THE AYURVEDIC PHARMACOPOEIA OF INDIA

THE AYURVEDIC PHARMACOPOEIA OF INDIA

PART –I
VOLUME –V
First Edition

सत्यमेव जयते

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सत्यमेव जयते
उमा पिल्ले
Uma Pillai

सचिव
भारत सरकार
स्वास्थ्य एवं परिवार कल्याण मंत्रालय
आयुर्वेद, योग व प्राकृतिक चिकित्सा,
यूनानी, सिद्ध एवं होम्योपैथी (आयुष) विभाग
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FOREWORD

The demand for Ayurvedic medicines as well as other natural products for healthcare is increasing globally. Their acceptability and future prospects are associated with the quality standards of these products. Therefore, it is essential to have scientific standards for identity, purity and strength of these medicines. Government of India appreciated the need for developing Pharmacopoeial Standards of Ayurveda, Siddha & Unani medicines and established the Pharmacopoeial Laboratory of Indian Medicines (PLIM) at Ghaziabad in the year 1970 to undertake pharmacopoeial work on Ayurvedic, Siddha & Unani medicines. The Ayurvedic Pharmacopoeia Committee (APC) comprising of experts in Pharmacognosy, Chemistry, Pharmaceuticals and Ayurvedic Pharmacy have been constantly advising PLIM and other Laboratories on Pharmacopoeial work. Quality standardization of natural products is a complex task and so 15 other laboratories of the Council of Scientific & Industrial Research (CSIR), Central Council for Research in Ayurveda & Siddha (CCRAS) and other eminent institutions have been associated to develop the Pharmacopoeial Standards under the APC Scheme of the Department of AYUSH. The scientific work of various laboratories has been regularly monitored by experts of the Ayurvedic Pharmacopoeia Committee and ultimately 93 monographs on Ayurvedic medicines have been prepared which constitute Volume V of the Ayurvedic Pharmacopoeia of India.

This volume is a result of hard work of various scientists working in various laboratories under the APC Scheme, PLIM, office bearers and members representing Ayurveda on the Pharmacopoeia Committee. I want to place on record my appreciation for their work resulting in the publication of this Volume. I hope that all those associated with the Ayurvedic Pharmacopoeia Committee will redouble their efforts and expedite the work of finalizing Pharmacopoeial standards for all the classical poly-herbal/ herbo-metallic preparations and simultaneously also develop chromatographic fingerprints for inclusion in the Ayurvedic Pharmacopoeia.

Science & Technology are developing very rapidly and so new scientific parameters of assessment of quality, purity and strength of natural drugs are also being developed. These scientific parameters need to be adopted for Ayurvedic drugs as well. The Department of AYUSH would welcome suggestions of experts/user-industries to improve the quality standards of future editions.

I hope the Fifth Volume of the Ayurvedic Pharmacopoeia of India will meet the needs of the industry and regulatory authorities and will help to improve the quality of Ayurvedic products.

Uma Pillai

(Uma Pillai)

17th January 2006.

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LEGAL NOTICES

In India there are laws dealing with drugs that are the subject of monographs which follow. These monographs should be read subject to the restrictions imposed by these laws wherever they are applicable.

It is expedient that enquiry be made in each case in order to ensure that the provisions of the law are being complied with.

In general, the Drugs & Cosmetics Act, 1940 (subsequently amended in 1964 and 1982), the Dangerous Drugs Act, 1930 and the Poisons Act, 1919 and the rules framed thereunder should be consulted.

Under the Drugs & Cosmetics Act, the Ayurvedic Pharmacopoeia of India (A.P.I.), Part-I, Vol. V, is the book of standards for single drugs included therein and the standards prescribed in the Ayurvedic Pharmacopoeia of India, Part-I, Vol. V would be official. If considered necessary these standards can be amended and the Chairman of the Ayurvedic Pharmacopoeia Committee authorised to issue such amendments. Whenever such amendments are issued the Ayurvedic Pharmacopoeia of India, Part-I, Vol. V, would be deemed to have been amended accordingly.

GENERAL NOTICES

Title - The title of the book is "Ayurvedic Pharmacopoeia of India". Wherever the abbreviation A.P.I. is used, it may be presumed to stand for the same and the supplements thereto.

Name of the Drugs - The name given on the top of each monograph of the drug is in Sanskrit as mentioned in the Ayurvedic classics and/or in the Ayurvedic Formulary of India, Part-I and Part-II will be considered official. These names have been arranged in English alphabetical order. The Latin name (taxonomical nomenclature) of each drug as found in authentic scientific literature has been provided in the monograph in the introductory paragraph. The official name will be the main title of the drug and its scientific name will also be considered as legal name.

Introductory Para - Each monograph begins with an introductory paragraph indicating the part, scientific name of the drug in Latin with short description about its habit, distribution and method of collection, if any.

Synonyms - Synonyms of each drug appearing in each monograph in Sanskrit, English, Hindi, Urdu and other Indian regional languages have been mentioned as found in the classical texts, Ayurvedic Formulary of India, Part-I and Part-II as procured from the experts, scholars of Ayurveda and officials in the field from different states.

Italics - Italic type has been used for scientific name of the drug appearing in the introductory paragraph of each monograph as also for chemicals and reagents, substances or processes described in Appendix.

Odour and Taste - Wherever a specific odour has been found it has been mentioned but the description as 'odourless' or 'no odour' has in many cases been avoided in the description, as large numbers of drugs have got no specific odour. The "odour" is examined by directly smelling 25 g of the powdered drug contained in a package or freshly powdered. If the odour is discernible the sample is rapidly transferred to an open container and re-examined after 15 minutes. If the odour persists to be discernible, it is described as having odour.

The "Taste" of a drug is examined by taking a small quantity of 85 mesh powder by a tip of moist glass rod and applying it on tongue previously rinsed with water. This may not be done in case if poisonous drugs, indicated in monograph.

Mesh Number - Wherever the powdering of the drug has been required the sieve "Mesh Number 85" has been used. This will not apply for drugs containing much oily substance.

Weights and Measures - The metric system of weights and measures is employed. Weights are given in multiples or fractions of a gramme (g) or of a milligram (mg). Fluid measures are given in multiples or fractions of millilitre (ml).

When the term "drop" is used, the measurement is to be made by means of a tube, which delivers in 20 drops 1 gram of distilled water at $15^{o}C$.

Metric measures are required by the Pharmacopoeia to be graduated at $20^{o}C$ and all measurements involved in the analytical operations of the Pharmacopoeia are intended, unless otherwise stated to be made at that temperature.

Identity, Purity and Strength - Under the heading "Identification" tests are provided as an aid to identification and are described in their respective monographs.

The term "Foreign Matter" is used to designate any matter, which does not form part of the drug as defined in the monograph. Vegetable drugs used as such or in formulations, should be duly identified

and authenticated and be free from insects, pests, fungi, micro-organisms, pesticides, and other animal matter including animal excreta, be within the permitted and specified limits for lead, arsenic and heavy metals, and show no abnormal odour, colour, sliminess, mould or other evidence of deterioration.

The quantitative tests e.g. total ash, acid-insoluble ash, water-soluble ash, alcohol-soluble extractive, water- soluble extractive, ether-soluble extractive, moisture content, volatile oil content and assays are the methods upon which the standards of Pharmacopoeia depend. The methods for assays are described in their respective monographs and for other quantitative tests, methods are not repeated in the text of monographs but only the corresponding reference of appropriate appendix is given. The analyst is not precluded from employing an alternate method in any instance if he is satisfied that the method, which he uses, will give the same result as the Pharmacopoeial Method. In suitable instances the methods of microanalysis, if of equivalent accuracy, may be substituted for the tests and assays described. However, in the event of doubt or dispute the methods of analysis of the Pharmacopoeia are alone authoritative.

Limits for Heavy Metals – All Ayurvedic Drugs (Single/Compound formulation) must comply with the limits for Heavy Metals prescribed in individual Monograph and wherever limit is not given then they must comply with the limits given in WHO publication "Quality Control Methods for Medicinal Plants and Material".

Standards - For statutory purpose, statements appearing in the API, Part-I, Vol. V, under Description, those of definition of the part and source plants, and Identity, Purity and Strength, shall constitute standards.

Thin Layer Chromatography (T.L.C.) - Under this head, wherever given, the number of spots and Rf values of the spots with their colour have been mentioned as a guide for identification of the drug and not as Pharmacopoeial requirement. However, the analyst may use any other solvent system and detecting reagent in any instance if he is satisfied that the method which he uses, even by applying known reference standards, will give better result to establish the identity of any particular chemical constituent reported to be present in the drug.

Quantities to be weighed for Assays and Tests - In all description quantity of the substance to be taken for testing is indicated. The amount stated is approximate but the quantity actually used must be accurately weighed and must not deviate by more than 10 per cent from the one stated.

Constant Weight - the term "Constant Weight" when it refers to drying or ignition means that two consecutive weighings do not differ by more than 1.0 mg per g of the substance taken for the determination, the second weighing following an additional hour of drying on further ignition.

Constituents - Under this head only the names of important chemical constituents, groups of constituents reported in research publications have been mentioned as a guide and not as pharmacopoeial requirement.

Percentage of Solutions - In defining standards, the expression per cent (%), is used, according to circumstances, with one of the four meanings given below.

Per cent w/w (percentage weight in weight) expresses the number of grammes of active substance, in 100 grammes of product.

Per cent w/v (Percentage weight in volume) expresses the number of grammes of active substance in 100 millilitres of product.

Per cent v/v (percentage volume in volume) expresses the number of millilitres of active substance in 100 millilitres of product.

Per cent v/w (percentage volume in weight) expresses the number of millilitres of active substance in 100 grammes of product.

Percentage of alcohol - All statements of percentage of alcohol (C_2H_5OH) refer to percentage by volume at 15.56 °C.

Temperature - Unless otherwise specified all temperatures refer to centigrade (celsius), thermometric scale.

Solutions - Unless otherwise specified in the individual monograph, all solutions are prepared with purified water.

Reagents and Solutions - The chemicals and reagents required for the test in Pharmacopoeia are described in Appendices.

Solubility - When stating the solubilities of Chemical substances the term "Soluble" is necessarily sometimes used in a general sense irrespective of concomitant chemical changes.

Statements of solubilities, which are expressed as a precise relation of weights of dissolved substance of volume of solvent, at a stated temperature, are intended to apply at that temperature. Statements of approximate solubilities for which no figures are given, are intended to apply at ordinary room temperature.

Pharmacopoeial chemicals when dissolved may show slight physical impurities, such as fragment of filter papers, fibres, and dust particles, unless excluded by definite tests in the individual monographs.

When the expression "parts" is used in defining the solubility of a substance, it is to be understood to mean that 1 gramme of a solid or 1 millilitre of a liquid is soluble in that number of millilitres of the solvent represented by the stated number of parts.

When the exact solubility of pharmacopoeial substance is not known, a descriptive term is used to indicate its solubility.

The following table indicates the meaning of such terms :-

Descriptive terms	*Relative quantities of solvent*
Very soluble	Less than 1 part.
Freely soluble	From 1 to 10 parts.
Soluble	From 10 to 30 parts.
Sparingly soluble	From 30 to 100 parts.
Slightly soluble	From 100 to 1000 parts.
Very slightly soluble	From 1000 to 10,000 parts.
Practically insoluble	More than 10,000 parts.

Therapeutic uses and important formulations –Therapeutic uses and important formulations mentioned in this Pharmacopoeia are, as provided in the recognised Ayurvedic classics and in the Ayurvedic Formulary of India, Part –I and Part-II.

Doses –The doses mentioned in each monograph are in metric system of weights, which are the approximate conversions from classical weights mentioned in Ayurvedic texts. A conversion table is appended giving classical weights of Ayurvedic System of Medicine with their metric equivalents. Doses mentioned in the Ayurvedic Pharmacopoeia of India (A.P.I.) are intended merely for general guidance and represent, unless otherwise stated, the average range of quantities per dose which is generally regarded suitable by clinicians for adults only when administered orally.

It is to be noted that the relation between doses in metric and Ayurvedic systems set forth in the text is of approximate equivalence. These quantities are for convenience of prescriber and sufficiently accurate for pharmaceutical purposes.

Abbreviations of technical terms – The abbreviations commonly employed are as follows :

m	Metre
l	Litre
mm.	Millimetre
cm.	Centimetre
μ	Micron (0.001 mm)
Kg.	Kilogram
g.	Gramme
mg.	Milligram
ml.	Millilitre
IN.	Normal solution
0.5 N	Half-normal solution
0.1 N	Decinormal solution
1M.	Molar solution
Fam.	Family
PS.	Primary Standards
TS.	Transverse Section

Abbreviations used for languages

Sansk.	Sanskrit
Assam.	Assamese
Beng.	Bengali
Eng.	English
Guj.	Gujrati
Kan.	Kannada
Kash.	Kashmiri
Mal.	Malayalam
Mar.	Marathi
Ori.	Oriya
Puj.	Punjabi
Tam.	Tamil
Tel.	Telgu

PREFACE

India, due to its unique variety of geographical and climatic factors, has had a rich and varied flora of medicinal plants since the vedic period. No wonder that out of a total number of over 15,000 plant species in India about 2000 are known to have medicinal properties and some of them are even used as home-remedies in the rural and remotest parts of the country.

2. The vastness of the country with its inadequate means of communication and facilities for transport of drugs coupled with diverse regional languages, resulted into a multitude of synonyms (the names in regional languages). Further, Ayurveda being a science put into professional practice on umpteen occasions to try newer drugs locally available, led to the successful use of several other drugs with therapeutic values similar to those of the drugs which were originally equated with the classical Ayurvedic drug, but later assumed the name of the very same classical drug and continued to be locally collected, sold and used in that name since the main classical drug was famous yet locally unavailable and substitution was a necessity. Later, in the first half of the century, while scientifically identifying the drugs in vogue in different regions, the scientists found that there were more than one species, belonging even to different families of plants, claiming the same classical name of the Ayurvedic drug. 'Brahmi' could be cited as a good example. This created a sensation that there existed a great controversy about the identity of Ayurvedic drugs and that there were more than one independent drug claiming the classical name of drug and one drug therefore, having different scientific identities. This innocent impression of scientists was further exaggerated during the alien rule to run down the claim of Ayurveda as a cultural heritage of India out of patriotism. All such drugs with a multiple claim on the classical name in different provinces, were stamped as controversial drugs without going into their genesis basically as therapeutic equivalents.

3. Ayurveda had never been static. Its practitioners had been innovative and dynamic in the therapeutic practice and carried on clinical trials out of the local flora and discovered newer medicine with same therapeutic values as the classical drugs, which might have been then either locally un-available or perhaps demanding heavy prices. These newer drugs have been accepted by the then practicing profession as substitutes. In fact on study of Ayurvedic literature, one comes across several references of permitting the use of a substitute drug when the classical drug is not available. This is based on its therapeutic equivalence and clinical efficacy.

4. Then there were certain classical drugs of Himalayan origin whose supply was limited and seasonal. They were not, or perhaps could not be, grown on plains and hence their use was restricted to the traders. By the time efforts were made to identify these drugs, their supply had dwindled and commercial substitution started. These few drugs were rightly stamped as "Sandigdha Dravyas" (or drugs of doubtful identity) of which 'Ashta Varga' could be cited as a glaring example.

5. It was again during the last 100 years of the alien rule, that the social and economic conditions in India changed, that the process of urbanisation began and growth of forests neglected. It was during this period that the Ayurvedic physicians took to cities and lost their contact with forests and drug sources. It was during this period that as a consequence of better transport facilities, the crude drug supplying agencies came up and commercial manufacture of Ayurvedic Medicines on mass scale in factories started. These were the inevitable consequences of the socio-economic changes in the country. The new economic set up was such that the Ayurvedic practitioner could no longer process and prepare his own medicines but had to depend on the big pharmaceutical houses run commercially and on the suppliers of crude drugs to whatever extent he needed them. There was, in a way, a forced division of labour where he had no choice but to purchase his drugs and no means to ascertain the authenticity of the medicines and formulations offered to him by the pharmaceutical houses, nor was there any Governmental control on the manufacture to ensure the quality of the medicines marketed, prescribed and administered to his patient.

6. The conditions prevailing in India for compilation of Ayurvedic Formulary and the Ayurvedic Pharmacopoeia were quite discouraging under the alien rule. Not only no efforts were made to investigate the efficacy and potency of Ayurvedic drugs, but there was also a systematic policy to discourage such moves and project Ayurveda as an out-dated and unscientific native system of treatment. Its drugs were publicised to be crude, poisonous and detrimental to health. The influence of this canard unfortunately still continues to lurk in some quarters. It was under these circumstances that some of the rationalist Indian Scientists and Scholars of Ayurveda dedicated themselves to the renaissance of Ayurveda. It was a part of the overall movement of independence of the country. But it gave the necessary momentum and after independence, not only Ayurvedic education but Ayurvedic drugs and their marketing were looked into.

7. As an outcome of the first Health Minister's Conference of 1946, a Committee under the Chairmanship of Lt. Col. R.N. Chopra was appointed in 1946 by the Government of India. It was the Chopra Committee that had first gone into the question of need for proper identification of Ayurvedic medicinal plants, control over collection and distribution of crude drugs and made positive recommendation for compilation of an Ayurvedic Pharmacopoeia. Thereafter, the Dave Committee (1955) reiterated the recommendations for compilation of an Ayurvedic Pharmacopoeia.

8. The Government of Bombay, was specially interested in the survey of resources of Ayurvedic Drugs, their collection, cultivation, farming, distribution and standardization. They, therefore had appointed a Committee for Standard and Genuine Ayurvedic Herbs and Drugs in 1955 and subsequently after receiving its report with fresh set of terms of reference, appointed a second committee called the Committee for Standard Ayurvedic Herbs and Drugs in 1957 both under the Chairmanship of Vaidya Bapalal Shah, of which Professor A.N. Namjoshi was the Member Secretary. The Bapalal Committee has very elaborately recommended the compilation of the Ayurvedic Pharmacopoeia as an urgent prerequisite for effective control of Ayurvedic Drugs to ensure quality assurance. Finally Government of India appointed the "Ayurvedic Research Evaluation Committee", under the Chairmanship of Dr. K.N. Udupa (1958) which had strongly highlighted the urgency of the compilation of an Ayurvedic Pharmacopoeia.

9. In compliance with some of these recommendations, the Union Government as also some of the State Governments had started taking positive steps. The Government of Bombay State established its Board of Research in Ayurveda, Bombay in 1951, which was subsequently reconstituted in 1955 and 1958. The Government of India established CCRIMH in 1969 for research in all aspects including drug standardisation in Indian Medicine & Homoeopathy. This Council was divided into 4 research councils in 1978 and the research work in Ayurveda and Siddha was entrusted to the Central Council for Research in Ayurveda & Siddha. The PLIM, at Ghaziabad was established in 1970 for testing and standardisation of single drugs and compound formulations. Under the auspices of the Central Council for Research in Ayurveda and Siddha, several survey units in different States were established and work of standardisation of single drugs and compound medicines as also composite research work was initiated. The first Ayurvedic Pharmacopoeia Committee was constituted in 1962 under the Chairmanship of Col. Sir Ram Nath Chopra. The Committee was reconstituted in 1972 under the Chairmanship of Prof. A.N. Namjoshi which took over the work of compilation of the Ayurvedic Formulary of India as a pre-requisite for under taking the work of Ayurvedic Pharmacopoeia of India.

10. After publication of the First and the Second part of the Ayurvedic Formulary of India, Part-III of the Formulary is under preparation. A list of single drugs, which enter into the formulations, has been prepared and the Committee could now apply its mind to the task of collection of data from published material and to entrust experimental work to produce data necessary to supplement the information already available as well as to verify experimentally some of the information previously gathered.

11. The First and Second Part of the Ayurvedic Formulary of India comprising of some 444 and 191 formulations respectively cover more than 351 single drugs of plant origin. This takes up about 500 priority drugs of plant origin to come within the ambit of the Ayurvedic Pharmacopoeia of India.

12. As against the above land-marks of growing interest in the renaissance of Ayurveda and systematic efforts to investigate into the merits of this ancient science during the post-independence period it is

interesting to note that the western or modern system of medicine with a formidable armoury of mostly synthetic drugs, chemo-therapeutic agents and later antibiotics, slowly realised that they also had adverse side effects and toxicity which would damage human systems. The western world slowly started appreciating the value of herbal medicines, and understanding the basic comprehensive philosophy of Ayurveda, which initially appeared to be rather abstract and difficult to interpret in terms of modern medical sciences.

13. With the introduction of a uniform system of Ayurvedic education all over the country, a process initiated some 50 years ago, there would be some uniformity in the Ayurvedic medicines marketed, in so far as their identity, purity and strength are concerned, with the physician and the patient needing to be assured of the quality of the medicine through proper drug control measures. The efforts to publish an Ayurvedic Formulary of India and to compile the Ayurvedic Pharmacopoeia of India have been well scheduled as to serve the profession and the public through proper quality assurance.

14. The Union Government have brought the Ayurvedic Drugs under the preview of the Drugs and Cosmetic Act 1940 from 15-9-1964. The publication of the Ayurvedic Formulary of India and the Ayurvedic Pharmacopoeia of India would give Government a base for fuller enforcement of the Act in respect of standards.

15. In the absence of technical information officially published by Government for statutory purposes, the Indian Pharmaceutical Industry in general and the Ayurvedic Pharmaceutical Industry in particular have been experiencing a great handicap in imposing standards as a part of their own internal discipline, as whatever standards they would lay down would be only arbitrary and subjective.

16. To meet the acute need of the hour felt by the academic institutions, the Ayurvedic Pharmacists and Pharmaceutical Industry and the authorities, implementing Drugs and Cosmetics Act, the Ayurvedic Pharmacopoeia Committee has made a modest effort to lay down earlier some norms of single drugs based on experimental data worked out at the PLIM, Ghaziabad and some of the units of the Central Council for Research in Ayurveda and Siddha, supplemented by the published scientific literature on the subject after due verification wherever found necessary and additions wherever possible.

17. The Western countries did pass through this phase years ago and had to codify their medicine and their characteristics, methods of preparation and determining criteria of their identity, purity and strength. Endeavors to determining the above were made by researchers all over the world and out of this common pool of scientific data the pharmacopoeial monographs of single drugs and formulations were drafted. And the result of these efforts are the several pharmacopoeias of the modern world with considerable commonness of approach and information. Thus, while for compilation of the modern pharmacopoeia universal need of information and scientific data was available, for the compilation of the Ayurvedic Pharmacopoeia little information and published data existed and the Ayurvedic Pharmacopoeia Committee had to begin from scratch.

18. While incorporating the experimental data like macrospoic and microscopic pharmacognostic descriptions and chemical norms, one must admit that modern pharmacognosy had its genesis in Texts of Ayurvedic Nighantus where entire drug and drug plant have been minutely studied and eloquent sanskrit terms used to describe the parts of plant so that it projects a convincing picture of the drug and the drug plant before the reader. The description of the Castor oil plant –(*Ricinus communis* Linn.) given by Bhavprakash and of Guduchi (*Tinospora cordifolia* (Willd.) Miers.) are typical examples. Thus when we insist on the pharmacognostic study of each drug, we are really extending and expanding Ayurvedic Pharmacognosy.

19. The Ayurvedic Pharmacopoeia of India Part–I, Vol-I, II, III and IV comprises 80, 78, 100 and 68 monographs of Ayurvedic single drugs of plant origin, which go into one or more formulations enlisted in the Ayurvedic Formulary of India Part-I and Part-II. In compiling the monographs, the title of each drug had been given in Sanskrit as already obtained in the Ayurvedic Formulary of India. Then comes the definition of the drug giving its identity in scientific nomenclature and very brief information about its source, occurrence, distribution and precautions in collection if any, etc.

20. This is followed by a list of synonyms in Sanskrit and also the other Indian regional languages. The monographs then record the detailed gross or Microscopic description of the drug and its Microscopic tissue structures, the individual elements, deposition of crystals, starch grains, hairy out growths etc, each having a pharmacognostic value in identification, especially when the drug is in powder form.

21. The monograph then gives norms and limits under "Identity, Purity and Strength" like tolerance of foreign matter, total ash, acid insoluble ash, alcohol soluble extractive, water soluble extractive, volatile oil contents etc. Some of them have a direct bearing on the purity and strength, while others enable to detect substitution or adulteration, if any. Where possible, Assay of one constituent or group of constituents like total alkaloids or total volatile oils has been given. However, under the heading 'Constituents' one or more constituents or group of constituents like oleoresins, essential oils, alkaloids have been mentioned which only have an informative value based on published research work in phytochemistry. In the case of water soluble or alcohol soluble extractives specification of lower limit has an added relevance to the maturity of the drug in addition to its authenticity. It will however, be worth mentioning that there is always a wide variation in crude drugs (raw materials) of plant origin in respect of their chemical contents, due to varied climatic conditions, geographical distribution, source and season of collection and lack of scientific methods of storage and preservation. Therefore, the variation in the chemical data created a great difficulty in fixing the standards for single drugs. However, the data has been fixed up by working out as many samples as possible procured from different sources.

22. Since the effort is to compile pharmacopoeial monographs of Ayurvedic drugs, the accent of the classical attributes of respective drugs according to the doctrine of Rasa, Guna, Virya, Vipaka and Karma has not been lost sight of, though some of them appear to be abstract and subjective in the absence of an established experimental methods to quantify them.

23. The Legal Notices and General Notices have been given for guidance of the analysts, the Pharmaceutical suppliers and manufactures and the research workers engaged in this field. Details about the apparatus, reagents and solutions, tests, methods of preparation of speciments for microscopical examinations have been given in the Appendices.

24. The Committee hopes that with the publication of Ayurvedic Pharmacopoeia of India Part I, Vol. V comprising of 93 single drugs of vegetables origin, as per the format and procedure laid down, the different research units under Deptt. of AYUSH under the Ministry of Health and Family Welfare would plan their research enquiries such that the output of work would be accelerated. At the same time, these 93 drugs would provide basic information and norms about these drugs to those research institutions which would be interested in an in-depth study of these drugs, the outcome of which might provide further data for incorporation to the extent it would be relevant to the second edition of the pharmacopoeia.

25. The Committee urges the Government of India to recommend the adoption of these monographs for the purposes of identity, purity and strength of drugs for use in their Government, Semi-Government and Government aided institutions and voluntary public organisations. The Ayurvedic Pharmacopoeia of India, 2005, Part-I, Vol. V may also be notified by Government as a book of reference for implementation of the Drugs and Cosmetics Act, 1940 all over India as Ayurvedic Pharmacopoeia of India Part-I, Vol. I, II, III and IV is already included in the First Schedule of Drugs & Cosmetics Act 1940.

26. The Ayurvedic Pharmacopoeia Committee records the appreciation for the Directors, Officer In-charges, Project Officers and scientific staff of all the contributing laboratories and institutions those were associated with the project work on developing Pharmacopoeial Standards. The present volume of Ayurvedic Pharmacopoeia of India comprises the technical work contributed by these laboratories and institutions.

27. On behalf of the Ayurvedic Pharmacopoeia Committee, I feel it my duty to place on records our sincere thanks and appreciation to the Government of India, State Governments, Institutions, Councils, Scientists and Ayurvedic Scholars for their whole hearted co-operation in preparing the monographs on Single Drugs. I sincerely thank all the members of the Ayurvedic Pharmacopoeia Committee without whose co-operation this volume would not have seen the light of day. My thanks are also due to Km. Savita

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Dr. S. K. Sharma
Advisor (Ayurveda)
Member Secretary
Ayurvedic Pharmacopoeia Committee

New Delhi
Dated

INTRODUCTION

The Ayurvedic system of medicine is prevalent in India since the Vedic period and as early as the dawn of human civilization. Though Ayurveda has under gone many changes in the course of its long history, it still remains the mainstay of medical relief to a large section of population of the nation. Due to urbanisation and dwindling of forests, the Vaidya by and large is no longer a self contained unit collecting and preparing his own medicines as before. He has now to depend on the newly developed agencies like one collecting and supplying the crude drugs and the other undertaking mass production of medicines in the Ayurvedic Pharmaceutical units run on commercial scale.

