xi*) Anemia, (*xii*) Constipation, (*xiii*) Edema, (*xiv*) Vomiting, (*xv*) Epilepsy, (*xvi*) Insanity, (*xvii*) Neuraesthenia, (*xviii*) Hysteria, (*xix*)Mental disorders, (*xx*) Gonorrhoea, (*xxi*) Leprosy, (*xxii*) Tuberculosis, (*xxiii*) Eczema, (*xxiv*) Liver disease etc.

1962

Single oral doses *of Jasad Bhasma*(100-500mg/kg) elicited no effect on fasting blood sugar concentrations of rabbits over an eight hour period of observation. Prolonged administration (500 mg/kg po for 6 weeks) showed hypoglycemic effect. It caused enhancement of the hypoglycemic action of Tolbutamide both on single dose and chronic treatment schedules[18]

Tribhang Shila: an Ayurvedic formulation containing *Bhasmas* of Sn, Ph and Zn was tested for anti-hyperglycemic action in anterior pituitary extract treated rats.The test drug(40 mg/Kg po) caused insignificant reduction in fasting blood sugar level of normal rats but produced significant hypoglycemic action in hyperglycemic animals. It seems to influence the disturbed carbohydrate metabolism in hyperglycemic rats probably by limiting the carbohydrate turnover and inhibiting the vicious cycle of hyperglycemia[19]

Sharma and coworkers[20] studied the effect of *Tamra Bhasma* on ascorbic acid content in adrenal glands in experimental animals. The drug was earlier found to raise the hemoglobin content in experimental animals and human subjects. Experimental studies revealed marked reduction in gluteal muscle degeneration and roughness and discolouration of fur in g. pigs treated with the *Bhasma* for 20 days. This study showed that *Tamra Bhasma* induced depletion of Ascorbic acid content in experimental animals. The reduction was more marked in g. pigs than in albino rats.

1967

Singh and coworkers[21] carried out absorption, excretion and toxicity studies on some Ayurvedic mercurials. *Kajjali Bhasma* was more readily absorbed from the gastro-intestinal tract vs. other Hg preparations. Preparations made with *Shodhit* (purified) Hg were found to be less toxic than those prepared with non purified metal.

1968

Gupta and coworkers[22] standardized *Putas* and *Bhasmas* (specially *Kapardika Bhasma*) and concluded: (*a*) The maximum temperature attained in *Varaha puta* was found to be very high (850-940 °C) which

required 15 Kg cow dung cakes, (*b*) Reducing *Kapardika* into fine powder at the time of incineration facilitates *Bhasma* formation, (*c*) *Kapardika Bhasma* prepared by the prescribed method consists of Ca carbonate and oxide with traces of Ca phosphate, (*d*) Electric furnace (controlled) temperature between 600 to 650 °C (for 7 hours) or 900 °C (for 15-30 minutes) can replace the *Puta* method. This method ensures better controlled heat vs that by the *Puta* method.

1969

Oral administration of *Tamra Bhasma* in rats and human subjects resulted in a significant increase in hemoglobin content and RBC counts. The hematinic activity was attributed to the presence of Cu and Fe in an ionic form in the drug. The pharmaceutical processes used in preparation of the *Bhasma* reduce the toxicity of Cu and help to convert the metal to a readily assimilable form[23]

Singh and coworkers[24] conducted studies on the absorption and excretion pattern of Ayurvedic mercurials.*Kajjali* (20 mg/Kg /day po) was administered to albino rats for 15 days. Urine samples were tested periodically for the presence of Hg.The animals were sacrificed after 4.5 months.Histopathological examination revealed: (*a*) Both liver and kidneys were affected by untreated Hg (*b*) In the *Kajjali* treated group, kidneys remained unaffected in 5/6 animals and the liver was not grossly affected. The sixth *Kajjali* treated animal, which remained alive upto 4.5 months after discontinuation of treatment, both liver and kidneys were found to be normal. It is reasonable to presume that the damage, if any, caused by *Kajjali* was reversible Histochemical studies showed no Hg deposits in the liver and kidneys of surviving animals suggesting its excretion.

1971

Analysis of *Jasad Bhasma* prepared by the three different methods described in Ayurvedic texts and a sample procured from the market, revealed marked variation in the physico-chemical properties and composition[25]

(*a*) Density of the sample collected from the Ayurvedic Pharmacy of Banaras Hindu university (4.33) was found to be almost twice that of the samples prepared in the laboratory (2.30). This was attributed to the presence of metallic Zn that remained unoxidised (Zinc content BHUsample: 10-11%, Laboratory sample: 0.9-1.0 %).

(*b*) Zinc oxide content in *Jasad Bhasma* prepared by three methods showed wide variation (Method 1: 55-56%, Method 2: 97.0-97.5%, Method 3: 98%)

(*c*) The *Bhasma* prepared by Method 1 showed considerable quantity of Ferric oxide (10-10.5%) presumably obtained from *Apmarga*.The sample prepared by Method 2 contained traces of Mercuric oxide (0.005-0.01%).This was attributed to partial retention of mercuric oxide which does not volatalize completely even after heating.

Preliminary microbiological investigations indicate that *Jasad Bhasma* exerts a fungicidal effect.

Vasanth and coworkers[26] carried out analytical studies on *Naga Bhasma*. The raw drug and purified raw drug were found to contain 99-100% Pb. The *Bhasma* contained (%): Pb 65-68., As 5.5 - 6.5, Sb 0.1 – 0.3, Al 0.7-0.8, Oxide 0.05-0.1, Sulphate 9-14; *Manashila* was found to contain (%): As 63, S (as sulphide) 37. *Sphatikam* (Alum) contained (%): Al 5.9. About 83% of the *Bhasma* was soluble in 0.26% HCl. The acid soluble portion contained 49% Pb and small amounts of As and Fe. Almost all of the sulphate present in the *Bhasma* was soluble in 0.26% HCl.

1972

Israili[27] conducted preliminary standardization work on *Kushta Nuqra*. His findings are summarized as follows: (*a*) **Silver content:** The market samples contained 67-96% Ag, (*b*) **Other Metals/Salts:** Al, Ca, phosphate, chloride and carbonate were detected in the sample, (*c*) **Particle Size:** 0.0825 mm (65-80%), 0.165 mm (7-12%), 0.25 mm (7-27%), (*d*) **Physical Properties:** Greyish white, lusterous in appearance. Sprinkling on the surface of water caused particles to settle at the bottom of the container, (*e*) **Chemical Test:** The *Kushta* elicited positive reaction with ferric and nitric acid tests indicating the presence of metallic Ag. (*f*) **pH:** The filtrate obtained after boiling the *Kushta* in water gave the following reaction with litmus paper: Blue (pH 8.4), Dark blue (pH 9.0), Dark green (pH 7.9), Light green (pH 7.5).

The author compared *Kushtas* prepared by traditional techniques with that prepared in the laboratory using a muffle furnace. The latter was found to be astringent and caustic and so not suitable for internal administration. *Kushtas* prepared by traditional calcinations techniques were quite good and palatable.

1973

Joshi[28] carried out detailed investigations on *Abhraka Bhasma*. These included:

1. Pharmaceutical Studies

Bhasma prepared from *Vajra Abhraka* (Biotite, Sample A) and *Shweta Abhraka* (Muscovite, Sample B) were compared. Though upto 1000 *Putas* are mentioned in classical Ayurvedic texts, the study was limited to 100 *Putas* only. Sample A exhibited less loss of weight during the *Marna* process vs sample B. *Vajra Abhraka Bhasma* was light brown/brick red in colour during the initial stage. The colour turned progressively deeper in advanced stages. This was accompanied by a gradual increase in fineness of particles. *Shweta Abhraka* was light pink in colour. The two varieties showed no difference in ash values. Both varieties were found to contain Fe, Si, Al and Mg. Sample B contained Ca in addition to these elements. Quantitative analysis for elemental content in the raw material and the two varieties of *Bhasmas* is presented in (Table 10.1).

TABLE 10.1
ELEMENTAL ANALYSIS OF *VAJRA ABHRAKA, ABHRAKA BHASMA* AND *SHWEJA ABHRAKA BHASMA*[28]

SAMPLE	ELEMENTAL CONTENT (%)				
	Fe	Al	Mg	Si	Ca
VAJRA ABHRAKA	12.4	5.8	4.6	53.6	—
ABHRAKA BHASMA					
20 *Putas*	15.6	6.2	4.9	45.9	—
50 *Putas*	15.8	6.3	4.9	44.4	—
100 *Putas*	17.4	6.5	5.2	42.2	—
SHWETA ABHRAKA BHASMA	15.2	9.5	4.2	38.2	20.1

While the pH values in 0.1 N HCl did not show significant differences between the samples (pH: 2.5-2.6), the pH value in aqueous solution was found to be markedly high in *Shweta Abhraka Bhasma* (pH: 8.1) in comparison to those in other samples (pH: 6.0-6.3). the relative antacid strength, determined by back titration method showed significant differences (Table 10.2).

TABLE 10.2

RELATIVE ANTACID STRENGTH OF *VAJRA ABHRAKA BHASMA* AND *SHWETA ABHRAKA BHASMA*[28]

SAMPLE	9.1 N KOH (ml)	ANTACID STRENGHT
BLANK (0.1 N HCl, 50ml)	43.0	0
VAJRA ABHRAKA	42.4	1.5
ABHRAKA BHASMA 20 *Putas*	37.6	6.3
100 *Putas*	37.8	6.1
SHWETA ABHRAKA BHASMA	5.1	28.8

2. Pharmacological Studies

The following effects were observed in experimental animals:

2.1 *Blood Presure* (*Cat*): Oral: No effect. Intra-venous, transient fall in BP and blocking of adrenaline effect.

2.2 *Smooth Muscle/Isolated Ileum Preparation* (*Rat*): No effect.

2.3 *Cardiac Muscle* (*Frog, Guinea Pig*): Slight stimulatory action was observed with 100 *Puta Bhasma* in isolated perfused frog heart preparations. Higher doses caused arrhythmias lasting 6-8 min. *Bhasmas* prepared with 20 *Putas* elicited no effect. Slight stimulatory effect was also observed on isolated guinea pig auricle preparations.

2.4 *Anti-convulsant Activity* (*Mice*): No effect

2.5 *Hemoglobin* (*Rat*): Oral administration of *Bhasma* for 15 days lead to significant increase in hemoglobin values.

2.6 *Urine Volume/Albumin* (*Guinea Pigs*): Decrease in daily output was noted. Albumin was not detected in urine samples.

2.7 *Histamine-induced Ulcers* (*Rats*): Anti-ulcer activity was observed in treated animals. Lower dose of *Bhasma* (1mg/Kg) elicited effect in 70% rats and prevented stomach damage in 40% animals. The corresponding values with higher dose (5 mg/Kg) were found to be 100% and 55.6% respectively. Severity was reduced in 11.6% rats and beneficial effects were observed in 67.2 animals.

3. Clinical Studies

Very encouraging results were observed in cases of *Amla Pitta* (Hyperacidity). The patients for the study were selected on the basis of clinical findings and gastric analysis. Assessment was done by symptomatic relief and decline in hyperacidity pattern. Treatment with *Bhasma* for 7-10 days revealed marked efficacy in treated patients. (20 *Puta Abhrak Bhasma*: 66%, *Shweta Abhraka Bhasma*: 88.9%).

Malik and Ahmad[29] studied the effect of *Lauha Bhasma* (LB) and *Tamra Bhasma.* (TB) on the growth and behaviour of *Escherichia coli*. No pronounced effect of LB was noted on the growth of organisms except at a concentration of 50 µg/ml which promoted growth. Higher concentration of LB (100 µg/ml) revealed a toxic trend exhibited by reduced growth. The behaviour of *E. coli* did not differ for treatments with Fe as such or in the *Bhasma.* TB (50 µg/ml) caused reduction in growth of *E. coli* vs the control. Higher

concentrations of TB (100 µg/ml) led to total cessation of growth. Behaviour of *E. coli* was similar to the group treated with Cu metal.

1977

A clinical study on *Shuddha Kashish* and *Kashish Bhasma* was carried out in 70 students with complaints of loss of appetite, weakness, weight loss, disturbed bowel movement and anemia. The drugs exhibited marked symptomatic improvement: increase in body weight, hemoglobin content and *Aharshakti* in treated groups vs the placebo group.[30]

1978

It is claimed that the number of *Putas* given enhance the efficacy of *Bhasmas*. Pandey and associates[31] studied the chemical changes in *Abhraka Bhasmas* prepared by 40,50 and 60 *Putas*. Relative antacid strength was determined by treating the *Bhasmas* (1gm) with hydrochloric acid (25ml) and titrating the filterate with 1N KOH. The volume of KOH consumed was measured .The analytical data is recorded in table 10.3.

TABLE 10.3
ANALYTICAL DATA FOR *ABHRAKA BHASMA* PREPARED USING DIFFERENT NUMBER OF *PUTAS*[31]

PARAMETER	NUMBER OF *PUTAS*		
	40	50	60
IRON	15.9	14.7	14.4
MAGNESIUM	1.62	1.60	1.55
ACID INSOLUBLE SUBSTANCE	60.72	60.68	60.61
RELATIVE ANTACID STRENGTH	16.4	20.0	20.6

With increasing number of *Putas:*

(*a*) More metal is converted to oxide
(*b*) Antacid character is progressively increased.
(*c*) Free metals (Fe and Mg %) decreased.
(*d*) Solubility in acid increased and so acid, insoluble substances are decreased

1979

Alam and coworkers[32] prepared *Draksharishtam* and *Lohasvam* according to the ancient textual procedures and periodically determined (*a*) Rate of fermentation and (*b*) Amounts of sugar and alcohol. Prolonged boiling destroyed the organic matter in the preparation of *Kashyam* for *Draksharishtam*. The rate of fermentation was very slow; it was completed in 30 days. Alcohol and Sugar concentrations in the finished drugs were found to be 5.4% and 36.8% respectively. The rate of fermentation in *Lohasvam* was relatively faster; it was completed in 15 days. The Alcohol and Sugar content in the final drug were found to be 11.4% and 2.62% respectively. Both fermentations were produced by *Bacillus sp* .

Makardhwaja is seldom used alone. It is mixed with various *Anupanas* or adjuvants for therapeutic purposes eg honey, pepper, juice of ginger and betel leaves etc. Dutta and coworkers[33] rubbed the drug with: (*a*) Honey, (*b*) Ginger juice, (*c*) Juice of Betel leaves, (*d*) Water, (*e*) Glycerine and (*f*) Butanol. The six mixtures were put on TLC and developed with butanol, acetic acid and water (4 : 1 : 2). The drug did not move from baseline in all six mixtures but in three mixtures (*a*, *b* and (*c*), an extra colour spot (Rf 0.1) was formed. It did not come from the adjuvants. Honey and Juice of Ginger and Betel leaves were shown to contain amino function when tested with ninhydrin reagent. Yellow Hg oxide is known to form complexes

with amino function. It is quite possible that *Makardhwaja* may form complexes of composition SHg_2NR_2OH with amino function present in *Anupana Dravya*. When treated with acids, the complex is neutralised to yield a salt of composition SHg_2NRX (X = acid radical). Formation of such complexes may rationalise how *Makardhwaja* is absorbed in the body.

1980

Antarkar and associates[34] evaluated *Arogyawardhini* (750 mg three times a day for 14 days) by a double blind clinical trial in 28 patients of acute viral hepatitis. The results were quite encouraging:

(*a*) Clinical signs (tenderness and hepatosplenomegaly) were markedly reduced in the treated patients vs. the placebo group.
(*b*) Total serum bilirubin was elevated in the placebo group at the end of 4 days. The levels significantly dropped ($p<0.005$) in the *Arogyawardhini*-treated group during the same period. The decline continued to be significant for next two weeks.
(*c*) The SGPT values were significantly lower in treated group vs. the placebo group after 1 week.
(*d*) No side effect were observed

Dixit[35] presented a detailed literary review and carried out chemical and pharmacological investigations on *Tamra Bhasma*. He described (*i*) *Samanya Shodhna* (general purification), (*ii*) *Vishesh Shodhna* (special purification), (*iii*) *Marna* (calcination), and (*iv*) *Amritkarna* (detoxification) processes used in the preparation of this drug. Procedures (*iii*) and (*iv*) were performed using *Gajaputa* and *Varahaputa* techniques. Trituration was done with 17.5gm of sulplhur. Pyrometer was used to record the temperatures. The findings are summarized below:

- Ash values (500 °C) – Total ash: 19.9 %
  – Acid insoluble ash: 6.0 %
- Loss of weight on drying (110 °C) :0.4 %
- Fineness of *Bhasmas*: the drug was found to be in a state of fine powder; 100 % passed through seive no.85
- Analysis (IR Spectra X-ray defraction, Chemical): Ca and Fe present in oxide forms. Fe content increased in the final product. Traces of S were also detected.