2. In view of the new trend in Ayurvedic Pharmaceutical field, Government of India considered it expedient to utilise the existing Drug and Cosmetics Act 1940, to also control to a limited measure the Ayurvedic, Siddha and Unani drugs by amending the Act.

3. The Act was accordingly amended in 1964, to ensure only a limited control over the production and sale of these medicines namely :-

i. The manufacture should be carried under prescribed hygienic conditions, under supervision of a person having a prescribed qualification;

ii. The raw materials used in the preparation of durgs should be genuine and properly identified; and

iii. The formula or the true list of all the ingredients contained in the drugs, should be displayed on the label of every container.

4. To start with, development of standards for the identity, purity and strength of single drugs and formulations at a later stage, assumed importance for the effective enforcement of the provision of the Act. If the raw materials to be used in a medicine and stage by stage processes of manufacturer standardised, the final product namely, the compound formulation could be expected to conform to uniform standards. The requirements that the list of ingredients be displayed on the label will enable analysts in important cases to verify label claims and to that extent will bind the manufacture to a true claim. Arrangements to evolve and lay down physical, chemical and biological tests, where necessary, to identify the drugs and ascertain their quality and to detect adulterations, are an urgent necessity of the profession. Setting up of Drug Standardisation Units, Research Centres, Drug Testing Institutes and Central Drug Laboratories for Ayurvedic Medicines both at the All-India and Regional levels for this purpose are therefore, essential. The several Committees appointed by the Government of India to assess and evaluate the status and practice of Ayurvedic Medicine have stressed the importance of preparing an Ayurvedic Pharmacopoeia.

5. Having regard to all these considerations, the Central Council of Ayurvedic Research recommended the constitution of Ayurvedic Pharmacopoeia Committee consisting of experts on Ayurveda and other sciences. The Government of India accepted the recommendations of the Central Council of Ayurvedic Research and constituted the First Ayurvedic Pharmacopoeia Committee, vide their letter No. 14-8/62-ISM, dated the 20th September, 1962 for a period of three years with effect from the date of its first meeting under the Chairmanship of Col. Sir R.N. Chopra with the following member :-

1. Col. Sir Ram Nath Chopra, Drugs Research Laboratory, Srinagar.	*Chairman*
2. Vaidya B.V. Gokhale, 29/14-15, Erandavanc, Deccan Gymkhana, Poona-4.	*Member*
3. Vaidya D.A. Kulkarni, Principal, Post Graduate, Training Centre in Ayurveda, Jamnagar.	*Member*
4. Kaviraj B.N. Sircar, 779-780, Nicholson Road, Kashmere Gate, Delhi-6.	*Member*

5. Shri A.N. Namjoshi, Navyug Mansion, 19-A, Sleater Road, Bombay-7. *Member*

6. Dr. B.B. Gaitonde, Profossor of Pharmacology, Grant Medical College, Bombay. *Member*

7. Dr. C.G. Pandit, Director, Indian Council of Medical Research, New Delhi. *Member*

8. Dr. G.K. Karandikar, Dean, Medical College, Aurangabad. *Member*

9. Dr. G.S. Pande, Honorary Director, Indian Drug Research Association, 955-Sadashiv Peth, Lakshmi Road, Poona-2. *Member*

10. Dr. M.V. Venkataraghava, Chellakoti, Nungabakkum, Madras-34. *Member*

11. Ayurvedachara Kaladi K. Parameswaran Pillai, Laksmivilasam Vaidyasala, Vanchiyur, Trivandrum. *Member*

12. Dr. V. Narayanaswamy, 70, Tana Street, Vepeiy, Madras-7. *Member*

13. Vaidya P.V. Dhamankar Shastri, Pardeshi Lane, Panvel, District Kolaba, Bombay. *Member*

14. S.K. Borkar, Drug Controller (India), Directorate General of Health Services, Government of India, New Delhi. *Member*

15. Shri Bapalal G. Vaidya, Principal, O.H. Nazar Ayurveda Mahavidyalaya, Surat. *Member*

16. Kumari Savita Satakopan, Drugs Control Laboratory, Near Polytechnic, Highway 8, Baroda. *Member*

17. Vaidya Vasudev M. Dwivedi, Director of Ayurveda, Government of Gujrat, Ahmedabad. *Member*

18. Shri P.V. Bhatt, M.Sc., Chemist, The Ayurvedic Rasashala, Deccan Gymkhana, Poona. *Member*

19. Vaidya Ram Sushill Singh, Assistant Director of Ayurveda, Director of Medical Services, (Ayurveda), Govt. of U.P. *Member*

20. Dr.Y. Kondal Rao,Secretary,Indian Medical Practitioner's Cooperative Pharmacy & Stores Limited, Adyar, Madras-20. *Member*

21. Dr. V. Srinivasan, M.Sc., M.B.B.S., Ph.D., Director, Sarabhai Chemicals Research Institute, Shahibag, Ahmedabad-4. *Member*

22. Dr.C.Dwarakanath,Adviser in Indian System of Medicine, Ministry of Health, New Delhi. *Member* Secretary

The Committee was assigned the following function :-

1. To prepare an official Formulary in 2 parts :-

   (a) Single drugs, of whose identity and therapeutic value there is no doubt; and

   (b) Compound preparations which are frequently used in Ayurvedic practice throughout the country.

2. To provide standards for drug and medicines of therapeutic usefulness or pharmaceutical necessity sufficiently used in Ayurvedic practice.

3. To lay down tests for identity, quality and purity.

4. To ensure as far as possible uniformity, physcial properties and active constituents; and

5. To provide all other information regarding the distinguishing characteristics, methods of preparation, dosage, method of administration with various anupanas or vehicles and their toxicity.

As a first step in this direction the Ayurvedic Pharmacopoeia Committee started preparing the official Formulary of Ayurveda in two parts as mentioned under the assigned functions of the Committee. Since the work of preparation of Ayurvedic Formulary was in progress after the completion of first three years, The Government of India extended the term of the Committee by another three years vide their notification No. F. 20-1/66-RISM, dated 14th January, 1966 and a gain for a further period of three years vide their notification No. F. 1-1/69-APC, dated 9th January, 1969.

In the year 1972, 1981, 1988 and 1994 Ayurvedic Pharmacopoeia Committees were reconstituted under the Chairman ship of Prof. A.N. Namjoshi.

In view of the importance of laying down standards of single drugs and compound formulations used in Ayurveda for quality control purposes the Government of India further reconstituted the Ayurvedic Pharmacopoeia Committee, vide Order No. X.19011/6/94-APC, dated 6th January 1998, with the following members and the functions assigned as under :-

1.	Vaidya.I.Sanjeeva Rao, Sri Sai Krupa, 5-8-293/A Mahesh Nagar, Chirag Ali Lane, Hyderabad – 500 002.	Chairman
	Official Members	
2.	Drugs Controller General (India), Ministry of Health & Family Welfare, Nirman Bhawan, New Delhi.	Member (Ex-officio)
3.	The Director, Pharmacopoeial Laboratory for Indian Medicine (PLIM), C.G.O. Complex-I, Kamla Nehru Nagar, Ghaziabad.	Member (Ex-officio)
4.	The Director, Central Council for Research in Ayurveda & Siddha (CCRAS), Ansundhan Bhavan, 61-65, Institutional Area, D-Block, Janakpuri, New Delhi.	Member (Ex-officio)
5.	Managing Director, IMPCL, Mohan, Via Ramnagar (UP).	Member (Ex-officio)

Non-Official Members

6.	Prof. S.S. Handa, Director, Regional Research Laboratory (CSIR), Canal Road, Jammu Tawi (J & K).	Member
7.	Ms. Savita Satakopan, 12, Maruti Apts., Block-2, Flat-A, Third Main Rd., Nanganallur, Madras-600061.	Member
8.	Vd. Devendra Triguna, 143, Sarai Kale Khan, Nizamuddin, New Delhi.	Member
9.	Vaidya B. Vaidyanathan, No. 1, Ganapathy, Ist Street, Hawai Nagar, Thiruvanmiyar, Madras-600041.	Member
10.	Dr. D.B. Ananatha Narayana, 262, -Pocket L, Sarita Vihar, New Delhi-44, Fax-8770913.	Member
11.	Dr. D.S. Lucas, Principal & Head of Deptt. Dravyaguna, Govt. Ayurvedic Medical College, Dhanwantri Road, Banglore-560009.	Member
12.	Prof. V.V. Prasad, Head of Dept. Dravyaguna, Ayurvedic College, Tirupati (AP).	Member
13.	Dr. C.K. Katiyar, Dabur Research Foundation, 22-Site IV, Sahibabad-201010.	Member
14.	Dr. M.A. Iyengar, Prof. of Pharmacognosy, College of Pharmaceutical Sciences, Kasturba Medical College, Manipal-576119.	Member
15.	Dr. M.K. Raina, 203, Rainbow Apartments, Raheja Vihar, Powai, Bombay-400012.	Member
16.	Dr. Balaji Tambe, Chairman, ATM Santulan, Vill. (P.O.) Kurla, Pune, Maharashtra.	Member

17. Dr. M.S. Ansari, Member
454-E, Kaila, Behind Masjid,
Ghaziabad (UP).

18. Dr. S.K. Sharma, Member-Secretary
Adviser (Ayurveda) I/C,
Ministry of Health & Family Welfare,
Department of ISM & H,
New Delhi.

2. Terms of the Committee shall be as follows : -

i. The term of the Committee shall be for a period of 3 years from the date of its first meeting and the members shall hold office for that period.

ii. The Chairman of the Committee shall have the powers to form sub-committee whenever required and to co-opt experts from out side such sub-committees.

iii. the committee will have the power to frame rules and procedures of functioning.

3. The Functions of the Committee shall be as follows :-

(a) To prepare an Ayurvedic Pharmacopoeial of India of single & compound drugs.

(b) To prescribe the working standards for compound Ayurvedic formulations including tests for identity, purity and quality so as to ensure uniformity of the finished formulations.

(c) Keeping in view the time constraint, to identify such methods, procedures and plan of work enable the formulary and standards of all commonly used drugs to be brought out in a phased manner.

(d) To prepare remaining parts of the official formulary of compound preparations from the classical texts listed with Ist schedule of the Drugs & Cosmetics Act including standardised compositions, methods of preparations, dosage, toxicity and administrations with various anupanas of vehicles.

4. The following are the targets of the Committee :-

(i) To evolve standards of single drugs mentioned in the Ayurvedic Formulary of India.

The Ayurvedic Pharmacopoeia Committee (APC) was reconstituted under the Deptt. of ISM&H consisting of following members vide letter No.X-19011/6/94-APC dated 21st June, 2001.

1. Dr. P.D. Sethi, M.Pharma, Ph.D., Chairman
B-140, Shivalik Enclave, New Delhi-110 017.

OFFICIAL MEMBERS

2. Drugs Controller General (I), Member (Ex-officio)
Ministry of Health & Family Welfare,
Nirman Bhawan, New Delhi.

3. Director, Member (Ex-officio)
Pharmacopoeial Laboratory of Indian Medicine,
Central Govt. Offices Complex,
Kamla Nehru Nagar, Ghaziabad-201 002.

4.	Director, Central Council for Research in Ayurveda & Siddha, 61-65, Institutional Area, D-Block, Janakpuri, New Delhi.	Member (Ex-officio)
5.	Managing Director, Indian Medicines and Pharmaceuticals Ltd., Mohan, Uttaranchal (U.P.).	Member (Ex-officio)

NON-OFFICIAL MEMBERS

6.	Prof. S.S. Handa, M.Pharma, Ph.D., F-7, 3rd Floor, Lajpat Nagar-III, New Delhi-110 024.	Member
7.	Ms. S. Satakopan, M.Sc., 40-A, Ist Main Road, (Opp. Pillayar Koil) Nanganallur, Chennai-600 061.	Member
8.	Vaidya Devendra Triguna, Ayurvedacharya, 143-Sarai Kale Khan, Nizamuddin East, New Delhi.	Member
9.	Dr. I. Sanjiva Rao, D. Ay. M., Sri Sai Krupa, 5-8-293/A-Mahesh Nagar, Chirag Ali Lane, Hyderabad-500 001.	Member
10.	Dr. Madhavan Kutti Warrier, M.D. (Ay.), Arya Vaidya Sala, Malappuram Distt., Kottakkal-676 503 (Kerala).	Member
11.	Dr. G.N. Tiwari, M.D. (Ay.), Ph.D., Shri Ayurveda Mahavidyalaya, Nagpur.	Member
12.	Dr. V.V. Prasad, M.D. (Ay.), Ph.D., Director, Rashtriya Ayurveda Vidyapeeth, Dhanvantri Bhavan, Road No.66, Punjabi Bagh (West), New Delhi – 110 026.	Member
13.	Dr. M.R. Uniyal, Former Director, CRIA (CCRAS, Patiala) and presently – Director (Drugs), Maharishi Ayurved Products, 17/18, Noida Export Processing Zone, NOIDA – 201 305 (U.P.).	Member

14.	Dr. (Prof.) S.K. Dixit, Ph.D., Head of the Department of Rasa Shastra, Institute of Medical Sciences, Banaras Hindu University, Varanasi – 221 005.	Member
15.	Vaidya D.R. Acharya, GAMS, Ph.D., Former Principal, Govt. Ayurvedic College, Paprola, P.O. Paprola, Himachal Pradesh – 176 115.	Member
16.	Vaidya Sidhinandan Mishra, GAMS, Ph.D., Former Director, Ayurvedic Pharmacy, G.A.U., Jamnagar (Presently at Varanasi).	Member
17.	Dr. M.A. Iyengar, M.Pharma, Ph.D., Prof. of Pharmacognosy, College of Pharmaceutical Sciences, Kasturba Medical College, Manipal – 576 119.	Member
18.	Dr. M.K. Raina, M.Sc., Ph.D., 203, Rainbow Apartments, Raheja Vihar, Powai, Mumbai – 400 012.	Member
19.	Dr. K.K. Sharma, M.Sc., Ph.D., Scientist F, Wadia Himalaya Institute of Geology, Dehradun.	Member
20.	Dr. Narender Nath Mehrotra, M.Sc. Ph.D., Sr. Scientist (E II), National Information Centre for Drugs & Pharmaceuticals, Central Drug Research Institute, Lucknow.	Member
21.	Dr. M.S. Ansari, M.Sc., Ph.D., 454-E, Kaila, Behind Masjid, Ghaziabad (U.P.).	Member
22.	Dr. (Mrs.) Shanta Mehrota, M.Sc., Ph.D., Incharge of the Drug Standardization Unit, National Botanical Research Institute (CSIR), Rana Pratap Marg, P.B. No.-436, Lucknow-226 001.	Member
23.	Dr. C.K. Katiyar, M.D. (Ayu.), Ph.D., Medical Advisor, Dabur India Limited, 22, Site IV, Sahibad, Ghaziabad – 201 010.	Member
24.	Dr. G.G. Parikh, M. Pharma, Ph.D., Managing Director, Zandu Pharmaceutical Works Ltd., 70, Gokhale Road South, Dadar, Mumbai – 400 025.	Member

25. Dr. K.C. Chunekar, Ph.D., Member
18/7, Ratan Phatak,
Varanasi.

26. Dr. S.K. Sharma, M.D. (Ay.), Ph.D., Member Secretary
Advisor (Ayurveda), Deptt. of ISM & H,
Red Cross Building, New Delhi.

1. The term of the Committee shall be for a period of 3 years from the date of its first meeting and the members shall hold office for that period.

2. The Chairman of the Committee shall have the powers to form sub-committees whenever required and to co-opt experts from outside for such sub-committees.

3. The Committee shall have the power to frame rules and procedures of functioning.

4. The functions of the Committee shall be as follows:

(i) To prepare a Ayurvedic Pharmacopoeia of India of single and compound drugs.

(ii) To prescribe the working standards for compound Ayurvedic formulations including tests for identity, purity and quality so as to ensure uniformity of the finished formulation.

(iii) Keeping in view the time constraint, to identify such methods, procedures and plan of work as would enable the formulary and standards of all commonly used drugs to be brought out in a phased manner.

(iv) To prepare remaining parts of the official formulary of compound preparations from the classical texts listed with Ist Schedule of the Drugs & Cosmetics Act including standardized compositions, methods of preparations, dosage, toxicity and administrations with various anupanas of vehicles.

5. The following are the targets of the Committee:

(i) To evolve standards of single drugs mentioned in the Ayurvedic formularies of India.

(ii) To evolve standards for compound formulations mentioned in the Ayurvedic formularies of India.

(iii) To prepare drafts of Ayurvedic formularies of India from the classical texts listed in the Ist Schedule of the Drugs & Cosmetics Act and other sources.

The Ayurvedic Pharmacopoeia Committee (APC) has further been reconstituted under the Deptt. of AYUSH consisting of following members vide letter No.X-19011/6/94-APC (AYUSH) dated 9th March, 2005.

Ms. S. Satakopan, M.Sc., Chair-Person
Former Drug Analyst,
Government of Gujarat,
7/4, Padmam Flats, Seventh Street,
Nanganallur, Chennai – 600 061.

OFFICIAL MEMBERS

1. Drugs Controller General (India), Member (Ex-officio)
Ministry of Health & Family Welfare,
Nirman Bhawan, New Delhi – 110 011.

2.	Director, Pharmacopoeial Laboratory for Indian Medicine, Central Govt. Offices Complex, Kamla Nehru Nagar, Ghaziabad – 201 002.	Member (Ex-officio)
3.	Director, Central Council for Research in Ayurveda & Siddha, 61-65, Institutional Area, D-Block, Janakpuri, New Delhi – 110 058.	Member (Ex-officio)
4.	Managing Director, Indian Medicines Pharmaceutical Corporation Ltd., Mohan, Via – Ram Nagar, Distt.- Almora, Uttranchal.	Member (Ex-officio)
5.	Advisor (Ayurveda), Department of AYUSH, Red Cross Society Building, New Delhi – 110 001.	Member Secretary

NON-OFFICIAL MEMBERS

Sub-Committee of Phytochemistry & Chemistry (of APC)

1.	Prof. S.S. Handa, M. Pharma, Ph.D., (Former Director, RRL), 522-A, Block 'C', Sushant Lok, Phase-I, Gurgaon, Haryana – 122 001.	Member
2.	Dr. P.D. Sethi, M. Pharma, Ph.D., Former Director, Central Indian Pharmacopoeial Laboratory, B-140, Shivalik Enclave, New Delhi – 110 017.	Member
3.	Shri J.K. Dhing, M.Sc, Former Chief Manager (Exploration), Hindustan Copper Ltd., SF-8, Sector-5, (Gayatri Nagar) Hiran Magri, Udaipur – 313 002. (Rajasthan).	Member
4.	Prof. V.K. Kapoor, M. Pharma, Ph.D., Deptt. of Pharmaceutical Chemistry University Institute of Pharmaceutical Sciences, Punjab University, Chandigarh, Punjab – 160 014.	Member

Sub-Committee on Pharmacognosy (of APC)

5.	Ms. S. Satakopan, M.Sc, (Former Drug Analyst), Government of Gujarat, 7/4, Padmam Flats, Seventh Street, Nanganallur, Chennai – 600 061.	Member
6.	Dr. (Mrs.) Shanta Mehrotra, M.Sc., Ph.D., Emeritus Scientist, National Botanical Research Institute, Rana Pratap Marg, P.B. No.-436, Lucknow – 226 001 (U.P.).	Member
7.	Dr. M.A. Iyengar, M. Pharma, Ph.D, Prof. of Pharmacognosy (Retd.), 14, HIG, HUDCO, Manipal – 576 119.	Member
8.	Dr. J. Mohanasundraram, M.D., Former Professor of Pharmacology & Deputy Director of Medical Education, Chennai.	Member

Formulary Sub-Committee of APC:
(Ras Shastra/Bhaishjya Kalpana – Ayurvedic Pharmacy)

9.	Dr. (Prof.) S.S. Dixit, M.D. (Ay.), Ph.D., (Former Head of the Department of Rasa Shastra, BHU), B-3/402, Shivala, Varanasi – 221 005 (U.P.).	Member
10.	Vaidya Siddhinandan Mishra, GAMS, Ph.D., Pharmacy In-charge, H.P.A., SDM, Ayurvedic College, P.O. Kuthpady, Udupi – 574 118, (South Karnataka).	Member
11.	Prof. Ved Vrat Sharma, H.P.A., (Former Principal, DAV Ayurvedic College), House No. 65, Sector-8, Panchkula, Haryana.	Member
12.	Dr. Narendra Bhatt, M.D. (Ay.), Chief Executive Officer, Zandu Pharmaceutical Works Ltd., 70, Ghokhle Road (South), Dadar, Mumbai – 400 025.	Member
13.	Shri Ranjit Puranik, General Manager, Shree Dhootapapeshwar Ltd., 135, Nanubhai Desai Road, Khetwadi, Mumbai.	Member

14.	Dr. P.K. Prajapati, M.D. (Ay.), Ph. D., Reader & Head, Deptt. of Ras Shastra, IPGT & RA, Gujarat Ayurved University, Jamnagar, Gujarat – 361 008.	Member
15.	Dr. B.L. Gaur, Ph.D., Director, National Institute of Ayurveda, Madhav Vilas, Amer Road, Jaipur, Rajasthan – 302 002.	Member

Ayurveda Sub-Committee of APC
(Single Drugs of Plants, Minerals, Metals, Animal origin)

16.	Prof. K.C. Chunekar, Ph.D., (Former Reader, Deptt. of Dravyaguna, BHU), 18/7, Ratan Phatak, Varanasi, (U.P.).	Member
17.	Vaidya Devender Triguna, Ayurvedacharya, "PADAM SHREE", 143-Sarai Kale Khan, Nizamuddin East, New Delhi.	Member
18.	Dr. M.R. Uniyal, M.D. (Ay.), Ph.D., (Former Director, CRIA, CCRAS), Director (Drugs), Maharishi Ayurved Products, 17/18, NOIDA Export Processing Zone, NOIDA – 201 305.	Member
19.	Prof. V.K. Joshi, M.D. (Ay.), Ph.D., Deptt. Dravyaguna, Institute of Medical Sciences, Banaras Hindu University (BHU), Varanasi – 221 005 (U.P.).	Member
20.	Prof. V.V. Prasad, M.D. (Ay.), Ph.D., Director, Rashtriya Ayurveda Vidyapeeth, Dhanvantri Bhawan, Road No. 66, Punjabi Bagh (West), New Delhi – 110 026.	Member
21.	* Dr. S.K. Sharma, M.D. (Ay.), Ph.D. Advisor (Ay.), Deptt. of AYUSH, Ministry of Health & Family Welfare, Govt. of India, New Delhi.	Member Secretary

1. The term of the Committee shall be for a period of 3 years from the date of its first meeting and the members shall hold office for that period.

2. The chairman of the APC shall have the powers to form sub-committees whenever required and to co-opt experts from outside for such sub-committees.

3. The Committee shall have the power to frame procedures of functioning.

4. The functions of the Committee shall be as follows:

(i) To prepare a Ayurvedic Pharmacopoeia of India of single and compound drugs.

(ii) To prescribe the working standards for compound Ayurvedic formulations including tests for identity, purity, strength and quality so as to ensure uniformity of the finished formulations.

(iii) Keeping in view the time constraint, to identify such methods, procedures and plan of work as would enable to publish the formulary and standards of all commonly used drugs to be brought out in a phased manner.

(iv) To prepare remaining parts of the official formulary of compound preparations from the classical texts including standardized composition of reputed institution.

(v) To develop and standardize methods of preparations, dosage form toxicity profile etc.

(vi) To develop Quality standards, safety, efficacy profile of Intermediates like extracts of Ayurvedic raw drugs.

(vii) To develop the Quality standards, safety, efficacy profile of different parts of the plants; as well as to inclusion of new plants as Ayurvedic drugs.

(viii) Any other matter relating to the Quality standards, shelf life, identification, new formulations etc.

5. The following are the targets focus of the Committee:

(i) To evolve standards of single drugs mentioned in the Ayurvedic formularies of India.

(ii) To evolve standards for compound formulations mentioned in the Ayurvedic formularies of India & other Ayurvedic formulations of National Priority.

(iii) To prepare drafts Standard Operation Procedure of Manufacturing Process (SOP) of Ayurvedic formularies of India from the classical texts and other authentic sources.

Contributing Laboratories & Institutions

The following institutions have carried out the scientific work of monographs under APC scheme :

1. Central Institute of Medicinal and Aromatic Plants (Council of Scientific & Industrial Research), Lucknow.
2. I.P.G.T.R.A. Gujarat Ayurved University, Dhanvantari Mandir, Jamnagar.
3. Industrial Toxicology Research Centre (Council of Scientific & Industrial Research), Lucknow.
4. Jawaharlal Nehru Ayurvedic Medicinal Plants Garden & Herbarium (Central Council for Research in Ayurveda and Siddha), Pune.
5. National Botanical Research Institute (Council of Scientific & Industrial Research), Lucknow.
6. National Institute of Pharmaceutical Education & Research, S. A. S. Nagar (Punjab).
7. C.S.M.D.R.I.A. Central Council for Research in Ayurveda and Siddha, Department of AYUSH, New Delhi.
8. Pharmacopoeial Laboratory for Indian Medicine, Department of AYUSH, Ghaziabad.
9. Govt. Drug Testing Laboratory, Joginder Nagar, Distt. Mandi (H.P.).
10. Regional Research Laboratory (Council of Scientific & Industrial Research), Jammu - Tawi.
11. Regional Research Laboratory (Council of Scientific Industrial Research), Bhubaneswar.
12. Shri Ayurved Mahavidyalaya, Dhanwantari Marg, Hanuman Nagar, Nagpur.
13. University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh.

ABBREVIATIONS FOR PARTS OF PLANTS

Flower	Fl.
Fruit	Fr.
Heart Wood	Ht. Wd.
Leaf	Lf.
Pseudo-bulb	Pseudo-bulb
Root Bark	Rt. Bk.
Root	Rt.
Rhizome	Rz.
Seed	Sd.
Stem Bark	St. Bk.
Stem	St.
Tuberous Root	Tub. Rt.
Wood	Wd.
Whole Plant	Wh.Pl.

Indo-Romanic Equivalents of Devanagari Alphabets

अ	a	ड	ḍa
आ	ā	ढ	ḍha
इ	i	ण	ṇa
ई	ī	त	ta
उ	u	थ	tha
ऊ	ū	द	da
ऋ	ṛ	ध	dha
ए	a	न	na
ऐ	ai	प	pa
ओ	o	फ	pha
औ	au	ब	ba
ं	ṁ	भ	bha
:	ḥ	म	ma
क	ka	य	ya
ख	kha	र	ra
ग	ga	ल	la
घ	gha	व	va
ङ	ṅa	श	śa
च	ca	ष	ṣa
छ	cha	स	sa
ज	ja	ह	ha
झ	jha	क्ष	kṣa
ञ	ña	त्र	tra
ट	ṭa	ज्ञ	jña
ठ	ṭha		

MONOGRAPHS

ĀMRA HARIDRĀ (Rhizome)

Āmra Haridrā consists of the rhizome of *Curcuma amada* Roxb. (Fam. Zingiberaceae), a biennial with ovoid root stock, 60 to 90 cm high, grown in W. Bengal and on the hills of west coast of India.