Tiwari and Jain[36] carried out a clinical study to assess the effect of *Arogyawardhini* in 101 patients of hypercholesterolemia. These patients were suffering from obesity, diabetes mellitus, hypertension, ischemic heart disease, hemiplegia etc. Treatment with the composite drug resulted in mean fall in cholesterol levels by 29.1% (range: 23.0 – 36.4%). The effect compared well with other hypocholesterolemic agents. A reduction in 15% serum cholesterol is estimated to decrease the coronary heart disease by 35%. Therapeutic potential of *Arogyawardhini* in obesity and cardiac ailments deserves further investigations.

Zafarullah et al[37] reviewed and tabulated single drugs (plant, animal and mineral origin) and compound formulations used for the treatment of *Juzam* (Leprosy) in Unani medicine. Mineral origin drugs listed included : (*i*) *Sankhia* (As), (*ii*) *Lajward* (Lapis laziole), (*iii*) *Hartal* (As trisulphide), (*iv*) *Kushta Hartal Warqi* (calcined preparation of As), (*v*) *Geru* (Silicate of alumina and Fe oxide), (*vi*) *Gandhak* (Sulphur) and (*vii*) *Sangraf* (Cinnabar) with methods of administration and doses.

1981

Administration of *Kajjali* (an Ayurvedic mercurial preparation) for one month exhibited the following effects in albino rats (*a*) Ataxia, (*b*) Crossing of hind limbs, (*c*) Loss of appetite, (*d*) Reduction in growth and body weight and (*e*) Decrease in glycogen content in different parts of the brain[38]

1982

Nagaraju[39] carried out chemical, pharmacological and toxicological studies on *Vanga Bhasma*. Though the starting material for preparation of this *Bhasma* is 99.5 % pure Sn, the final product showed the presence of Fe, Al, and Mg also. These were probably introduced from the herbal constituents during processing. The drug exhibited preventive action against Cd-induced testicular damage in albino rats. The testes of treated animals showed near normal semniferous tubules with adequate number of spermatozoa. The *Bhasma* was found to be safer vs. commercial Sn oxide. Except in very high doses and on prolonged use, no toxic manifestations (local, on gastro-intestinal tract and systemic) were discernible at therapeutic doses. The drug appears to be of value in cases of oligospermia and male sterility.

Sanyal and coworkers[40] studied the effect of a traditional preparation of Cu (*Tamra Bhasma*) on experimental ulcers and gastric secretion in rats and guinea pigs.The drugs revealed anti-ulcerogenic activity in: (*a*) Immobilized (8 hours),(*b*) Pylorus ligated (4 hours) and (*c*) Aspirin (200mg/Kg po for 3 days)-treated rats. Such effect was also observed against (*d*) Histamine-induced gastric and duodenal ulcers in male guinea pigs. The minimum effective dose was found to be 1mg/Kg.It caused decrease in total acid and pepsin output and increase in carbohydrate/protein ratio indicating increased mucus in the gastric secretion of rats. Acute (1gm/Kg po) and sub acute (100mg/Kg/day po for 7 days) toxicity studies revealed no alterations in histological and biochemical parameters in liver and kidneys. This shows potential efficacy of *Tamra Bhasma* in the treatment of *Amlapitta* without discernible toxic effects.

1983

Administration of *Kajjali* was reported to affect hematological parameters, ion concentration, morphology of erythrocytes and enzyme activities in experimental animals[41,46].

Studies on biochemical parameters revealed that *Kajjjali* produced alterations in the concentrations of DNA, RNA, proteins and free amino acids in brain, Delta -ALAD in blood and acid and alkaline phophatase in serum. Highest residual Hg content in kidneys was found in treated animals[42]

Tamra Bhasma (TB) is used in Ayurvedic system of medicine for the treatment of *Amlapitta* (Peptic ulcer syndrome). The drug, from 3 different sources, was compared with pure Cu compound and a mixture of its reported ingredients for anti-ulcer activity against immobilization-induced gastric ulcers in albino rats. TB was found to be better vs pure Cu compounds and mixture of ingredients of the drug obtained from 3 sources. The pharmaceutical processing in Ayurveda, thus, appears to have a major role in the therapeutic activity of TB. The duration of anti-ulcer action was studied using three models: (*a*) Immobilization, (*b*) Aspirin, and (*c*) Pylorus ligation-induced ulcers. The protective effect of TB lasted upto 5 days after discontinuation of treatment. No effect was observed on the anti-inflamatory activity of Aspirin[43].

Sharma[44] carried out pharmaceutical and experimental studies on *Swarna Vanga*:

(*a*) Chemical examination revealed the presence of Sn (major constituent), S (free and combined), Hg and traces of Fe and Al

(*b*) It was shown that the preparation of *Swarna Vanga* requires less degree of temperature vs. other *Kupi-pakwa Rasayanas*. Study of different samples of the drug indicated that the presence of Hg (in at least half the quantity of Sn) in the *Kajjali* is necessary to prepare *Swarna Vanga* of standard quality.

(*c*) The drug was found to be non-toxic in rats in doses up to 250 mg/Kg po. Higher dose (500 mg/Kg po) elicited slight toxicity but it was reversible on withdrawal of the drug.

(*d*) The *Bhasma* was shown to have a capacity to regenerate partially damaged testicular tissue (germinal epithelium). Moderate preventive action was demonstrated against Cd-induced testicular degeneration in male rats. These findings support the traditional claims for its utility in cases of male sterility.

Singh[45] carried out pharmaceutical and experimental studies with *Naga Bhasma* with special reference to its toxicity and testicular regeneration. The *Bhasma*, prepared by classical Ayurvedic methods, elicited no toxic effects in doses upto 60 mg/Kg body weight in albino rats. Higher dose(240mg/Kg) was found to be toxic on prolonged use. While the toxic effects/histopathological changes were noted in brain, liver, kidney, lungs, large and small intestines, such effects were not discernible in heart, adrenals, skeletal muscle, bone marrow and the skin .*Naga Bhasma* exhibited regenerative activity in the germinal epithelium of testes. It also showed good preventive effect against Cd-induced testicular degeneration. These findings support its claimed utility in cases of male sterility.

1984

Abdullah et al[47] reported protective effect of *Kushta-e-jast* (KJ) on carbon tetra chloride-induced liver damage in rats. KJ (10mg/Kg po) reversed CCl_4 – induced depletion of liver glycogen and adrenal ascorbic acid and elevation of SGOT and SGPT levels. The increase in serum fatty acids produced by CCl_4 was significantly less in the group treated with KJ.

Pre-treatment with *Kushta-e-Sheba* (10mg/kg po for 4 days) elicited protective action against myocardial infarction in rats. It reversed Isoprinaline-induced fall in cardiac glycogen and cholesterol and rise in free fatty acids, SGOT, SGPT and LDH levels[48].

Das and associates[49] established scientific basis for the use of Cu preparations in Indian systems of medicine. *Tamra Bhasma* (5 mg/kg po for 3 days) was shown to exhibit protective action against two models of experimental gastric ulcers in rats induced by:

(*a*) Immobilization stress and

(*b*) Aspirin

The anti-ulcer effect was observed without affecting the anti-inflammatory activity of Aspirin. An increase in carbohydrate: proteins ratio was observed in the gastric secretion of pylorus-ligated *Bhasma* – treated rats. The findings suggest enhanced defensive factors by the test drug.

Mohanty and associates[50] studied the effect of mercurial Ayurvedic drug (*Kajyoli*) on the ion concentration and respiratory activity in brain, liver and kidney tissues of albino rats. A marked decrease in respiratory activity, renal Na and hepatic Ca levels was observed in treated animals.

Pal[51] propounded hypothesis that Hg acts as a promoter of enzymes. Curdling of milk is facilitated by enzymes contained in *Lacto-bacilli* or *Streptococcus lactis*. Comparative studies carried out with 'seed'

(ferment) enriched with *Makardhwaja* and with ordinary 'seed', revealed faster curdling of milk with the former. The observation tended to show that Hg available in traces from the virtually insoluble or sparingly soluble HgS in *Makardhwaja* might have a promoting effect on the enzymes in the ferment that brought about curdling of milk.

Swarna Vanga, was shown to cause significant fall in blood sugar of normoglycemic rats but no effect was discernible against alloxan-induced hyperglycemia. Further investigations were suggested using: (*a*) Other experiments models of diabetes mellitus, and (*b*) Suitable *Anupanas*. The latter play a major role in Ayurvedic therapy.[52]

1986

Trivang Bhasma, a compound metallic preparation used in Ayurvedic medicine contains Sn, Pb, Zn with traces of Fe and Al. Gupta[53] reported its regenerative action on the germinal epithelium of testes in rats in with $CdCl_2$-induced testicular damage. It caused no androgenic or testosterone-like activity. No toxic effects were observed with 6 mg dose of the drug administered for short (14 days) and long (40 days) duration. Higher doses (12 and 48 mg) produced toxic histopathological changes in both short and long duration studies.

Clinical trials were done to evaluate a Siddha drugs containing mica (*Abrga chendooram*) in the management of diabetes mellitus (*Neerazhivu*). The study was carried out in 60 patients (41-60 years, more males) at Safderjang Hospital, New Delhi. Cases in which: (*a*) reduction in calorie-intake controlled the disease effectively, and (*b*) cases with serious complications (ketoacidosis, nephropathy, neuropathy, retinopathy) were excluded from the study. Only cases with mild and moderate disease were selected. Administration of the drug (200mg twice daily for 45 days) exhibited the following results:

		Number of Patients
Complete relief	:	35
Partial relief	:	20
No response to therapy	:	5

No side effects were observed[54].

Singh and associates[55] carried out standardization studies on *Narach Rosa*, an important herbomineral formulation used in Ayurveda for the treatment of *Udar Roga* (abdominal diseases) including *Gulma* (abdominal tumour). Laboratory sample was prepared using the following ingredients and classical methods described in ancient Ayurvedic texts.

A. Mineral Ingredients		
Shudha Parada (Purified Hg)	:	8 gm
Shudha Gandhaka (Purified S)	:	16 gm
Shudha Tankana (Purified Borax)	:	8 gm
B. Plant Ingredients		
Sunthi (*Zingiber officinale*, rhizomes)	:	16 gm
Maricha (*Piper nigram*, seeds)	:	8 gm
Pippali (*Piper longam*, seeds)	:	16 gm
Shudha Dantibeej (*Heliospermum montanum*, purified seeds)	:	72 gm
Yield		144 gm

Standards were established both for the ingredients (raw and purified) and the final product for: (*a*) Content of Hg, S, Borax, (*b*) Ash values, (*c*) Fixed oil content, (*d*) Thin layer chromatography and (*e*) Microscopic characters for authenticity and purity.

1987

Dash and coworkers[56] conducted a clinical trial to evaluate the efficacy of *Sutasekhasa Rasa, Dhatri Lauha* and *Kama Dudha Rasa* in the management of *Parinamsula* (duodenal ulcers). Combination of the three drugs (500 mg each given for 21 days) in 9 patients showed the following results:

		No. of patients (%)
Complete relief	:	60 (55.04)
Partial relief	:	11 (10.09)
No relief	:	1 (0.92)
Drop out	:	37 (33.94)

The drug was found to be more effective in female patients (59.09%) vs males (54.07%). Efficacy was shown in chronic patients with disease (< 1 year).

Cinnabar (a naturally occurring HgS) and Cow Bezoar Pill (a traditional Korean medicine containing over 20 ingredients including 60 mg Cinnabar in each pill) were investigated for: (*a*) Dissociation of Hg in low HCl solution having the same pH as gastric fluid, and (*b*) Accumulation of Hg in kidneys and liver of rats. The amount of Hg liberated from Cow Bezoar Pill (pH 1: 0.53 ppm, pH 2: 0.28 ppm) was much lower vs that from Cinnabar (pH 1: 20.26 ppm, pH 2: 17.47 ppm). Probably the presence of other ingredients in the traditional pill inhibited dissociation of Hg. Continuous administration of Cinnabar resulted in Hg accumulation in liver and kidneys. In the rats receiving Cow Bezoar Pill, Hg concentrations in rat organs returned to normal other 10 days. The pill should, therefore, pose no toxicological problems.[57]

Rizivi and Rizvi[58] demonstrated *Kushta Hartal* (KH, a calcined As preparation used in Unani medicine) to be a cheap, effective and safe drug for the treatment of diabetes. Comparative evaluation was done in 206 uncomplicated cases of maturity onset diabetes using this drug (KH) and Chlorpropamide (CP) in two groups matched for age, sex and intensity of diabetic status. In the KH group 90/103 patients achieved adequate control with a daily dose of 500 mg and 13 were controlled with 250 mg. In the CP group, 80/103 patients were controlled with doses ranging between 250 and 375 mg per day while 23 required only 250 mg per day. Symptomatic improvement along with blood sugar control, achieved in both groups, was not found to be significantly different. The tolerance to KH were reportedly excellent and normoglycaemia and freedom from diabetic symptoms was maintained during the follow up period of two years. The mechanisms involved in the reported anti-diabetic effects of KH were not investigated.

1988

Naga Bhasma exhibited moderate anti-diabetic activity in experimental animals and human trials. No serious untoward effects were observed. The *Bhasma*, however, is advised to be used in combination with other drugs to minimize toxicity as crude *Nagam* (Lead) is known to be very toxic metal.[59]

1989

Ghoshal[60] isolated organic compounds: 4-methoxy-6-carbomethoxy-biphenyl (MCB), dihydroxy-dibenzopyrones (DB) and fulvic acid (FA) from *Shilajit*. These compounds were shown to exhibit anti-

ulcerogenic, anti-stress and immunomodulatory effects in rats and mice using the following parameters of study:

(*a*) Stress-induced gastric ulcers
(*b*) Pyloric ligation
(*c*) Cystamine-induced duodenal ulcer
(*d*) Peritoneal macrophages
(*e*) Eherlich Ascietes-induced tumour growth

Navabal Rasayan (NR), with claimed utility for the treatment of relapsing tyhoid, chronic osteomyelitis, otitis and viral diseases eg measles, chicken pox etc. did not exhibit any anti-microbial activity against: *Streptococcus faecalis, Klebsiella pneumoniae, Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Candida albicans, Cryptococus neoformans, Sporotrichum sohenchii, Trichophyton mentagrophytes* and *Aspergillus fumigatus*. Despite its ineffectiveness in these organisms, empirical use of NR has been claimed very effective by Ayurvedic Physicians in cases of osteomyelitis.[61]

1990

Kumar[62] prepared *Loha Bhasma* by *Trividha Loha Paka* method using *Tikana Loha* (Stainless steel blades) and *Kanta Loha* (Magnetic Fe). Spectral analysis revealed the presence of Al, C, Ca, Fe, Cr, Mn, Na, Si, Sn and Y in processed and unprocessed samples Iron content (%) was found to be as follows:

Shodhita Tikana Loha	:	42.56
Tikana Loha Bhasma	:	51.59
Shodhita Kanta Loha	:	40.32
Kanta Loha Bhasma	:	58.80

Chronic toxicity studies with the two *Bhasmas* (120-480 mg/kg/day for 40 days) revealed no significant effect on vital organs except sinusidol dialation of hepatic cells and cloudy swelling in kidneys. Other organs/tissues (brain, heart, bone marrow, adrenal gland and pancreas) were normal.

Shah and Vohora[63] reported significant protective effect of Borax (BX), a Vitamin-Mineral formulation (VM) and Garlic oil (G) against formaldehyde-induced arthritis in rats. The anti-arthritic effects of G (25%) and BX (30%) were further enhanced when these drugs were used in combination in half (40%) or equivalent (68%) doses indicating a synergistic action. Some CNS depressant and hypothermic activity was also observed with BX and VM. Herbo-mineral-vitamin formulations appear to have a good therapeutic potential for the treatment of arthritis.