SYNONYMS –

Sansk.	:	Āmrārdrakam, Āmragandha-haridrā
Beng.	:	Aamaa Aadaa
Eng.	:	Mango-ginger
Guj.	:	Aambaa haldhar
Hindi	:	Aamaa-haldi, Amiyaa haldi
Kan.	:	Ambarasini, Huli Arsin
Mal.	:	Mangayinji
Mar.	:	Aambe halad, Ambaa halad
Punj.	:	Ambiya haladi
Tam.	:	Mankayyinji
Tel.	:	Mamidi Allamu

DESCRIPTION –

a) Macroscopic :

Rhizome laterally flattened, longitudinally wrinkled, 2 to 6 cm long, 0.5 to 2 cm in diameter, branched, remnant of scaly leaves arranged circularly giving the appearance of growth rings; cut pieces 1.5 to 3.5 cm in diameter, circular, punctate scars on the surface, branching sympodial, horizontal; roots long, unbranched, tapering, thread like, yellowish-brown; rhizome buff coloured with short and smooth fracture; odour and taste like raw mango.

b) Microscopic :

T.S. of rhizome circular in outline; epidermal cells rectangular-oval; cuticle thick, long unicellular trichomes present, storied suberized cork cells interrupted by lysigenous oil glands; a wide cortex having irregularly scattered vascular bundles, each vascular bundle with a prominent fibrous sheath; inner limit of cortex marked by endodermis followed by pericycle; vascular bundles devoid of sheath, arranged in a ring; schizogenous canals and abundant oil cells with suberized walls found in cortex and in central region; most of the parenchymatous cells filled with starch grains, which are oval-ellipsoidal, sometimes polygonal in shape, 10 to 60 μm, simple, hilum circular or a 2 to 5 rayed cleft, lamellae distinct and concentric; vascular bundles in the central cylinder are similar to those in the cortex, scattered, closed, collateral, surrounded by sheath of thick walled cells; secondary wall thickening reticulate; fibres thin walled lignified, lumen narrow.

Powder - Powder light yellow, sweet, raw mango like odour; shows fragments of storied cork, xylem vessels with reticulate thickenings, lignified xylem fibres, oil cells, patches of parenchymatous cells filled with starch grains which are oval-ellipsoidal, sometimes polygonal in shape, 10 to 60 μm, simple, hilum circular or a 2 to 5 rayed cleft, lamellae distinct and concentric. Powder when treated with 1N aqueous NaOH becomes green with yellowish tinge under UV 254 nm; with 1N HCl and nitrocellulose in amylacetate added one after the other, powder becomes orange in daylight.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 12 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 2 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 9 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 14 percent, Appendix 2.2.7.
Starch	-	Not less than 16 percent, Appendix 2.2.13.
Essential oil	-	Not less than 1 percent, Appendix 2.2.10.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate : methanol (5 : 0.5 : 0.05) shows fluorescent zones at Rf. 0.10 (green) and 0.34 (blue) under UV (366 nm). On spraying with anisaldehyde-sulphuric acid reagent and heating the plate for ten minutes at 120^0C, spots of purple colour appear at Rf. 0.16, 0.32, 0.72 and 0.97.

CONSTITUENTS – Volatile oil (α-pinene, δ-camphor), α-curcumene, 1-β curcumene, phytosterol.

PROPERTIES AND ACTION -

Rasa	:	Madhura, Tikta
Guṇa	:	Laghu, Sara
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Vṛṣya, Ruciprada, Dīpanī

IMPORTANT FORMULATIONS - Asthisandhānaka Lepa

THERAPEUTIC USES – Kaṇḍu; Vrana; Kāsa; Śvāsa; Hikkā; Jvara; Abhighātaja Śopha; Karṇaśūla; Sannipāta

DOSE - 2- 4 g.

ANISŪNA (Fruit)

Anisūna consists of dried fruit of *Pimpinella anisum* Linn. (Fam. Apiaceae); an annual erect plant introduced and cultivated in India at Uttar Pradesh, Orissa and Punjab.

SYNONYMS -

Sansk	:	Śvetapuṣpā
Beng.	:	Muhuri
Eng.	:	Anise
Hindi	:	Badiyan Rumee, Sauph, Anisoon
Mar.	:	Anisuna Shopa
Tam.	:	Shombu

DESCRIPTION -

a) Macroscopic:

The fruits are entire cremocarp, 3 to 5 mm long and 1 to 2 mm wide, ovoid, generally attached with slender pedicel, stylopods with bifurcate short styles; greenish-yellow or greenish-brown in colour; rough to touch due to the presence of trichomes; primary ridges 8 to 12 in number with uniform width; odour characteristic and taste sweet and aromatic.

b) Microscopic:

T.S. of fruit shows single layered epidermis with small, numerous, conical, mostly unicellular, occasionally two celled, thick walled and warty trichomes, vascular tissues present under the ridges; about 40 vittae are present on the dorsal surface and two large vittae on commissural surface; a few of the vittae are branched; small patch of mesocarpic stone cells are present at the commissural surface; inner epidermis represented by parquetry layer consisting of tangentially elongated cells; endosperm exhibits thick walled parenchyma cells with numerous aleurone grains usually containing a minute rosette of calcium oxalate and occasionally oil globules.

Powder - Powder shows fragments of vascular elements with scalariform, spiral and reticulate thickening; striated epidermal cells with occasional anomocytic stomata, thin walled parenchyma cells, tangentially elongated cells of parquetry layer, thick walled cells of endosperm with aleurone grains containing minute rosettes of calcium oxalate and oil globules, scattered aleurone grains with crystals of calcium oxalate and small conical, unicellular, occasionally bicellular, warty trichomes; fibres, stone cells and vittae with underlying parquetry cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 15 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 30 percent, Appendix 2.2.7.

T.L.C. -

TLC of alcoholic extract on Silica gel 'G' plates (Merck), using Toulene : Ethyl acetate (93.7) shows under UV (254nm) five spots at Rf.0.18, 0.32(both orange), 0.38(white), 0.44 (red), 0.88(violet); on exposure to iodine vapours four yellow spots appear at Rf.0.23, 0.32, 0.38 and 0.88; on exposures to with vanillin-sulphuric acid and heating the plate at 110^0C for 10 minutes, six violet spots appear at Rf. 0.18, 0.23, 0.32, 0.38, 0.60 and 0.88.

CONSTITUENTS - Volatile oil, fixed oils and protein.

ASSAY - The drug on steam distillation yields colourless oil, not less than 1.8% v/w (Appendix 2.2.10).

PROPERTIES AND ACTION -

Rasa	:	Tikta, Kaṭu
Guṇa	:	Tīkṣṇa, Laghu
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātānulomaka, Rakṣoghna, Kaphahara, Ārtavajanana

IMPORTANT FORMULATIONS - Brāhmī Vaṭī

THERAPEUTIC USES – Śūla; Ādhmāna; Kaphavikāra; Mūtraghāta; Bālagraha

DOSE - 1-3 g.

- Q. S. for dhupanārtha [fumigation].

AṄKOLAḤ (Leaf)

Aṅkolaḥ consist of dried leaf of *Alangium salviifolium* (Linn. f.) Wang. syn. *A. lamarckii* Thw.; (Fam. Alangiaceae), a small tree found over the plains and foothills throughout India.

SYNONYMS -

Sansk.	:	Ankola, Aṅkoṭa, Deerghakeela, Nikochaka, Tāmraphala, Gupta Sneha
Beng.	:	Akarkanta, Baghankura, Aankod, Angkura, Dhalakura
Eng.	:	Sage-leaved Alangium
Guj.	:	Ankol, Onkla
Hindi	:	Ankol, Ankora, Dhera
Kan.	:	Ankolimara, Ansaroli, Arinjil, Ankol
Mal.	:	Ankolam, Velittanti, Irinjil, Chemmaram
Mar.	:	Ankola
Ori.	:	Ankul, Baghonokhiya, Dolanku, Konkonolo
Tam.	:	Alangi, Ankolum, Atikoevam
Tel.	:	Ankolamu, Udagu, Urgen
Urdu	:	Ankola

DESCRIPTION -

a) Macroscopic:

Leaves 8 to13 cm in length and 3 to 5 cm in width, simple, petiolate, petiole 6 to13 mm long, lanceolate, narrowly oblong or ovate, base rounded or acute, glabrous above, pubescent on the nerves, venation reticulate.

b) Microscopic:

Leaf -

Petiole - Epidermis single layered, covered by cuticle; nonglandular, mostly unicellular, rarely bicellular, uniseriate trichomes, measuring upto 280 μ in length and upto 16 μ in width; 7 to10 layered collenchyma present just beneath the epidermis, followed by parenchymatous tissue; collateral vascular bundles 3 to10 in number arranged in an arch and surrounding parenchymatous pith; vascular bundles composed of xylem and phloem; xylem consists of fibres, tracheids and xylem parenchyma; abundant rosette crystals of calcium oxalate present in the parenchyma tissue, measuring upto 45 μ in diam.; granulated pigments noticed in all tissues except in the vascular bundle.

Midrib - T.S. shows biconvex outline; epidermis on both surfaces covered by cuticle; abundant nonglandular, unicellular trichomes measuring upto 385 μ in length and upto 16 μ in width present on epidermis; 4 or 5 layered collenchyma situated just beneath the epidermis; collenchyma followed by 3 or 4 layered chlorenchyma; vascular bundle

surrounded by sclerenchymatous tissue except on lateral sides; phloem located on the outer peripheral parts of xylem; xylem mainly consists of tracheids, vessels and fibres; central part of the midrib occupied by parenchyma cells, containing rosettes of calcium oxalate crystals, measuring upto 20 μ in diam.

Lamina - T. S. shows dorsiventral structure; epidermis on both the sides covered by cuticle; in surface view the lower epidermis shows straight walled, polygonal cells with prominent cuticular striations and anomocytic type of stomata; upper epidermis either devoid of stomata or with rare ones; cuticular striations also absent; nonglandular, unicellular trichomes similar to midrib abundant on lower epidermis; upper epidermis followed by a two layered palisade; mesophyll traversed by veins. Dispersed in the region are rhomboid calcium oxalate crystals, measuring 10 to 26 μ in length and 6 to 16 μ in width; palisade ratio 7 to 11; vein islet number 8 to 12; stomatal index 7 to 14.

Powder - Greenish brown, taste bitter; shows tracheids, vessels, lignified fibres with tapered ends measuring 40 to 280 μ in length and upto 20 μ in width, rosettes of calcium oxalate crystals, rhomboid crystals, nonglandular unicellular trichomes, groups of palisade cells, fragments of upper epidermis and lower epidermis with anomocytic stomata.

IDENTITY, PURITY AND STRENGTH -

Foreign Matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 10 per cent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 per cent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 5 per cent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 15 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the alcoholic extract on silica gel G plates (0.2 mm thick) using toluene: ethyl acetate: diethylamine (60:30:10) shows under UV (254 nm) six spots at Rf. 0.12 (brown), 0.17, 0.21,0.38 (all violet), 0.60 and 0.66 (both yellowish green). Under UV (366 nm) eight fluorescent spots appear at Rf. 0.12, (yellow) 0.17, 0.21(both faint blue), 0.24 (blue), 0.30 (pink), 0.38 (blue), 0.60 and 0.66 (both pink). On exposure to iodine vapour nine spots appear at Rf. 0.12, 0.17, 0.21 (all yellowish brown), 0.24 (reddish brown), 0.30, 0.38, 0.50 (all yellowish brown), 0.60 and 0.66 (both green). On spraying with Dragendorff's reagent six orange spots appear at Rf. 0.17, 0.21, 0.24, 0.30, 0.38, 0.50.

ASSAY -

Contains not less than 0.35 per cent of alkaloid as determined by the following method :-

Soxlet extract coarsely crushed (25g) dried leaves of *A. salviifolium* with n-hexane (700 ml) for 15 hours. Leave the exhausted (defatted) plant material to dry at room temperature and then extract with methanol (500 ml) for 16 hours. Remove methanol under reduced pressure, acidify with 3 % acetic acid, wash with diethyl ether (3 x 100 ml) and make aqueous phase alkaline with 10 % aqueous sodium carbonate. Extract the liberated (free) alkaloids first with dichloromethane (3 x 100 ml) and then with ethyl acetate (5 x 100 ml). Combine both the extracts, evaporate to dryness and weigh the residue as total alkaloids.

CONSTITUENTS - Alkaloids (Alangimarckine, deoxytubulosine, ankorine); campesterol, episterol, stigmast-5,22,25-trien-3β-ol, alangidiol and isoalangidiol.

PROPERTIES AND ACTION -

Rasa	:	Tikta, Kaṭu, Kaṣāya
Guṇa	:	Laghu, Snigdha , Tīkṣṇa, Sara
Vīrya	:	Uṣna
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Vāmaka, Recaka, Vraṇaśodhaka, Mūtrala, Pārada śodhra, Jvarghna

IMPORTANT FORMULATIONS – (No formulation)

THERAPEUTIC USES – Matsyaviṣa; Amavāta, Jvara, Kaṇtharoga; Sotha, Sopha, Sūla, Kṛmi, Visarpa, Graha bādhā, Raktavikāra, Muṣakaviṣa, Jantuviṣa, Lūtāviṣa, Kukkuraviṣa, Viṣarikāra

DOSE - 2-10 g.

ĀRAGVĀDHA (Stem Bark)

Āragvādha consists of stem bark of *Cassia fistula* Linn. (Fam. Fabaceae), a medium sized deciduous tree, 6 to 9 m tall with bright yellow flowers in long pendulous racemes, and long cylindrical blackish-brown pods of 25 to 50 cm in length and upto 3 cm in width; found wild and also commonly planted as ornamental tree in most parts of the country up to an altitude of 1200 m.

SYNONYMS -

Sansk.	:	Kṛtamāla, Vyādhighāta, Śampāka, Śamyāka, Ṇrpadruma, Kṛtamālaka, Rājavṛkṣa
Beng.	:	Sondaalee, Sonaalu
Eng.	:	Indian Laburnum, Purging Fistula, Pudding pipe tree
Guj.	:	Garmaalo
Hindi	:	Amaltaas, Girimaal
Kan.	:	Kakke, Kakkemar
Mal.	:	Konna
Mar.	:	Baahvaa
Ori.	:	Sunaari
Punj.	:	Amaltaas, Kaniyaar, Girdnalee
Tam.	:	Konnai
Tel.	:	Rela
Urdu.	:	Amaltaas

DESCRIPTION -

a) Macroscopic :

Drug occurs in flat or curved thick pieces; outer surface smooth to rough with warty patches; greenish-grey to red; inner surface rough, reddish with parallel striations; fracture, laminate; odour, sweet and characteristic; taste, astringent.

b) Microscopic :

Stem bark shows 5 to 8 layers of cork, composed of square to rectangular cells; cortex many layered, outer consisting of rectangular cells, middle tangentially elongated cells and inner of polygonal cells; groups of stone cells, oval to elongated arranged tangentially forming a continuous or discontinuous band; fibres present in groups in rest of the cortex; phloem shows sieve elements, phloem parenchyma and bast fibres in patches, traversed by uni to triseriate medullary rays of radially elongated oval cells; phloem parenchyma of rectangular to polygonal thin walled cells; bast fibres moderately thick walled, lignified, in groups surrounded by crystal fibres; abundant isolated calcium oxalate prism crystals present also in cells of outer cortex and inner cortex; starch grains mostly simple, but a few with 2 or 3 components in phloem parenchyma.

Powder -Light brown; shows thin walled parenchymatous cells; numerous bundles of lignified fibres associated with crystal fibres; sieve tubes, many, well-developed; numerous stone cells, thick walled, lumen nearly absent; abundant prismatic crystals of calcium oxalate mostly present singly in a cell and also as numerous crystal fibres; starch grains mostly simple, 2 or 3 in compound grains, hilum inconspicuous.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 13 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 25 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 18 percent, Appendix 2.2.7.

T.L.C.-

T.L.C. of the diethyl ether extract on precoated silica gel 'G' plate (0.2 mm thick) using petroleum ether : ethyl acetate : formic acid (15:2.5:0.2) showed spots at Rf 0.19, 0.28, 0.54 and 0.72 (all pink) on spraying with vanillin-sulphuric acid reagent and heating the plate at 105 °C for about ten minutes.

CONSTITUENTS- Anthraquinones, tannins, sterols.

PROPERTIES AND ACTION –

Rasa	:	Tikta
Guṇa	:	Guru
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Vātahara, Pittahara, Koṣṭhaśuddhikara

IMOPORTANT FORMULATIONS - Avittoladi Bhasma Kṣāra, Mānasamitra Vaṭaka

THERAPEUTIC USES – Gaṇḍamālā; Upadaṁsa; Kuṣṭha; Aruci; Vibandha; Śūla; Kāmalā; Hṛdroga; Raktapitta; Vātarakta; Śotha; Mūtrakṛcchra; Dāha; Jvara; Udaravikāra; Kṛmi; Prameha; Gulma; Vraṇa; Kaṇḍu; Grahanī; Aśmarī

DOSE - 50 - 100 ml kvātha.

ĀSPHOṬĀ (Root)

Āsphoṭā consists of the dried root pieces of *Vallaris solanacea* Kuntze syn. *V.heynei* Spreng. (Fam. Apocynaceae), a large woody climbing shrub, occurring wild in subtropical Himalayan forests, up to an altitude of 1500 m and on the Konkan coast and further south; often cultivated in the gardens as an ornamental plant due to its fragrant white flowers.

SYNONYMS –

Sansk.	:	Āsphoṭā, Bhadravallī
Beng.	:	Haaparmaali
Hindi	:	Dudhibel
Ori.	:	Bonokonerinoi, Haporomoli
Tel.	:	Nagamalle, Nityamalle

DESCRIPTION -

a) Macroscopic :

The dried, young and old root pieces are light, tough, cylindrical, tortuous and rarely branched. Young root about 5 to 6 cm. in length and about 1 to 2 cm. in diameter, surface smooth to faintly longitudinally wrinkled, with transversely elongated lenticels, cracks and exfoliation at places exposing the inner wood, buff to greyish externally, pale yellowish brown internally.

Old root pieces are about 5 to 12 cm. in length and 3 to 8 cm. in diameter, surface very rough, knotty, longitudinally fissured, furrowed, cracked, prominent rootlet scars present, small rounded protuberances encircle the lenticels and exfoliation; earthy brown to grey externally, pale brown internally; transversely cut surface shows brown coloured outer bark, colourless, papery, thin inner bark and a wide zone of pale brown central wood, occupying the major area of the root; odour slightly aromatic and irritant; taste, bitter.

b) Microscopic :

Cork many layered, outer one lignified, inner few layers suberised, cork cambium distinct 2 to 3 layered, cortex narrow in young root and compressed in old; parenchymatous, filled with cluster crystals of calcium oxalate and simple as well as compound starch grains; pericycle is characterised by the presence of isolated groups of small, thick walled, lignified fibres; phloem many layered, characterised by two distinct zones, cells of the outer one filled with yellowish brown contents, the inner narrow zone is devoid of this; medullary rays mostly uniseriate, rarely bi to fourseriate, narrow, almost running parallel to each other but becoming wavy in the outer phloem and abruptly getting broad at its extremities especially in case of old roots; sieve tubes, companion cells and phloem parenchyma distinct, all parenchymatous cells of the phloem including

medullary ray cells are filled with abundant clusters and a few prisms of calcium oxalate crystals and starch grains, microclusters of calcium oxalates arranged in rows form the characteristic feature of the phloem; thick walled, circular latex cells, rectangular, tangentially elongated oil channels filled with oil globules traverse throughout the phloem; a few thick walled, lignified, pitted stone cells are located especially in the old roots; cambium distinct, continuous; xylem very wide, lignified consisting of mostly isolated xylem vessels and tracheids, both border - pitted; fibers thin walled; parenchyma and medullarly rays pitted, containing starch grains.

Powder - Under the microscope it exhibits polygonal lignified cork cells in surface view, parenchymatous cells of the cortex and the phloem cells with starch grains and calicum oxalate cluster crystals, pitted xylem vessels and tracheids, lignified pitted medullary rays cells; occasionally groups of lignified thick walled, pitted stone cells and thin walled xylem fibres with wide lumen are also seen.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.7 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 6 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 11 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the methanolic extract on silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (9:1) under UV (254 nm) shows prominent spots at Rf. 0.51, 0.62, 0.68, 0.76 (all dark spot) and 0.96 (blue fluorescence). On exposure to iodine vapour spots appear at Rf. 0.12, 0.19, 0.29, 0.44, 0.50, 0.67, 0.80 and 0.95.

PROPERTIES AND ACTION –

Rasa	:	Tikta, Kaṣāya
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Vraṇaśodhaka

IMPORTANT FORMULATIONS – Vajraka Taila, Abhayā Lavaṇa

THERAPEUTIC USES – Aśmarī; Śūla; Mūtrakrcchra; Pūtanāgrahavista (Bālaroga); Kuṣṭha; Grahaṇī; Śvāsa; Mūsaka Viṣavikāra; Arśa; Vraṇa

DOSE - 3-6 g.

BASTĀNTRĪ (Root)

Bastāntrī consist of dried root of *Argyreia nervosa* (Burm.f.) Boj. syn. *A. speciosa* Sweet. (Fam. Convolvulaceae), a woody climber with stout stems, extensively planted in garden along trellises and walls and also found wild as an escape.

SYNONYMS -

Sansk.	:	Vṛddhadāru, Antah Koṭarapuṣpī, Chāgalāntrī
Beng.	:	Bijataadaka, Bridhadarak
Eng.	:	Elephant Creeper
Guj.	:	Samudara Sosha, Varadhaaro, Shamadrasosh
Hindi	:	Samandar-kaa-paat, Samundarsosh, Ghaavapattaa, Vidhaaraa
Kan.	:	Samudrapala, Samudraballi
Mal.	:	Samudra Pacchha, Samudra-Pala, Marikkunn Marututari
Mar.	:	Samudrashok
Tam.	:	Samudrappachai
Tel.	:	Samudrapaala
Urdu.	:	Samandarotha

DESCRIPTION –

a) Macroscopic :

Roots of varying sizes and thickness, thin pieces show somewhat smooth brownish exterior, thick pieces tough and woody, light brown in colour, rough, longitudinally striated, lenticellate and with circular root scars; fracture fibrous; rootlets and branches, thin and somewhat fibrous; odour, nil; taste, pungent, bitter and astringent.

b) Microscopic :

T.S. comprises of 6 to 9 layers of cork cells, a single layer of phellogen and usually 10 to 12 layers of phelloderm; cortical cells thin walled and tangentially elongated, containing circular starch grains, rosette crystals of calcium oxalate found scattered; a wide zone of secondary phloem consisting of sieve tubes, companion cells and phloem parenchyma present, traversed by medullary rays containing circular starch grains; resin canals present; secondary xylem a wide zone comprising of xylem vessels, tracheids, fibre-tracheids and fibres.

Powder - Creamish brown when fresh turning greyish brown on storage; shows under microscope, cortical cells parenchymatous filled with circular starch grain measuring between 3 to 16 μ in diameter; brown colouring matter and rosette crystals of calcium oxalate present; vessels, tracheids, xylem parenchyma, fibres and fibre tracheids present; vessels, drum shaped, pitted with large end perforations; tracheids, much longer than wide

with bordered pits; fibres having pointed ends; fibre tracheids, having blunt ends and a few oblique pits.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	- Not more than 1 per cent,	Appendix 2.2.2.
Total ash	- Not more than 11 per cent,	Appendix 2.2.3.
Acid insoluble ash	- Not more than 0.8 per cent,	Appendix 2.2.4.
Alcohol soluble extractive	- Not less than 4 per cent,	Appendix 2.2.6.
Water soluble extractive	- Not less than 8 per cent,	Appendix 2.2.7.

T.L.C. -

T.L.C. of methanolic extract of the roots on precoated silica gel G plate using methanol - chloroform (20 : 80) showed a blue fluorescent spot under UV (365nm) along with number of other spots of very weak intensity. Due to the presence of very negligible amount of alkaloids in the roots these could not be isolated. However, methanolic extract of *A. nervosa* seeds was prepared and T.L.C. compared with *A. nervosa* roots extract. The T.L.C. pattern of root and seed extracts (prepared in methanol) was similar although the intensity of spots in case of root extracts was very poor.

PROPERTIES AND ACTION -

Rasa	:	Kaṭu, Tikta, Kaṣāya
Guṇa	:	Sara, Laghu
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Kaphavātahara, Adhobhāgahara, Vṛṣya, Rasāyana, Āyurvṛdhikara, Balya, Medhya, Rucya, Svarya, Kaṇṭhya, Asthisandhāna Kārī, Agnikara, Kāntikara, Viṣaghna

IMPORTANT FORMULATIONS - Miśraka Sneha

THERAPEUTIC USES – Gulma; Mūtrakrchra; Aruci; Hṛdrujā; Ānāha; Udāvarta; Arśa; Udara; Graharbādhā; Śūla; Vātarujā; Raktapitta; Vātarakta; Āmavata; Śopha; Meha; Vātārśa; Svayathu; Kṛmi; Pāṇdu; Kṣaya; Kāsa; Unmāda; Apasmāra; Visūcī; Pratītum; Ślīpada

DOSE - 3-5 g.

BHURJAḤ (Stem Bark)

Bhurjaḥ consists of the stem bark of *Betula utilis* D.Don syn. *B.bhojpattra* Wall. (Fam. Betulaceae), a moderate sized tree, usually with a somewhat irregular bole; occasionally a mere shrub, forming the upper limit of forest vegetation, found throughout the main Himalayan range ascending to an altitude of 4200 m.

SYNONYMS -

Sansk.	:	Bhurja Patrah, Mṛducchada, Bahulavalkala, Bhūrjagranthi, Carmī, Lekhyapatrakah
Beng.	:	Bhoojpatra, Bhujipatra
Eng.	:	Himalayan Silver Birch
Guj.	:	Bhojpatra
Hindi	:	Bhojapatra
Mal.	:	Bhurjamaram
Mar.	:	Bhoorjapatra
Tam.	:	Bhojapatram
Tel.	:	Bhurjapatri

DESCRIPTION –

a) Macroscopic :

Broad, horizontal paper like strips, flaps or flakes of varying sizes or loosely laminated exfoliating pieces of bark; outer surface smooth silver grey or creamish-yellow with brown streaks; inner surface shining, reddish brown in colour, slightly wrinkled, more often devoid of markings; odour, slightly terbinthene; taste-none.

b) Microscopic :

T.S. shows rectangular cells, 6 to 9 layers of thin walled parenchymatous cells, containing prismatic calcium oxalate crystals.

Powder - Light brown; parenchymatous cells, with a few prismatic calcium oxalate crystals present.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 2.1 per cent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1.1 per cent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 19 per cent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 0.8 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of chloroform extract of the drug on a precoated silica gel G plate using n-hexane : ethyl acetate (9:1), on spraying with Liberman-Burchard reagent and heating the plate for about 5 minutes at 110°C, three spots appear at Rf . 0.31 (blackish-grey), 0.62 (dark pink) and 0.54 (light pink) and were comparable to the spots of betulin, lupeol and 3β-acetoxy-12-oleanen-28-oic acid respectively.

CONSTITUENTS - Betulin, lupeol and 3 β - aetoxy - 12 - oleanen - 28 - oic acid.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Kasāya
Guṇa : Laghu
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Tridoṣaśamana, Bhūtaraksākara, Viṣaghna, Balya, Śleṣmahara, Medohara

IMPORTANT FORMULATIONS – Ayaskrti

THERAPEUTIC USES – Karṇaroga; Raktapitta; Kuṣṭharoga; Rakṣoghnadhūpana; Vraṇa; Aparāpātana; Garbhasaṅga; Granthivisarpa; Bālagraha

DOSE - 1-3 g.

CAṆḌĀ (Root)

Caṇḍā consists of dried root of *Angelica archangelica* Linn. (Fam. Apiaceae), a tall perennial herb with thick hollow stem bearing large bipinnate leaves and umbels of greenish-white flowers; found wild in inner valleys of Himalayas viz. Kashmir, Chamba, Kullu, Pangi, Lahaul and Kinnaur at altitudes between 3200 and 4200 m.

SYNONYMS -

Sansk. : Laghu coraka
Hindi : Choraka bheda, Dudhachoraa

DESCRIPTION –

a) Macroscopic :

Tap root thick, twisted, fleshy, highly aromatic with numerous rootlets, greyish in colour; odour, musk-like; taste, sweet.

b) Microscopic :

T.S. shows periderm composed of 5 to 9 layers of cork, followed by a layer of phellogen and a few layers of phelloderm, cork cells rectangular; cortex composed of thin walled parenchymatous cells, irregular in shape with intercellular spaces and contain abundant starch grains; numerous oleo-resin cells filled with oil globules are present, which, in mature roots may degenerate and form irregular cavities; vascular region and cortex traversed by biseriate medullary rays, containing circular starch grains, measuring usually upto 24 μ but some upto 65 μ in length and 45 μ in breadth; phloem a wide zone composed of sieve tubes, companion cells, phloem parenchyma and medullary rays; schizogenous oleo-resin cells lined by epithelium containing yellowish brown substances present in this zone; cambium very distinct consisting of 4 to 8 layers; xylem consists of vessels and tracheids.

Powder - Creamish yellow; shows under microscope drum shaped vessels with reticulate thickenings, tracheids elongated with pointed ends having reticulate thickenings; fibres narrow elongated with pointed ends; circular starch grains present.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2.0 per cent, Appendix 2.2.2.
Total ash	-	Not more than 7 per cent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1.2 per cent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 10 per cent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 12 per cent, Appendix 2.2.7.
Volatile oil	-	Not less than 0.3 per cent, Appendix 2.2.10.

T.L.C. –

T.L.C. of the methanolic extract of the roots on precoated silica gel 'G' plates, using methanol : chloroform (2:98) as the mobile phase, on spraying with 2% vanillin in sulphuric acid reagent and heating the plate for five minutes at 110 °C showed on orange brown spot at Rf.0.37 (comparable to the spot of selimone) and a greyish blue spot at Rf.0.68 (comparable to the spot of archangelin).

CONSTITUENTS –

Essential oil: Containing limonene, α-phellandrene, pinene, p-cymene, terpinolene, myrcene, fenchone, linalool, α-terpineol, cadinene, borneol, β-caryophyllene, bisabolol, angelica lactone, and other mono and sesquiterpenes. Other constituents include selimone, archangelin, oxypeucedanin.

PROPERTIES AND ACTION -

Rasa	:	Kaṭu
Guṇa	:	Laghu, Tīkṣṇa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Śvāsahara, Mūtrala, Varṇaprasādaka, Svedaghna, Kaṇḍūghna, Viṣaghna, Daurgandhahara

IMPORTANT FORMULATIONS - Mañjisthādi Taila

THERAPEUTIC USES – Śotha; Śvāsa; Apasmāra; Hikkā; Arsa; Kaṇḍu; Pidakā; Koṭha

DOSE - 1-3 g.

CORAKAḤ (Root & Root Stock)

Corakaḥ consists of dried mature root and root stock of *Angelica glauca* Edgw. (Fam. Apiaceae), a glabrous herb, upto 1.5 m tall, stem erect, grooved and fistular with pinnately divided leaves having compound umbels of white or purple flowers, found in temperate north-west Himalayas.

SYNONYMS -

Sansk.	:	Taskarah, Ksemakah
Beng.	:	Chorak
Guj.	:	Chorak
Hindi	:	Choraa, Gandrayan, Rikha Choraa
Kan.	:	Choraka
Mal.	:	Choraka Pullu
Mar.	:	Corak
Punj.	:	Choraa, Churaa
Tel.	:	Gaddi Davanamu

DESCRIPTION –

a) Macroscopic :

Root stock : Small, thick pieces, 5 to 15 cm long and 1 to 3 cm in thickness; yellowish to grey in colour, rough due to the presence of deep furrows and longitudinal wrinkles; frequently crowned with leaf or stem base; fracture, hard and fibrous; odour characteristically aromatic; taste, sweet with a bitter after effect and pungent aromatic flavour.

Root : Small pieces of 5 to 20 mm in thickness, externally grayish-brown and spongy; surface rough due to longitudinal wrinkles, furrows and transverse cracks; internally it shows a yellow porous radiating wood surrounded by dark brown cork; fracture short, smooth and the fractured surface shows bark with numerous radially arranged schizogenous oleo-resin cavities with brown or yellow content.

b) Microscopic :

Root stock : T.S. shows 6 to 10 layered cork of tangentially elongated cells, followed by 3 or 4 layers of phellogen and a wide zone of phelloderm consisting of thin walled parenchyma in which schizogenous cavities present; phloem, cone shaped, traversed by parenchymatous medullary rays filled with circular starch grains measuring between 3 and 23 μ in diameter; numerous schizogenous oleo-resin cells present; cambium present; xylem arranged in concentric layers and consists of vessels, tracheids, fibres and xylem parenchyma and traversed by medullary rays; pith consists of thin walled parenchymatous tissue in which schizogenous oleo-resin cavities, filled with yellowish contents of resin are present.

Root : T.S. shows periderm consisting of 5 to 8 layers of thin walled yellowish - brown cork, a layer of phellogen and phelloderm, composed of thin-walled parenchyma cells, irregular in shape with intercellular space and containing abundant starch grains measuring upto 20 μ in diameter; some of these cells disintegrate in the mature roots and give rise to some irregular cavities; schizogenous type of oleo-resin cavities in this region contain oil globules and resin; phloem a wide zone and traversed by medullary rays, consisting of phloem parenchyma, sieve tubes and companion cells; numerous radially arranged schizogenous oleo-resin cavities present in phloem parenchyma, containing yellowish or yellowish-brown contents; cambium present; xylem diarch and radiating wood traversed by parenchymatous, multiseriate medullary rays filled with starch grains measuring upto 20 μ in diameter; wood consists of vessels, tracheids, wood parenchyma and wood fibres; vessels large, drum - shaped or elongated, reticulately thickened having oblique or transverse perforation.

Powder - Yellowish - brown, shows under microscope, parenchymatous cells filled with yellow or reddish-brown colouring matter and oil globules; schizogenous cavities and vessels with reticulate thickenings present; starch grains simple, oval to circular, upto 25μ approximately.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent,	Appendix 2.2.2.
Total ash	-	Not more than 6.5 per cent,	Appendix 2.2.3.
Acid insoluble ash	-	Not more than 2 per cent,	Appendix 2.2.4.
Alcohol soluble extractive value	-	Not less than 14 per cent,	Appendix 2.2.6.
Water soluble extractive value	-	Not less than 30 per cent,	Appendix 2.2.7.
Volatile oil	-	Not less than 0.4 per cent,	Appendix 2.2.10.

T.L.C. –

T.L.C. of essential oil of the drug on precoated silica gel G plate using ethyl acetate : hexane (3:97) shows under UV light (365 nm) four spots at Rf. 0.48, 0.40 & 0.29 (yellowish blue fluoresence) and 0.25 (blue fluoresence). On spraying with dragendroff's reagent two spots at Rf. 0.48 and 0.40 appeared as orange coloured. On spraying with 2% vanillin-sulphuric acid appears four spots at Rf 0.48 & 0.40 (greyish-purple), 0.29 (cremish) and 0.25 (pinkish-purple).

The methanol extract of the drug on precoated silica gel G plate, using methanol-chloroform (2: 98) shows one spot at Rf. 0.71, and ethyl acetate : hexane (5:95) appear single spot at Rf. 0.21 (yellowish–blue colour) under UV light (365 nm) and was comparable to the spot of oxypeucedanin.

CONSTITUENTS - Oxypeucedanin, 3-butylidene phthalide, 3-butylidene dihydrophthalide [(E-and (Z)-ligustilide] and dimers of butyl phthalides [angiolide, angelicolide].

PROPERTIES AND ACTION -

Rasa	:	Madhura, Tikta, Kaṭu
Guṇa	:	Laghu, Tīkṣṇa, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara Kaphahara, Medohara, Swedahara, Hṛdya, Sajñasthāpana, Dīpana, Pācana, Vranaprasādana, Vāmaka

IMPORTANT FORMULATIONS - Gudūcyādi Modaka, Balāsvagandhalākṣādi Taila, Mahānārāyaṇa Taila

THERAPEUTIC USES – Kaṇḍu; Piṭikā; Koṭha; Kuṣṭha; Jvara; Viṣaroga; Vraṇa; Raktadoṣa; Agnimāndya; Śirah śūla; Unmāda; Apasmāra; Hikkā; Śvāsa; Pratiśyāya; Śītajvara; Bālaroga

DOSE - 3-6 g.

DARBHA (Root)

Darbha consists of root of *Imperata cylindrica* (Linn.) Beauv. (Fam. Poaceae), a perennial, erect, 30 to 90 cm tall tufted grass, distributed in the hotter parts of India from Punjab southwards.

SYNONYMS -

Sansk.	:	Yajñamūla, Ulu, Kutuka, Kharadarbha, Śvetadarbha
Beng.	:	Ulu
Eng.	:	Thatch grass, Cogon grass
Guj.	:	Daabhdo, Darabh
Hindi	:	Daabha, Siru, Ulu
Kan.	:	Sanna dabbac hullu
Mal.	:	Vidulam
Mar.	:	Darsnaa, Dhub
Punj.	:	Daaba, Sil
Tam.	:	Darbhaipul, Nanal
Tel.	:	Darbalu, Darbha gaddi, Modewa gaddi

DESCRIPTION -

a) Macroscopic:

The roots are fibrous, upto 2 mm. in diameter, arising from the nodes of stolons; surface uneven, with fine wrinkles, light brown to dark brown in colour; fracture, fibrous; taste and odour-indistinct.

b) Microscopic:

T.S. shows single layered epidermis with a few long root hairs, followed by cortex which can be differentiated into outer and inner regions; outer cortex represented by 3 to 5 layers of circular to oval-shaped thin walled parenchyma cells; inner cortical region exhibits numerous air cavities lined by thin walled radially elongated parenchymatous cells forming the trabeculae; the central region of the root exhibits a typical monocotyledonous structure having 10 to 15 bundles of xylem elements alternating with small patches of phloem and surrounded by rings of endodermis and pericycle; except those of phloem elements all the cells from metaxylem to pericycle region are thick walled and lignified; the centre of the vascular cylinder is occupied by pith consisting of thin walled parenchymatous cells; the vessels are border pitted; tracheids exhibit bordered pits as well as reticulate thickening; parenchyma of vascular region are pitted and fibres are thick walled with pointed to tapering ends.

Powder - The powder exhibits fragments of hairs, thin walled parenchyma cells, thick walled fibres with tapering or pointed ends; border pitted vessels, elongated tracheids with tapering to blunt ends exhibiting reticulate thickening or bordered pits and rectangular, thick walled, pitted parenchyma cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 4 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 3 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 2 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 4 percent, Appendix 2.2.7.

T.L.C. -

TLC of alcoholic extract on pre-coated Silica 'G' plates (Merck), using Chloroform: Toulene:Ethanol:Acetic : Water (22:8:1:0.5:1, lower phase), shows under U.V. (254 nm) two white fluorescent spots at Rf.0.72 and 0.42; on exposure to iodine vapours six spots appear at Rf. 0.94, 0.85, 0.72, 0.45, 0.39 (all yellow) and 0.36 (orange); after spraying with 5% ethanolic–sulphuric acid and heating the plate at 110^0C for 30 minutes, ten spots appear at Rf. 0.94 (dark brown), 0.85 (light brown), 0.76 (faint brown), 0.72 (brown), 0.52 (light brown), 0.45 (light brown), 0.39 (violet), 0.36 (yellow), 0.26 (orange) and 0.21 (faint brown).

CONSTITUENTS - Contains five triterpenoids viz. cylindrin, arundoin, fernenon, isoburneol, and simiarenol.

PROPERTIES AND ACTION -

Rasa	:	Madhura, Kaṣāya
Guṇa	:	Laghu, Snigdha
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Tridoṣahara, Rasāyana, Mūtravirecanīya, Stanyajanana, Pipāsāhara, Kuṣthaghna, Dāhapraśamana, Vāmaka

IMPORTANT FORMULATIONS - Karpūrādyārka, Brāhmarasāyana, Traikaṇṭaka Ghṛta, Sukumāra Ghṛta

THERAPEUTIC USES – Mūtrakṛcchra; Aśmarī; Mūtraghāta; Bastiśūla; Tṛṣā; Dāha; Raktapradara; Raktārsa; Pradara; Raktapitta; Jvara; Visarpa; Pittabhiṣyanda

DOSE - 10-20 g for decoction.

DHANVAYĀSAḤ (Whole Plant)

Dhanvayāsaḥ consists of dried whole plant of *Fagonia cretica* Linn. syn. *F. arabica* Linn., *F. bruguieri* DC. (Fam. Zygophyllaceae), a small spiny under shrub with stiff, more or less prostrate branches found in north-west India and Deccan.

SYNONYMS -

Sansk.	:	Duhsparśā, Durālambhā, Dhanvayavāsakah, Virupā, Durālabhā, Uṣṭrabhakṣyā
Beng.	:	Duralabha
Eng.	:	Khorasan thorn
Guj.	:	Dhamaaso
Hindi	:	Damahan, Dhamaasa, Hinguaa, Dhanhare
Mal.	:	Kodittuva
Mar.	:	Dhamaasaa
Punj.	:	Dama, Dhamah, Dhamaha
Tam.	:	Tulganari
Tel.	:	Chittigava, Gilaregati

DESCRIPTION -

a) Macroscopic :

Root - Tap root externally brownish green, rough, with longitudinal striations, core yellowish-green; fracture, fibrous.

Stem - Stem pieces 0.5 to 1.5 cm thick, of variable lengths; young green, mature brown; spiny, two pairs of spines present at each node, spines sharp, slender, 1.5 to 2 cm in length; external surface of stem green, whitish brown when dry, striated; transversely smoothened surface showing a thin bark and prominent wood, bark peeling from stem; fracture, short.

Leaf - Small, subsessile, linear, oblong, leaflets entire, green or blackish brown, 0.5 to 1.5 cm in length and 0.05 to 0.1 cm in width, without any prominent midrib region projected above the level of lamina.

Flower - Flowers small, pale rose or purple, pedicels slender, 6 to 12 mm long; sepals 3 to 4 mm long, ovate, aristate; petals twice as long as the sepals, spathulate, claw long; ovary hairy, style tapering.

Fruit - Pentagonous schizocarp, composed of five compressed, two valved cocci.

b) Microscopic:

Root - T.S. shows outermost cork represented by 4 or 5 layers of small, narrow, tangentially elongated cells; phelloderm composed of 6 to 10 layers of somewhat tangentially elongated, thin walled parenchymatous cells, some cells having rhomboid crystals of calcium oxalate measuring 10 to 15 μ in length and 8 to 10 μ in width; outer part of secondary phloem characterised by the presence of abundant, but small patches of 2 or 3 thick walled phloem fibres; wood composed of vessels, xylem fibres and traversed by 1 to 3 seriate medullary rays; vessels arranged in singles or doubles; fibres long, thick walled with tapering ends and measuring upto 500 μ in length and about 25 μ in width.

Stem - T.S. shows more or less circular outline; single layered epidermis with thick cuticle; unicellular trichomes occasionally present; cortex consisting of 7 to 10 layers of parenchymatous cells showing large patches of fibres; sclereids with narrow lumen occurring singly or in groups in the cortex, measuring upto 50 μ in diam.; several cortical cells contain tannins; secondary phloem consisting of thin walled cells; vascular cambium composed of 3 to 4 layers of thin walled tangentially elongated cells; secondary xylem composed of fibres, tracheids, vessels, xylem parenchyma; fibres long, thick walled with tapering ends and measuring 260 to 950 μ in length and upto 20 μ in width; medullary rays mostly uniseriate or sometimes biseriate; pith composed of large thin walled parenchymatous cells, some cells containing tannins; rhomboid crystals measuring 18 to 30 μ in length and 12 to 20 μ in width present in cortex and pith.

Leaf - Isobilateral; single layered epidermis consisting of mostly tangentially elongated cells covered with thick cuticle. In surface view both upper and lower epidermii show anomocytic type of stomata, epidermal cells polygonal in shape; 2 or 3 layered palisade cells present on both the sides, adjacent to the epidermis; vascular bundles show xylem towards lower side and phloem towards upper side; sclerenchyma tissue occur as a bundle cap just above the phloem; small lateral vascular bundles also present in lamina; vein-islet number 11 to14; stomatal index 16 to 17 on lower epidermis and 5 to 7 on upper epidermis; palisade ratio 2 or 3 on upper epidermis and 2 to 4 on lower epidermis.

Powder – Yellowish-white, bitter taste, showing groups of fibres, bordered pitted vessels, fragments of palisade tissue, sclereids, rhomboid crystals of calcium oxalate, cork cells, and unicellular glandular and nonglandular trichomes (both from fruit epicarp), epidermal cells (cubical, rectangular or polygonal) with slightly wavy walls and anomocytic stomata.

IDENTITY, PURITY AND STRENGTH -

Foreign Matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 10 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.4 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 5 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 10 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the alcoholic extract on silica gel 'G' plates (0.2 mm thick) using chloroform : methanol: acetic acid (70:30:0.2) shows under UV (254 nm) four spots at Rf. 0.14, 0.32, 0.46 (all violet) and 0.72 (yellowish green). Under UV (366nm) six fluorescent spots appear at Rf. 0.14, 0.32 (both brown), 0.39, 0.51, 0.61 and 0.72 (all pink). On exposure to iodine vapour nine spots appear at Rf. 0.14, 0.19, 0.28, 0.35 (all yellow), 0.46 (faint orange), 0.51, 0.61 and 0.72 (all yellow). On spraying with vanillin sulphuric acid reagent and heating the plate at 110°C for 10 min. ten spots appear at Rf. 0.06 (bluish grey), 0.14 (violet), 0.19 (brown), 0.28 (violet), 0.35 (brown), 0.39 (violet), 0.46 (brown), 0.51 (violet), 0.61 (brown) and 0.72 (violet).

CONSTITUENTS - Alkaloids (Harmine); amino acids (alanine, glycine, leucine, arginine isoleucine, lysine, phenylalanine, proline, tyrosine and valline); terpenoids of oleanane group.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta, Kaṣāya, Kaṭu
Guṇa : Laghu, Sara
Vīrya : Śīta
Vipāka : Madhura
Karma : Kaphahara, Vātahara, Pittahara, Medohara

IMPORTANT FORMULATIONS - Durālabhādi Kvātha, Durālabhādi Kaṣāya, Rāsnādi Kvātha Cūrṇa (Mahā), Tiktaka Ghṛta, Usīrāsava, Kaṇṭakaryāvaleha, Mahāpancagavya Ghṛta, Daśamūlāriṣṭa, Punarnavāsava

THERAPEUTIC USES – Atisāra; Grahaṇī; Dāha; Jvara; Viṣamajvara; Tṛṣṇā; Prameha; Moha; Murcchā; Madaroga; Raktapitta; Raktavikāra; Kuṣṭha; Visarpa; Vātarakta; Bhrama; Gulma; Chardi; Kāsa; Mūtraghata

DOSE - 5-10 g powder.

40-80 ml phānta.

DRAVANTĪ (Seed)

Dravantī is the dried seeds of *Jatropha glandulifera* Roxb. (Fam. Euphorbiaceae), an evergreen shrub with stout branches and a smooth papery bark, found mostly in the black cotton soil of Deccan but also found in plains of northern India.

SYNONYMS –

Sansk.	:	Bṛhaddantī, Vyāghrairaṇḍa, Putraśreṇī
Eng.	:	Purging nut
Guj.	:	Ratanjota
Hindi	:	Laal Bagharend, Jangali erandi
Kan.	:	Erandane danti, Totla
Mal.	:	Katalaavanakku
Mar.	:	Thoradanti, Mogali eranda
Tam.	:	Kattamanakku, Adalai
Tel.	:	Adavi Amadam, Vatti amudamu

DESCRIPTION –

a) Macroscopic :

Seeds 6 mm long, 4 mm broad and 2 to 3 mm thick, ellipsoid, oblong, light brown in colour, surface smooth with median sutures on both sides, with a small hard brownish white and minutely lobed caruncle round the micropyle, weight of 100 seeds are 1to 2 g.

b) Microscopic :

Subtrigonous to oval in transverse section; outer epidermis of testa single layered, thick walled, pitted narrow columnar cells with dark brown contents; mesophyll parenchymatous with intercellular spaces and schizogenous latex tubes; the inner epidermis has short palisade of narrow thin walled cells, tegmen 16 to 20 cells thick, the outer layer straight or curving, malphighian cells 2 or 3 with finely pitted yellowish brown walls followed by reddish-brown elongated single celled sclereids; the lower layer consists of large parenchymatous cells 12 to 16 layers deep with the inner cells radially elongated and crushed; inner epidermis not characteristic; endosperm composed of cells filled with starch grains and oil globules, starch grains spherical to oval, 5-20 µm in diameter, simple, hilum circular or indistinct, crescent shaped leucoplast at one side of the grains, lamellae indistinct.

Powder - Powder of seeds creamish-brown, mucilagenous in taste without any odour, shows the presence of parenchymatous patches; cells filled with starch, spherical to oval, 5 to 20 µm in diameter, simple, hilum circular or indistinct; lamellae indistinct; sclereids upto 160 µ long and 30 µ broad, oil globules, laticifers, vessels, elongated thick walled palisade cell, malphighian cells, and aleurone grains are observed; the powder when

treated with 1N HCl on a microscope slide, becomes pink when observed in day light and pinkish red under UV light 254 nm.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than	2 percent, Appendix 2.2.2.
Total ash	-	Not more than	6 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than	0.3 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than	9 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than	7 percent, Appendix 2.2.7.
Fatty oil	-	Not less than	9 percent, Appendix 2.2.15.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate : methanol (80 : 20 : 0.4) on spraying with anisaldehyde-sulphuric acid reagent and heating the plate for ten minutes at 120^0C, spots appear at Rf. 0.45, 0.53, 0.84 (all brown) and 0.31 (pink).

CONSTITUENTS – Jatrophin, jatropholone A, fraxetin, coumarino-lignan (I).

PROPERTIES AND ACTION –

Rasa	:	Kaṭu
Guṇa	:	Laghu, Tīkṣṇa, Snigdha
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Recaka, Viḍabhedana, Dīpana, Viṣaghna

IMPORTANT FORMULATIONS – Misraka sneha

THERAPEUTIC USES – Raktavikāra; Kaṇḍu; Kuṣṭha; Sotha; Pāṇḍu; Gulma; Udara; Ānāha; Udāvarta; Ajīrṇa; Sula; Hṛdroga; Grahaṇīroga; Tṛṣṇā; Jvara; Garaviṣa; Prameha; Bhagandara; Āmavāta; Pakṣāghāta; Urustambha; Granthī; Pārsvasula; Plīhāroga; Duṣṭavraṇa; Duṣṭaapacī

DOSE - 250 - 500 mg after purification.

DUGDHIKĀ (Whole Plant)

Dugdhikā consists of whole plant of *Euphorbia prostrata* W. Ait. (Fam. Euphorbiaceae), an accepted substitute for *E. thymifolia,* the official drug; it is a small more or less pubescent, much branched prostrate annual, found throughout India as a naturalized weed.

SYNONYMS –

Sansk.	:	Svāduparṇī, Kṣīriṇī, Laghudugdhikā, Nāgārjunī, Gorakṣadugdhī
Beng.	:	Bara, Kharui, Kerai, Dudiya, Shwet Keruee
Guj.	:	Raati Dudhelee, Naagalaa dudhelee
Hindi	:	Dudhi, Duddhi, Dudhdee, Chhotidudhi
Kan.	:	Kempu nene hakki
Mal.	:	Nilappal
Mar.	:	Lahaan naaytee, Naayeti, Lahaandudhi
Punj.	:	Dodhak, Hajardana, Baradodk, Hazardana
Tam.	:	Sittirappaladi, Sittirappaladi
Tel.	:	Peddivari manubaala
Urdu.	:	Dudhi

DESCRIPTION –

a) Macroscopic :

Branched prostrate with many stems spreading from the roots, slender upto 20 cm long; leaves green but occasionally purplish red, opposite, 2.5 to 5 mm long and 2 to 4 mm broad, oblong or subquadrate, tip mucronate, base symmetric and more or less cordate, margin serrulate in upper portion, glabrous above, slightly pubescent beneath especially on the apex; petiole short, 1 mm or even less in length; tap root 1 to 3 mm in diameter; inflorescence cyathium in short axillary racemiform clusters, involucre lobes 5, deltoid ovate, ciliate; nectary gland 4, minute; ovary tricarpellary, suborbicular, stipitate, narrowly limbed long styles; stigma three branched, each bifid; capsule 1 to 1.5 mm long, densely hairy on ridges, hairs occasionally present on the surface; fruit subglobosely trigamous, long stalked; seeds 0.6 to 0.8 mm long, oblong, 4 angled, smooth with 5 to7 transverse ribs, reddish brown and bluntly pointed; smell oily; no characteristic taste.

b) Microscopic :

Root - T. S. of young root circular in outline, endodermis without casparian bands; triarch stele; mature roots phelloderm 6 to 8 layers, outer most layer thickly suberized; cork cells obliterated; cambium indistinct; broad xylem vessels solitary or in a group of 2 or 3, surrounded by a number of radially arranged narrow vessels and tracheids; medullary rays short, one or two seriate and extend upto phloem.

Stem - Cross section of stem circular in outline, thick, non striated cuticle, interrupted by unicellular or multicellular uniseritate trichomes upto 185 μ long and 15 μ broad; paracytic stomata at some places; cortex with a few latex canals; pericyclic fibres in groups; cambium not discernible; medullary rays narrow, 1 or 2 cell wide, parenchymatous pith with intercellular spaces.

Leaf - Two types of hairs present (a) multicellular, multiseriate glandular hairs with single apical cell at leaf margins only, (b) uniseriate 1 to 3 celled hairs on the margins, at abaxial side and in apex; cross section shows dorso-ventral structure, single layered upper and lower epidermis, mesophyll and vascular bundles; in surface view, the abaxial epidermal cells angular with straight cell walls, stomata anomocytic to anisocytic, stomatal indices 17.6 to 26.3 and density 60 to 130; adaxial epidermal cell walls slightly wavy with globular thickening at the angles; stomata anisocytic, stomatal indices 11.4 to 18.7 and stomatal density 25 to 60; palisade ratio 3 to 6; vascular bundles collateral, with bundle sheath; laticiferous canals observed; vein islet 1 to 5 and vein termination numbers is 3 to 13.

Powder - Powder yellowish-green, tasteless with oily odour; on microscopical examination it shows angular and slightly wavy epidermal cells with stomata, uniseriate, 1 to 3 celled trichomes or hairs and some pieces of glandular hairs parenchymatous patches, laticiferous canals, pollen grains, pieces of nectary glands, fragments of vessels, tracheids, fibres and stomata; when treated with 1N NaOH in methanol shows purple colour with yellowish tinge, and in acetic acid reddish yellow colour under UV – 254 nm.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 11 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.2 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 11 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 27 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate (80 : 20) shows under UV (366 nm.) fluorescent zones at Rf. 0.05 (Maroon), 0.15 (light blue) and 0.66 (red). On spraying with anisaldehyde-sulphuric acid reagent and heating the plate for ten minutes at 120^0C, spots appear at Rf. 0.12 (bright green), 0.23 (pinkish blue), 0.32 (pink), 0.38 (grey), 0.48 (dark greyish blue), 0.52 (pink), 0.61 (magenta), 0.66 (magenta) and 0.94 (blue).