Formulations containing *Chandraprabha Vati, Swarna Vanga* and *Yashada Bhasma* were shown to exhibit prolonged anti-diabetic activity against streptozotacin-induced disease in albino rats. *Chendraprabha Vati* exlubited symptomatic relief and controlled blood sugar levels in diabetic patients.[64] Vohora[65] reviewed and tabulated indigenous mineral origin drugs used in diabetes:

TABLE 10.4

SOME INDIGENOUS MINERAL ANTI-DIABETIC DRUGS[65]

S.No.	Name	Anti-Diabetic Activity	Elemental Composition
1	*Kushta Hartal Tabqi*	Clinical trial exhibited good results in maturity onset diabetes	As, S are the chief ingredients
2	*Kushta-Poast-Baiza-i-Murgh*	No experimental or clinical studies are available	Considerable variation in Ca content in commercial (29.50-43.15%) and laboratory (62.13%) samples
3	*Nawajas*	Favourable effect on blood sugar in 33% of cases on clinical trials	Mixture of several minerals Ca, Cu, Fe, S, Sn, Zn, Mica, Shilajit etc. Mica ash contains: Al, Ca, Fe, K, Mg, Na, O, P, Si, etc.
4	*Shilajit*	Favourable effect on glucose tolerance and weight gain probably by enhancing endogenous insulin secretion	Al, Ca, Cl, Fe, H, K, Mg, N, Na, O, P, S etc.
5	*Trivang Bhasma*	Marked effect on pituitary hypoglycaemia and weight loss in albino rats	Al, As, Fe, O, Pb, S, Si, Sn, Zn etc.
6	*Yashada Bhasma*	Experimental and clinical studies revealed some hypoglycaemic action	Chief ingredient: Zn (63.53 - 74.03%) other elements detected: Al, Cl, F, Fe, Na, O, Si

Incorporation of herbal juices, during the ashing process by specialized traditional techniques, is believed to enhance the efficacy of the component metal (s) and reduce their toxicity. These claims, with few exceptions have not be investigated. A perusal of the elemental composition of these drugs revealed that many of their constituent elements figure in the list of 18 elements selected from a survey of global literature for having links with diabetes mellitus. Though Cr, Mn and Se are known to have definite influence on the disease, no reports are available for their presence in the indigenous mineral antidiabetic preparations.

1991

Dixit and Shivahare[66] prepared *Bhasmas* of *Sankha, Muktasukti, Mukta, Pravala, Kapardika, Svaranmakshika* and *Yasada* in the laboratory using muffle furnace and by classical textual methods. Physical properties, chemical analysis, IR and X-ray studies revealed no differences between the *Bhasma* prepared by *Gajaputa* (classic) and muffle furnace (laboratory) methods. Antibacterial activity was also observed in *Pravala* and *Mukta Sukti Bhasmas.*

Ayurvedic medicinal preparations, commonly known as *Bhasmas*, were analysed for the determination of polycyclic aromatic hydrocarbons (PAH). All the preparations contained PAH. The level of total PAH

varied widely (2.32-9.55 ppm) among the preparations tested. Similarly, the benzo pyrene level also varied the highest concentration being 9.7 ppm.[67]

Rao[68] developed a spot test for testing indigenous drugs. The test involves identification of colour reaction by specially prepared filter paper:

(*a*) *Digestion*: Samples of mineral drugs *Bhasmas/Sindura* to be tested (100 mg) are dissolved in 7 ml aqua regia and 3 ml concentrated nitric acid and kept at room temperature for 24 hours. Aliquots (1ml) from the material are heated at 5 min intervals for 30 min taking care to avoid bumping and spillage. The mixture is heated again in a similar manner for 10 min.

(*b*) *Preparation of Filter Paper*: Whatman filter paper no. 1 are impregnated with 10% potassium iodide and 5% potassium ferrocyaniole. The papers are dried for 24 hours. Spots are made on the prepared filter paper using the digested samples (0.05 ml). First phase reactions are recorded after 5-10 min. These give characteristic colour pattern for different *Bhasmas*

Sharma[69] reported regenerative potential of *Swarna Vanga* against Cd-induced testicular damage in rats. Some histopathological changes were, however, observed in the gastrointestinal tissues. Ideal quality *Bhasma* should have Sn, Hg and S in the ratio of 2:1:1. Preparation of the *Bhasma* required 7-8 hours heating in the muffle furnace with stepwise increase in temperature between 200-400 °C. Clinical studies, in oligospermic and normospermic males with the drugs (500 mg/day in two divided doses administered for 74 days) revealed encouraging results. Increase was observed in: (*a*) Body weight, (*b*) Sperm count, (*c*) Sperm motility and (*d*) Semen volume was maintained between 2-3 ml. These findings suggest beneficial effects of the test drug on the urinogenital system: *Balya* and *Vrisya* effects.

1992

Goel and associates[70] studied the effect of *Tamra Bhasma* (TB) cupric chloride on prostaglandin formation by human gastric and colonic mucosa and sub-mucosa. Prostaglandins are known to have mucosal protective activity and their release may contribute to the anti-ulcer effect .The results are summarized below:

(*a*) *Gastric Mucosa*: TB (10 µg/ml) significantly increased prostaglandin E (PGE) concentration by 38% with little or no effect on other prostaglandins measured: 6-keto-PGF_{1a}, thromboxane B_2, the leukotriene (LT) and LTC_4/ LTD_4. Lower concentration of TB (0.1 and 1 µg/ml) elicited no effect on any of the eicosanoids studied. Cupric chloride (10 µg/ml) lower or higher doses(0.1, 1, 50, and 25.0 µg/ml) did not affect any of the postanoids and only the highest concentration reduced the amount of LTC_4/LTD_4.

(*b*) *Colon Mucosa*: TB (1 and 10 µg/ml) significantly increased all the prostanoids and the effect was greater vs that in gastric mucosa but there was no effect on LTC_4/LTD_4. Indomethacin (0.1 to 10 µg/ml) caused a concentration-dependent reduction in prostanoids.

The effect of TB was probably not only due to the presence of Cu^{2+} as it was more effective than cupric chloride alone and the solubility of CuO is very low. Increased prostanoid levels might explain, at least partly, the protective effect of TB on gastric mucosa. The results in the colon mucosa suggest that TB may be of therapeutic value in inflammatory bowel syndrome. Studies are warranted to probe this possibility.

Heavy metal intoxication of newborn infants fed with "*Ba-Pao-Neu-Hwant-San*" has been reported every year by many hospitals in Taiwan.

About nine years ago, the National Laboratories of Foods and Drugs of the Department of Health, Executive Yuan, received one case report of a five month old female infant who died as a result of long term feeding with *Ba_Pao-Neu-Hwang-San*. Chi and coworkers[71] analyzed this traditional Chinese medicine for heavy metal content. The drug was found to contain 44,000 ppm Pb. Despite such high Pb content, it continues to be used widely by people in China. Herbal medicine doctors prefer complex mineral drugs as did their ancestors thousand of years ago. In the last two years, the author collected 5 samples of *Ba-Pao-Neu-Hwang-San* from different manufacturers and measured the concentration of 16 heavy metals (including Cadmium, Mercury, Arsenic, Lead, Chromium, Manganese, Selenium, Germanium, Nickel, Calcium, Magnesium, Aluminum, Iron, Copper, Zinc, and Vanadium) in these drugs with Inductively-Coupled Plasma Atomic Emission Spectrometry and Graphite Furnace Atomic Absorption Spectrometry, The result of the survey revealed that the first sample (from Tainan) contained 52.800 ppm, Hg, the fourth (from Ping-tung) contained mercury 34,500 ppm Hg and the fifth (from Sin-chu) contained 65,700 ppm Hg. The mercurial contents of these samples appear to be too high for a safe drug.

Nagaraja[72] prepared *Naga Bhasma* from 92 % pure starting material using classical methods. It showed the presence of many elements besides Pb including Al, As, Au, Cu, Fe, Hg, S, Sn and Zn. *Sasti Puta Naga Bhasma* and *Naga Bhasma* are two important varieties of *Naga Bhasma*. The solubility of *Sastiputa Naga Bhasma* in 0.17 N HCL was found to be 36.2% and that of Pb was 3.97%.

Naga Bhasma (120 mg/kg for 40 days) caused no renal damage; minimal changes in treated rats did not differ significantly from those in the control group. This is in contrast to inorganic Pb salts (oxides and sulphides) which at the same dose caused epithelial damage in the kidneys.

Clinical study with *Sastiputa Naga Bhasma* (120 mg single dose daily) revealed interesting results in 30 diabetic patients. Twenty patients turned for follow up and continued treatment for 2-6 months. Clinical benefit was observed without untoward effects in any of the patients.

		Patients (%)
Feeling of well being	:	90
Symptomatic improvement	:	70
Reduction in blood sugar	:	65
Serum creatinine Blood urea Routine and Microscopic Urine examination Hemoglobin (%)		No untoward effects

Prajapati[73] analysed *Makardhwaja* prepared by using *Astamrita Parada* and *Samanya Shodhita Parada*. The drug, prepared by both methods, contained Hg and S as major constituents and traces of Co, Cr, Fe,

Mn and Ni. The drug (80 mg/kg) exhibited no discernible toxic effects on histopathological examination of vital organs. Higher dose (160 mg/kg) on prolonged administration (40 days) caused mild pathological changes in liver, lungs, kidneys and intestinal tissue. *Makardhwaja*, prepared from *Astamrita Parada*, was found to be safer in comparison to that prepared from *Samanya Shodhita Parada*.

Tie and Niu[74] from Beijing College of Traditional Chinese Medicine studied the effect of processing on the As content in *Magnetitum*. They found that the As content was 5-25 times higher than that in the calcinated samples suggesting that the toxic effect of *Magnetitum* can be reduced or eliminated after it is processed by traditional method.

1994

Alcoholism is common among industry workers and a significant proportion of population who may be exposed to heavy metals. Flora and Dube[75] reviewed the modulatory effect of alcohol ingestion on the toxicology of heavy metals (Pb, Cd, V, Mn, methyl Hg, Al). Experimental evidence suggests that ethanol can enhance the absorption of metals in the body and alcoholics may be more susceptible to metal intoxication. Clinical evidence is also available for alcoholism as an important factor in determining the individual susceptibility to metal poisoning. While a number of recent studies clearly suggest the modulatory role of ethanol on Pb toxicity, there are conflicting repsorts for the effects of alcohol ingestion on the toxicity of various other metals particularly Cd and Hg. The available literature does not provide an exact mechanism of ethanol action in affecting metal toxicity . Some recent studies point to nutritional deficiencies (caused by alcoholism) to be responsible for increased metal intake. Metals affect hemopoietic , renal, nervous and hepatic systems and consequently the possible sites for toxicological interaction between these two toxic principles, research on these aspects is warranted to elucidate the mechanisms involved and suggest safeguards.

Tamra Bhasma (TMB), an Indian indigenous preparation of Cu, was studied for its effects on factors related to rat gastric mucosal resistance. Rats of either sex treated with TMB (2.5 mg/kg po, twice daily for 3 days) showed: (*i*) increased mucosal sialomucin and fucose contents; (*ii*) decreased gastric juice DNA and protein; and (*iii*) no change in DNA and the incorporation of (3H)-thymidine in to mucosal cell. DNA aspirin treatment decreased both the sialomucin and fucose contents, and increased DNA and incorporation of (3H)-thymidine in to mucosal cell DNA. However, aspirin increased gastric juice DNA and protein contents. Since gastric juice DNA and the incorporation of (3H)-thymidine into mucosal cell DNA indicate the rate of mucosal shedding and cell proliferation, the results indicate ways in which TMB may increase gastric mucosal resistance to damage.[76]

Mahajan[77] carried out analytical and nootropic studies on *Rajat Bhasma*. X-ray diffraction studies revealed that chemically it is Ag sulphide. The drug (5-20 mg/kg) showed potent nootropic action and it protected experimentally-induced memory loss in albino rats. The *Bhasma* exhibited anxiolytic, antidepressant and anti-convulsant effects also. Acute (single dose), sub-acute (14 days) and chronic (45 days) studies revealed no discernible toxic effects on histopathological examination.

1995

Rao[78] used purified ingredients to prepare *Godanti Bhasma* in a muffle furnace. Studies using different temperatures in the range of 200-800 °C, revealed that the standard temperature for producing the *Bhasma* of desired characteristics was 300°C. It is a calcium group *Bhasma* containing mainly oxide, phosphate and sulphate of Ca. Small amounts of chloride and carbonate were also detected. The investigator devel-

oped a spot test using filter paper impregnated with *Haridra* (*Curcuma longa*) and classified Calcium *Bhasmas* using the following criteria:

(*i*) Itensity of colour
(*ii*) Fading time
(*iii*) pH of the supernatant fluid

Three groups and sub-groups were proposed:

Group I: *Bhasmas* giving immediate high intensity pink coloured spot. Supernatant fluid pH: more than 7.0

Sub-Group I A: Fading time less than 3 days
Pravala Bhasma (pH 7.3)
Vartika Bhasma (pH 7.4)

Sub-Group I B: Exhibited low intensity pink spot after 7 days
Shankha Bhasma (pH 7.3)
Mukta Bhasma (pH 8.4)

Sub-Group I C: Exhibited high intensity pink spot (vs IB group) after 7 days
Mukta Sukti Bhasma (pH 9.4)
Jala Sukti Bhasma (pH 8.3)

Group II: *Bhasmas* giving immediate low intensity pink coloured spot. Supernatant fluid pH: less than 7.0

Mring Sringa Bhasma
Sambuka Bhasma
Khatika Bhasma
Samudra Phena
Sudha Bhasma

Group III: *Bhasmas* giving immediate colourless spot. Supernatant fluid pH: less than 7.0
Godanti Bhasma

An Indo-Korean collaborative study from Hamdard University, New Delhi and Kyung-Hee University, Seoul[79] revealed interesting CNS and adaptogenic effects of *Siddha Makardhwaja* in experimental animals. The drug showed: (*a*) growth promoting, (*b*) memory improving and (*c*) carbohydrate sparing/anti-fatigue properties Other CNS parameters in rats and mice (pentobarbitone-induced sleeping time, traction test, activity counts in water wheel, rectal temperature, behavioural despair in forced swimming test, acetic acid induced writhing, amphetamine-aggregate toxicity etc) were not affected. While the effects were observed at 15 mg/kg po, the drug was well tolerated in single doses upto 16 g/kg po and 1 g/kg ip in mice indicating a wide margin of safety. A very high dose could be tolerated because of: (*a*) Poor dissociation of Hg ions from *Siddha Makardhwaja* even in a highly acidic solution (pH 1.0) and (*b*) Less tissue accumulation in liver and kidney vs that with chemical Hg S or Cinnabar. The drug helped in all round (physical and mental) development of experimental animals without discernible toxic effects of Hg. Parentral

administration of high doses (> 100 mg/kg) elicited CNS depressant activity and hypothermia. Ayurvedic mineral preparations in general, and *Siddha Makardhwaja* in particular are advocated for use in minute doses only and are invariably given by oral route.

1996

Choudhary[80] carried out literary, pharmaceutical, hematinic and toxicological studies on *Makshika Bhasma* and *Makshika Satva Bhasma*. The former is indicated in anemia and skin diseases and the latter is considered anti-aging with utility in geriatric practice. Chemical analysis revealed Fe and S as major constituents in both varieties. *Swarna Bhasma* contained Cu in addition. Traces of Al, Si and Zn were detected in both *Bhasmas*. Therapeutic doses of the *Bhasmas* exhibited excellent effect on blood profile of rabbits: marked increase in hemoglobin and changes of total leucocytic count. The hematinic action was accompanied by considerable gain in body weight. Both *Makshika Bhasma* and *Makshika Satva Bhasma* were found to be quite safe on acute (single dose) , sub-acute (14 days) and chronic (40 days) toxicity studies in rats. No untoward effects were observed. Differential leucocyte count (DLC), and SGOT, SGPT levels remained in normal ranges after treatment with these *Bhasmas*.

Vohora[81] studied two calcined preparations used in Unani medicine (*Kushta Marjan* and *Kushta Khar Mohra*) for neurobehavioural effects using a battery of screening tests. The study revealed:

(*a*) Non-narcotic analgesic activity

(*b*) No discernible effects on pentobarbitone narcosis, active learning, conditioned avoidance response, spontaneous motor activity, performance in activity wheel, forced swimming test, haloperidol-induced catalepsy, MES, strychnine and pentylene tetrazole-induced convulsions.

(*c*) Test doses and MTD for both drugs were 2.5 mg/kg po and more than 2 g/kg po respectively,

Medical Elementology envisades that the key to all human ailments is hidden within our body. This necessitates a better understanding of our own resources. Liver is reported to contain 55 elements including all of the known essential and possibly essential elements. Vohora[82] reported that at least 41 elements can be linked to liver disease and/or alcoholism by virtue their deficiency, excess or medicinal use. Alterations in blood/serum/plasma/liver/hair concentrations of 7 elements (Cu, Fe, Mg, Mn, Ni, Se, Zn) in these diseases and their significance (diagnostic and therapeutic) were reviewed.

Elements with hepataprotective effects and therapeutic potential include:

(*a*) *Selenium* (factor 3 prevents hepatic necrosis)

(*b*) *Zinc* (clinical benefits in alcoholic cirrhosis and Indian childhood cirrhosis

(*c*) *Tin* (coating of brass/copper utensils protects against Cu contamination and ICC).

(*d*) *Sulphur* (amino acids: methionine and choline protected liver against hepatic lesions in rats fed high fat diet).