CONSTITUENTS – Glucoside, Galactoside, β-sitosterol, Compesterol, Stigmasterol, Cholesterol.

PROPERTIES AND ACTION –

Rasa	:	Kaṭu, Tikta, Madhura, Lavaṇa
Guṇa	:	Guru, Rūkṣa, Tīkṣṇa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Kaphahara, Garbhakāraka, Mūtrala, Viṣtambhinī, Grāhī, Malastambhaka, Dhātuvṛddhikara, Vṛṣya, Hṛdya

IMPORTANT FORMULATIONS - Gaganasundara Rasa

THERAPEUTIC USES – Kuṣṭha; Kṛmi; Śvāsa; Pravāhikā; Raktapitta; Prameha; Raktārśa; Palita; Danta-ghuṇa; Dadru; Sphoṭa

DOSE – 5-10 g.

ELAVĀLUKAṂ (Seed)

Elavālukaṁ consists of dried mature seed of *Prunus avium* Linn.f. (Fam. Rosaceae), a tree cultivated in Kashmir and lower Himalayas of Uttar Pradesh and W. Bengal; seeds available in the market are enclosed in hard woody endocarp.

SYNONYMS -

Sansk.	:	Aileyah, Elavālūh, Elukākhyah
Beng.	:	Elavaaluka
Eng.	:	Sweet Cherry
Hindi	:	Aaluvaalu, Gilaas, Krusabala
Punj.	:	Aaluvaalu

DESCRIPTION –

a) Macroscopic :

Brown kernel, ovoid, with pointed apical end and blunt opposite end, with ridges on the surface, measuring 0.8 to 1 cm in length, weighing about 300 mg each; similar to a tiny almond kernel, having same taste and smell.

b) Microscopic :

Seed – T.S. of seed shows the outermost uneven layer of stone cells interrupted by longitudinally running spirally thickened vascular element; stone cells oval to circular, thick walled, pitted, pit canal clear, lumen narrow (distinction from stone cell of *P. amygdalus*, where stone cells are squarish, with large lumen, showing pit occasionally and from stone cell of *P. domestica*, where stone cells are very thick walled, closely striated with small or obliterated lumen); size varies greatly; stone cell layer intermingled with very conspicucous pigment layer which contains hexagonal cells in surface view with well marked pits on the walls followed by 2 or 3 layers of disintegrated cells; thick, brown inner epidermal layer covers the parenchymatous cells of cotyledon which are angular, thick walled, completely filled with protein granules and oil globules; provasculature can be seen in the cotyledon.

Powder – White, oily with brown pieces of seed coat, stone cells oval to circular thick walled with pit canals, spirally thickened vascular elements, parenchymatous cells containing oil and protein granules.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent,	Appendix 2.2.2.
Total ash	-	Not more than 3 percent,	Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.1 percent,	Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 14 percent,	Appendix 2.2.6.
Water soluble extractive	-	Not less than 16 percent,	Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract of the drug on silica gel 'G' plate (0.2 mm thick) using toluene : dichlora methane : ethanol : formic acid (10:5:3:1) as mobile phase shows seven bands on exposure to Iodine vapour at Rf. 017 (dark brown), 0.30, 0.46, 0.60. 0.67, 0.71, 0.77 (all light brown). On spraying with 5% Ethanolic sulphuric acid reagent and heating the plate for 10 minutes at 105^0 C eight bands appear at Rf. 0.17, 0.30 (both dark brown), 0.46, 0.52, 0.58, 0.67, 0.71, 0.77 (all light brown).

CONSTITUENTS – Prunasin (D-mandelonitrile-β-glucoside), Quercetin-3-0- rutinosyl-7, 3-0-biglucoside, Kaempferol-3-0-rutinosyl-4'-di-0-glucoside and 6-ethoxykaempferol.

PROPERTIES AND ACTION -

Rasa	:	Kaṣāya
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Kaphahara, Yonidoṣahara, Varṇya, Stambhana, Śukraśodhaka, Vedanāsthāpana, Viṣaghna

IMPORTANT FORMULATIONS - Aśvagandhā Taila

THERAPEUTIC USES – Kaṇḍu; Vraṇa; Chardi; Aruci; Kāsa; Hrdroga; Raktapitta; Kuṣṭha; Kṛmiroga; Mukharoga; Medoroga; Tṛṣṇā; Arśa; Pāṇḍu; Unmāda; Jvara; Dāha

DOSE - 3 - 6 g.

GAṆḌĪRA (Root)

Gaṇḍīra consists of dried mature root of *Coleus forskohlii* Briq. syn. *C. barbatus* Benth. (Fam. Lamiaceae), a perennial branched aromatic herb; found in subtropical western Himalayas, Nilgiri hills, Gujarat and Bihar, and also cultivated in Maharashtra.

SYNONYMS –

Sansk. : Gaṇḍīra (Sthalaja)
Guj. : Garmar, Garmal
Hindi : Garmar

DESCRIPTION –

a) Macroscopic :

Roots light in weight, light brown, longitudinally wrinkled, tapering, with a few rootlets, cut surface yellowish-white; fracture, short, characteristic pleasing odour; taste, slightly bitter and pungent.

b) Microscopic :

T.S. of root is irregular in outline, epidermal cells not discernible due to secondary growth; outermost multilayered storied cork of rectangular cork cells, below which is 1 or 2 layered cork cambium, followed by rectangular parenchymatous secondary cortical region in which oval stone cells with narrow lumen and walls with radiating canals and containing rhomboidal calcium-oxalate crystals present; vascular cambium in the form of continuous ring; phloem consists of sieve tubes, companion cells and phloem parenchyma; medullary rays well developed, radiating, varying in size, heterogenous as seen in tangential section; thin walled; in young root these are very broad as compared to the older ones; xylem represented by diffuse porous vessels, mostly solitary; xylem parenchyma surrounding the tracheids and vessels, filled with starch grains of 20 to 60 µm in diameter, hilum distinct, star-shaped central cleft, lamellae occasionally observed; xylem parenchyma well developed in the young root, however in the older one fibres abundant; central zone comprises of compactly arranged vessels, fibres and fibre tracheids, oil cells with oil globules present in cortical phloem and xylem regions.

Powder - Powder yellowish-brown with pleasant aromatic smell, bitter in taste; powder shows numerous simple circular, ovoid, elliptical simple starch grains, 20 to 60 µm in diameter, hilum distinct, star-shaped central cleft, occasionally lamellae observed; oil cells with oil globules, tracheids and vessels, parenchymatous cells filled with starch, tailed vessels, fibre tracheids, prismatic calcium oxalate crystals; powder becomes greenish-brown under UV 254 nm with nitrocellulose in amylacetate and also with 50% KOH.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 9 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1.5 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 16 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 23 percent, Appendix 2.2.7.
Essential oil	-	Not less than 0.1 percent, Appendix 2.2.10.
Coleonol	-	Not less than 0.15 percent, Appendix 2.2.17A.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plates (0.2 mm thick) using toluene : ethyl acetate : methanol (80 : 20 : 0.5) shows under UV (366 nm) fluorescent spots at Rf. 0.14 (brick red), 0.20 (red), 0.25 (pink), 0.32 (brick pink), 0.46 (blue), 0.55 (brick red), 0.59 (brick red), 0.67 (blue), 0.87 (green) and 0.95 (blue). On spraying with anisaldehyde-sulphuric acid reagent and on heating the plate for ten minutes at 120^0C, spots appear at Rf. 0.14 (brown), 0.2 (brown), 0.25 (light brown), 0.46 (grey), 0.55 (orangish brown), 0.59 (brown) and 0.87 (yellow).

CONSTITUENTS – Diterpene, coleonol, coleosol, deoxy-coleonol, forskohlin, naphthopyrone, coleoforsine.

PROPERTIES AND ACTION –

Rasa	:	Kaṭu, Kaṣāya, Tikta
Guṇa	:	Rūkṣa, Tīkṣṇa, Sara
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Tridoṣahara, Vraṇaśodhana, Vidāhī

IMPORTANT FORMULATIONS - Kṛmighna Kaṣāya Cūrṇa

THRAPEUTIC USES – Śotha; Arśa; Kāsa; Kṛmi; Kuṣṭha; Duṣṭa vraṇa; Hutaviṣa; Gulma; Udara; Pliihāroga; Śūla; Mandāgni; Mūtrabandha; Malabandha

DOSE – 3-5 g.

Remarks : Being a controversial drug, at present, the above species may be accepted as Sthalaja Gaṇḍīra. Others are jalaja and a tree (Sara-taru) species.

GAVEDHUKA (Root)

Gavedhuka consists of the dried root of *Coix lachryma-jobi* Linn. syn. *C. lachryma* Linn. (Fam. Gramineae), a perennial or annual grass found in India, widely distributed throughout the plains and warm slopes of hills upto 1500 m.

SYNONYMS -

Sansk.	:	Gavedhu, Gavedhuka
Beng.	:	Gadagad, Dedhaan, Devaan
Eng.	:	Adlay, Job's tears
Guj.	:	Kasai
Hindi	:	Kasai, Garheduaa, Garahedu, Gargari
Kan.	:	Manjutti
Mal.	:	Kaatugotampu, Kaakkappalunku
Mar.	:	Kasai
Tam.	:	Kaattukuntumani
Tel.	:	Adaviguruginja

DESCRIPTION -

a) Macroscopic :

Roots fibrous, 1 to 3 mm in thickness, present in tufts, unbranched with tapering ends, hollow in centre, straw coloured, woody smell and pungent taste.

b) Microscopic :

T.S. of root shows presence of ruptured piliferous layer consisting of closely packed elongated cells; below the epidermis one layered exodermis, a well developed cortex, with several layers of parenchymatous cells, mostly oval or rounded with intercellular spaces present; exodermal cells are lignified; cortex consists of 4 or 5 layered thick walled sclerenchymatous cells towards periphery; middle region consists of large thin walled parenchymatous cells and the inner region is made up of air spaces traversed by broad trabeculae; endodermis characterised by the presence of casparian strips on both transverse and radial walls, pericyclic fibres thick walled; vascular bundles polyarch, composed of alternating strands of xylem and phloem, both with their usual elements; parenchymatous pith present, starch absent.

Powder- Powder light brown in colour, woody smell and pungent taste; shows thick walled fibres with broad lumen, tracheids with dense helical thickenings and border pits; shows hexagonal striated epidermal cells; double walled hexagonal sclerenchymatous cells of exodermis.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	- Not more than	2 percent, Appendix 2.2.2.
Total Ash	- Not more than	4 percent, Appendix 2.2.3.
Acid insoluble ash	- Not more than	1 percent, Appendix 2.2.4.
Alcohol soluble extractive	- Not less than	10 percent, Appendix 2.2.6.
Water soluble extractive	- Not less than	10 percent, Appendix 2.2.7.

T.L.C.-

T.L.C. of the methanolic extract on silica gel 'G' plate (0.2 mm thick) using toluene: ethyl acetate: methanol (85:15:0.5) shows under UV (366 nm) spots at Rf. 0.33 (greenish blue) and 0.71 (light blue). After spraying with anisaldehyde–sulphuric acid reagent, spots appear at Rf. 0.34 (green) and 0.42 (purple).

CONSTITUENTS – Benzoxazolinones, amino acids (leucine, tyrosine, histadin, arginine and coicin).

PROPERTIES AND ACTION -

Rasa	:	Kaṭu, Madhura
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Kaphahara, Pittahara, Mūtrala, Kārśniya

IMPORTANT FORMULATIONS - Viṣṇu Taila

THERAPEUTIC USES – Mūtrakrcchra; Netra-Masūrikā; Pittaja Chardi; Sthaulya

DOSE - 3-6 g.

GHOṆṬĀ (Fruit)

Ghoṇṭā consists of fruit of *Ziziphus xylopyrus* Willd. (Fam. Rhamnaceae), a straggling shrub distributed in North-West India, U.P., Bihar and South India, in moist deciduous forests.

SYNONYMS -

Sansk.	:	Ghoṭī, Goṭikā
Beng.	:	Kulphal
Eng.	:	Jujab
Guj.	:	Gatbadar, Gatabordi
Hindi	:	Ghunta, Kakora, Kaathabera
Kan.	:	Yeranu
Mar.	:	Ghoti, Bhorghoti
Tam.	:	Kottai, Mulkottai
Tel.	:	Gotti, Got, Gotiki

DESCRIPTION –

a) Macroscopic:

Fruit is a drupaceous berry, globular or rounded, diameter 1.2 to 1.8 cm; surface rough, warty; colour dark brown; point of detachment of stalk marked by a rounded concave depression upto 2 mm in diameter and a raised ring along the circumference; a pointed beak at the opposite end; occasionally seen; pericarp leathery and hard; endocarp stony; fruit 3-celled, each locule with one dark brown, orbicular, compressed, beaked, seed 5 to 8 mm across; cotyledons creamish yellow; odour not very distinct; taste, slightly astringent.

b) Microscopic:

A transverse section of the fruit reveals a thick cuticle followed by epidermis consisting of unevenly arranged rounded cells; scattered thick-walled, uniseriate, multicellular trichomes present on epidermis; mesocarp with three zones - narrow outer and inner zones of small, compactly arranged parenchyma cells; a third wide middle spongy zone composed of thin walled parenchyma cells, lacunated and containing scattered vascular strands; endocarp consisting of thick walled stone cells, narrow fibres and a few lacunae, some stone cells containing prismatic crystals of calcium oxalate up to 12 μ in size; occasional inroads of mesocarp into the endocarp also seen; epidermis and a few outer layers of mesocarp adjacent to it contain abundant brown substances.

A section through the testa shows radially elongated, narrow, transluscent cells, followed by a subepidermal zone of crushed, thin walled, parenchyma cells demarcated inside by a reddish brown lining.

A section through the cotyledons shows an outermost epidermal layer of small, squarish cells and a ground tissue composed of rectangular thin walled, prominently nucleated cells rich in fixed oil.

Powder - Thick walled uniseriate, multicellular, 200 to 260 μ long trichomes; fibres (upto 50 μ in width) and angular stone-cells with radial canals and circular striations, 40 to 170 μ in size are seen- tissue fragments of epidermis in surface view present.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 percent,	Appendix 2.2.2.
Total ash	-	Not more than 12 percent,	Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 percent,	Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 3 percent,	Appendix 2.2.6.
Water-soluble extractive	-	Not less than 2 percent,	Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (95:5) as mobile phase shows on spraying with methanolic: sulphuric acid reagent and on heating the plate for ten minutes at 110^0C spots at Rf. 0.24 (Pink), 0.39 (Pinkish orange), 0.48 (Yellow), 0.61 (Pink), 0.71 (Blue).

CONSTITUENTS - The pulp of the fruit contains reducing sugars, sucrose, citric acid, carotene, vitamin C and tannins.

PROPERTIES AND ACTION -

Rasa	:	Kaṣāya, Kaṭu, Madhura
Guṇa	:	Laghu
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātakaphahara, Viṣaghna

IMPORTANT FORMULATIONS - Āragvadhādi Kvātha Cūrṇa

THERAPEUTIC USES – Vraṇa; Kaṇḍu; Kuṣṭha; Raktavikāra; Śvayathu; Prameha; Nāḍīvraṇa; Duṣṭavraṇa; Vamana; Jvara

DOSE - 3-6 g.

GUNDRĀḤ (Rhizome and Root)

Gundrāḥ consists of rhizome with root of *Typha australis* Schum. and Thonn. syn. *T. angustata* Bory and Chaub., (Fam. Typhaceae), a hardy perennial, monoecious plant, often growing gregariously in fresh water and marshy places, commonly found throughout India, upto 1730 m.

SYNONYMS -

Sansk.	:	Guṇṭhah, Gunṭhah
Beng.	:	Hogalap
Eng.	:	Lesser Indian Reed-mace
Guj.	:	Ghaabaajariyu
Hindi	:	Pater, Gondpater
Mar.	:	Ramban, Paankanis
Punj.	:	Gundra
Tel.	:	Jammugaddi, Enugajamu

DESCRIPTION -

a) Macroscopic :

Rhizome - 1 to 5 cm. long and 1 to 2.5 cm. wide pieces, external surface light brown, core yellowish-brown, transverse ridges on external surface, small roots and scaly leaves present attached on runners; fracture, hard, fibrous.

Root - Adventitious, rootlets present, 2 to 15 cm long, yellowish-brown; fracture, fibrous.

b) Microscopic :

Rhizome - T.S. shows circular outline; single layered epidermis consisting of tangentially elongated cells, covered with thin cuticle; cortex divided into two parts - outer cortex comprising of 7 to 11 layers of thin walled parenchymatous cells, oval to polygonal in shape, having intercellular spaces; patches consisting of 10 to 35 fibres distributed in the entire outer cortex; fibres thick walled with tapering tips, varying in length from 160 to 930 μ and in width from 10 to 30 μ; inner cortex consisting of aerenchyma; endodermis single layered; vascular bundles 35 to 42 in number, collateral, conjoint, vessels prominent; pith consisting of thin walled parenchymatous cells with intercellular spaces; starch grains in pith region, single or compound, spherical to oval and measuring from 5 to 25 μ in diam.; pith mucilagenous, as seen when mounted in Ruthenium red treated with a few drops of 10% lead acetate solution.

Root - T.S. shows epiblema followed by a 4 to 6 layered hypodermis of thin walled cells and a broad cortex consisting of radially elongated air spaces separated by trabeculae; a few layers of cells forming the innermost layer of cortex, in contact with

endodermis; vascular bundles with xylem vessels forming a circle; fibres thick walled with tapering tips, varying in length from 260 to 1480 μ and in width from 10 to 24 μ.

Powder - Brown, no specific odour and slightly acrid taste; shows abundant starch grains measuring 5 to 25 μ in diam., fragments of fibres, parenchyma cells and bordered pitted vessels.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 10 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 4 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 6 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 8 percent, Appendix 2.2.7.

T. L. C. -

T.L.C. of the alcoholic extract on silica gel 'G' plates (0.2 mm thick) using chloroform : methanol (80:20) shows under UV (254nm) three spots at Rf. 0.30, 0.58 and 0.72 (all violet). Under UV (366nm) three fluorescent spots appear at Rf. 0.58, 0.62 and 0.72 (all blue). On exposure to iodine vapour five spots appear at Rf. 0.14, 0.30. 0.40, 0.58 and 0.72 (all yellow). On spraying with 10% ethanolic potassium hydroxide and then observing under UV (366nm) shows two fluorescent spots at Rf. 0.58 (green) and 0.62 (blue). On spraying with 10% methanolic-sulphuric acid and heating the plate at 110°C for ten minutes six spots appear at Rf. 0.18 (brown), 0.40 (purple), 0.58 (brown), 0.62, 0.67 (both purple) and 0.76 (brown).

CONSTITUENTS - Flavonoids (Quercetin, isorhamnetin-3-0-rutinoside); sterols (β-sitosterol, lanosterol, cholesterol).

PROPERTIES AND ACTION -

Rasa	:	Kaṣāya, Madhura
Guṇa	:	Guru
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Pittasaṁśamana, Vātahara, Stanyaśodhaka, Stanyajanana, Śukraśodhaka, Rajośodhaka, Mūtravirecanīya, Mūtraśodhaka

IMPORTANT FORMULATIONS - Mūtravirecanīya Kaṣāya Cūrṇa, Stanyajanana Kaṣāya Cūrṇa

THERAPEUTIC USES – Raktapitta; Aśmarī; Śarkarā; Mūtrāghāta; Mūtrakṛcchra; Stanya Kṣaya

DOSE - 3-6 g.

HIṀSRĀ (Root)

Hiṁsrā consists of root of *Capparis spinosa* Linn. (Fam. Capparidaceae), a thorny shrub distributed in the plains, lower Himalayas, and Western Ghats.

SYNONYMS -

Sansk.	:	Ahiṁsrā, Kanthārī, Tīkṣṇa, Kaṇṭakā Tīkṣṇagandhā
Eng.	:	Ceper Plant
Guj.	:	Kabaree
Hindi	:	Kabara, Hainsaa, Kanthara
Mar.	:	Kabar
Punj.	:	Barar, Kaur
Urdu.	:	Kabar

DESCRIPTION –

a) Macroscopic:

Root pieces are upto 5.5 cm in thickness; bark rough to touch, thick showing longitudinal lenticels; freshly broken surface light yellowish; wood hard and compact; remnants of robust and slender rootlets present on the bark; colour varies from pale yellow to reddish-brown; no particular odour or taste.

b) Microscopic:

A transverse section of root characterised by outermost layer of slightly suberised corky zone of several layers showing irregular and broken outline; cork cambium made of 4 or 5 layers of thin walled, small, squarish cells; cortex consisting of thin walled, irregular or somewhat tangentially elongated cells; angular sclereids in groups of 2 to 3 and upto 30 μ in size scattered in cortex; phloem in the form of multiple layers of cells forming a continuous cylinder around inner vascular zone, separated from the xylem by 4 to 5 layers of vascular cambium; wedges of vascular elements with thick walled cells span the centre of the root and the outer zone; vessels isolated or in groups of two, distributed uniformly among xylem parenchyma, which has granular contents; medullary rays of thin walled, mostly uniseriate, rectangular cells, often having granular contents; pith absent.

Powder - Powder shows vessel fragments with simple pitted thickenings and tracheids with tapering or blunt ends; sclereids upto 30 μ size and in groups of 2 or 3.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 per cent,	Appendix 2.2.2.
Total ash	-	Not more than 13 per cent,	Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 5 per cent,	Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 1 per cent,	Appendix 2.2.6.
Water-soluble extractive	-	Not less than 2 per cent,	Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcohol soluble extract of the drug on precoated silica gel 'G' plate (0.2 mm thick) using chloroform:methanol (95:5) under UV (366nm) shows spots at Rf 0.01 (Blue), 0.11 (Blue); 0.93(Blue).On spraying with anisaidehyde: sulphuric acid reagent and heating the plate for ten minutes at 110^0 C three spots appear at Rf 0.32(Orange), 0.62 (Purple), 0.68 (Cream).

CONSTITUENTS - The roots contain alkaloid stachydrine. Glucobrassicin, neoglucobrassicin and 4-methoxyglucobrassicin have also been identified in the roots.

PROPERTIES AND ACTION -

Rasa	:	Katu, Tikta
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Dīpanī, Rucya

IMPORTANT FORMULATIONS – Amṛatādi Taila, Kutikhadi Vatika, Himsrādya Ghṛta

THERAPEUTIC USES – Vātavikāra; Kāsa; Svāsa; Galagaṇḍa; Gulma; Arśa; Āmavāta; Gṛdhrasī; Vātarakta; Raktagranthi; Vātikayoniroga; Vātaśopha; Vraṇa; Granthi

DOSE - 1 - 3 g.

HIṄGUPATRĪ (Leaf)

Hiṅgupatrī consists of dried leaf of *Ferula jaeschkeana* Vatke (Fam. Apiaceae), a perennial herb, producing a bunch of radical leaves around the base of the flowering axis and distributed in north-western Himalayas, on dry sunny slopes between 2000 and 3900 m; abundant in Kashmir, Ladakh and Lahaul & Spiti in Himachal Pradesh.

SYNONYMS -

Sansk.	:	Hinguparṇī, Hingupatrikā, Bāṣpikā
Beng.	:	Hing, Desaj Hing
Guj.	:	Hing, Hingro, Hinglavadharni, Hingupatri
Hindi	:	Hingupatri
Kan.	:	Doddahingina Balli
Mal.	:	Kayam, Penungayam, Perungkayam
Mar.	:	Hing Patree
Ori.	:	Hengu
Punj.	:	Hinge, Hing
Tam.	:	Inguva, Perungayam
Tel.	:	Hingo Patramu

DESCRIPTION –

a) Macroscopic :

Leaf upto 50 cm long, green, both radical and cauline, cauline are alternately arranged on the axis, 2 or 3 lobed, pubescent when young, petiole of cauline leaves broadly sheathing, decurrent, lobe oblong, upto 10 cm long, margin of the lobes distinctly serrate; odour, nil; taste, slightly spicy.

b) Microscopic :

T.S. of cauline leaf shows midrib prominent below, isobilateral with a single layer each of upper and lower epidermis of slightly thick walled cells and somewhat drum shaped in nature; anomocytic stomata present on both surfaces; simple unicellular trichomes present only on the lower epidermis; lamina wavy in outline with ridges and grooves, each groove containing a patch of collenchymatous cells below epidermis; secretory canals present below the collenchymatous patches, lined by 8 to 10 parenchymatous cells; two layers of palisade cells present on both surfaces, spongy tissue composed of somewhat elongated cells; vascular bundles collateral with xylem above and phloem below; stomatal index 13 to 17;palisade ratio of 5 to 7 and vein-islet number 2 or 3.

Powder - Yellowish green; shows under microscope, epidermis with anomocytic stomata, epidermal cells with unicellular trichomes, palisade cells, numerous isolated trichomes and vessels with spiral thickenings.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent,	Appendix 2.2.2.
Total ash	-	Not more than 13.0 per cent,	Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1.10 per cent,	Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 10 per cent,	Appendix 2.2.6.
Water soluble extractive	-	Not less than 30 per cent,	Appendix 2.2.7.

T.L.C.-

T.L.C. of the methanolic extract on precoated silica gel G plate using methanol : chloroform (40: 60); shows under UV (365 nm) three fluorescent zones at Rf. 0.52 (blue fluorescence), 0.39 (quinching brownish-purple) and 0.12 (blue fluorescence). On expossure to iodine vapour three zones appeared as brown colour spots. On spraying with 2% vanillin sulfuric acid reagent shows three spots at Rf. 0.52 (Pink), 0.39 (cream coloured) and 0.12 (brownish with blue tinge).

PROPERTIES AND ACTION -

Rasa	:	Kaṭu, Tikta
Guṇa	:	Tīkṣṇa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Pācana, Hṛdya, Vātakaphahara, Rucikara

IMPORTANT FORMULATIONS - Kumāryāsava

THERAPEUTIC USES – Hṛdroga; Bastiśūla; Vibandha; Garbhaṇī; Arśa; Gulmaroga; Kṛmi; Plīhāroga; Apasmāra; Unmāda

DOSE - 3-6 g.

ITKAṬA (Root)

Itkaṭa consists of dried root of *Sesbania bispinosa* W. F. Wight (Fam. Fabaceae) an erect 1.5 to 2.5 m tall, annual, shrub with minute prickles on rachis and young branches, usually found as a weed in the rice fields or water logged areas in the plains of India.

SYNONYMS –

Sansk.	:	Vanajayantī, Utkaṭa
Beng.	:	Dhanicha, Dhunsha
Guj.	:	Sasee Ikad, Ikad
Hindi	:	Ikkada
Kan.	:	Mullu jinangi
Mal.	:	Kitamu
Mar.	:	Raanshevari, Chinchani
Ori.	:	Tentua
Punj.	:	Jhanjhan
Tam.	:	Mudchembai, Nirchembai
Tel.	:	Ettejangaa

DESCRIPTION -

a) Macroscopic:

Chopped pieces of roots of variable sizes and thickness usually irregular in shape and with thick and thin rootlets, main roots 0.2 to 2.0 cm in diam. solid, no root nodules observed, outer surface light brown, smooth; wood cream in colour, odourless and tasteless.

b) Microscopic:

T.S. shows discontinuous cork, compressed and broken, 3 to 6 cells deep, thin walled; cortical cells parenchymatous, some containing prismatic crystals of calcium oxalate of about 16 to 25 μ size and some containing tannins; towards the inner side of the cortex conical patches of sclerenchymatous fibre present, broader towards inner side and narrower towards the outside, phloem is about 5 cell deep, thin walled; cambium compressed, not very distinct; xylem vessels; usually with scalariform thickenings; ray cells uniseriate, with simple starch grains of 10 to 40 μ size and occasionally prismatic crystals of calcium oxalate; pith absent.