Ayuvedic/Unani formulations with clinical benefit in liver diseases are:

Durg	Major Constituent(S)
(*a*) *Tamra Bhasma*	Cu
(*b*) *Loha Bhasma*	Fe
(*c*) *Kushta Faulad*	Fe
(*d*) *Yashad Bhasma*	Zn
(*e*) *Kushta Sheba*	Zn
(*f*) *Arogya Wardhini*	Herbs, Cu, Fe, Hg, S, Mica

1997

Ayesha et al[83] evaluated calcined Ag preparations used in Indian systems of medicine and Ag leaves for analgesic activity in rats and mice. Ayurvedic *Raupya Bhasma*, Unani *Kushta Nuqra* and *Chandi Warq* (25-50 mg/kg po) exhibited analgesic activity against chemical, thermal and electrical noxious stimuli but not against mechanical stimuli. The effects were reduced in naloxone pre-treated animals. The MTD were found to be more than 2 g/kg po. The test drugs exhibited marked analgesic activity with a wide margin of safety. The effects appear to be mediated through opioidergic mechanisms.

Chandi Warq (50 mg/day or 1 gm cumulative dose) was found to be well tolerated in human volunteers as evidenced by gross observations, enzymatic parameters and absence of pathological indicators in blood, urine, heart, pancreas, bones and muscles.[84]

1998

Bajaj and Vohora[85] reported analgesic activity in *Swarna Bhasma* against various noxious stimuli in rats and mice: (*a*) Chemical (acetic acid-induced writhing), (*b*) Electrical (Pododolorimeter), (*c*) Thermal (Eddey's hot plate test for direct heat and Analgesiometer for radiant heat) and (*d*) Mechanical (Tail elip) stimuli. The analgesic action of *Bhasma* could be partly blocked by pre-treatment with naloxone suggesting the involvement of opioidergic mechanisms.

Prajapati[86] stated that use of electric muffle furnace ensured better temperature regulation and it was more convenient vs the use of traditional *Valuka Yantra* for preparation of *Makardhwaja*. For optimum yield successive heating (6 hours for each phase) at following temperatures was recommended:

Mridu (Low heat, 120-300 °C)
Madhya (Medium heat, 200-400°C)
Tivra (High heat, 400-600°C)

No mortality was observed in doses upto 2.56 g/kg in albino rats. No toxicity was detected in rabbits given the drug at 30 mg/Kg/day for 6 weeks and in single human doses upto 120 mg/day.

Rai[87] conducted comparative studies on *Tuttha* (Cu sulphate) and *Tamra Bhasma*. The main ingredient of both drugs is Cu (mostly in sulphide form with traces of Cu oxide). *Tamra Bhasma* also contains some Fe. Traditional *Laghaputta* was found to be better in comparison to the muffle furnace technique for *Marana* of *Tuttha*. Properly prepared *Tuttha* and *Tamra Bhasma* revealed no untoward effects in acute, sub-acute and chronic toxicity studies.

1999

Bajaj and associates[88] evaluated *Kushta Tila Kalan* (KTK), Unani gold preparation, for immunomodulatory effects in mice using the following parameters of study:

(*a*) Body weight and Organ weights (liver, kidney, spleen and thymus gland)
(*b*) Cellularity of lymphoid organs: spleen, thymus, bone marrow (femur).
(*c*) Macrophages from peritoneal washings.
(*d*) Delayed Type Hypersensitivity (DTH) response using sheep, RBCs and
(*e*) Plaque forming cell (PFC) assay.

KTK augmented both cell-mediated and humoral immunity responses at dose levels of 6.25, 12.5 and 25mg/Kg po administered for 10 days. The optimum activities were recorded at 25 mg/Kg; higher dose of 50mg/Kg showed suppressive effects on immune function. This is very interesting in view of the known immunosuppressant effects of gold preparations used in modern medicines (eg Auranofin, Gold sodium thiomalate etc) for the treatment of rheumatoid arthritis. The immunostimulant activity of KTK may be attributed to its interaction with herbomineral .adjuncts(*Aloe vera, Rosa damascena*, Mercury, Sulphur etc) incorporated during the specialized ashing techniques used in preparation of *Kushta*. KTK is thus a mixture of varied herbomineral components with gold in highest concentration(47%).Acemannan (a carbohydrate fraction of *Aloe vera*) is known to possess immunostimulant activity. While the precise chemical changes /formulation of unidentified metal complexes and mechanisms involved are not clearly understood, the authors speculated that the toxic and immunosuppressive effects of Gold are favorably altered by these adjuncts supporting such claims of the exponents of Unani medicine.

Kumar[89] carried out analytical and toxicological studies on *Naga Bhasma* .While the major constituent metal was Pb, traces of Hg , S, and As were also detected in the *Bhasma* .Chronic treatment (90 days) caused significant loss of weight even at therapeutic doses. Histopathological changes observed in treated animals included: fatty infiltration of liver, bronco-pneumonic changes in lungs and hypercellular glomeruli in the kidney. The changes were noted in acute and sub-acute studies with heavy doses. Therapeutic doses, even on chronic treatment, caused no significant morphological changes in the treated animals. The *Bhasma* appears to be reasonably safe as no ill effect were discernible at therapeutic doses even after prolonged use.

Calcined Ag preparations *Raupya Bhasma* and *Kushta Nuqra* are claimed to: (*a*) Strengthen the vital organs heart, brain and liver, (*b*) Possess aphrodisiac, general tonic, nervine tonic and rejuvenating properties, and (*c*) Therapeutically useful in neuropsychiatric disorders. Besides very thin leaves of Ag: *Chandi Warq* are used in the Indian sub-continent *on* sweets, betel and as a covering for tonic pills .Nadeem and associates[90] evaluated these drugs for safety aspects on rats and mice. They reported:

(*a*) A wide therapeutic index (effective doses: 25 mg/Kg po ,MTD: more than 2 g/Kg po)
(*b*) No mortality, weight loss or rota rod fall upto 15 days period of observation.

(*c*) No adverse effects on hematological parameters (RBC/WBC counts, hemoglobin, packed cell volume, mean corpuscular volume, mean corpuscular hemoglobin concentration) with oral doses of 50 mg/kg/day for 10 days.

(*d*) Incorporation into diet (0.025% w/w for 6 weeks) of young rat pups, showed better growth rate vs the vehicle-treated group.

Nadeem and coworkers[91] investigated calcined silver preparations used in Ayurveda (*Raupya Bhasma*), Unani medicine (*Kushta Nuqra*) and on sweets and desserts (*Chandi warq*) for neuropsychobehavioural effects. A battery of more than 30 tests was used including tests for general neuropsychopharmacological effects, cognitive function, anti-depressant, anxiolytic, neuroleptic and serenic activities, effects on growth. body weight, endurance and fatigue. The test drugs (50 mg/kg po) caused significant reduction in haloperidol-induced catalepsy in rat. Incorporation in the diet of rat pups (1% w/w for 6 weeks) lead to significantly higher growth rates when compared to control animals. No appreciable effects were discernible on other parameters. Ayurvedic and Unani Ag preparations exhibited anti-cataleptic and growth promoting effects without gross or subtle toxicity, weight loss, sedation, motor deficit, aggression or ill effects on cognitive function.

Pre-treatment with *Kushta Sammul Far Aatishaki* (KS-A, 5 mg/kg po, - 60 min) caused significant reduction in onset time of various phases of convulsions and mortality in animal models of epilepsy (pentylene tetrazole and maximal electroshock-induced convulsions in mice) vs the vehicle-treated control animals. *Kushta Sammul Far Qawi* (KS-Q) showed similar pro-convalsive tendency but the effects were not significant. The oral LD_{50} values of KS-A and KS-Q were found to be 750 and 490 mg/kg respectively. The test drug showed no acute toxicity and apparantly had a wide therapeutic index but KS-A exhibited proconvulrant activity necessitating caution in its use in epilepsy-prone patients. Such usage might precipitate seizure episodes in latent cases of epilepsy[92].

2000

Bajaj and Vohora[93] reported anxiolytic, anti-depressant and anti-cataleptic activity in calcined gold preparations used in Indian systems of medicine. Ayurvedic *Swarna Bhasma* and Unani *Kushta Tila Kalan* (25 mg/kg po for 10 days) caused significant increase in punished drinking episodes in anxiometer, entries and time spent in open arm of the elevated plus maze and decrease in isolation-induced social behavioural deficit in rats and mice suggesting anxiolytic activity. The test drugs also exhibited anti-depressant effects (decrease in immobility time in Porsolts forced swimming test and normalization of shock-induced escape failures in the learned helplessness test). The maximum tolerated doses were found to be more than 80 times the effective doses and no weight loss or untoward effects were observed on gross behaviour and hematological parameters indicating a wide margin of safety.

Bhatnagar[94] conducted analytical and toxicological studies on laboratory-prepared and market samples of *Rajat Bhasma*. The Ag content was found to be 66.1-78.6% and S 13.2-32.3%. Traces of As were also detected; quantitative analysis for As was not done. Acute (7days), sub-acute (45 days) and chronic (60 days) toxicity studies in albino rats revealed no discernible toxic manifestations/ histopathological changes in vital organs (brain, heart, liver, kidney, spleen, lungs, pancreas) and other tissues (skin, skeletal muscle, testes and gastro-intestinal tract) with doses upto 10 times the therapeutic dose administered for 7 days.

Chandra and Mandal[95] carried out pharmacological and toxicological studies on *Navbal Rasayan* (NR): a metal based formulation for the treatment of multiple sclerosis in India and Australia. This preparation

contains Fe, As, Pb, Hg and Au. These metals were detected in dangerous levels in the blood of Australian patients under treatment with NR at New Wales. Though no secondary morbidity or increased mortality rate was reported in these patients, experimental studies were carried out in laboratory animals. The parameters included: acute and chronic (one month) toxicity in rats, effect on isolated guinea pig ileum, analgesic activity against acetic acid-induced writhing episodes in mice, effect on pentobarbitone-induced sleeping time in rats and effect on pentylene tetrazol-induced convulsions in mice. NR did not show acute or chronic toxicities in rats upto 3 g/kg po. Pre-treatment of g. pigs with NR (1.5 g/kg po for 3 days) caused marked decrease in sensitivity of the isolated ileum preparation to histamine (ED_{50} µg/ml: Treated group: 10.20, Control group: 0.28). The agonistic effects of acetylcholine and 5 hydroxy tryptamine were completely attenuated. No appreciable analgesic, hypnotic or sedative effects were observed. It was concluded that NR did not show any toxic effects in the animal models used. Decrease/attenuation of agonistic activities of histamine, acetylcholine and serotonin needs further explorations. Metal levels (Fe, As, Pb, Hg, Au) in blood or tissues were not measured.

Chinta[96] conducted extensive experimental and clinical studies on *Makardhwaja* (main constituents: Hg, S and Au). The *Bhasma* was prepared in an electric muffle furnace by giving *Mridu, Madhyam* and *Teevra* (Low, Medium and High) heat for 8 hours each in succession. This ensured easy handling, regulated temperature and optimum yield. No toxic effects on vital organs were observed upto 10 times the therapeutic dose in acute (7 days), sub-acute (42 days) and chronic (90 days) studies in rats. Biochemical investigations (blood urea, serum, creatinine, glucose, cholesterol and Ca) exhibited no significant alterations upto 10 times the therapeutic dose and 3 month duration and thus supported the histopathological observations. At higher dose (20 times the therapeutic dose given for 2 months), serum creatinine levels were significantly increased. This shows that: (*a*) The drug is absorbed by oral route and is cumulative, (*b*) It elicits renal toxicity in high doses, and (*c*) Toxic effects are markedly less vs those reported for inorganic and organic Hg compounds.

Clinical studies in healthy volunteers and patients with chronic renal failure indicated the drug to be safe at therapeutic doses in the former. The mean values for serum IgG, IgA and IgM were slightly increased following 15 day treatment but the rise was not found to be statistically significant. Some renoprotective action was observed in patients:

(*a*) Improvement in clinical symptoms (anorexia, weakness, vomiting, oedema).
(*b*) Reduction in blood urea and serum creatinine.
(*c*) Increase in serum Ig levels. This was suggested as a possible mechanism for nephroprotection.

More clinical studies with larger number of patients and increased duration of follow up are warranted to confirm these findings.

Gautam[97] carried out comparative studies on *Naga Bhasma* and *Nilanjana*. He prepared the *Bhasmas* by traditional *Puta* method and also in muffle furnace. *Bhasmas* prepared by two methods did not differ analytically and toxicologically. *Nilanjana* is also PbS chemically but it differs from *Shastiputa Naga Bhasma*. Chemical analysis revealed the following composition: *Raw Naga* (Pb 92%), *Nilanjana* as Pb S (Pb 58%, Fe 2%), *Nilanjana* as SbS (Sb 45.7%, S 12%). After purification, Pb content was reduced in the former with no change in Fe and S content. Dissolution values (%) in O.17N HCl were found to be 35-36% for *Shastiputa Naga Bhasma*, 28% and 30% for impure and pure PbS *Nilanjana* and 32% and 16% for impure and pure SbS *Nilanjana*.

Gold and Silver are not used internally for the treatment of neuropsychiatric disorders in modern medicine. Calcined forms of these metals: *Bhasmas* in Ayurveda and *Kushtas* in Unani Tibb are, however, attributed with therapeutic utility including epilepsy. Nadeem and coworkers[98] studied effect of calcined Au and Ag preparations in experimental models of epilepsy. Studies on pentylene tetrazole, strychnine and MES-induced seizures in mice revealed pro-convulsant tendencies in *Raupya Bhasma* and silver *Warqs* and anti-convulsant effects of in *Swarna Bhasma, Kushta Tila Kalan* and *Kushta Nuqra.* While the use of former in patients with latent (sub-clinical) epilepsy might be dangerous and calls for caution, the latter deserve detailed investigations to unearth their full therapeutic potential.

Pharmacokinetic studies on *Tamra Bhasma* revealed that after an optimum dose, there is no further increase in blood Cu concentrations even after long-term administration suggesting self-regulated absorption. The drug (5 mg/kg) exhibited anti-oxidant activity: increase in reduced glutathione (GSH) and superoxide dismutase (SOD) and decrease in lipid peroxidation (LPO). No discernible toxic effects were observed on behavioural hematological, biochemical and histopatholgocal parameters following treatment of albino rats with the *Bhasma* for 90 days[99].

2001

Kushta Sammul Far Aatishaki (KS-A) and *Qawi* (KS-Q) varieties (5 mg/kg po) exhibited analgesic activity against chemical (Acetic acid induced writhing), thermal (Eddy's hot plate) and electrical (Pododolorimeter) but not against mechanical (Tail clip) stimuli in rats and mice. The effects were reduced in naloxone pre-treated animals suggesting the involvement of opioidergic mechanisms. The oral LD_{50} values for KS-A and KS-Q were found to be 750 and 490 mg/kg respectively indicating a wide margin of safety. Long term safety studies are needed[100].

Bajaj and coworkers[101] demonstrated augmentation of non-specific immunity by traditional gold preparations. Ayurvedic *Swarna Bhasma* (SB) and Unani *Kushta Tila Kalan* (KTK) significantly increased counts of peritoneal macrophages and stimulated phagocytic index of macrophages. Auranofin (AN), used in modern medicine, elicited a suppressive action on these parameters. Calcined gold preparations (SB and KTK) exhibited immuno-stimulant activity on macrophage function in contrast to the immunosuppressive effects of AN. This is an interesting observation as it provides a rational basis to the traditional claims of efficacy and safety of gold in calcined form.

Kovi[102] studied *Yasada Bhasma* and *Yasada Compound* for elemental content, antihyperglycemic action and toxicity. *Yasada Compound* was prepared by freshly mixing *Yasada Bhasma* (10-20 mg/kg) with the methanol extracts of *Jambu* (*Eugenia Jambolana*, 95-100 mg/kg) and *Mesaringi* (*Spathodea falcate*, 65-130 mg/kg). The *Bhasma* contained Zn as the main constituent (90% Zn O) and traces of Al, Ca, Cu, Fe, Mg, Mn, Ni and Pb. Significant anti-hyperglycemic action was observed following treatment with *Yasada Bhasma* (10-20 mg/kg) and *Yasada Compound* (170-340 mg/kg) against streptozotacin-induced hyperglycemia on days 17 and 24 (after 1-2 weeks). A synergistic effect of *Yasada Bhasma* with *E. jambolana* was suggested. Chronic toxicity studies, with 4 times the highest therapeutic doses administered for 45 days, revealed no toxic manifestations. The animals looked healthy and their water and food consumption was normal. The rats were sacrificed after Day 45 and subjected to histopathological examination. No changes were detected in vital organs.

Mishra and Vohora[103] tested Auyurvedic *Kajjali Bhasma* (1 gm/kg), *Naga Bhasma* (1 gm/kg), Unani *Kushta Sangraf* (300 mg/kg) and *Kushta Surb* (30 mg/kg) for effects on cognitive function. The parameters of study included:

(*a*) Active avoidance learning in rats (% Acquisition, % Retention, and Learning scores)
(*b*) Passive avoidance learning in mice (Step down errors and Time spent in shock zone)
(*c*) Acetylcholine and Serotonin concentrations in Hippocampus and Forntal Cortex of rat brains following 10 oral treatments with the test drugs. All of the test drugs exhibited impairment of cognitive function. The toxic effects were observed at 21-25 times the corresponding human doses and are much less than the known toxic effects of Hg and Pb metals as such.

Senapati and associates[104] found that concomitant use garlic extract and lead acetate in rats, considerably reduced tissue Pb concentration indicating prophylactic activity of garlic (*Allium sativum* Linn) against Pb toxicity.

2002

Calcined gold preparations: Ayurvedic *Swarna Bhasma* (SB) and Unani *Kushta Tila Kalan* (KTK) exhibited anti-oxidant and restorative effects against global and focal models of ischemia in rats. Lipid preroxidation was significantly increased and other enzymatic parameters (Reduced glutathione, Glutathione peroxidase, Glutathione reductase, Catalase, Glutathione-s-transferase, Superoxide dismutase and Glucose 6-phosphate dehydrogenase) showed significant decrease in the middle cerebral artery (Focal ischemia) and bilateral carotid artery (Global ischemia) occluded groups. The test drugs (25 mg/kg po for 10 days) significantly restorted the altered enzymatic values to near normal levels suggesting their neuro-protective action and therapeutic potential for the treatment of cerebrovascular diseases. Histopathological findings corroborated the biochemical observations. Hypoperfusion caused marked vascular congestion which was further aggravated after reperfusion as evidenced by lymphocytic proliferation and cellular necrosis. Both SB and KTK markedly reversed these changes. Sections from the treated groups were mostly comparable with those from the control rats without ischemia.[105]

Siddiqui and cowerkers[106] reported no significant effects of therapeutic doses of clacined As and Pb preparations used in Unani medicine on biochemical and histopathological parameters in rats. Authentic samples of As preparations: *Kushta Sammul Far Qawi* (KS-Q) and *Atishaki* (KS-A) varieties and Pb preparation, *Kushta-e-Musallus* (KM) were found to contain 18.89% As and 4.15% Pb. Oral treatment of rats with KS-A, KS-Q (5 mg/kg) and KM (25 mg/kg) for 10 days revealed no gross effects; all the treated and control animals remained apparently healthy throughout the period of study. The drugs did not produce significant alterations in serum Alaninine transaminase (ALT), Aspartate transaminase (AST), Creatinine and Urea levels and only mild histopathological changes in brain (edema but no effect on morphology of brain cells), liver (congestion of central vein with occasional extravasation of blood elements into the parenchymal tissue) and kidneys (no effect with KS-A and KS-Q, congestion and focal hemorrhage in the interestitium and increased periglomerular spaces with KM). The effects of *Kushtas* are very mild in comparison to the known toxic effects of metals As and Pb *per se*.

2003

Wang and associates[107] studied comparative characteristics of absorption and distribution of Hg and As from Realgar and Cinnabar of *Angong Niuhuang* pill in normal rats and in rats with cerebral ischemia. Blood samples and tissue homogenates (liver, kidney and brain) were taken at various intervals after the treatment. Analysis for total Hg and As content in the blood and tissue homogenates was done using

Microwave Accelerated Reaction system and Atomic Absorption techniques. The blood concentration of Hg and As reached the highest level in normal rats at one hour post-treatment with single oral dose of *Angong Niuhuang* pill. In normal rats, Hg concentrations were found to be higher in blood and kidneys vs other organs. The As levels in blood were higher than those in tissues. No significant difference was observed in the distribution of Hg and As between normal rats and the ischemic rats.

2004

Kadam and Jha[108] reviewed the work done on *Abhraka Satva Bhasma* carried out by researchers from Jamnagar, Udaipur, Jaipur and Varanasi. This included properties, therapeutic indications. *Satva Patana*, standardization studies, *Anupanas* etc. From the research waork done in the recent past (1975 to 1998), the authors concluded that this *Bhasma* is a potent *Rasayana* medicine with utility in diabetes mellitus, cough, anemias, local swellings and edema. A list of 12 compound formulations of *Abhraka Sativa Bhasma* was also given: *Divyabhra rasayana, Amarsundari gutika, Gutika bandha, Gopya karni gutika, Vajrangasundari gutika, Navachitrangada guitka, Patal charini gutika, Salvabhra rasayana, Mritsanjivani gutika, Hemasiddha gutika* and *Khechari gutika*.

Schilling and coworkers[109] reported a case of Pb poisoning after ingestion of Ayurvedic drugs. A 60-year-old woman suffering from rheumatoid arthritis and taking methotrexate was admitted with recurrent episodes of nausea, vomiting, constipation, loss of appetite, myalgia and backache, sternal chest pain, costal and jaw pain. On examination the epigastrium was tender to palpation and nonrigid. Laboratory tests showed normocytic anemia (with a hemoglobin concentration of 8.6 g/dl), elevated blood urea and creatinine levels, hyponatremia, hypochloremia, hemolysis and polychromasia, anisocytosis, poikilocytosis and basophilic stippling of several red cells. On gastroscopy an ulcer was excluded, ultrasound scan of abdomen, X-ray of chest and pelvis showed no abnormalities. The electrocardiogram showed a right bundle branch block and left anterior hemiblock. In the differential diagnosis of anemia with basophilic stippling and abdominal discomfort, Pb. poisoning was found. Whole-blood Pb concentration was markedly raised to 852 µg/L (normal < 100 µg/l). Lead poisoning was the result of the use of Ayurvedic drugs during a period of 7.5 months prior to admission to the hospital. The authors opined that heavy metal poisoning, especially lead poisoning, should be considered in the differential diagnosis in patients with unspecific clinical symptoms taking traditional Indian remedies. (Note: The names of the Ayurvedic drugs could not be ascertained; only an Abstract of this paper, in German language, is available).

Siddiqui and Vohora[110] studied calcined As preparations. *Kushta Sammul Far Qawi* (KS-Q) and *Aatishaki* (KS-A) varieties for effects on anxiety and depression. The test drugs (5 mg/kg po x 10 days) exhibited significant anxiolytic effects as evidenced by increase in punished drinking episodes in anxiometer test, more time spent in open arm of elevated plus maze in rats and significant reduction in isolation-induced behavioural deficit in mice. No effect was observed on various parameters in video path analyzer studies. The results compared well with standard drugs (buspirone and diazepam) used for comparison. These findings are quite interesting for Arsenic, a metalloid known only for its toxic effects. Tests related to depression, however, revealed depressant (rather than anti-depressant) action in the: (*a*) Porsolt's behavioural despair and (*b*) Learned helplessness tests. This is a disturbing finding. The test drugs were found to be fairly safe and exhibited a wide therapeutic index. Approximate LD_{50} values were found to be 750 mg/kg po (150 times the test dose) for KS-A and 490 mg/kg po (98 times the test dose for KS-Q.

Measurement of Zn content in Mongolia patent drug *Zhungxigin* powder was done using pulse stripping voltammetry technique. The Zn content in three samples of the drug was found to be 493 ± 11.95, 526 ± 13.74 and 554 ± 9.84 µg/gm with relative standard deviations 2.42, 2.61 and 1.78% respectively. The Zn content in daily dosage of the drug is higher than the RDA values for healthy people.[111]

2005

Five varieties of salts (*Pancha Lavana*) are commonly used in the preparation of many Ayurvedic dosage forms and as routine dietic regimen. Dalal and coworkers[112] described the parameters which help in the identification of crude samples of these *lavanas*. These workers equated different varieties as follows:

1.	*Eka lavana*	*Saindhva*
2.	*Dwie lavana*	*Saindhva and Saubarchala*
3.	*Tri lavana*	*Saindhva, Saubarchala and Vida*
4.	*Chauth lavana*	*Saindhva, Saubarchala, Vida* and *Samudra*
5.	*Pancha lavana*	*Saindhva, Saubarchala, Vida, Samudra* and *Romaka*

Al-Ahmar, a reputed mercurial preparation used in Unani-Tibb, is attributed with aphrodisiac and erythropoietic properties. Its chief ingredient is *Shangraf* (Cinnabar). The drug was shown to elicit good erythropoietic activity in albino rats.[113]

Lynch and Braithwaite[114] from the Regional Laboratory for Toxicology, City Hospital, Birmingham reviewed the clinical and toxicological aspects of traditional (herbal) medicines adulterated with heavy metals (Pb, Hg, As). The authors presented a spreadsheet detailing information on published cases of heavy metal poisoning by Indian traditional medicines from Australia, Canada, Germany, India, Israel, Netherlands, UK and USA and cited 110 references. They stressed that such cases are under-reported, the problem needs serious attention, effective communication and education to bring a change in attitude towards the use of these remedies within the general public and the Indian community in particular.

Mishra and associates[115] reported amazingly enhanced tolerance of some toxic metals (As, Hg, Pb) when administered in experimental animals in calcined forms (*Bhasma* and *Kushtas* used in Ayurveda and Unani-Tbb). Further, these preparations revealed positive effects on adaptagenic and neurobehavioural parameters.

Parveen and associates[116] conducted clinical trial of *Habis* capsules: (*a*) combination of *Geru* (red coloured earth) and *Phitkari* (alum) in cases of menorrhagia. The drug (2 capsules of 250 mg thrice a day for 5-7 days) exhibited good hemostatic effect/clinical efficacy in the management of menorrhagia.

Problems associated with mental health have increased tremendously in modern time. The search for effective and safe alternatives should, therefore be pursued vigorously. Forced immobilization is one of the best explored models of stress in rats and the role of corticosterone (CS), serotonin (5-HT) and catecholamines, i.e. norepinephrine (NE), epinephrine (EN), dopamine (DA) is well documented. Shah and coworkers[117] studied the therapeutic potential of two gold preparations (Ayurvedic *Swarna Bhasma* and

Unani *Kushta Tila Kalan*) in restraint induced stress at different time points of 1, 2 and 4 hours. Rats were pretreated with the two gold preparations (25 mg/kg, orally for 10 days) prior to restraint stress. Whole brain catecholamine, serotonin and plasma corticosterone levels were determined following 1, 2 and 4 h restraint stress, using HPLC and also plasma corticosterone using luminescence spectrophotometry. Gold preparations restored restraint stress-induced elevation in whole brain levels of catecholamines (NE, EN, DA), 5-HT and plasma corticosterone to near normal levels, Gold, widely used in modern medicine for the treatment of rheumatoid arthritis, is highly valued for various medicinal uses in Indian systems of medicine. Traditional gold preparations are attributed with tonic/rejuvenating and antioxidant properties. Earlier studies revealed interesting analgesic, immunostimulant, adaptogenic and glycogen sparing properties in these preparations. Significant restoration of altered values to near normal levels suggest potentials for gold preparations in stress and depression.

Sharbat-e-Faulad, a herbo-mineral formulation used in Unani medicine contains *Burada-e-Faulad* (Fe rust), *Dadyan* (*Foenicum vulgare*), *Sumbul Teeb* (*Valriana valichii*) and *Zanjbeel* (*Zingiber officinalis*) as chief ingredients. Sultana and coworkers[118] reported very encouraging results with this drug in a clinical trial on 50 patients suffering from Fe deficiency anemia.

Tank and associates[119] conducted a clinical study to assess the comparative therapeutic efficacy of *Shankha Bhasma* alone and alongwith *Amlaki Churna* in the management of *Amlapitta* (hyperacidity). The study, carried out on 104 patients at the hospital of Institute of Postgraduate Teaching and Research in Ayurveda, Gujarat Ayurveda University, Jamnagar, exhibited the following results:

TABLE 10.5
EFFECT OF *SHANKHA BHASMA* ALONE AND IN COMBINATION WITH *AMLAKI CHURNA* IN *AMLAPITTA*[119]

RESULT	TREATMENT	
	Shankha Bhasma Alone No. of patients (%)	*Shankha Bhasma* + *Amlaki Churna* No of patients (%)
Complete remission	25 (48.1)	13 (25.0)
Improvement	11 (21.2)	15(28.8)
Partial improvement	3 (5.8)	8 (15.4)
No change	2 (3.8)	3 (5.8)

While good clinical response was observed in both the treatment groups, total efficacy was better when *Shankha Bhasma* was used alone. No untoward effects were observed on biochemical and hematological parameters.

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Agarwal[120] evaluated safety and efficacy profile of *Makardhwaja*: an Ayurvedic drug containing inorganic Hg. Albino rats of Charles Foster strain and rabbits of Holland strain were used for comparative acute and chronic toxicity studies with *Makardhwaja*, Methyl Hg and Mercuric chloride. The neurotoxic-

ity was assessed by measuring dopaminergic, cholinergic, noradrenergic and serotonergic neurons. Methyl Hg exhibited significant damage to these neurons, Methyl mercury showed nephro-toxicity exhibited by expansion in sodium space and reduction in creatinine clearance. *Makardhwaja* revealed no alterations in brain neurotransmitters, hepatic or cardiac enzyme systems suggesting safety of Hg after processing by Ayurvedic techniques.

Dubey[121] reported experimental and clinical studies on *Makardhwaja, Shwaskuthar Rasa* and *Arogyawardhinini Vati* (Ayurvedic formulations containing Hg, Pb and herbal ingredients). Acute and chronic toxicity studies revealed no ultra-structural and micro-vascular changes in experimental animals. Clinical trials in 10 diagnosed cases of bronchial asthma, 6 cases of hepatic disorders with *Shwaskuthar Rosa*, revealed no adverse effects on gross observation and on neurologic, endocrine, metabolic and renal parameters.

Kohli[122] reported that *Vasanta Malti Rasa, Vasant Kusumakar Rasa, Swarna Bhasma, Siddha Makardhwaja, Ras Raja Rasa, Chandraprabha Vati, Medohar Vidangdi Lauha, Kumar Kalyan Rasa, Lauha Bhasma* and *Tamra Bhasma*, when administered orally in therapeutic doses for 90 days, did not produce adverse effects indicating safety of these herbo-mineral formulations. Further clinical studies with *Vasant Kusumakar Rasa* in cases of diabetes mellitus and diabetic retionopathy showed that it is absolutely safe for human use. The author opined that doubts of safety of about Ayurvedic herbo-mineral drugs should not be made on the basis of analytical data only; safety should be properly investigated using experimental toxicity studies and clinical trials.

Twenty Ayurvedic *Bhasmas* based on Ca, Fe, Zn, K, As, Cu, Sn and gem stones were analyzed for upto 18 elements by neutron activation analysis (NAA), including their C, H, N and S content. In addition to the major constituent elements at % level, several essential elements eg Na, K, Ca, Mg, V, Mn, Fe, Cu and Zn were detected in μg/g amounts and Au and Co in ultra trace (ng/g) amounts. These seem to remain chelated with organic ligands derived from medicinal herbs used during preparation of the *Bhasmas* by traditional techniques. The investigators[123] stated that *Bhasmas* are biologically produced nanoparticles. These are taken with milk, butter, *Ghee* (clarified butter) or honey. This enhances biocompatibility of the component elements, makes them easily assimilable and eliminates their harmful effects. *Siddha Makardhwaja*, a Hg preparations, was found to be stoichiometrically Hg S without traces of any other element. *Swet Parpati* is stoichiometrically KNO_3 but it was found to contain Mn, Cu, Zn, Na, P and Cl as well. An attempt was made to correlate the metallic content of *Bhasmas* with their medicinal importance. The two electrolytes (Na and K) appear to be well correlated inspite of wide range of K/Na ratio in different *Bhasmas* (0.06 to 95) with specifically low values for Ca, Fe and Zn based *Bhasmas*. K/P ratio also showed a wide range (0.23 to 12, modal value 2.3 ± 1.2). Fe/Mn ratio was found to linearly correlated (r = 0.96) with Fe in 9 non-iron *Bhasmas*.[123]

Wadekar and associates[124] studied the effect of number of calcination cycles (*Putas*) followed in the preparation of Sn oxide based Ayurvedic drug *Vanga Bhasma*. Systematic characterization of the drug samples was done after various stages of calcinations. It was found that Sn was in the form of Sn (4+) state and that the formation of SnO (2) proceeded stepwise through Sn (OH) (4).