Powder - Yellowish brown, fibrous, free flowing, characterized by the presence of large cells filled with tannins, some small parenchymatous cells containing tannins, long fibres, simple starch grains, tracheids and vessels with scalariform thickenings.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 5 per cent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 per cent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 2 per cent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 6 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of methanol extract on silica gel 60 F 254 plate using Toluene : Acetone (90:10) shows eight spots at Rf 0.15, 0.24, 0.38, 0.46, 0.58, 0.61, 0.74 and 0.78 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110^0C.

CONSTITUENTS – Amino acids such as lysine, arginine, histidine.

PROPERTIES AND ACTION -

Rasa	:	Madhura
Guṇa	:	Snigdha, Guru
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Pittahara, Vātahara, Mūtravirecanīya, Stanyajanana

IMPORTANT FORMULATIONS - Mūtravirecanīya Cūrṇa, Stanyajanana Kaṣāya Cūrṇa

THERAPEUTIC USES – Kāsa; Pratiśyāya; Jvara; Netraroga; Aśmarī; Pittāśmarī; Śarkarā; Mūtrakṛcchra; Mūtraghāta; Mūtrarujā

DOSE - 3-6 g.

ITKAṬA (Stem)

Itkaṭa consists of dried stem of *Sesbania bispinosa* W. F. Wight (Fam. Fabaceae) an erect 1.5 to 2.5 m tall, annual, shrub with minute prickles on rachis and young branches, usually found as a weed in the rice fields or water logged areas in the plains of India.

SYNONYMS –

Sansk.	:	Vanajayantī, Utkaṭa
Beng.	:	Dhanicha, Dhunsha
Guj.	:	Sasee Ikad, Ikad
Hindi	:	Ikkada
Kan.	:	Mullu jinangi
Mal.	:	Kitamu
Mar.	:	Raanshevari, Chinchani
Ori.	:	Tentua
Punj.	:	Jhanjhan
Tam.	:	Mudchembai, Nirchembai
Tel.	:	Ettejangaa

DESCRIPTION -

a) Macroscopic:

Drug consists of chopped pieces of stem, 0.2 to 2.5 cm in diam. with fine striations; size and thickness variable, minute prickles observed only on thin young branches; greenish-brown externally and cream coloured internally; pith soft and white; odourless and tasteless.

b) Microscopic:

T.S. shows wavy outline, epidermal cells tabular with moderately thick cuticle; some containing granular substances; cortex 5 to7 cells deep, composed of thin walled cells; some of those present below the epidermis contain tannins; endodermis present; pericycle composed of 3 to 6 cell layers of discontinuous patches of sclerenchymatous fibres about 20 to 33 μ in diam.; towards the inner side of the sclerenchymatous fibre patches, tannin filled ducts of different sizes present; phloem 3 to 6 cells deep; cambium 3 to 5 cells deep, made up of compressed thin walled cells; xylem forms a closed ring around the central pith, showing secondary growth; the number of primary xylem equal to the ridges present on the outer surface of the stem; xylem vessels range from 24 to 82 μ in diam.; towards the inner side of the primary xylem, a cavity filled with tannins is present similar to that beneath the phloem; ray cells show starch grains; pith parenchymatous.

Powder – Yellowish-brown, fine fibrous, free flowing, characterized by the presence of large thin walled cells filled with tannins, thin walled parenchymatous cells abundant, tissues with stomata present, tracheids and fibre cells are also found.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 5 per cent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 per cent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 2 per cent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 8 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of methanol extract on silica gel 60 F 254 plate using Toluene : Acetone (90:10) shows seven spots at Rf 0.15, 0.23, 0.28, 0.31, 0.38, 0.55 and 0.91 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110^0C.

CONSTITUENTS - Amino acids such as lysine, arginine, histidine.

PROPERTIES AND ACTION -

Rasa	:	Madhura
Guṇa	:	Snigdha, Guru
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Vātahara, Pittahara, Śleṣmaprakopaka, Stanyajanana Mūtravirecanīya

IMPORTANT FORMULATIONS - Candanādi Taila (Caraka)

THERAPEUTIC USES – Kāsa; Pratiśyāya; Jvara; Netraroga; Aśmarī; Pittāśmarī; Śarkarā; Mūtrakṛcchra; Mūtraghāta; Mūtrarujā

DOSE - 3-6 g.

JALAPIPPALĪ (Whole Plant)

Jalapippalī consists of the dried whole plant of *Phyla nodiflora* Greene syn. *Lippia nodiflora* Mich. (Fam. Verbenaceae) a small creeping perennial herb found commonly in sandy wet, grassy places along bunds of irrigation channels, canal edges and river banks almost throughout greater part of India and up to 900 m on the hills.

SYNONYMS -

Sansk.	:	Jalapippalikā, Toyavallarī, Śaradī, Matsyādanī, Matsyagandhā
Beng.	:	Bukkana, Kaanchadaa
Eng.	:	Purple Lippia
Guj.	:	Rataveliyo
Hindi	:	Jalpipali, Panisigaa, Bhuiokaraa
Kan.	:	Nelahippali
Mal.	:	Nirtippali, Podutalai (Siddha)
Mar.	:	Jalpippali, Ratavel
Tam.	:	Potuttali
Tel.	:	Bokkena

DESCRIPTION -

a) Macroscopic:

Root - Fibrous, branched, brown in colour, 2 to 10 cm in length and 1.0 to 1.5 mm in diam., nodal roots are smaller, 0.5 to 1.0 cm in length and unbranched.

Stem - Much branched, sub quadrangular, 1 to 2 mm in diam., rooting at nodes, more or less clothed with appressed, two armed, white hairs when seen under 10x, brownish-green, length of internode 5.0 to 9.0 cm.

Leaf - Opposite, sub-sessile, 1.5 to 3.7 cm long and 1 to 2 cm broad, spathulate, cuneate at the base, deeply and sharply serrate in the upper part, appressed by two armed, white minute hairs on both sides.

Flower - Sessile, densely packed in long pedunculate axillary spikes, mature ones 1.0 to 2.0 cm long and 0.4 to 0.5 cm broad, flowering densely becoming oblong during fruiting; peduncles 2.5 to 7.5 cm long, bracts about 2.5 mm long, broadly elliptic or obovate, cuneate at base, mucronate, glabrous; calyx 2.0 mm long, membranous, bilobed, compressed, mitre-shaped, pubescent underneath with ordinary trichomes closely covering the fruit, the acuminate lobes projecting beyond it; corolla 2.5 to 3.0 mm long, white or light pink, bilipped, upper lip erect and bifid, lower lip 3 lobed of which the middle lobe largest, falling off as a calyptra when fruits ripens; stamens 4, didynamous, anthers 2-celled, dehiscing longitudinally, dorsifixed; ovary superior, bicarpellary, ovules in each cell solitary; style short, stigma oblique, subcapitate.

Fruit - Small, 1.5 to 2.0 mm long, globose, oblong, spliting into two, 1-seeded plano-convex pyrenes; seeds exalbuminous about 1 mm in size.

b) Microscopic:

Root - T.S. shows slightly wavy outline composed of a single layered epiblema; cortex 6 to 9 cells deep, most of the outer cortical cells in the nodal roots contain chloroplast; some of the cortical cells towards the inner side are thick walled; phloem cells are irregularly thick walled consisting of sieve tubes, companion cells and phloem parenchyma; xylem composed of vessels, tracheids, parenchyma and fibers; vessels are variable in size, range in diameter from 16 to 65 μ; medullary rays about 2 or 3 cells in width, cells are pitted; pith absent.

Stem - T.S. shows a nearly quadrant outline with ridges and deep furrows, striated cuticle, a single layer of epidermis with cells longer than broad; surface possesses unicellular trichomes with two unequal arms which usually gets detached; cortex is about 7 cells deep in the furrows, mainly chlorenchyma while those of ridges are of collenchyma; a few cells contain amorphous inclusions and many inner cells contain chloroplast; endodermis observed; pericycle 2 or 3 layers of cells, thick walled; phloem compressed and 5 or 6 cells deep; xylem a continuous ring, broader at the troughs. Pith large, composed of thin walled parenchymatous cells; central cells usually degenerated, but several others may occasionally contain a few chloroplasts.

Leaf - Isobilateral, epidermis single layered followed by a layer of palisade cells; occasionally, a layer palisade also occurs adjacent to the lower epidermis; in surface view, the epidermal cells have straight walls; stomata diacytic, present on both lower and upper surface, but more in number on lower surface, covering and glandular trichomes occur on both the surfaces; unicellular, 2 unequally armed warty trichomes, with pointed tips are frequent on both the surfaces; midrib vascular bundle possesses xylem on dorsal side and phloem on ventral side; stomatal index of upper and lower surface 11 to 18 and 18 to 30 respectively; the palisade ratio of upper surface 6 to 11 and that of lower 8 to 13.

Powder: Greenish-brown, fibrous, free flowing, characterized by the presence of glandular hairs, 2 armed trichomes which are usually attached to a epidermal cell from the slightly protruded stalk present in the middle, trichomes warty, leaf epidermis characterized by the presence of circular trichome scars, vessels and palisade cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 27 per cent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 5 per cent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 4 per cent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 12 per cent, Appendix 2.2.7.

T.L .C. –

T.L.C. of methanol extract on silica gel 'G' plate using Chloroform : Methanol (95:05) shows five spots at Rf 0.21, 0.26, 0.34, 0.40 and 0.79 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110^0C.

CONSTITUENTS – Flavonoids namely nodiflorin A and nodiflorin B, nodifloretin, lippiflorins A and B.

PROPERTIES AND ACTION -

Rasa	:	Kaṭu, Tikta, Kaṣāya
Guṇa	:	Rūkṣa, Tīkṣṇa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Mūtral, Jvaraghna, Śukarala, Mukhaśodhanī, Dīpanī, Hṛdya, Cakṣuṣya, Sangrāhi, Rucya, Viṣaghna

IMPORTANT FORMULATIONS - Akīka, Piṣṭī, Akīka Bhasma

THERAPEUTIC USES – Raktaroga; Dāha; Vrana; Śvāsa; Bhrama; Mūrchhā; Tṛṣā; Raktadoṣa; Kṛmi; Jvara; Pittātisāra; Visarpa

DOSE - 2 to 3 g powder.

½ to 2 ml juice.

JĪVAKAḤ (Pseudo-bulb)

Jīvakaḥ consists of dried and fresh pseudo-bulb of *Malaxis acuminata* D. Don syn. *Microstylis wallichii* Lindl. (Fam. Orchidaceae), a short stemmed terrestrial herb up to 25 cm in height, distributed throughout India on hills at an altitude of 2000 – 3000 m.

SYNONYMS –

Sansk.	:	Jīvya, Dīrghāyu, Cirajīvī
Eng.	:	Jeevak
Hindi	:	Jeevak
Mal.	:	Jeevakam
Tam.	:	Jeevakam
Tel.	:	Jeevakamu

DESCRIPTION –

a) Macroscopic :

Fresh pseudo bulb conical in shape, fleshy, green, smooth, shining, 1 to 9 cm long and 1 to 3 cm broad, slightly mucilagenous, covered with shining, transluscent light green, membraneous, 3 or 4 sheathing leaves arranged alternately and having parallel venation; stem rudimentary; roots arising at the union of stem and bulb.

Dried pseudo bulbs conical, transluscent, reddish-brown in colour, measuring 2 to 5 cm long and 0.25 to 1 cm wide, covered with sheathing leaves, which are light brown, membraneous with parallel venation; surface rough, punctated, fracture hard; cut surface dark brown, coarsely granulated with irregular margins and white spots; pleasant smell; astringent, slightly mucilagenous in taste.

b) Microscopic :

T.S. of pseudo bulb oval to circular in outline; section passing through scaly leaves which exfoliate, showing a single layered, thick walled, sclerified epidermis having acicular crystals of calcium oxalate, followed by mesophyll adjacent to the upper epidermis composed of 2 to 4 layers of elongated cells with lignified reticulate thickening the lignification was confirmed with phloroglucinol and Conc. HCl, devoid of chlorolplast; vascular bundles prominent, phloem well developed with large sieve plates, surrounded by sclerenchymatous bundle sheath; section passing through bulb shows a single layer of cuticle and a layer of thick walled sclerified epidermal cells; below this lie 1 or 2 layers of large sclerified cells and these extend unevenly into ground parenchymatous tissue; ground parenchyma irregular, with large air spaces with passage cells in the form of small protuberances at some places; vascular bundles scattered throughout the ground tissue surrounded by thick walled sclerenchymatous cells, which occasionally extend into intercellular spaces.

Powder – Yellowish-brown in colour, pleasant smell, slightly bitter and astringent in taste, shows groups of mesophyll cells with reticulate thickenings inside; vessels with spiral, scalariform and reticulate thickening; fibre tracheids of about 600 µm long upto 80 µm broad, and tracheids (about 19 µm long and 40 µm broad); groups of parenchyma with accicular crystals of calcium oxalate, sieve plates, sieve tubes and angular parenchymatous cells. Powder when treated with conc. HNO_3 on microscopic slide emits light green fluorescence under UV 365 nm.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 3 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.5 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 4 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 12 percent, Appendix 2.2.7.
Starch	-	Not less than 19 percent, Appendix 2.2.13.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate (90 : 10) [double run] shows spots after spraying with anisaldehyde-sulphuric acid reagent and heating the plate for ten minutes at 120^0C at Rf. 0.12 (orange), 0.18 (purple), 0.29 (grey), 0.38 (orange) and 0.59 (brown).

CONSTITUENTS – Alcohol (ceryl alcohol), glucose, rhamnose and diterpenes.

PROPERTIES AND ACTION –

Rasa	:	Madhura
Guṇa	:	Snigdha, Picchila
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Vātahara, Pittahara, Dhātuvardhaka, Śukrala, Bṛṁhaṇa, Balya, Snehopaga, Jīvanīya, Rasāyana

IMPORTANT FORMULATIONS – Daśamulāriṣṭa, Cyavanaprāśa, Brāhma Rasāyana, Śivaguṭikā, Amṛtaprāśa Ghṛta, Aśoka Ghṛta, Dhānvantara Taila, Balā Taila, Mānasamitra Vaṭaka, Guducyādi Taila, Bṛhat Aśvagandhā Ghṛta

THERAPEUTIC USES – Raktapitta; Dāha; Kṣaya; Raktavikāra; Kārśya; Śvāsa; Kāsa; Śoṣa

DOSE – 5-10 g.

KADARAḤ (Heart Wood)

Kadaraḥ consist of dried pieces of heart wood of *Acacia suma* Buch.-Ham. (Fam. Mimosaceae), a medium sized tree with white bark exfoliating in papery flakes with horizontal patches of darker colour, found in W. Bengal, Bihar and Southern Western Ghat.

SYNONYMS –

Sansk.	:	Somavalkah, Śvetakhadirah
Beng.	:	Shvet Khadir
Eng.	:	White Cutch tree, White Catechu
Guj.	:	Gorada, Gordio baaval
Hindi	:	Safed Khair
Kan.	:	Kandarah
Mal.	:	Venkarinnali, Somarayattoli
Mar.	:	Paandharaa Khair
Tam.	:	Kovil, Shilaiyunchai
Tel.	:	Tellatumma, Tellasundra, Tellachandra

DESCRIPTION –

a) Macroscopic :

Heart wood in cut rectangular pieces showing knots; pale yellow, rough; fracture, hard, emits faint odour of wood, almost tasteless.

b) Microscopic :

Heart wood – Transverse section shows diffuse porous wood, indistinct growth rings; vessels occasionally occur in pairs or in group of 3; paratracheal parenchyma abundant, vasicentric, filled with starch granules and prismatic calcium oxalate crystals, medullary rays wide, straight, multiseriate.

A tangential section shows heterocellular, multiseriate; medullary rays 5 to 7 times higher than the breadth; that is upto or over 50 cells vertically and about 10 to 12 cells across at their widest level; medullary rays are surrounded by crystal sheath with prismatic crystals; fibres are aseptate pitted; compactly arranged narrow squarish lignified tracheids; vessels with simple bordered pits; xylem parenchyma contain prismatic crystal of calcium oxalate; gums and tannins.

Powder – Yellow coloured, coarse, not free flowing; under microscope shows a number of fibres, vessels, thick walled cells of medullary rays, occasional crystals of calcium oxalate and thick lignified tissues and starch grains, fluorescence test negative, when an extract in alcohol / water is examined under 366 nm and 254 nm.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 4 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 2 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 2 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 8 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on silica gel 'G' (0.2 mm thick ness) plate using toluene : methanol (7:3) shows ten bands at Rf. 0.13, 0.26, 0.34, 0.38 (all yellow), 0.43 (purple), 0.47 (light brown), 0.51 (sky blue), 0.61 (pinkish brown), 0.69 (pink with blue border) 0.78 (grey). On spraying with 5% Ethanolic-sulphuric acid reagent and on heating the plate for ten minutes at 105^0 C, ten bands appear at Rf. 0.11, 0.21, 0.29, 0.53 (all purple), 0.66, 0.71 (both brown), 0.78 (purple core with blue border), 0.83, 0.90, 0.99 (all grey).

CONSTITUENTS – An alkaloid diaboline, β-sitosterol, stigmasterol, oleanolic acid and its 3β-acetate, a saponin containing oleanolic acid, galactose, mannose.

PROPERTIES AND ACTION -

Rasa	:	Tikta
Guṇa	:	Viṣada
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Kaphahara, Varṇya, Pittahara, Raktaśodhaka

IMPORTANT FORMULATIONS - Ayaskṛti

THERAPEUTIC USES – Madhumeha; Mukharoga; Udarda; Kaṇḍu; Medodoṣa; Vraṇa; Pāṇḍu; Kuṣṭha; Śvitra; Raktadoṣa

DOSE - 2-6 g.

KĀKAJAṄGHĀ (Seed)

Kākajaṅghā consists of dried mature seed of *Peristrophe bicalyculata* (Retz.) Nees (Fam. Acanthaceae), an erect hispid herb 60 to 180 cm tall, found in forests and waste lands almost throughout the country.

SYNONYMS -

Sansk.	:	Naḍīkāntā, Kākatiktā, Prācībala, Sulomaśā, Vāyasajaṅghā
Beng.	:	Naaskaaga
Guj.	:	Kaaliaghedi, Kariaghedi, Aghedi
Hindi	:	Atrilal, Masi, Kaakjanghaa
Kan.	:	Cibigid, Cibirsoppu
Mar.	:	Ghaatipittaapapadaa, Raankiraayat
Tam.	:	Chebira
Tel.	:	Chebira

DESCRIPTION –

a) Macroscopic :

Black, orbicular, 1.7 to 2 mm, slightly rugose, bitter with oily feeling on tongue and no special odour.

b) Microscopic :

Seed – Transverse section of seed shows testa having single layered epidermis, cells appearing straight walled and angular in surface view producing short stout unicellular hairs having recurved hooks and dark contents; tegmen 2 layered, parenchymatous; cotyledon has outer most epidermis and inner single layer of palisade like parenchyma and 4 or 5 layers of shorter cells; cotyledon shows provasculature at some places; cells contain protein aleurone grains and oil at some places.

Powder – The powder is blackish-yellow in colour; it shows hairs, a few cells of palisade parenchyma and cells of cotyledon with oil can also be seen, straight walled packed angular epidermal cells of testa with scars of hairs.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent,	Appendix 2.2.2.
Total ash	-	Not more than 6 percent,	Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.1 percent,	Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 10 percent,	Appendix 2.2.6.
Water soluble extractive	-	Not less than 20 percent,	Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on silica gel 'G' (0.2 mm thick ness) plate using toluene : dichloromethane : ethanol : formic acid (10:3:3:1) shows under U.V. (366 nm) five greenish blue fluorescent bands at Rf. 0.14, 0.18, 0.22, 0.39, 0.54. On exposure to Iodine vapour six bands appear at Rf. 0.18 (greenish brown), 0.22, 0.37 (both light brown), 0.53, 0.68, 0.74 (all yellow). On spraying with 5% Ethanolic-sulphuric acid reagent and heating the plate for ten minutes at 105^0 C, eleven bands appear at Rf. 0.14, 0.22, 0.30, 0.37 (all light brown), 0.48 (greenish brown), 0.53 (yellowish brown), 0.56 (brown), 0.59 (pinkish brown), 0.68 (lower half blue and upper half pink), 0.74, 0.87 (both pinkish brown).

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya
Guṇa : Sara, Picchila
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphapittanut, Kṛmighna, Varṇya, Vraṇahara, Viṣaghna

IMPORTANT FORMULATIONS - Mahāviṣagarbha Taila

THERAPEUTIC USES – Viṣamajvara; Bādhirya; Raktapitta; Pāndu; Pradara; Jvara; Kaṇḍu; Śoṣa; Kṣata Kṣīṇa; Jantakṛmi; Grahaṇī; Duṣṭavraṇa; Ślīpada; Sidhma; Sarpaviṣa; Śastrakṣata; Galagaṇḍa; Apacī; Bālagraha; Pratiśyāya

DOSE - 1- 3 g.

KĀKANAJA (Fruit)

Kākanaja consists of dried mature fruit of *Physalis alkekengi* Linn. (Fam. Solanaceae), it occurs in S. Europe through China to Japan; it does not occur in India, but fruits are available in the Indian bazaar, in the name of kakanaja.

SYNONYMS -

Sansk.	:	Rajaputrika
Beng.	:	Kakanaja
Eng.	:	Winter cherry, Bladder cherry
Guj.	:	Kakanaja
Hindi	:	Kakanaja
Kan.	:	Kakanaja
Mal.	:	Kakanaja
Mar.	:	Kakanaja
Punj.	:	Kaaknaj
Tam.	:	Sisayakkaali, Tottakkaali
Tel.	:	Kupante
Urdu.	:	Kakanaj

DESCRIPTION –

a) Macroscopic :

Red coloured berry, globose, about 1 to 1.5 cm in diameter, outer surface wrinkled, with dried flesh; unilocular, completely packed with seeds, overlapping, centrally oriented, insignificant placenta present; seeds 1.8 to 2.2 mm, numerous, flat, with curved embryo, hilum in the concavity; fruit sweet and sour in taste.

b) Microscopic :

Fruit – Cuticle present; fruit wall not distinguishable as epicarp, mesocarp and endocarp clearly; the outer layer consists of a single layer of non lignified, thin walled cell with brown contents; below this are a few layers of horizontally oriented cells with orange contents and loosely arranged layers of parenchyma, with mucilage cells; inner layers of the fruit wall and the placentae proliferate into the locule packed with minute seeds.

Seed – T.S. is elongated with a projection at both ends; testa has an outermost papillose thin walled cells followed by thickened sclereids, which appear bone shaped at the projected parts, the latter showing pits on their walls; below are 2 or 3 layers of thin walled cells followed by a thick cuticle and inner lignified single layered tegmen; endosperm contains thin walled polygonal parenchymatous cells filled with aleurone grains, oil globules and occasional sandy calcium oxalate crystals; embryo curved if present.

Powder – The powder is brownish-orange in colour; shows sclereids, parenchymatous cells, endospermic parenchymatous cells rich in oil and aleurone grains.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 6 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 10 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 22 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on silica gel 'G' (0.2 mm thick ness) plate using toluene : methanol (7:3) shows eleven bands at Rf. 0.11 (dark brown), 0.38, 0.44, 0.46, 0.52, 0.56 (all light grey), 0.66 (dark brown), 0.72, 0.78, 0.83, 0.88 (all light grey), on spraying with 5% Ethanolic-sulphuric acid reagent and heating the plate for ten minutes at 105^0 C.

CONSTITUENTS – Auroxanthin, mutatoxanthin, phydalein, zeaxanthin, β-Cryptoxanthin from the calyx of the fruit; glycoalkaloids detected in the seeds but alkaloids were absent in the fruit.

PROPERTIES AND ACTION -

Rasa	:	Madhura, Tikta
Guṇa	:	Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Vātahara, Dāhaśāmaka, Balya, Mūtrala, Virecana, Śūlanāśinī, Raktavidrāvaṇī

IMPORTANT FORMULATIONS – Lauha Rasāyana

THERAPEUTIC USES – Pūyameha; Tamakaśvāsa; Vraṇa; Visarpa; Kaṇḍu; Śopha; Kāsa; Śvāsa; Jvara

DOSE - 5-10 g. in the powder form.

KĀLĪYAKA (Root and Stem)

Kālīyaka consists of the dried root & stem of *Coscinium fenestratum* (Gaertn.) Colebr. (Fam. Menispermaceae), a large woody climber with stout stem and branches, occurring in the Western Ghats.

SYNONYMS –

Sansk.	:	Kalambaka, Kālīya, Kālīyākhya, Kāleyaka
Eng.	:	False Calumba
Hindi.	:	Jhaar-ki-hald
Kan.	:	Mardaa arashinaa
Mal.	:	Maramanjal
Mar.	:	Venivel
Tam.	:	Atturam, Kadari, Manjalkoid
Tel.	:	Manu pasupu

DESCRIPTION –

a) Macroscopic :

Root - 5 to 30 cm or more in length, 2 to 5 cm. in diameter, somewhat longitudinally grooved, transversely cut surface smooth, yellow; texture rough and fibrous; acrid in taste; no particular odour.

Stem - 15 to 30 cm. or more in length, 2 to 8 cm. in diameter, straight or occasionally slightly twisted, pale grey or greyish yellow with a fairly smooth surface, marked with longitudinal striations spaced about a mm apart, cut surface yellowish-green to yellow in colour showing wedge shaped areas, fissured with shallow vertical slits of varying length; texture, hard; acrid in taste.

b) Microscopic :

Root - Transverse section circular in outline; cork cream coloured, 20 to 30 or more rows of uniform rectangular cells with 1 to 2 stone cells; outer cortical tissue characterized by the presence of very prominent yellowish band almost in the form of ring of thick walled, pitted stone cells; prismatic crystals of calcium oxalate found in the thick walled cells; sieve tubes with simple perforation plate; evident in L.S.; narrow radiating wedge shaped xylem strips; alternating with wedge shaped, broad, multiseriate medullary rays with thick walled cells filled with rod shaped crystals of calcium oxalate and starch grains which are circular, appearing lenticular on edge view, simple, 30-45 μm in diameter; hilum indistinct or dot-like, centrally placed if present, lamellae indistinct; vessels filled with tyloses and in mature root these tyloses become thick walled giving the appearance of stone cells; fibres long, lignified.

Stem - The transverse section circular in outline, shallowly crenate; cork 20 to 40 cells thick; cortex 5 to 8 layers of tangentially elongated parenchymatous cells having very conspicuous yellowish crenate bands of hard tissue or stone cells with radiating canals and filled with dark yellow contents, almost capping the wedge shaped medullary rays and phloem; sclerotic elements cubical to oval with very thick pitted walls filled with prismatic crystals of calcium oxalate; phloem distinct; xylem narrow, radiating, wedge shaped as in root, vessels 70 to 160 µm in diameter, solitary, pitting reticulate with small lenticular orifices, occluded with thick walled tyloses; fibres septate to nonseptate, septate fibres having 2 to5 septa, 270 to 400 µm long and 12 µm in diameter; medullary rays extend from pith to periphery, broad, multiseriate, 15 to many cells high and 2 to many cells wide; pith consist of two regions: (i) 4 to 6 layers of smaller collenchymatous cells in the periphery; (ii) parenchymatous cells circular to polyhedral in shape with intercellular spaces, cells larger towards the centre.

Powder - Powder of both root and stem yellow with greenish tinge, bitter and odourless. Microscopical examination shows the presence of fibres, tyloses, stone cells containing prismatic crystals of calcium oxalate, starch grains circular appearing lenticular shaped on edge view, simple, 30-45 µm in diameter hilum indistinct or dot like centrally placed if present, lamellae indistinct, fragments of vessels, tracheids and parenchymatous cells; when treated on microscopic slide with 1N NaOH aqueous solution and mounted in nitrocellulose in amylacetate emits very characteristic canary yellow colour under UV-365 nm.

IDENTITY, PURITY AND STRENGTH –

Root –

Foreign matter	:	Not more than 1 percent, Appendix 2.2.2.
Total ash	:	Not more than 2 percent, Appendix 2.2.3.
Acid insoluble ash	:	Not more than 0.4 percent, Appendix 2.2.4.
Alcohol soluble extractive	:	Not less than 11 percent, Appendix 2.2.6.
Water soluble extractive	:	Not less than 10 percent, Appendix 2.2.7.
Total alkaloid as berberine chloride	:	Not less than 2 percent, Appendix 2.2.18.

Stem –

Foreign matter	:	Not more than 1 percent, Appendix 2.2.2.
Moisture content	:	Not more than 6 percent, Appendix 2.2.9.
Total ash	:	Not more than 3 percent, Appendix 2.2.3.
Acid insoluble ash	:	Not more than 2 percent, Appendix 2.2.4.
Alcohol soluble extractive	:	Not less than 3 percent, Appendix 2.2.6.
Water soluble extractive	:	Not less than 8 percent, Appendix 2.2.7.
Total alkaloid as berberine chloride	:	Not less then 1 percent, Appendix 2.2.18.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using isopropanol : formic acid : water (45 : 0.1 : 0.4) shows under UV (366 nm) fluorescent spots at Rf. 0.10, 0.17, 0.24, 0.34, 0.39, 0.5, 0.56, 0.78 at similar Rf. On spraying with modified Dragendroff's reagent orange spots appear at Rf. 0.10, 0.24, 0.34, 0.83 and 0.89.

CONSTITUENTS – Alkaloids-berberine, palmitine, jatrorrhizine, proto-berberine, N, N-di-lindacarpine, thalifendine and columbamine.

Kālīyaka (Root)

PROPERTIES AND ACTION –

Rasa : Kaṣāya
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Śleṣmasaṁaśamana, Pittahara, Dīpana, Pācana, Anulomaka, Raktaśodhaka

IMPORTANT FORMULATIONS – ----

THERAPEUTIC USES – Tikta-Usna; Raktapitta; Jīrṇa Jvara; Prameha; Kṛmi; Ajīrṇa; Ādhmāna; Kāmalā; Agnimāndya; Vraṇa; Vyonga

DOSE - 1–3 g.

Kālīyaka (Stem)

PROPERTIES AND ACTION –

Rasa : Tikta
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Śleṣmasaṁaśamana, Pittahara, Kaphamedohara, Dīpana, Pācana

IMPORTANT FORMULATIONS – ----

THERAPEUTIC USES – Kuṣṭha; Prameha; Pāṇḍuroga; Jvara; Ajīrna; Agnimāndya; Ādhamāna Yakrt Vikāna; Kṛmi; Dāha; Aśmarī; Upadaṁśa Vraṇa; Yuvānapiḍakā; Vyanga

DOSE - 2–6 g.

KAPĪTANA (Stem Bark)

Kapītana consists of stem bark of *Thespesia populnea* (L.) Soland. ex Correa syn. *Hibiscus populneus* Linn. (Fam. Malvaceae), a fast growing, medium-sized evergreen tree, upto 10 m tall with yellow, cup-shaped flowers having maroon centre and distributed throughout coastal forests of India and also largely grown as a roadside tree.

SYNONYMS-

Sansk.	:	Pāriṣah, Kandarala, Phalīśah, Gardabhāṇḍah
Beng.	:	Gajashundi, Paraasapipula
Eng.	:	Portia tree, Umbrella tree
Guj.	:	Paaraspipalo
Hindi	:	Paaraspipal
Kan.	:	Huvarasi
Mal.	:	Punavasu, Pupparutti
Mar.	:	Parasa pimpala
Tam.	:	Chilanti, Punarasu
Tel.	:	Ganyaraavi, Munigangaraavi

DESCRIPTION-

a) Macroscopic :

Bark occurs in flat to slightly curved pieces, varying in thickness according to age and parts of tree from where it is taken; external surface rough due to numerous irregularly scattered lenticels, fissured, exfoliating in irregular scales, greyish-brown; inner surface, laminated, foliaceous, reddish-brown; fracture, fibrous; no characteristic odour; taste, astringent.

b) Microscopic :

Shows outer exfoliating layer in hard, woody, older barks; cork cells, thin-walled, 10 to 20 layered, rectangular; cortex many layered, outer cortex consisting of closely packed, small, polygonal cells, inner cortex composed of large, rectangular to polygonal cells; bast fibres, abundant in groups, outer groups radially elongated and inner tangentially; medullary rays of two types, narrow, uni to triseriate of slightly elongated rectangular cells and wide, multiseriate, irregularly arranged; large ducts in cortex filled with yellow to orange contents; yellow inclusions present in the cells of outer cortex; rosette calcium oxalate crystals scattered in cortex and medullary rays; starch grains, simple or compound in phloem region.

Powder -Reddish-brown; shows stratified cork tissue, numerous fibres in groups with narrow lumen and bluntly pointed ends; phloem parenchyma cells with large single rosette calcium oxalate crystal; starch grains, simple to 2 or 3 compound; hilum, distinct.

IDENTITY, PURITY AND STRENGTH-

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 13 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 3 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 2 percent, Appendix 2.2.7.

T.L.C.-

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : methanol : formic acid (100:2.5:1) shows spots at Rf. 0.12 (brown), 0.18 (brown), 0.29 (brown) and 0.61 (reddish when hot turns yellowish on cooling) on spraying with vanillin-sulphuric acid reagent and heating the plate at 105 °C for about ten minutes.

CONSTITUENTS- Flavonoids, steroids and sesquiterpenoidal quinines.

PROPERTIES AND ACTION –

Rasa	:	Kaṣāya
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Vātahara, Pittahara, Kaphahara, Mūtrasaṁgrahaṇīya, Stambhana, Medohara, Sandhānīya, Śukrala, Saṁgrāhī, Bhagnasandhānakṛta, Puṁsavanam

IMPORTANT FORMULATIONS- Nyagrodhādi Kvātha Cūrṇa

THERAPEUTIC USES- Raktapitta; Prameha; Raktavikāra; Yoniroga; Dāha; Tṛṣā; Medoroga; Vraṇa; Śotha; Tvakroga; Bālavisarpa; Pāmā; Kaṇḍu; Dadru

DOSE- 50 - 100 ml kvātha.

KARKAŚA (Root)

Karkaśa consists of the root of *Momordica dioica* Roxb. ex Willd. (Fam. Cucurbitaceae) a vine found throughout India up to an altitude of 1500 m, also cultivated for its fruits, which are used as vegetables.

SYNONYMS –

Sansk.	:	Karkoṭakī, Vandhyā Karkoṭakī
Beng.	:	Titkaankarol
Guj.	:	Baanjhakartolaa, Kankodi
Hindi	:	Vanakakodaa, Baanja, Khekhasaa, Kakodaa
Kan.	:	Maadadaangal
Mar.	:	Vaanjh-Kartoli, Kartole
Ori.	:	Kaankada
Tam.	:	Paluppakai
Tel.	:	Aagaakar

DESCRIPTION –

a) Macroscopic:

Finely chopped pieces of tuberous roots, outer surface rough and greyish-brown, central portion white to cream, starchy, friable; fracture, fibrous; odourless and slightly bitter taste.

b) Microscopic:

T.S. shows cork 6 to 9 cells deep, cells brick-shaped and arranged in rows with greyish-brown contents; cork cambium cells similar in structure and size followed by a zone of compressed cells 2 to 4 cells deep; cortex composed of about 10 layers of cells, thin walled, irregular in shape and parenchymatous, towards the inner side of the cortex, scattered solitary or groups of sclerenchymatous cells are present; phloem 6 to 8 cells deep, phloem parenchyama usually filled with starch grains of about 16 to 25 μ in diam.; xylem composed of scattered vessel strands and xylem parenchyma; most of the vessels are usually solitary or found in groups of 2 or 3; xylem parenchyma contains round or oval starch grains similar to that in phloem.

Powder – Whitish-brown, free flowing, characterized by the presence of sclerenchymatous cells, showing radial pit canals and narrow lumen; starch grains, cork cells and parenchymatous cells are also present.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 3 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 31 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of water extract on silica gel 'G' plate using n-butanol : Acetic acid : Water (40:10:50) shows nine spots at Rf 0.19, 0.23, 0.24, 0.27, 0.36, 0.40, 0.53, 0.72 and 0.89 on spraying with 10% alcoholic sulphuric acid and heating the plate for 15 minutes at 110^0C.

CONSTITUENTS – α-eleostearic acid, 2-acetyl-5-chloropyrrole.

PROPERTIES AND ACTION -

Rasa	:	Tikta
Guṇa	:	Laghu, Tīkṣṇa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Kaphahara, Pittahara, Vraṇaśodhaka, Rucikara, Rasāyana

IMPORTANT FORMULATIONS- Hiraka rasāyana, Visanāśaka yoga (Ayurved Prakash), Kakadanī taila, Kālāgnīrudra rasa, Sannīpāta vidhvanisa rasa, Candrarudra rasa

THERAPEUTIC USES – Visarpa; Sarpaviṣavikāra; Mūtrakṛcchra; Sarpaviṣa; Jvara; Kāsa; Śvāsa; Hikkā; Arśa; Kṣaya; Raktārśa; Madhumeha; Netraroga; Śiroroga; Kāmalā; Aśmarī

DOSE - 3-6 g.

KARṆASPHOṬĀ (Seed)

Karṇasphoṭā consists of the seed of *Cardiospermum halicacabum* Linn. (Fam. Sapindaceae), commonly found as a weed throughout India, ascending upto 1,200 m. in the North West Himalayas.

SYNONYMS-

Sansk.	:	Kākādanī, Kākatiktā, Kākamardanikā, Śakakralata (S.y.)
Beng.	:	Jyotishmati (of Bengal)
Eng.	:	Ballon Vine, Heart's Pea
Guj.	:	Nayaphatki, Kapaalphodi, Bodha, Shivajaala
Hindi	:	Kaanphuti, Lataaphataki
Kan.	:	Kanakayya
Mal.	:	Ulinna
Mar.	:	Fatphati, Kaanphuti, Khiljala
Siddha	:	Mudakkarutana
Tam.	:	Mudukkottan, Modikkottan
Tel.	:	Vekkudutiga

DESCRIPTION-

a) Macroscopic :

Seeds are about 4 to 6 mm, subglobose, black, shiny with a whitish scar of aril, nutty flavour; no odour.

b) Microscopic :

T.S. shows an outermost thick yellowish layer of cuticle; testa shows a single layer of radially elongated, brown and thick walled palisade like cells showing linea lucida and with stellately lobed lumen as seen in surface view; a wide zone of sclereids with thick walled highly sinuous, light yellow to yellowish-brown lignified cells showing radiating canals on their walls in surface view; tegmen consists of parenchyamatous cells; ground tissue of the embryo consists of angular to hexagonal parenchyma cells with oil globules; starch grains absent.

Powder - Powder light brown in colour, with black fragments of the seed coat and has the taste and odour of cucurbitaceous seed with a nutty flavour; shows surface view of palisade layer with hexagonal outline and stellately lobed lumen, surface view of the much sinuous sclereid layer and oil globules.

IDENTITY, PURITY AND STRENGTH-

Foreign matter	-	Not more than	2 percent, Appendix 2.2.2.
Total Ash	-	Not more than	5 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than	0.5 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than	21 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than	5 percent, Appendix 2.2.7.
Fixed oil	-	Not less than	20 percent, Appendix 2.2.8.

T.L.C. -

T.L.C. of methanolic extract on silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate : diethyl amine (85:15:0.5) shows under UV (366 nm) fluorescent spots at Rf. 0.10 (white), 0.21 (blue) and 0.70 (blue). After spraying with anisaldehyde-sulphuric acid reagent and heating the plate at 105 °C for ten minutes spots appear at Rf. 0.15 (blue), 0.34 (greenish blue), 0.44 (bluish black), 0.64 (blue) and 0.71 (blue). T.L.C. of the methanolic extract using butanol : acetic acid : water (6:1:2) after spraying with anisaldehyde-sulphuric acid reagent shows spots at Rf. 0.08 (green), 0.15 (green), 0.23 (green), 0.28 (purple), 0.38 (green), 0.47 (pink), 0.53 (yellowish green), 0.83 (purple) and 0.93 (purple).

CONSTITUENTS – Fixed oil.

PROPERTIES AND ACTION -

Rasa	:	Tikta, Kaṭu
Guṇa	:	Laghu, Rūkṣa, Tīkṣṇa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Vātahara, Mūtrala, Keśya, Medhya, Viṣaghna

IMPORTANT FORMULATIONS – Āmatisāranāśaka Yoga, Vāsādilepa, Nāgarādi Taila, Laśunādi Kaṣāya

THERAPEUTIC USES - Jvara; Śopha; Pāṇḍu; Śūla; Vṛddhi; Sandhi-vata; Graha-Bādhā; Bhūtabādhā; Viṣabādhā

DOSE - 1-2 g.

KARṆASPHOṬĀ (Root)

Karṇasphoṭā consists of the root of *Cardiospermum halicacabum* Linn. (Fam. Sapindaceae), commonly found as a weed throughout India, ascending upto 1200 m. in the North Western Himalayas.

SYNONYMS-

Sansk.	:	Kākādanī, Kākatiktā, Kākamardanikā, Śakakralata (S.y.)
Beng.	:	Jyotishmati
Eng.	:	Ballon Vine, Heart's Pea
Guj.	:	Nayaphataki, Kapaalphodi, Bodha, Shivajaala
Hindi	:	Kaanphuti, Lataaphataki
Kan.	:	Kanakayya
Mal.	:	Ulinna
Mar.	:	Fatphati
Siddha	:	Mudakkarutana
Tam.	:	Mudukkottan, Modikkottan
Tel.	:	Vekkudutiga

DESCRIPTION-

a) Macroscopic :

Tap root, thick, reddish-brown, hard, woody, branched rootlets, 2 to 5 mm thick.

b) Microscopic :

T.S. shows outermost 3 or 4 layers of cork, cells of which are flattened and crushed, followed by a single layered cork cambium, followed by a cortex 10 to 15 layers deep, with cells compactly arranged and laterally elongated; endodermis single layered; phloem present, cambium 2 or 3 layered thick, xylem contain vessels of various diameters, medullary rays uniseriate, protoxylem points discernible among collapsed cells of pith.

Powder- Light brown. Fibres and pitted vessels are seen.

IDENTITY, PURITY AND STRENGTH-

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total Ash	-	Not more than 7 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 9 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 15 percent, Appendix 2.2.7.

T.L.C.-

T.L.C of methanolic extract on silica gel 'G' plate (0.2 mm thick) using phenol : water (3:1) shows spots at R_f 0.06 (pinkish brown), 0.17 (pinkish brown), 0.22 (greyish green), 0.29 (brown), 0.34 (greyish green) and 0.46 (purple) after spraying with 10% ethanolic-sulphuric acid reagent.

PROPERTIES AND ACTION-

Rasa	:	Tikta, Kaṭu
Guṇa	:	Tīkṣṇa, Laghu, Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphaśāmaka, Rasāyana, Keśya, Medhya, Vāmaka, Mūtrala, Virecaka, Viṣaghna

IMPORTANT FORMULATIONS - Āragvadhādi Kvātha Cūrṇa

THERAPEUTIC USES – Jvara; Pāṇḍu; Kāmala; Śūla; Vṛddhi; Smṛti Kṣaya; Sandhi-Vāta; Kuṣṭha; Sarpaviṣa; Mūsikāviṣa; Jvarayukta-Kāsa Indralupta; Sannipātodara; Aśmari; Śopha; Bhūta-bādhā; Grahabādhā

DOSE - 1-3 g.

KATTṚṆA (Whole Plant)

Kattṛṇa consists of the whole plant of *Cymbopogon citratus* (DC.) Stapf syn: *Andropogon citratus* DC. (Fam. Poaceae), a tall tufted perennial grass cultivated in various parts of India.

SYNONYMS-

Sansk.	:	Bhūtṛṇah, Jambīratṛṇah, Guhyabīja, Bhutīka
Beng.	:	Gandhatrun, Gandhabenaa
Eng.	:	Lemon grass
Guj.	:	Lilichaa
Hindi	:	Gandhatrun, Harichaaya
Kan.	:	Majjigahullu
Mal.	:	Chennanampullu, Incippullu, Vasanappullu
Mar.	:	Hirvaa Chahaa, Olaa Chahaa, Paatichahaa
Punj.	:	Gandhatrun, Sharbaan
Tam.	:	Vasanaipillu
Tel.	:	Nimmagaddi, Vasana gaddi

DESCRIPTION-

a) Macroscopic :

Root - Fibrous, adventitious, 5 to 10 mm in length, 0.2 to 0.7 mm in thickness.

Rhizome - Irregular, dark brown in colour, narrow internodes present 4 to 9 cm in length, 1.5 to 2 cm in diameter.

Stem - Pale yellow, hollow, 4 to 10 cm in length, 1 to 3 cm in diameter.

Leaf - Leaves glaucous, linear, parallel veined, about 90 cm in length, 2 to 3 cm in width, conspicuous midrib present, apex pointed, margin entire, with sheathing base and a ligule at its base; lemon odour, taste bitter.

b) Microscopic:

Root - Epiblema or piliferous layer uniseriate with compact tabular cells; unicellular root hairs present; beneath epidermis 1 to 3 layered exodermis of cells with thick walls present; cortex cells with intercellular spaces; barrel shaped cells of endodermis and several layered sclerified pericycle; vascular tissue with alternating strands of xylem and phloem, xylem exarch; pith parenchymatous with intercellular spaces.

Rhizome – T.S. shows outer epidermal layer of rectangular parenchymatous cells followed by 5 to 7 layered sclerenchymatous hypodermis; lysigenous cavities present in the hypodermis; below the hypodermis, a broad zone of ground tissue consisting of thin

walled parenchymatous cells with small intercellular spaces; vascular bundles scattered in the ground tissue; concentric, amphivasal, enclosed by sclerenchymatous sheath; rosette shaped calcium oxalate crystals present in the cortex.

Stem – T.S. shows thick cuticle followed by uniseriate epidermis and a cortex several layers deep; scattered concentric, amphivasal vascular bundles present in the ground tissue, with the larger ones towards centre, and smaller ones towards periphery; cortical bundles present.

Leaf –

Midrib – T.S. shows an upper and lower epidermis consisting of a single layer of cells with stomata and trichomes; regularly distributed sclerenchymatous patches present adjacent to both epidermis; ground tissue consist of non-uniform angular cells with intercellular spaces; vascular bundles surrounded by one or two layered bundle sheath and parenchymatous cells storing starch; phloem towards the lower epidermis and xylem towards the upper epidermis; phloem has sieve-tubes and companion cells; xylem consists of pitted metaxylem vessels which are oval in shape; tracheids present, xylem parenchyma scanty.

Lamina – T.S. shows a cuticle, an upper and lower epidermis composed of single layer of cells with bulliform cells, stomata and bristly trichomes; mesophyll with only spongy parenchyma; the narrow guard cells of the stomata are associated with subsidiary cells. Small silica cells filled with silica, solidified into bodies of various shapes, and cells with suberised walls called cork cells occur in pairs which alternate with elongated epidermal cells; lower epidermis with oval shaped stomata arranged in a parallel manner.

Powder - Powder green in colour with strong lemon odour and bitter taste, shows oil cells, fibres, rosette shaped calcium oxalate crystals, pitted and reticulate vessels, pitted and scalariform vessels, surface view of epidermis with stomata, trichome, cork cells, bristle and silica cells.

IDENTITY, PURITY AND STRENGTH-

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total Ash	-	Not more than 11 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 6 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 5 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 12 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of essential oil extracted by Clevenger apparatus on silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate (93:7) shows under UV (254 nm) spots at Rf. 0.07 (light green) and 0.47 (dark green). After spraying with anisaldehyde-sulphuric acid reagent spots appear at Rf. 0.05 (blue), 0.08 (bluish yellow), 0.19 (dark blue), 0.47 (blue), 0.52 (pink), 0.60 (light pink), 0.70 (purple) and 0.74 (purple).

CONSTITUENTS – Essential oil containing citral as major component besides geraniol and other terpenes.

PROPERTIES AND ACTION -

Rasa	:	Kaṭu, Tikta
Guṇa	:	Tīkṣṇa, Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Śītapraśamana, Stanyajanana, Dīpana, Recana, Viṣaghna, Mukhasodhana, Avṛṣya, Cakṣuṣya, Rūcikāraka, Vāmihara

IMPORTANT FORMULATIONS - Māṣabalādi Kvātha Cūrṇa

THERAPEUTIC USES – Kuṣṭha; Kṛmi; Arocaka; Santāpa; Dāha; Vami; Kāsa; Śvāsa; Dadru; Udara; Bhūtabādhā; Grahabādha; Udarda

DOSE - 3-6 g.

KEBUKA (Rhizome)

Kebuka consists of the dried rhizome of *Costus speciosus* (Koerning ex Retz.) Smith. (Fam. Zingiberaceae), a herb commonly found in sub-Himalayan tract extending between Kangra to Arunachal Pradesh and also in Western Ghats.

SYNONYMS-

Sansk.	:	Kembuka, Kebuka, Kemuka, Kembu
Beng.	:	Kevu
Hindi	:	Kebu, Kemuk, Kemuaa
Kan.	:	Chenglavaa-Koshtu, Changalvakoshtu
Mal.	:	Channakkilannu, Channakkuvva
Mar.	:	Pevaa
Tam.	:	Koshtam
Tel.	:	Chenglavaa-Koshtu

DESCRIPTION-

a) Macroscopic :

Tuberous rhizome, horizontally branched, 4 to 6 cm long and 2 to 3 cm thick; outer surface grey to dark brown, longitudinal wrinkles and small circular leaf scars on upper surface; numerous nipple-shaped buds present throughout its length; numerous slender roots occurs along with rhizome, possesses rootlets which makes it slightly rough; fracture, short fibrous and hard, odourless and tasteless.

b) Microscopic:

Rhizome- Rhizome consists of 6 to 10 layers of stratified cork cells, followed by ground tissue; 10 to 12 layers of cortex below the cork layers are more compactly arranged than the remaining layers; cells of the cortex filled with sac-shaped starch grains; starch grain measuring about 35 to 68 μm long and 26 to 38 μm wide, hilum eccentric, striations not visible; endodermis well marked. A large number of vascular bundles scattered throughout the ground tissue, but within the endodermis vascular bundles are closer to each other; each bundle has xylem almost surrounded by phloem; sclerenchymatous, fibrous sheath surrounds each of the vascular bundles; clusters of calcium oxalate found in some cells of the ground tissue.

Powder- Light to dark brown, easily flowable with fine to coarse texture; crystals of calcium oxalate prismatic and clusters; granules of sac-shaped starch are mostly simple but rarely compound form also found; thick walled fibres, both simple and septa, several show marks and adjacent cells appressed against them; tips blunt in shorter, and pointed in longer fibres; vessels both pitted and reticulate.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 20 percent, Appendix 2.2.3.
Acid–insoluble ash	-	Not more than 5 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 3 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 12 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Glacial acetic acid : Methanol : Water (5:2:2:1) shows under UV light (365 nm) a fluorescent zone at Rf. 0.95 (greenish yellow). On sparying with Anisaldehyde-Sulphuric acid reagent and heating the plate for ten minutes at 105 ^{0}C, nine spots appear at Rf. 0.11, 0.22, 0.33, 0.49, 0.59, 0.72, 0.79, 0.87 (all green) and 0.95 (blue)

CONSTITUENTS- Steroidal Saponins such as (Tigogenin and diosgenin).

PROPERTIES AND ACTION –

Rasa	:	Tikta
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Dīpana, Pācana, Grāhī, Kṛmighna, Hṛdya, Raktaśodhaka, Garbhāsāya, Sankocaka

IMPORTANT FORMULATIONS - Kṛmighna Kvātha Cūrṇa

THERAPEUTIC USES - Kaphapittaja vikara; Agnimāndya; Grahanī; Kṛmiroga; Raktavikāra; Ślīpada; Prameha; Śvitra; Kuṣṭha; Jvara; Kāsa; Kāmalā; Arśa; Kaphaja; Mutrakṛcchra

DOSE - 3-6 g (after purification).

KHAKHASA (Seed)

Khakhasa consists of seed of *Papaver somniferum* Linn. (Fam. Papaveraceae), a glaucous erect annual herb cultivated under State control in certain areas of Rajasthan, Madhya Pradesh and Uttar Pradesh.

SYNONYMS –

Sansk.	:	Khasatilah, Āphūkam, Khākhastilah, Khākhasah
Ben.	:	Aaphim, Postadaanaa, Postabeej
Eng.	:	Opium, Poppy Seeds
Guj.	:	Khaskhas
Hindi	:	Apheem, Postadaanaa, Khaskhas, Khasabija
Kan.	:	Gasgase, Aapheen, Aphini
Mal.	:	Avin, Karappu, Kashkash, Aalan
Mar.	:	Khaskhas
Ori.	:	Aapu
Tam.	:	Kasakash, Posttakkaai, Avinee
Tel.	:	Gasgashaalu, Nallamandu
Urdu	:	Apheem

DESCRIPTION –

a) Macroscopic:

Seeds are small, about 1.0 to 1.15 mm long, round to reniform or kidney shaped, generally dirty white, occasionally found mingled with a few brownish or greyish coloured seeds; surface coarsely reticulated, larger network enclosing within, numerous irregular smaller reticulations; hilum and micropyle are situated in the notch on the lateral side near the smaller end; seeds are inodorous and oily in taste.

b) Microscopic:

Testa is composed of 5 distinct cell layers, outermost layer of epidermal cells corresponding to the surface reticulations; the next layer consists of polygonal or elongated cells containing minute microsphenoidal crystals of calcium oxalate and below there is a single layer of thick walled unlignified elongated cells; this layer is followed by a single layer of thin walled cells; testa is limited internally by a single layer or elongated palisade like cells with reticulately thickened walls; central portion of the seed is occupied by polygonal parenchymatous cells of endosperm containing abundant oil drops and aleurone grains; embryo is slightly curved, radicle rod like, bearing 2, or rarely 3, cotyledonary leaves, embedded in the oily endosperm; contents of the cotyledon are similar to those of endosperm.

Powder - Light brown, coarse, not free flowing, clot or ball forming, under microscope exhibits large fatty oil droplets, characteristic penta to hexagonal testa cells, endosperm and reticulate layer cells; cells containing characteristic crystal and fibres also present.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than	1 percent, Appendix 2.2.2.
Total ash	-	Not more than	8 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than	1.5 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than	7 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than	13 percent, Appendix 2.2.7.
Fixed oil	-	Not less than	19 percent, Appendix 2.2.8.

T.L.C. –

T.L.C. of hexane extract on silica gel 60 F 254 plate using Toluene : Acetone (93:07) shows five spots at Rf 0.25, 0.39, 0.50, 0.76 and 0.83 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110^0C.

CONSTITUENTS - Fixed oil containing esters of linoleic, palmitic, oleic acids.