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11

FUTURE PROSPECTS

1. ENCOURAGING RESULTS

Abstracts of 124 research papers/Ph D theses for the period 1956 to 2006 have been presented. These include 21 clinical studies. Documentation of similar information for Medicinal Plants would have run into thousands of references necessitating several volumes. This indicates the extent of neglect of mineral/metallic drugs by researchers and government agencies. Even with such meager interest, some very encouraging results were observed. Highlights of such results are given below:

1.1 Effect of *Siddh Makardhwaja* on several enzymes *in vitro* (Succinic dehydrogenase, Cytochrome oxidase, Catalase and Succinic oxidase), and on oxidation of Ascorbic acid and Tyrosine. These studies, carried out at the Central Drug Research Institute, Lucknow between 1958 and 1961, demonstrated gastro-intestinal absorption of the drug and liberation of Hg ion in micro-quantities. Comparative studies with Hg salts, peculiarly revealed inhibition of ascorbic acid oxidation at very low solubilities and decrease in this activity with increasing solubility. Later an Indo-Korean study (Hamdard University, New Delhi and Kyung Hee University, Seoul) on this drug revealed that it helped in all round development of experimental animals; physical (growth promotion, anti-fatigue, adaptogenic) and mental (memory improving) effects without discernible toxicity. This was attributed to poor dissociation of Hg ions from *Siddha Makardhwaja* (even at pH 1.0) and less tissue accumulation (liver, kidney) in comparison to that with HgS or Cinnabar.

1.2 A series of studies on Ca group of *Bhasmas*, conducted at the Department of Biochemistry, Nagpur University, Nagpur, revealed better Ca retention in the body and negligible inhibitory action on Fe utilization by Ayurvedic Ca preparations *Mukta, Paraval* and *Shankha Bhasmas* vs the carbonate and lactate salts of Ca.

1.3 In studies at the Department of Medical Elementology and Toxicology, Hamdard University, New Delhi *Kushta Tila Kalan* (Unani gold preparation) was shown to augment cell-mediated and humoral immunity in contrast to the known immuno-suppressant effects of Au preparations used in modern medicine (Auranofin, Gold thiomalate etc) for the treatment of rheumatoid arthritis. These studies also revealed interesting analgesic, anti-cataleptic, growth stimulating, carbohydrate sparing (anti-fatigue), anxiolytic, and neuroprotective effects (against global and focal models of cerebral inschemia in rats) in Ayurvedic *Swarna Bhasma* and Unani *Kushta Tila Kalan*. Encouraging neuro-psychobehavioural and anti-oxidant effects were also observed in traditional preparations of Ag, As and Hg.

1.4 Experimental and clinical studies, carried out at the Banaras Hindu University, Varanasi, Grant Medical College, Mumbai, Gandhi Medical College, Bhopal and Kings College of Medicine and Dentistry, London, showed the efficacy of *Yashad Bhasma, Trivang Bhasma* and *Tamra Bhasma* in diabetes mellitus and gastric/duodenal ulcers.

2. FUTURE PROSPECTS

Resurgence of interest and activity is discernible following criticism and ban of some herbo-metallic preparations in western countries. This should prove a blessing in disguise. There is an urgent need to stop the blaming game and formulate an action plan. No system of medicine is superior or inferior. Let us not fight about it and fight the disease together.

2.1 Chemical Characterization

Toxic effects of metals and minerals are well documented in pure chemical form. These effects occur when the concerned metal is used as pure chemical entity.[1] In the traditional systems of medicine (Ayurveda and Unani-Tibb), metals and minerals are not ingested in pure form. These are rendered fit for human consumption by specialized traditional techniques. Probably some unidentified complexes are formed with the herbal ingredients during the ashing process.[2] These need to be identified and chemically characterized.

2.2. Validation for Efficacy and Safety

For the manufacture of *Bhasmas* and *Kushtas,* reference is always made to the classical texts eg *Rasa Shastra* and *Bayaz-e-Kabeer* written centuries ago. At that time methods of chemical characterization were not available. The ancient methods of purification are only subjective and need to be validated for efficacy and safety.[3]

2.3 Long-term Toxicological Studies

There is an urgent need to pursue the encouraging findings particularly for: (*a*) The mechanisms involved and (*b*) Long-term toxicity. The results emanating from such studies should be published in reputed scientific journals.

2.4 National and International Dialogue

Recently a National Consultation was organized to discuss the problems relating to herbo-metallic preparations. This meeting was organized by the Shri Ram Institute for Industrial Research, Delhi and supported by DST and AYUSH.[3] A workshop on Ayurvedic Medicines and Practices, organized jointly by Indian Geological Congress and BV Patel Pharmaceutical Education and Research Development Centre, Ahmedabad and supported by DST, also discussed these issues at length.[4] More of such meetings at National and International level will help exchange of views for standardization and development of better drugs acceptable worldwide.

Ernest efforts in the right direction will hopefully change the present dismal scenario. The prospects appear to be quite good.

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APPENDIX-1

MINERAL DRUGS AVAILABLE IN INDIAN MARKETS

***Ayurvedline*[1] listed 36 Ayurvedic *Bhasmas* commercially available in Indian markets. These have been tabulated with therapeutic indications, doses and Anupanas**

***BHASMAS* AVAILABLE IN INDIAN MARKETS[1]**

S. No	*BHASMA (CHIEF INGREDIENTS)*	INDICATIONS	DOSE	*ANUPANAS*
(*1*)	(*2*)	(*3*)	(*4*)	(*5*)
1	*Abhraka Bhasma* (Mica)	1. Anemia 2. Asthma 3. Dyspepsia 4. Fever 5. Irritable colon 6. *Kapha* disease 7. Promoter of longevity 8. Rejuvenating 9. Urinary disorders	125-375mg	1. Clarified butter 2. Extract of three myrobalans: *Terminatia officinalis, T. balerica. T. cbebula* 3. Honey 4. Juice of Tinospora cordifolia (*GUDUCHI*) 5. Juice of *Zingiber officinale* (*ADRAK*)
2	*Akika Bhasma* (Agate)	1. Cardiotonic 2. Eye diseases 3. Hemorrhage 4. Mental ailments 5. Menorrhagia	250-500mg twice daily	1. Honey 2. Milk
3	*Godanti Bhasma* (Selenite/Calcium Sulphate)	1. Asthma 2. Chronic fevers 3. Cough 4. Dyspepsia 5. Headache 6. *Pitta* diseases	500mg	1. Clarified butter 2. Honey 3. Juice of *Ocimum sanctum* (TULSI) leaves

(1)	(2)	(3)	(4)	(5)
4	*Hartala Bhasma* (Orpiment/Arsenic Sulphide)	1. Anal fistula 2. Anemia 3. Gastric disorders 4. Epilepsy 5. Hemorrhoids 6. Leprosy 7. Sinusitis 8. Tuberculosis	125mg	1. Butter 2. Honey
5	*Jahar Mohra Bhasma* (Bezoar Stone)	1. Gastroenteritis 2. Infantile diarrhoea 3. Vomiting	2-8 grains thrice daily	Honey
6	*Kanta Bhasma* (Iron)	1. Anemia 2. Debility 3. Hepatitis 4. Inflammation	200-400mg	Honey
7	*Kapardika Bhasma/ Vartika Bhasma* (Cowrie Shell)	1. Duodenal ulcer 2. Dyspepsia 3. Eye diseases 4. Inflammation 5. Irritable colon 6. Secretions from ear 7. Tuberculosis	250mg	Juice of 1. *Adhatoda vasica* (*VASA*) 2. *Citrus lemon* (*NIBU*) 3. *Ficus racemosus* (*UDUMBRA*) 4. *Tribulus terrertris* (*TRIKATU*)
8	*Kasisa Bhasma* (Iron Sulphate)	1. Anemia 2. Dysmenorrhoea 3. Erysepelas 4. Hiccup 5. Leucoderma	250mg	1. Extract of three myrobalans *Terminalia officinale, T. belerica, T. chebula* 2. Honey 3. Pulverized *Psoralia corylifolia* (*BAKUCI*)

(1)	(2)	(3)	(4)	(5)
9	*Kukkutandatvak Bhasma* (Egg Shell)	1. Leucorrhoea 2. Seminal defects	250-375mg	1. Milk 2. Water
10	*Loha Bhasma* (Iron)	1. Anemia 2. Asthma 3. Diarrhoea 4. Gastric disorders 5. Helminthiasis 6. Hepatitis 7. Hyperacidity 8. Inflammation 9. Leprosy 10. Splenic disease	120-250mg	1. Clarified butter 2. Honey 3. Juice of *Curcuma longa* (*HALDI*) 4. Powder of three myrobalans: *Terminalia officinale, T. belerica, T. chebula* 5. Powder of *Tribulas terrestris* (*TRIKATU*)
11	*Makardhwaja* (Mercury)	1. Aphrodisiac 2. Promotes longevity 3. Rejuvenating 4. Weakness of heart	125mg	1. Betel leaf 2. Honey 3. Milk
12	*Mallasindura* (Mercury)	1. Bronchial asthma 2. *Vata-Kapha* diseases	62.5-125mg	1. Honey 2. Juice of *Zingiber officinalis* (*ADRAK*)
13	*Mandura Bhasma* (Iron Rust)	1. Blood loss/Anemia 2. Enlarged liver 3. Enlarged spleen 4. Hepatitis 5. Inflammation	250-500mg	1. Extract of *Boerhaavia diffusa* (*PUNARNAVA*) 2. Extract of three myrobalans: *Terminalia officinalis, T. arjuna, T. chebula* (*TRIPHALA*) 3. Honey

(1)	(2)	(3)	(4)	(5)
14	*Manikya Bhasma* (Ruby)	1. Heart disease 2. Impotence 3. Seminal weakness	65-125mg thrice daily	1. Butter 2. Honey 3. Sugar candy
15	*Mayur Piccha Bhasma* (Peacock Feathers)	1. Asthma 2. Persistant Hiccup	2-4 grains	Equal quantity of *Piper longum* (*PIPALI*) and Honey
16	*Mukta Bhasma* (Pearls)	1. Asthma 2. Chronic fever 3. Cough 4. Fever due to dental problems 5. Mental ailments 6. *Pitta* fever 7. Weakness of heart	125mg	1. Butter 2. Honey 3. Milk
17	*Mukta Sukti Bhasma* (Pearl Oyester)	1. Blood disorders 2. Colic 3. Fevers including *Pitta* fever	250-500mg	1. Honey 2. Lemon juice
18	*Naga Bhasma* (Lead)	1. Abdominal swelling 2. Diarrhoea 3. Hemorrhoids 4. Irritable colon 5. Urinary disorders	62.5 125mg	1. Juice of *Curcuma longa* (*HALDI*) 2. Juice of *Eugenia jambolana* (*JAMUN*)
19	*Pravala Bhasma* (Coral)	1. Cough 2. Emaciation 3. Excess sweating 4. Oligouria 5. Osteoporosis 6. Palpitation	250mg	1. Extract of *Asparagus racemosus* (*SATAVARI*) 2. Extract of *Tribulus terrestsis* (*GOKSURA*) 3. Honey

(1)	(2)	(3)	(4)	(5)
20	*Rajata Bhasma* (Silver)	1. Debility 2. Epilepsy 3. Fever 4. Inflammation 5. Mental disorders 6. *Pitta* diseases 7. Poisoning 8. Pregnancy disorders 9. Splenic disease 10. Urinary ailments	125mg	1. Extract of *Bacopa monnieri* (*BRAHMI*) 2. Extract of *Plumbago zeylanica* (*CITRAKA*) roots 3. Extract of *Vetveria zizinoides* (*USIRA*) 4. Honey
21	*Rasa Sindura* (Mercury)	1. Debility 2. Emaciation 3. *Kapha* diseases 4. Weakness of heart	125 mg	Honey
22	*Sankh Bhasma* (Conch Shell)	1. Duodenal ulcer 2. Dyspepsia 3. Hepatospleno-megaly 4. Hyperacidity 5. Indigestion 6. Irritable colon 7. Poisoning	250-300mg	1. Extract of three myrobalans: *Terminalia officinale, T. arjuna, T. chebula* (*TRIPHALA*) 2. Lemon juice
23	*Siddha Makardhwaja* (Mercury)	1. Rejuvenating 2. Tonic for all vital organs	125mg twice daily	Honey
24	*Sphatika Bhasma* (Alum)	1. Anemia 2. Eye diseases 3. Hepatitis 4. Persistent fever	250-500mg twice daily	Water

(1)	(2)	(3)	(4)	(5)
25	*Sringa Bhasma* (Deer Horns)	1. Angina pectoris 2. Asthma 3. Chest pain 4. Cough 5. Hiccup	250-500mg	1. Butter 2. Honey
26	*Sukti Bhasma* (Pearl Oyester)	1. Abdominal inflammation 2. Cough 3. Indigestion 4. Strengthening	125-375mg	1. Clarified butter 2. Honey 3. Juice of *Tribulus terrestris* (*GUDUCI*)
27	*Svarna Bhasma* (Gold)	1. Anemia 2. Asthma 3. Cardiac disease 4. Epilepsy 5. Fever 6. Hiccup 7. Hyperacidity 8. Improves complexion 9. Irritable colon 10. Low I.Q. 11. Nervine tonic 12. Rejuvenating 13. Tuberculosis 14. *Vata* diseases 15. Weak ligaments	15.5-62.5mg	1. Butter 2. Honey
28	*Svarna Makshika Bhasma* (Copper Pyrite)	1. Anemia 2. Chronic fever 3. Epilepsy 4. Inflammation 5. Insomnia 6. Leprosy 7. Scanty menstruation 8. Tuberculosis	125-250mg	Honey

(1)	(2)	(3)	(4)	(5)
29	*Svarna Vanga* (Tin)	1. Asthma 2. Chronic cough 3. Urinary disorders	125-250mg	1. Butter 2. Honey
30	*Tamra Bhasma* (Copper)	1. Anemia 2. Ascites 3. Asthma 4. Cough 5. Eye disease 6. Inflammation 7. *Kapha-Pitta* disease 8. Leprosy 9. Tuberculosis 10. *Vata* diseases	31.25-62.5mg	1. Clarified butter 2. Honey 3. Juice of *Tinospora cordifolia* (*GUDUCI*) 4. Juice of *Zingiber officinalis* (*ADRAQ*)
31	*Tankana Bhasma* (Borax)	1. Asthma 2. Diarrhoea 3. Dysmenorrhoea	125-300mg	1. Honey 2. Water
32	*Trivanga Bhasma* (Lead, Tin, Zinc)	1. Diabetes mellitus 2. Urinary disorders	125mg	1. Butter 2. Honey
33	*Vaikranta Bhasma* (Tourmaline)	1. Anemia 2. Asthma 3. Chest wound 4. Cough 5. Hemarrhoids 6. Malabsorption syndrome 7. Tuberculosis	62.5mg	1. Clarified butter 2. Honey
34	*Vajra Bhasma* (Diamond)	1. Abdominal ailments 2. Anemia 3. Eye disease 4. Inflammation 5. Tuberculosis 6. Tumour 7. Urinary disorders	8mg	Honey

(1)	(2)	(3)	(4)	(5)
35	*Vanga Bhasma* (Tin)	1. Anemia 2. Asthma 3. Cough 4. Excess sweating 5. Helminthiasis 6. Leucorrhoea 7. Menorrhagia 8. Pregnancy disorders 9. Urinary diseases	125-250mg	1. Clarified butter 2. Honey 3. Juice of *Curcuma longa* (*HALD*) 4. Juice of *Tribulus terrestris* (*GUDUCI*)
36	*Yashada Bhasma* (Zinc)	1. Excess sweating 2. Leucorrhoea 3. Malabsorption syndorome 4. Tuberculosis 5. Urinary disorders	125mg	1. Honey 2. Juice of *Tribulus terrestris* (*GUDUCI*)

1 Nayak B (2005): *Ayurvediline*, Edn 8, pp. 265-379.

KUSHTAS AVAILABLE IN INDIAN MARKETS

S.No.	*KUSHTAS*	*INDICATIONS*	*DOSE*
1	*Kushta Abrak Kalan*	(*a*) Asthma (*b*) Cough (*c*) General weakness (*d*) Impotence	60 mg or 2 tabs with 10 g honey or 25 g milk cream
2	*Kushta Abrak Siyah*	(*a*) Asthma (*b*) Cough (*c*) General weakness (*d*) Strengthens sexual performance	30-60 mg or 1-2 tabs with 10 g honey
3	*Kushta Abrak Sufaid*	Properties and uses similar to *Kushta Abrak Siyah* but comparatively less effective	60-125 mg or 1-2 tabs with 10g honey
4	*Kushta Aqeeq*	(*a*) Cardiac tonic (*b*) Palpitation / relieves uneasy feeling	60 mg or 2 tabs with 5 g *Khamira Marwareed.* Should be taken on empty stomach in the morning
5	*Kushta Baiza Murgh*	(*a*) Diabetes (*b*) Leucorrhoea (*c*) Nocturnal emission (*d*) Polyurea	125 mg or 2 tabs with 10 g *Jawarish Mustagi Pak* followed by 250 ml milk
6	*Kushta Bussad*	(*a*) Asthma (*b*) Chronic catarrh (*c*) Cough	60 mg or 2 pills with 10 g *Khamira Gaozaban*
7	*Kushta Faulad*	(*a*) Hematinic (*b*) Hepatotonic (*c*) Tonic during convalescent period	60 mg or 2 tabs with 5 g Jawarish Jalinos
8	*Kushta Faulad Sone Chandiwala*	(*a*) Brain tonic (*b*) Heart tonic (*c*) Helps blood formation (*d*) Improves general health and brings lustre on face	20mg or 1 tab with 5g *Dawa-ul-misk Motadil Jawaharwali and 5 g Jawarish Jalinoos*
9	*Kushta Godanti*	(*a*) Fevers (*b*) Lumbago (*c*) Rheumatic pains	125 mg or 2 tabs. with 5 g *Majoon Sooranjan* after rolling on a *Tulsi* leaf

S.No.	KUSHTAS	INDICATIONS	DOSE
10	*Kushta Harjul Yahood*	(*a*) Cystic calculi (*b*) Renal calculi The calculi are broken into small particles and *evacuated through micturation*	30mg with 5 g *Majoon Hajrul Yahood*
11	*Kushta Hartal Warqi*	(*a*) Arthritis (*b*) Asthma (*c*) Bronchitis (*d*) Cough (*e*) Hemiplegia (*f*) Paralysis	30 mg or 1 pill with 10g honey, butter or cream
12	*Kushta Khubsul Hadeed*	(*a*) Hematinic (*b*) Hepatilis (*c*) Stomachic	125 mg or 2 tabs to be taken on empty stomach with 5 g *Jawarish Jalinoos*
13	*Kushta Marjan Jawaharwala*	(*a*) Catarrh (*b*) Common cold (*c*) Cough (*d*) Tonic for brain and heart	60 mg or 2 tabs with 5 g *Khamira Gaozaban.* Should be taken on empty stomach in the morning
14	*Kushta Marjan Sada*	As above	60mg or 2 tabs with 10 g *Khamira Gaozaban Ambari*
15	*Kushta Mirgang*	(*a*) Stomachic (*b*) Hepatotonic	60 mg or 2 tabs with 5 g *Jawarish Jalinoos*
16	*Kushta Musallas*	(*a*) Nocturnal emission (*b*) Seminal weakness (*c*) Spermatorrhoea	60 mg or 2 tabs with 10 g *Majun Asad Khurma* followed by 250 ml milk
17	*Kushta Nuqrah*	(*a*) Aphrodisiac (*b*) Brain tonic (*c*) Cardiac tonic (*d*) Liver tonic (*e*) Palpitation	60mg or 2 tabs with 5 g *Khamira Gaozaban*
18	*Kushta Qalai*	(*a*) Impotence (*b*) Nocturnal emission (*c*) Spermatorrhoea	125 mg or 2 tabs with 10 g *Khamira Asad Khurma* followed by 250 ml milk
19	*Kushta Qaran-ul-Ayyal*	(*a*) Chest pain (*b*) Common cold (*c*) Cough (*d*) Broncho-pneumonia	125 mg or 2 tabs with 10 g *Lauq Sapistan Khyar Shambri*

S.No.	KUSHTAS	INDICATIONS	DOSE
20	*Kushta Sadaf*	(*a*) Leucorrhoea (*b*) Nocturnal emission	60 mg or 1 tab with 125g butter
21	*Kushta Sammul Far*	(*a*) Aphrodisiac of high order (*b*) Appetizer (*c*) Improves digestion	30 mg with 25 g cream followed by 250ml milk
22	*Kushta Surb*	(*a*) Irregular menstruation (*b*) Seminal weakness (*c*) Spermatorrhoea	30mg or 1 tab with 10g Majun Asad Khurma followed by 250 milk
23	*Kushta Tila Kalan*	(*a*) General debility (*b*) Restores good health and vigour (*c*) Vitalizer of first order	30mg or 1 tab with 5g *Dawa-ul-misk Motadil Jawaharwali* or 5g *Labulb Kabir* and 250ml milk
24	*Kushta Yaqoot*	(*a*) Brain tonic (*b*) Cardiac tonic	60 mg or 1 tab with 5g *Khamira Marwareed*
25	*Kushta Zamarrud*	(*a*) Cardiac tonic (*b*) Cough (*c*) Hepatotonic (*d*) Polyurea	30mg or 1 tab with *Jawarish Zaruni Ambari*

APPENDIX-2

GLOSSARY OF AYURVEDIC/UNANI TERMS

Ayurvedic/Unani/Vernacular Names—English/Latin Names

Aab-e-Lemu: Lemon juice

Aak/Arka: *Calotropis gigantea*

Aatishak: Syphilis

Abhra/Abhraka: Mica/Talc/Biotite/Silicate of Aluminium and Iron

Abkar: Salt petre/Pure potassium nitrate

Adati-e-Isqat: Habitual abortion

Adhyavata: Gout

Afim/Ahiphena: Opium

Afsar: Topaz

Aga/Agaru: *Acacia arabica*

Agasti Barna: *Sesbania grandifolia*

Agnimandya: Digestive impairment

Ahna: Iron

Ajirna: Indigestion

Ajmutra: Goat urine

Akkal: Corrosive

Akik/Aqiq: Agate

Aksepa: Convulsions

Amlaki/Amla: Embelic myrobalan/*Emblica officinalis*

Amlapitta: Hyperacidity

Amritkarna: Giving the *Bhasma* an ambrosial form

Amvata: Rheumatism

Anaf-ul-Anzah: Influenza

Anant: Sexual debility/Impotence

Anda Roga: Disease of testicles

Anidra: Insomnia

Anupanas: Given with the drug as an adjunct or vehicle

Anar: Pomegranate/*Punica granatum*

Apurn bhawatwa: Test for quality of *Bhasmas*: when heated with a mixture of black sugar, borax, *Abrus precatorius* and clarified butter, it should not revert to original metallic state

Ardha: Half

Arsa: Piles

Arjuntvak Kvatha: Extract of *Terminalia arjuna* bark

Arq Gulab: *Aqua Rosa damascena*/Distillate of Rose flowers

Ashk: Slaked lime/Calcium hydroxide

Asthisosa: Osteoporosis
Atash-e-Mufrit: Excessive thirst/Polydipsia
Atisara: Diarrhoea
Badam: Almonds/*Prunus amygdalis*
Bahumutra: Polyuria
Baiza-e-Murgh: Hens egg
Bajr Lauha: Sky blue coloured Iron with thin lines
Bal Sosa: Emaciation in children
Banga: Tin
Bars: Leucoderma
Basti Roga: Urinary diseases
Bawaseer Damiya: Bleeding Piles
Bhagandar: Anal Fistula
Bhaishajya Kalpana: Formulation of dosage forms
Bhang: *Canabis sativa*
Bhasma: Calcined metal preparations used in Ayurveda
Bit: Black salt
Bodara: Litharge
Bodhana: Revival of potency
Bhrama: Vertigo
Badarsama: Fossil encritinine/Silicate of lime
Brahmaka: It makes all kinds of Iron to move about
Buddhimandya: Low intelligence
Burada Faulad: Iron dust
Busud: Coral roots/ *Corralium rubrum*
Busoor: Acne/Pimples
Caladanta: Loose teeth
Carmadala: Exfoliative dermatitis
Chandi: Silver
Chandra Kanta: Moon Stone
Chardi: Emesis/Vomiting
Charm Roga: Skin diseases
Chetana Dravya: Live fluid
Chumbaka: Load stone/Magnet
Chuna: Slaked lime/Calcium hydroxide
Dabba atfal: Infantile brocho-penumonia
Daf-e-Alam: Analgesic
Daf-e-Nazla: Anti-catarrh
Daha: Burning sensation
Damameel: Fruncles/Boil

Dant Soola: Toothache
Daq-wa-Sahaq: Pounding and grinding
Darchikna: A compound of Mercury and Arsenic
Da-ul-Feel: Elephantiasis/Filariasis
Da-ul-Salab: Alopecia
Deha Soola: Bodyache
Dhatu: Metal
Diq: Tuberculosis
Diq-e-Rewi: Pulmonary tuberculosis
Dola Yantra: Traditional apparatus for calcination. The drug is wrapped in thick cloth, tied, and immersed in a desired liquid kept in a pot and heated over charcoal or wood fuel
Dravaka: It can melt other types of Iron instantly
Dusta Vrina: Non-healing ulcer
Ehraq-e-Adviyah: Incineration/Burning of drugs
Ekanga Vata: Monoplegia
Falij: Hemiplegia
Faqr-ul-Dam: Anemia
Faulad: Iron
Fuwaq: Hiccough
Gairica/Geru Mitti/Gil-e-Surkh: Red ochre/Aluminum Silicate and Iron oxide
Gajadanta: Ivory
Gajputa: Pit for incineration/Calcination (Dimension: one cubic yard)
Galena: Lead sulphide
Gandhaka: Sulphur
Galaganda: Goiter
Galagriha: Difficulty in swallowing
Garbhasya Dora: Uterine disorder
Garbhapata: Abortion
Gara Visa: Slow/Accumulated poison
Gatra Kampa: Treamours
Gatra Kandu: Generalized pruritus
Ghashi: Fainting
Ghasi-e-Adviya: Purification of drugs
Ghasiyan: Nausea
Ghee/Ghrata: Clarified butter
Ghee Kanwar: Aloe barbadensis
Gil-e-Armani: Armenian Bole
Gil-e-Hikmat: Calcination technique using earthen pots sealed in layers of cloth and clay
Gil-e-Makhtoom: Clay/Aluminum silicate and Iron oxide
Gil-e-Safed: Chalk/Marble/Calcium carbonate

Godanti/Godanti Haritala: Gypsum/A compound of Calcium and Sulphur (not an Arsenic compound)

Gakstra: Cows milk

Gomeda: Onyx

Gomutra: Cows urine

Gopichandan: A kind of clay resembling Multani mitti/Anhydrous Aluminum silicate

Gorachna: Bezoar stone/Serpent stone/Slicate of Magnesium and Iron

Gradhrasi: Sciatica

Grahani: Malabsorption syndrome

Granthi: Cyst

Guduci: *Tinospora cordifolia*

Gulma: Abdominal lump

Gulukand: Rose petals preserved in sugar syrup

Hadida: Iron

Haiza: Cholera

Hajr-i-Maquates: Magnet

Harjr-ul-Musa: Asphalt/Mineral pitch

Hajrul Yahud: Jews stone

Haldi/Haridra: Turmeric/*Curcuma longa*

Halimaka: Chronic obstructive jaundice

Haraq: Burn

Hartal Tabqi: Realgar/Red Orpiment/Red bisulphide of Arsenic

Hartal Warqi: Yellow Orpiment/Yellow trisulphide of Arsenic

Harit Shyma: urquoise

Hazrul Bahr: Bezoar stone/Serpent stone/Silicate of Magnesium and Iron

Heeraka/Heera: Diamond

Hikka/Hidhma: Hiccup/Itching/Pruritus

Hingula: Cinnabar/Vermilon/Red sulphide of Mercury

Hira Kasis/Kasisa: Green Vitriol/Iron sulphide

Hradyasula/Hrtsula: *Angina pectoris*/Pain in heart

Humma/Hummiyat: Fever/Pyrexia

Ikhtenaq-ur-Rahem: Hysteria

Imli: *Tamarindus indicus*

Indralupta/Irq-un-Nisa: Alopecia

Indraneel: Sciatica

Is-hal-e-Aftal: Infantile diarrhea

Istehaza: Metrorrhagia

Istirkha: Atony

Istisqa: Dropsy

Iya: Fatigue

Izm-e-Tehal: Enlargement of spleen

Izmehlal: Depression

Jalodara: Ascites

Jamun: *Eugenia jambolana* fruits

Jangala: Copper sub-acetate

Jara: Senility

Jarab: Scabies

Jarab-ul-Ajfan: Trachoma

Jast: Zinc

Javalanopala: Sun stone

Jawakhar: Salt of tartar/Crude potassium carbonate

Jirn Jvara: Chronic fever

Juzam: Leprosy

Kaca: Cataract

Kadram: Variety of iron that breaks on being struck with a hammer with black fracture

Kalasya/Kala: Blue-black brilliant iron which does not break on being struck

Kancha: Glass

Kanji: A kind of vinegar

Kanta: Load stone/Magnetic ore of iron

Kansya: Brass

Kapardica: Outer hard shell of Cowrie *(Cyprea moneta)*

Karach: Sun dried sea salt

Kardama: Hydrous Aluminium silicate

Karela: Bitter gourd/*Momordica charantia*

Kasa: Cough

Kasr-e-Azam: Fracture

Kasrat-e-Baul: Polyuria

Kasrat-e-Ehtelam: Excessive nocturnal emission

Kasrat-e-Tams: Menorrhagia

Kasturi: Musk

Katuki/Kutki: *Picrorrhiza kurroa*

Khadar: Numbness

Khafqan: Palpitation

Khara: Variety of Iron: Rough, free from hair like lines, shows lustre of quick silver on breaking

Kharia Mitti/Kaikini Mitti: Clay/Aluminium silicate and Iron oxide

Kharpara: Calamine/Zinc ore/Contains Zinc carbonate and silicate with traces of Iron oxide

Khatiba: Calcium carbonate

Khubsul Hadeed: Iron rust/Impure oxide of iron

Khushunat-e-Halaq: Sore throat

Kibreet: Sulphur

Kirm-e-Dandan: Dental caries
Kotha: Urticaria
Krimi: Worm infestation/Helminthiasis
Ksaya: Pthisis
Ksina sukra/Ksina reta: Oligozoospermia
Kuhl: Traditional ophthalmic drug/eye cosmetic
Kulatha Qalai: *Dolichos biflorus*
Kumari Svaras: *Aloe barbadensis* juice
Kushta: Calcined metal preparation used in Unani medicine
Lajward: Lazurite/*Lapis lazuli*
Lakri-ka-Koyala: Wood charcoal/Medicinal charcoal
Laqwa: Paralysis
Lasuna/Lehsan: Garlic/*Allium sativum*
Lauha/Loha: Iron
Lavana: Salt
Lavang Patra: *Cinnamon leaves/Cinnamomum tamala* or *zeylanica*
Laza: Irritation
Mada: Intoxication
Madar: *Calotropis procera*
Madhu: Honey
Madhumeha: Diabeties mellitus
Madhya: Medium
Maghs: Cramps/Tenesmus
Makardhwaja: Reputed Mercury preparation used in Ayurveda
Makshika: Chalco pyrites/Copper pyrites
Mandura/Manduram: Iron rust/Hydrated oxide of iron
Manashila: Bisulphide of Arsenic
Manikya: Ruby/Red carborandum
Manodosa: Mental disorder
Manoglani: Depression
Mardana: Hot trituration
Marjan/Munga: Coral
Mayur Pankh: Peacock feathers
Medhya: Brain tonic/Memory improving/Nootropic
Miraq: Psychoneurosis
Mirgang: Mixture of purified Mercury, Tin, Sulphur, Ammonium chloride, Salt Petre and Mica
Momiai Faqrul Yahud: Asphalt/Mineral pitch
Mrga Sranga: Stag horns
Mridu: Mild
Mukta/Mauktika/Moti/Marwarid: Pearls

Mukta Shukti: Outer covering of Pearl oyster

Murchha: Loss of physico-chemical properties of the metal

Murchana: Syncope

Murdar Sang: Litharge/Lead carbonate and lead oxide

Mutraghata: Urinary obstruction

Nabhi Sul: Pain in umbilical region

Naga: Lead

Naktandhya: Night blindness

Namak/Namak-i-Khurdam/Namak-i-Sang: Common salt/Sea salt/Impure sodium chloride

Napunsakta: Impotence

Narikela/Nariel: Coconut/*Cocos mucifera*

Nasagata raktapitta: Bleeding from nose/Epistaxis

Nasoor: Fistula

Navasadara/Navasara/Noshadar: Ammonium chloride

Nazla: Catarrh

Netravikar: Eye diseases

Nibu/Nimbu: Citrus lemon fruit

Nila: Saphire

Nilika: Mole

Niqras: Gout

Nirutthatwa: Inability of *Bhasma* to fix on silver rod on heating indicates good quality

Nischandratwa: Completely free of original metallic lustre

Nisyan: Amnesia

Niyaman: Regulation of physical properties

Nizool-ul-Ma: Cataract

Nuhas: Copper

Ojaksya: Loss of immunity/body strength

Padmagra: Ruby

Pakshghata/Paksvadha: Paralysis/Hemiplegia

Pama: Eczema

Pandu: Anemia

Pani Sokhta: A kind of clay resembling Multani Mitti/Anhy drous Aluminium silicate

Pansu/Pansuja: Salt from saline earth

Para/Parada: Mercury

Parinamsula: Duodenal ulcer

Parpati: Disc-shaped Mercurial preparation containing Iron, Gold, Copper and Sulphur

Pashanbheda: Carbonate of Iron and lime

Patana: Sublimation/Distillation etc.

Phakka roga: Rickets

Phiranga: Syphilis

Phitkari: Alum
Pinasa: Chronic rhinitis/sinusitis
Pitta Kosha: Gall bladder
Pliha roga: Splenic disease
Post-Baiza: Egg shell peels
Pradara: Excessive vaginal discharge/leucorrhoea
Prameha: Urinary disease
Pravahika: Dysentry
Pravala: Corals/Shells group
Pradipna: Burning with Alum, Borax, Iron sulphate, Rock salt and some herbal drugs
Punarnava: Spreading Hogweed/*Boerhaavia diffusa*
Puttam: Cow dung cakes
Putas: Incineration/calcinations process/Repeated ashing and pulverization
Putty: White zinc/Flower of zinc/Zinc oxide
Qabz: Constipation
Qai-ud-Dam: Bloody vomiting/Hematemesis
Qalai: Tin
Qaranul Aiyal: Stag horns/*Carvus elephas*
Qurooh: Ulcer
Rajat/Raupya: Silver
Rajavarta: *Lepis lazuli*/Lazurite
Rakh: Ash
Rakt Naga: Red oxide of Lead
Rasa: Pleasure/Juice/Mercury/Quick silver
Rasaka: Calamine/Zinc carbonate and silicate with trace of Iron
Rasa Kapoor/Rasa Karpoorva: Calomel/Sublimed black sulphide of Mercury with common salt or rock salt
Rasa Sindura: Mercury sulphide
Ratna: Precious stones
Reeti: Calcined zinc
Rekha poornatwa: Test for quality of *Bhasma*: it should spread into lines and crevices of fingers
Roma Kanta: Variety of Iron which on breaking shoots forth hair like filaments
Rumi Mastaki: *Pistacia lenticum*
Sadaf: Oyester shell
Sadr: Vertigo
Sahar: Insomnia
Saindhwa: Rock salt
Sala: Tumour
Sambra: Sambar like salt
Samip Drasti: Myopia

Samskara: Processing of metal to make it fit for human consumption

Samudra: Sun dried sea salt

Samudraphena: Sea foam/Cuttle fish bones/*Sepia officinalis*

Sammul Far/Sankh Visha: White Arsenic

Sandhi pida: Joint pain

Sandhigraha: Stiffness of joints

Sandhi satha: Arthritis

Sang-e-Barsi: Calamine/zinc carbonate and zinc silicate with traces of Iron

Sang-e-Jerahat: Soap stone

Sang-e-Sare- Mahi: Otolith from fishes

Sang-e-Rasikh: Calcium sulphate

Sang-e-Yasara: Zade

Sang-e-Yashab: Agate

Sangraf: Compound of Mercury and Sulphur

Sangrahani: Sprue

Sanyasa: Coma

Sara: Epilepsy

Sarsam: Meningitis

Sankh: Conch

Sheer-e-Madar: Latex of *Calotropis gigantea*

Shodhna: Purification and Detoxification

Shora Qalmi/Tezab shora: Salt Petre/Potassium nitrate

Shilajita: Asphalt/Mineral Pitch

Siddha Makardhwaja: A reputed Ayurvedic Mercury preparation attributed with varied therapeutic properties

Sikata: Silica

Sindoor: Red oxide of Lead

Sinjiraph: Cinnabar/Vermilon/Red sulphide of Mercury

Simab: Mercury/Quick Silver

Sirka: Vinegar

Sirashula: Headache

Sittapitta: Urticaria

Smriti Daurbalya: Weak Memory

Sona Ratna: Ruby

Sopha: Edema

Soraka/Suryakshara: Potassium nitrate

Sotha: Inflammation

Sphatika/Shibb-e-Yamani: Alum/Crystal

Sphota/Sphotaka: Boil

Sthulata: Obesity

Sual: Cough
Sudakshara/Sudha: Quick lime/Calx/Calcium oxide
Suhaga: Borax
Sukr Ksya: Deficiency of semen
Sukr Meha: Spermatorrhoea
Sunyafa: Numbness
Supari: *Piper betel*
Surb: Lead
Surma: Eye cosmetic/Antimony
Suvarna: Gold
Suvarna Makshika: Yellow pyrite/Copper pyrite/Iron pyrite
Surya Kanta: Sun stone
Svasa: Dyspnoea/Asthma
Svitra: Leucoderma/Vitiligo
Swedna: Fermentation
Tabasheer: Plant origin drug. Mixture of silicates and alkaline earths
Tadbir-e-Adviya: Techniques for detoxification of drugs
Takra/Chaach: *Butter milk*
Talaka: Trisulphide of Arsenic
Tamra/Tamba: Copper
Tandra: Drowsiness
Tanaka: Borax
Tarkasya: Emerald
Tasfiya: Cleaning
Tasveel-e-Adviya: Sieving of drugs
Teen-e-Rumi: Red Ochre
Teevra: High/Intense
Tikshanan: Properly cast Iron and Steel
Til: Sesame
Tila: Gold
Timira: Cataract
Tinkar: Suhaga
Trikatu: Mixture of dried ginger, long pepper and black pepper
Triphala: Mixture of three myrobalans: *Harad, Bahera* and *Amla* (fruits)
Trivanga: Mixture of Lead, Tin and Zinc *Bhasmas*
Trsna: Thirst
Tulsi: *Ocimum sanctum* (leaves)
Tuni: Neuralgic pain
Tutiya/Tuttha: Blue Vitriol Coppr sulhate
Tutiya Sabz: Green Vitriol/Iron sulphide

Tvadosa: Skin diseases
Udakodara: Ascites
Udar Roga: Abdominal diseases
Um-us-sibiyan: Infantile Epilepsy
Uqr: Sterility
Ushara: Saline earth
Usrab: Litharge/Lead carbonate and lead oxide
Usr-ul-Baul: Dysuria
Usr-e-Tanaffus: Dyspnoea
Uthapana: Revival of physico-chemical properties
Vahni Garbha: Sun stone
Vaidurya: Cats eye
Vaikranta: Tourmaline
Vajr: Diamond
Vajikarna: Aphrodisiac
Vakdosa: Disorder of speech
Vami: Vomiting
Vandhatva: Infertility
Vanga: Tin
Varitaratwa: Test for quality of *Bhasma:* floating in still water
Vartika: Shells of *Cyprea moneta*
Vidardhi: Abscess
Vidruma: Coral
Viryaksya/Nastasukra: Azoorpermia
Visarpa: Erysepelas
Vraddhi: *Hydrocele*
Vrna: Ulcer
Warm-e-Kabid: Hepatitis
Warm-e-Mafasil: Arthritis
Warq: Thin metal leaves/foil
Waswas: Jaundice
Yakratodara: Enlargement of liver/Hepatomegaly
Yakshma: Tuberculosis
Yaqoot Surkh: Ruby/Red Carborandum
Yaqoot Zard: Topaz
Yarqan: Jaundice
Yashad: Zinc
Yashad Pushpa: Zinc oxide
Yasti: Liquorice root/*Glycyrrhiza glabra*
Yavakshara: Salt of tartar/Crude potassium carbonate

Zahar Mohra: Bezoar stone

Zajul-Akshal: Blue Vitriol/Copper sulphate

Zak-i-Sabz: Green Vitriol/Iron sulphide

Zamarrud: Emerald

Zarb: Trauma

Zat-ur-Riya: Pneumonia

Zeeq-un-Nafs: Asthma

Ziabetes Sadiq: Diabetes mellitus

Zirnikh-i-Surkh: Realgar/Red Orpiment/Red sulphide of Arsenic

Zirnikh-i-Zard: Yellow Orpiment/Yellow tri-sulphide of Arsenic

Zof-e-Badan: General debility

Zof-e-Bah: Sexual debility

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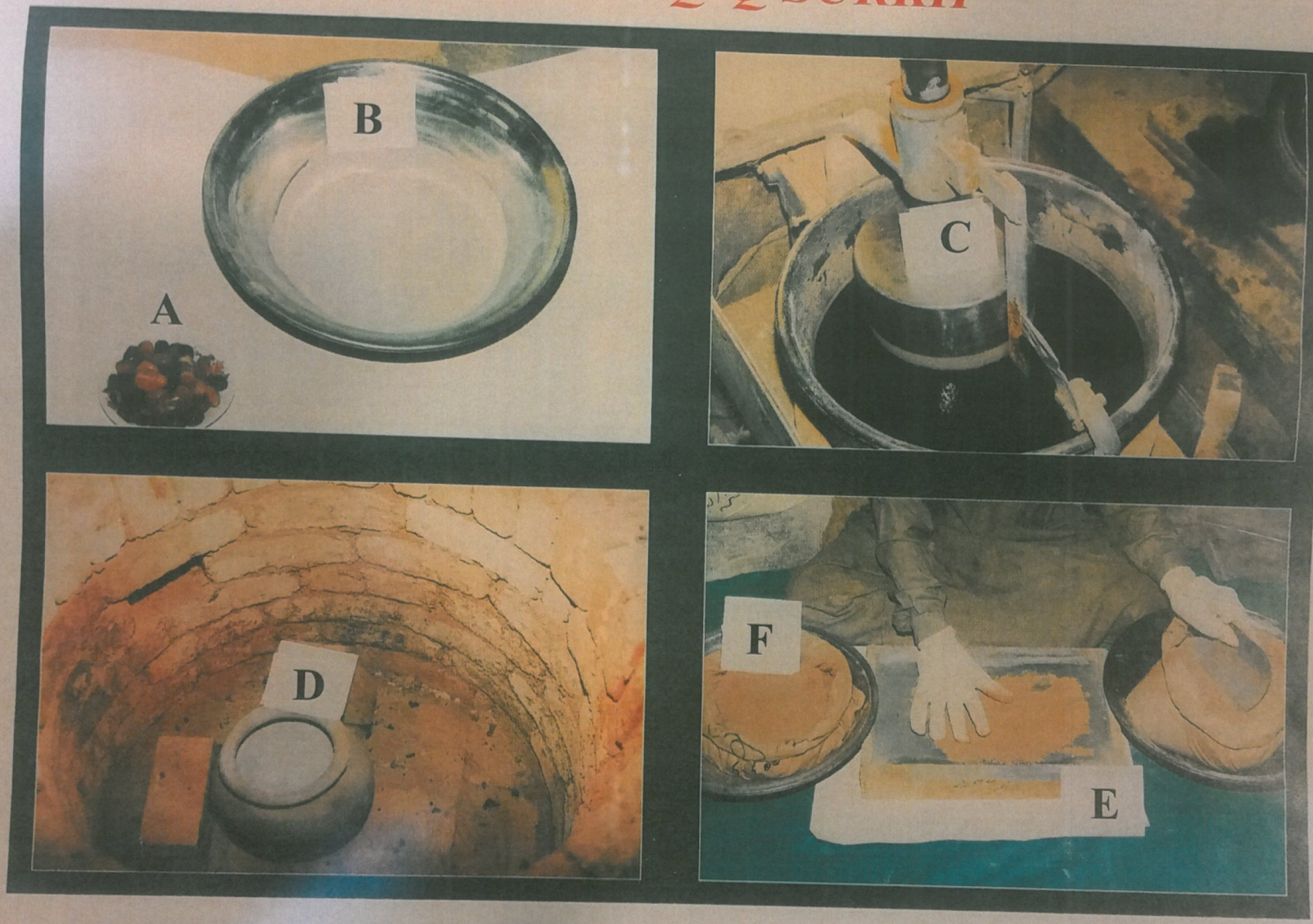
KUSHTA AQIQ SURKH



A: Raw / Unprocessed *Aqiq Surkh* (Red Agate). **B:** *Aqiq* Powder. **C:** Grinding. **D:** Calcination. **E:** Sieving. **F:** Final product *(Kushta)*.

Courtesy: Ms Sadia Rashid, Chairperson, Hamdard Laboratories (Waqf), Pakistan.

KUSHTA KHUBSUL HADEED

A: Raw / Unprocessed *Khubsul Hadeed* (Iron rust) in a clay pot. **B:** Appearance after subjecting to heat. **C:** *Kushta* (calcined material) under washing with water. **D:** Drying. **E:** Grinding. **F:** Sieving. **G:** Final product (*Kushta*)

Courtesy: Ms Sadia Rashid, Chairperson, Hamdard Laboratories (Waqf), Pakistan.

KUSHTA QARAN-UL-AIYAL

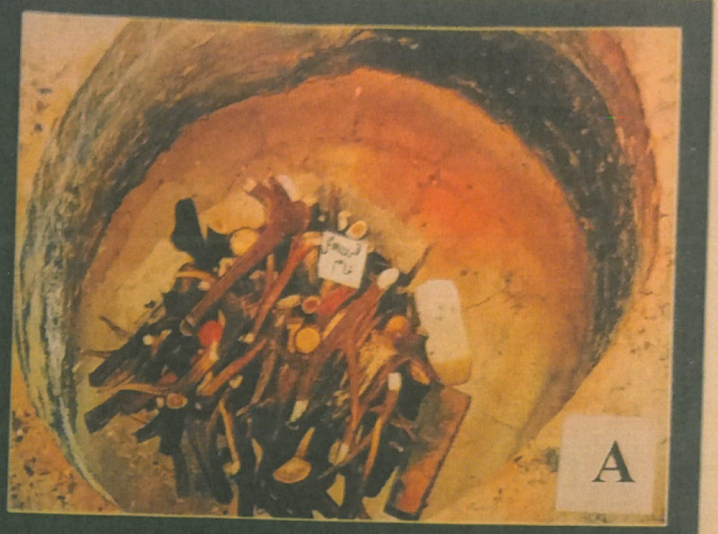
A: Raw / Unprocessed Qaran-ul-Aiyal (Stag Horns)

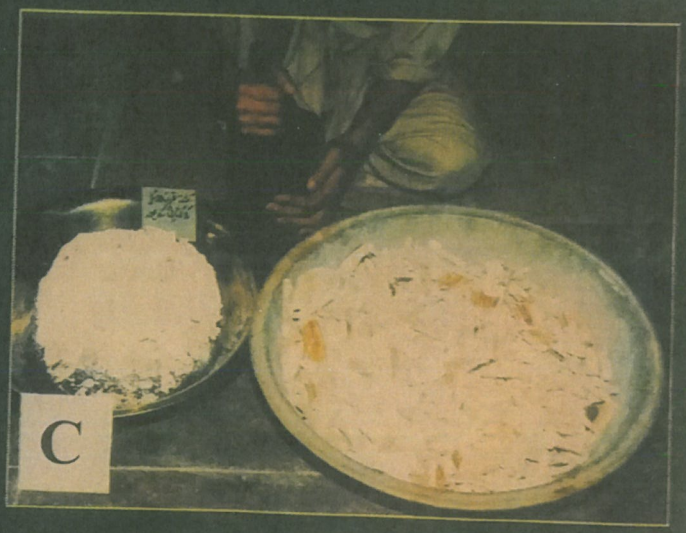
B: Calcined form

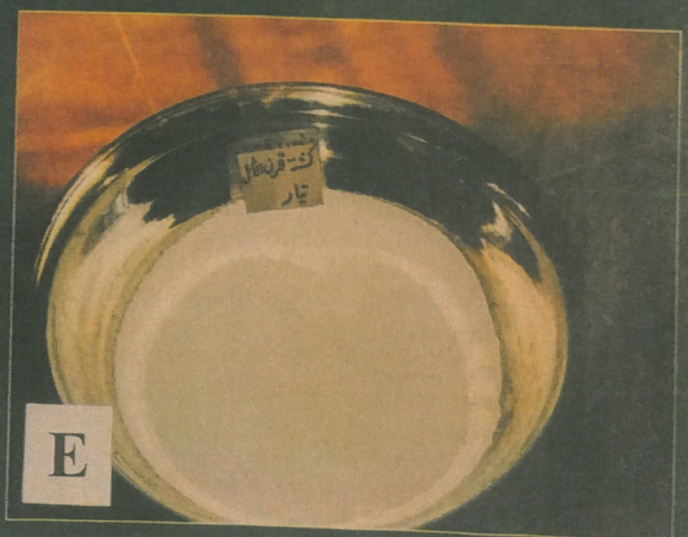
C: Calcined material cut into small pieces

D: Grinding

E: Powder form







Courtesy: Ms Sadia Rashid, Chairperson, Hamdard Laboratories (Waqf), Pakistan.

KUSHTA SADAF SADIQ

A: Unprocessed *Sadaf Sadiq* (Pearl Shells) under washing with water. **B:** Calcination.
C: *Kushta* (Calcined form). **D:** Sieving. **E:** Final product.

Courtesy: Ms Sadia Rashid, Chairperson, Hamdard Laboratories (Waqf), *Pakistan.*