PROPERTIES AND ACTION –

Rasa	:	Madhura
Guṇa	:	Guru
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Vātahara, Rūcya, Stambhana, Vedanāsthāpana, Vṛṣya, Balya, Varṇya

IMPORTANT FORMULATIONS – Abhyādi Gutika, Abhrakādi Vati, Asvani Kumār Rasa

THERAPEUTIC USES – Kāsa; Atisāra

DOSE - 5-10 g.

KHATMĪ (Root)

Khatmī consists of the root of *Althaea officinalis* Linn. (Fam. Malvaceae) a perennial, uniformly downy herb, occurring in Kashmir region.

SYNONYMS –

Sansk.	:	Khatmī
Eng.	:	Marsh Mallow
Hindi	:	Khatmi
Mar.	:	Khatmi
Tam.	:	Khatmi
Tel.	:	Khatmi
Urdu.	:	Aslua Khitmi, Reshah-e-Khatmi

DESCRIPTION –

a) Macroscopic :

Roots 0.2 to 3 cm in diameter, light brown in colour, strongly longitudinally furrowed, often spirally twisted; fracture, short, texture rough, internally yellowish white; odour, pleasant; taste, sweet and mucilaginous.

b) Microscopic :

T.S. root circular in outline; cork 8 to 12 cells broad, radially arranged flattened cells; cortex broad, loosely arranged, parenchymatous, cells filled with mucilage; small patches of lignified fibres present; large number of schizogenous and lysigenous mucilage canals present; phloem well developed consisting of sieve tubes, companion cells and phloem parenchyma filled with mucilage; cambium 2 to 3 celled, xylem diffuse porous, made up of vessels, tracheids, fibres, and tracheidal fibres, vessels mostly solitary - filled with tyloses at some places, medullary rays 3 to 5 cells deep; rosette crystals of calcium oxalate present in cortical, phloem and xylem region; cells contain mucilage, stained red with 1% ruthenium red, and deep yellow with potassium hydroxide solution; most of the parenchymatous cells contain starch grains, polygonal to rounded, 5 to 20 µm, most grains less than 12 µm in diameter, simple, hilum circular or a 2 to 5 rayed cleft lamellae indistinct.

Powder - Powder white to light yellow, sweet in taste; under the microscope numerous fragments of parenchyma, the cells containing mucilage and starch grains polygonal to rounded, 5-20 µm, most grains less than 12 µm in diameter, simple, hilum circular or a 2-5 rayed cleft lamellae indistinct; occasionally small rosette crystals of calcium oxalate, group of sclerenchymatous cells, vessels measuring 113 to 262 µm long, fibres measuring 519 to 1038 µm long and 9 to 19 µm broad; mucilaginous canals; when treated with 50% HNO_3 turns yellowish-orange and emits yellow fluorescence under UV

254 nm; with 50% KOH, it emits light yellow fluorescence under UV 254 nm, while with 1 N-NaOH in methanol orangeish brown colour is seen in day light.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Moisture content	-	Not more than 8 percent, Appendix 2.2.9.
Total ash	-	Not more than 7 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1.5 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 8 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 21 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate : methanol (80 : 20 : 0.05) shows under UV (366 nm) fluorescent zones at Rf. 0.12, 0.27, 0.33, 0.82. On spraying with anisaldehyde-sulphuric acid and heating for ten minutes at 120^0C, shows spots at Rf. 0.12, 0.18, 0.43, 0.47, 0.69 and 0.82.

CONSTITUENTS – Galacturonic acid, galactose, glucose, xylose & rhamnose, polysaccharide althaea mucilage-O, asparaginene, betaine, lecithin and phytosterol, polysaccharides.

PROPERTIES AND ACTION –

Rasa	:	Madhura
Guṇa	:	Snigdha, Picchila, Guru
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Vātahara, Pittahara, Śleṣmasāraka, Mūtrala, Vedanāsthāpana, Kaphaghna

IMPORTANT FORMULATIONS – Gojihvādi Kvātha Cūrṇa

THERAPEUTIC USES – Kāsa; Pratiśyāya; Mūtradāha; Mūtrāśayaśotha; Kaṇṭharoga; Mūtrakṛcchra; Āntraśotha; Dāha; Raktapitta

DOSE - 3 -6 g.

KHATMĪ (Seed)

Khatmī seeds or Tukhm-e-khatmi, consist of dried seeds of *Althaea officinalis* Linn. (Fam. Malvaceae), a perennial, uniformly downy herb occurring in Kashmir region.

SYNONYMS –

Sansk.	:	Khatmī
Eng.	:	Marsh Mallow
Hindi	:	Khatmi bija
Mar.	:	Khatmi
Tam.	:	Khatmi
Tel.	:	Khatmi
Urdu.	:	Bajrul Khitmi, Khatmee, Tukhma-e-Khatmee

DESCRIPTION –

a) Macroscopic :

The seeds are small to moderate size, approximately 6 mm, usually brownish-black, reniform, rugose, hairy at margins; become mucilagenous when soaked in water.

b) Microscopic :

T.S. shows testa - an outer multicellular layer comprising of outer most thick walled epidermis with multicellular, 2 to 6 armed stellate and some unicellular hairs, longest being near the micropyle; this is followed by 4 to 10 layers of parenchymatous cells several with rosette crystals of calcium oxalate, interrupted by schizogenous mucilage canals; the inner epidermis of testa is also thick walled. Tegmen two layered; outer tegmen - 4 to 6 cells deep, lignified 2 to 6 armed stellate hairs present also on it, this easily detached from the inner tegmen; inner tegmen - 4 to 6 cells deep, the outer being a row of palisade-like malphighian cells followed by a slightly thick walled, non-lignified two layered hypodermis of cells with their inner periclinal walls concave (i); 2 to 3 layered parenchymatous mesophyll; the inner epidermis is a layer of thin walled cells with rod like lignified thickening scattered on the anticlinal walls; endosperm cells filled with starch grains which are polygonal to rounded, 5 to 20 µm in size, hilum circular or showing a 2 to 5 rayed cleft, lamellae indistinct; ovule campylotropous; seeds of *Althaea rosea* do not show the type of hairs present in *A. officinalis,* but have mostly unicellular hairs.

Powder - Powder brownish-black in colour, odourless, mucilaginous and sweetish in taste; shows elongated thick walled ridged malphighian cells; in surface view they are hexagonal showing wall thickenings; patches of parenchyma with mucilage and starch grains, polygonal to rounded, 5 to 20 µm, hilum circular, or with a 2 to 5 rayed cleft, lamellae indistinct; rosette crystals of calcium oxalate and stellate hairs; a small amount of powder on microscopic slide turns maroon with 50 % H_2SO_4 and black with 1N-

NaOH in amylacetate. When treated with 1% ruthenium red, powder becomes pink in colour showing the presence of mucilage.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1.5 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 10 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 18 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate : methanol (85 : 15 : 0.5) shows under UV (366 nm) blue fluorescent at Rf. 0.18, 0.33 and 0.67. On spraying with Anisaldehyde-Sulphuric acid and heating the plate for ten minutes at 120^0C, spots appear at Rf. 0.10 (grey), 0.18 (grey), 0.32 (green), 0.37 (navy blue), 0.57 (greyish blue) and 0.67 (greyish blue).

CONSTITUENTS – Glucose, sucrose, galactose & mannose; linoleic acid; isobutylalcohol, limonene, phellandrene, γ-toluerldehyde, citral, terpeneol, β- sitosterol.

PROPERTIES AND ACTION –

Rasa	:	Madhura
Guṇa	:	Snigdha, Picchila, Guru
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Vātahara, Pittahara, Śleṣma sāraka, Mūtrala, Vedanāsthāpana, Śleṣma kalā Snehakara

IMPORTANT FORMULATIONS - Gojihvādi Kvātha Cūrṇa

THERAPEUTIC USES – Pratiśyāya; Kāsa; Mūtrakṛcchra; Mūtradāha; Kaṇtharoga

DOSE - 3-6 g.

KHŪBKALĀN (Seed)

Khūbkalān is the seed of *Sisymbrium irio* Linn. (Fam. Brassicaceae), an annual or biennial herb found in Kashmir, Punjab and Haryana and from Rajasthan to U.P. especially on moist soil.

SYNONYMS -

Eng.	:	Hedge-mustard, London Rocket
Hindi	:	Khub Kalaan, Khaaksee
Mar.	:	Ranteekhee
Punj.	:	Janglisarson, Maktrusa, Maktaroosaa
Urdu.	:	Khubakalan

DESCRIPTION -

a) Macroscopic :

Seeds more or less ellipsoid, minute, size about a mm, orangish-brown, mucilaginous with warty surface; odour, pungent like mustard oil and taste like bitter mustard oil.

b) Microscopic :

T.S. of seed shows seed coat with six layers, outermost a single layer of epidermis of rectangular, flattened and thin walled cells ranging from 30 to 50 μ in length containing colourless, concentrically striated mucilage; a two-cell deep layer of parenchymatous cells, a single row of sclerenchymatous cells with their radial and inner tangential walls thickened, a single-cell layer of pigment, a single cell layer of aleurone grains, followed by crushed parenchymatous cells; cotyledons contain aleurone grains and oil globules; embryo folded; starch absent.

Powder - Brown, with pungent mustard oil smell, shows oil globules; aleurone grains containing crystalloids, globoids and sclerenchymatous cells; with ruthenium red mucilage turns pink.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total Ash	-	Not more than 5 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 22 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 14 percent, Appendix 2.2.7.
Fixed oil	-	Not less than 20 percent, Appendix 2.2.8.

T.L.C. -

T.L.C. of the methanolic extract on silica gel 'G' plate (0.2 mm thick) using butanol : acetic acid : methanol (60:10:20) shows under UV (254 nm) green spots at Rf. 0.07, 0.17, 0.23, 0.29, 0.55 and 0.87. After spraying with anisaldehyde-sulphuric acid reagent and heating the plate at 105 °C for ten minutes spots appear at Rf. 0.05 (green), 0.09 (green), 0.13 (light green), 0.21 (dark green), 0.28 (purple), 0.40 (purple), 0.76 (light purple) and 0.93 (dark purple). After spraying with Dragendorff's reagent, one spot appears at Rf. 0.24 (bright orange).

CONSTITUENTS – Fixed oil and Isorhamnetin.

PROPERTIES AND ACTION-

Rasa	:	Kaṭu
Guṇa	:	Snigdha, Guru, Picchila
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahar, Balya, Svedakara, Śothahara

IMPORTANT FORMULATIONS - Gojihvādi Kvātha Cūrṇa

THERAPEUTIC USES – Jvara; Kāsa; Vātajanya Vikāra; Śvāsa; Svarabheda; Daurbalya; Kaphavikāra

DOSE - 3-6 g.

KODRAVAḤ (Grain)

Kodravaḥ consists of dehusked and well-matured caryopsis of *Paspalum scrobiculatum* Linn. (Fam. Poaceae), an annual grass 60 to 90 cm tall, cultivated in the plains of India for its grains; newly gathered grains with husks are poisonous; husks are removed prior to use or powdering.

SYNONYMS –

Sansk.	:	Koradūṣah, Koradūṣakah
Beng.	:	Kodo aadhaan
Eng.	:	Kodo Millet
Guj.	:	Kodro, Kodaraa
Hindi	:	Kodon, Kodava, Kododhaam
Kan.	:	Harak, Harike
Mal.	:	Varaku
Mar.	:	Kodra, Harik, Kodru
Ori.	:	Kodua
Punj.	:	Kodon, Kodra
Tam.	:	Varagu
Tel.	:	Arikelu, Kiraruga
Urdu.	:	Kodon

DESCRIPTION -

a) Macroscopic:

Grain oval to rounded in shape, plano-convex and up to about 4 mm in length; pericarp brown, adherent to seeds, can be removed by rubbing; as seen under hand lens, on the convex side of caryopsis, there is one central line, and on the plane surface, three lines; inside pericarp is a shiny brown seed; seeds possess three prominent ridges on the convex side and in between these ridges, fine striations are present; plane side of the seed shows finely striated oval central depression, apical side pointed.

b) Microscopic:

T.S. shows thick pericarp composed of 6 to 10 layers of cells; outermost layer elongated with outer and inner walls lignified; below this, cells have thickened walls, and a much-reduced lumen; testa not well defined and composed of crushed cells; cells of scutellum irregular in shape and usually contain oil droplets; outer cells of endosperm contain aleurone grains; endosperm cells thin walled, polygonal, large and fully packed with penta to hexagonal starch grains, usually 8 to 20 μ.

Powder - Brown, fine, free flowing, characterized by the presence of characteristic thick walled, pericarp cells, penta to hexagonal starch grains, which are isolated, or in groups.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total Ash	-	Not more than 6 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 4 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 3 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 2 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of ethanol extract on silica gel 'G' plate using Chloroform : Methanol (95:05) shows five spots at Rf 0.25, 0.38, 0.55, 0.67 and 0.89 on spraying with 10% alcoholic sulphuric acid and heating the plate for 15 minutes at 110^0C.

CONSTITUENTS – Hydrocarcons hentriacontanol, hentriacontanone; sterols such aṣβ-β-sitosterol, campestrol.

PROPERTIES AND ACTION –

Rasa	:	Kaṣāya, Madhura
Guṇa	:	Rūkṣa, Laghu
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Grāhī, Lekhana, Viṣaghna

IMPORTANT FORMULATIONS- Nādīvraṇahara āturyādi lepa, Nādīvraṇahara āturyādi taila

THERAPEUTIC USES – Raktapitta; Vraṇa; Atisthaulya; Annadravaśūla; Prameha; Medovṛddhi; Nāḍīvraṇa; Jalodara

DOSE - 50-100 g.

KṢĪRAKĀKOLĪ (Bulb)

Kṣīrakākolī consists of the dried whole bulb of *Fritillaria roylei* Hook. (Fam. Liliaceae), a glabrous herb 6-24 m in height, found in Western temperate Himalayas from Kumaon to Kashmir at an altitude of 2500-4000 m; processed by boiling.

SYNONYMS -

Sansk.	:	Śuklā, Kṣīrvallikā
Eng.	:	Fritillary
Hindi	:	Kshira, Kakoli
Mar.	:	Kshira, Kakoli
Tam.	:	Kshira, Kakoli
Tel.	:	Kshira, Kakoli

DESCRIPTION -

a) Macroscopic :

Whole bulbs are hard, conical 1.5 to 2.5 in width and 3 to 3.5 cm in length, transluscent with slight longitudinal ridges, covered with hard membranous scales arranged in a concentric manner and breaking readily with a short fracture; cut surface white to creamish-yellow and starchy; scars of adventitious roots seen; odour, pleasant; taste, bitter.

b) Microscopic :

T.S. of bulb shows concentric layers of scale leaves; axis of bulb show three concentric layers of scale leaves, with an outer and inner epidermis consisting of single layered parenchymatous cells with mucilage; cuticle of both epidermis is slightly wavy and horny, mesophyll consists of 6 to 9 layered hexagonal parenchyma cells; starch grains gelatinised; raphides ranging from 100 to 230 μ in length are also present in the mesophyll; surface view of upper epidermis show compactly arranged rectangular, elongated thin walled cells.

Powder- Powder creamish with pleasant smell; raphides present; powder treated with ruthenium red, mucilage turns bright pink.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total Ash	-	Not more than 3 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.5 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 4 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 14 percent, Appendix 2.2.7.

T.L.C.-

T.L.C of the methanolic extract on silica gel 'G' plate (0.2 mm thick) using butanol : acetic acid : water (6:1:2) shows under UV (366 nm) spots at Rf. 0.11, 0.18, 0.29, 0.33, 0.37, 0.45, 0.49, 0.62 and 0.93 (all fluorescent blue) under UV 254 nm spots at Rf. 0.33, 0.37, 0.62 and 0.93 (all green). After spraying with Dragendorff's reagent orange spots appear at Rf. 0.33 and 0.37.

CONSTITUENTS - Alkaloids Kashimirine (imperialine), peimine, Peimisine, Propeimine, Peimiphine and Peimitidine.

PROPERTIES AND ACTION -

Rasa	:	Madhura
Guṇa	:	Guru, Snigdha
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Vātahara, Pittahara, Rasāyana, Bṛmhaṇa, Śukravardhaka, Vṛṣya, Stanyajanana, Kaphakara, Tṛṣāhara, Basti viśodhanī, Viṣaghna

IMPORTANT FORMULATIONS - Daśamūlariṣta, Śivāgutikā, Bṛhataphala Ghṛta, Bṛhat-guḍūcī Taila, Bṛhatmāṣa Taila, Mānasamitra Vaṭaka, Rasarāja Rasa

THERAPEUTIC USES – Raktapitta; Dāha; Śoṣa; Jvara; Kṣaya; Raktadoṣa; Raktaroga; Hṛdroga; Śvasā; Kāsa; Vāatarakta; Yoni Vyāpad; Vātavyādhi; Vatapittarujā; Kṣaya; Hṛdroga

DOSE - 3-5 g in the powder form.

KṢHĪRAVIDĀRĪ (Root)

Kṣhīravidārī is the dried root of *Ipomoea digitata* Linn. syn. *Ipomoea paniculata* (Linn.) R. Br. (Fam. Convolvulaceae); a perennial climber, distributed throughout the warm and moist regions of India.

SYNONYMS -

Sansk.	:	Ikṣugandhā, Ikṣuvallī, Payasvini, Dirghakandā
Beng.	:	Bhuh Kumdaa, Bhooi Kumhdaa
Eng.	:	Giant potato
Guj.	:	Vidaaree Kand
Hindi	:	Vidaaree Kanda, Bhuh Kumdaa, Bhui Kumbhadaa
Kan.	:	Nelkumbal, Naadakumbala
Mal.	:	Paalmutakku
Mar.	:	Bhui Kohalaa
Ori.	:	Bhuin Kakhaaru
Tam.	:	Nilappuchani, Paalmudamgi
Tel.	:	Paalagummudu, Nelagummudu

DESCRIPTION -

a) Macroscopic:

The root consists of thick pieces of different sizes, usually 2 to 8 mm in diameter; outer surface brownish and rough due to the presence of longitudinal fissures, ridges and numerous circular lenticels; core light brown and fibrous; fracture, fibrous, odourless and sweetish in taste.

b) Microscopic:

Root- Root shows 6 to 9 layers of thin walled cork cells, externally covered by rhytidoma; phelloderm composed of 8 to10 layers of cells, thin walled and filled with starch grains, individual starch grain rounded to irregular in shape, variable in size measuring about 13 to 24 µm, with distinct centric hilum; rosettes of calcium oxalate present; secondary phloem consists of companion cells, sieve tube elements and phloem parenchyma, traversed by uni- or biseriate medullary ray; numerous resin ducts and starch grains occur in the secondary phloem; secondary xylem consists of xylem parenchyma, xylem vessels, xylem fibres and tracheids; vessels large in size and numerous.

Powder- Light to dark brown, fine to coarse texture; simple and compound starch grains of variable size, crystals of calcium oxalate in prismatic and cluster form; pitted vessels; tracheids; parenchymatous cells with simple pits and long fibres with wide lumen and pointed ends.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 6 percent, Appendix 2.2.3.
Acid–insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 20 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 8 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract of dried root powder on Silica gel 'G' plate (0.2 mm thick) using Petroleum ether: Diethyl ether: Glacial acetic acid (8: 2: 0.1) under UV light (365 nm) shows two fluorescent zones at Rf. 0.24 and 0.42 (both green). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 105 ^{0}C, three spots appear at Rf. 0.18, 0.55 and 0.95 (all black).

CONSTITUENTS - Glycosides, steroids, tannins and fixed oil.

PROPERTIES AND ACTION –

Rasa	:	Madhura, Kaṣāya, Tikta
Guṇa	:	Snigdha, Guru
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Vātahara, Vṛṣya, Bṛṁhaṇa, Atimūtrala, Balya, Svarya, Varṇya, Stanyajanana, Rasāyana, Jīvanīya

IMPORTANT FORMULATIONS – Śivāgutikā

THERAPEUTIC USES – Stanyavikāra; Pittaja śūla; Raktavikāra; Mahāvātavyādhi; Mūtraroga; Vraṇa; Bhagna

DOSE - 5 - 10 g.

KULAÑJANA (Rhizome)

Kulañjana consists of dried rhizome of *Alpinia galanga* Willd. (Fam. Zingiberaceae), a plant upto about 2.0 m high bearing perennial rhizome, growing in eastern Himalayas and southwest India.

SYNONYMS –

Sansk.	:	Sugandhamūla, Malaya Vacā, Sthūlagranthih, Mahābharī Vacā, Rāsnā (South)
Assam.	:	Khulanjaana
Beng.	:	Kulanjan, Kurachi Vach
Eng.	:	Greater galangal, Javagalangal
Guj.	:	Kulinjan Jaanu, Kolinjan
Hindi	:	Kulanjan, Kulinjan
Kan.	:	Doddarasagadde, Dhoomraasmi
Mal.	:	Aratta, Ciffaratta
Mar.	:	Kulinlan, Koshta Kulinjan, Mothe Kolanjan
Tam.	:	Arattai, Sittarattai
Tel.	:	Dumparaastramu

DESCRIPTION –

a) Macroscopic :

Root - The roots are adventitious, in groups, fibrous, persistent in dried rhizomes, about 0.5 to 2 cm long and 0.1 to 0.2 cm in diameter and yellowish-brown in colour.

Rhizome - Rhizome cylindrical, branched, 2 to 8 cm in diameter, longitudinally ridged with prominent rounded warts (remnants of roots) marked with fine annulations; scaly leaves arranged circularly; externally reddish-brown, internally orange yellow in colour; fracture, hard and fibrous; fracture, surface rough; odour, pleasant and aromatic; spicy and sweet in taste.

b) Microscopic :

Root - T.S. of root circular in outline, single layered epidermis with barrel shaped cells having unicellular root hairs, hypodermis 3 or 4 cells deep and sclerenchymatous, cortex parenchymatous, many cells deep, with well developed intercellular spaces; endodermis showing prominent casparian strips and 'v' shaped thickening, followed by many celled sclerenchymatous pericycle; xylem and phloem in separate radial strands; centre occupied with a parenchymatous pith.

Rhizome - T.S. of young rhizome circular in outline; epidermal cells small and angular, thick cuticle present, rhizome differentiated into a wide cortex and a central cylinder, both regions having irregularly scattered vascular bundles, each vascular bundle with a

prominent fibrous sheath; inner limit of cortex marked by rectangular parenchymatous cells; stele with irregular, closely placed vascular bundles towards periphery, root traces present, schizogenous canals and oil cells with suberized walls found in cortex and in central region; most of the parenchymatous cells filled with starch grains which are ellipsoidal to ovoid, sometimes beaked, simple, 10 to 64 μm, hilum eccentric, circular or crescent shaped at the broad end, the narrow beak-like end become black when stained with dil. iodine water and chlor-zinc iodide but the remaining part become light blue or brown. Macerated prepration shows vessels 95 to 710 μm long and 19 to 190 μm broad, tracheidal fibres 68 to 920 μm long and 19 to 30 μm broad.

Powder - Powder is orange brown in colour, spicy and sweet in taste, shows parenchymatous cells containing starch (as described under microscopy of rhizome), oil cells, schizogenous canals, vessels with scalariform and reticulate thickenings and tracheidal fibres.

IDENTIFICATION TEST –

One drop of an extract of 1 g dried powdered material with ethanol placed on filter paper and observed under UV light does not show fluorescence; (distinction from 'lesser galangal' *Alpinia officinarum* which gives bluish fluorescence).

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 5 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 2 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 6 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 13 percent, Appendix 2.2.7.
Starch	-	Not less than 22 percent, Appendix 2.2.13.
Essential oil	-	Not less than 0.4 percent, Appendix 2.2.10.

T.L.C –

T.L.C. of the methanolic extract on precoated silica gel 'G' plates (0.2 mm thick) using toluene : ethyl acetate : methanol (80:20:0.4) shows under UV (366 nm) blue fluorescent zones of yellow, green and blue at Rf. 0.15, 0.25, 0.69 respectively. On spraying with anisaldehyde-sulphuric acid reagent and heating the plate for ten minutes at 120^0C, spots appear at Rf. 0.15 (greyish green), 0.35 (violet), 0.48 (greyish green), 0.63 (greyish green), 0.69 (green) and 0.91 (violet).

CONSTITUENTS – Essential oil, containing α - pinene, β - pinene, limonene, cineol, terpinen - 4 - ol and α - terpineol.

PROPERTIES AND ACTION –

Rasa : Kaṭu, Tikta
Guṇa : Guru
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Kaphahara, Pācanī, Rūcya, Svarya, Hṛdya, Kaṇṭhya, Mukha Śodhaka, Viṣaghna

IMPORTANT FORMULATION - Brāhmī Vaṭī, Rāsnādikaṣāya, Rāsnādārvādi Kaṣāya, Rāsnāpañcakam, Rāsnā saptakam, Rāsnāśuṇṭhyādi Kaṣāya, Rāsnairaṇḍādi Kaṣāya

THERAPEUTIC USES – Pratiśyāya; Śvāsa; Hikkā; Śopha; Vātaja Śūla; Udararoga; Kampa; Viṣamajvara; Kaphajakāsa; Aśiti; Vātavyādhi; Mahākuṣṭha

DOSE - 1-3 g powder.

KUMBHĪKAḤ (Seed)

Kumbhīkaḥ consists of dried seed of *Careya arborea* Roxb. (Fam. Lecythidaceae), a medium sized deciduous tree attaining a height of 9 to 18 m. occurring throughout India upto an altitude of 1,500 m.

SYNONYMS-

Sansk.	:	Svādupuṣpa, Viṭapī, Sthala Kumbhī, Romaśā
Beng.	:	Kumbhi
Eng.	:	Kumbi
Hindi	:	Sthala Kumbhi
Kan.	:	Daddala, Gudda, Daddippe
Mal.	:	Pezuntol
Mar.	:	Kumbhaa
Tam.	:	Kumbi
Tel.	:	Dudippi

DESCRIPTION -

a) Macroscopic :

Seeds, exalbuminous, dark brown, oval ellipsoid, 1.5 to 2 cm long, upto one cm or slightly above in width; indehiscent; testa hard and wrinkled; odour, pleasant; taste, astringent.

b) Microscopic :

Testa sclerenchymatous followed by a zone of collapsed cells of outer integument, inner integument lined by cuticle on both sides; outer layers of both integuments filled with dark brown material; cotyledons of many layered, thin walled, polygonal parenchymatous cells, filled abundantly with starch grains and occasionally with oil.

Powder - Creamish-yellow to light-brown, shows fragments of cotyledon cells; scattered stone cells of testa, abundant starch grains, simple and round, about 5 μ.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 4 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 7 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 15 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the hexane extract on precoated silica gel 'G' plate (0.2 mm thick) using petroleum ether : diethyl ether : acetic acid (9:1:0.1) shows spots at Rf. 0.14 (purple), 0.26 (brown), 0.32 (light pink), 0.44 (pink) and 0.77 (purple) on spraying with vanillin-sulphuric acid reagent and heating the plate at 105 °C for about ten minutes.

CONSTITUENTS -Saponins (five sapogenols- careyagenol A, B, C, D & E); sterols, α-spinosterol and α-spinosterone.

PROPERTIES AND ACTION –

Rasa : Kaṭu, Kaṣāya
Guṇa : Rūkṣa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphahara, Vātahara, Grāhī, Vraṇa Ropana

IMPORTANTFORMULATIONS- Marma Guṭikā

THERAPEUTIC USES - Vātika Kāsa; Kuṣṭha; Prameha; Kṛmi; Viṣaroga; Pakvātisāra; Vraṇa; Nāḍīvraṇa

DOSE - 2-6 g powder.

LATĀKARAÑJA (Seed)

Latākarañja consists of seed of *Caesalpinia bonduc* (Linn.) Roxb. (Fam. Caesalpiniaceae), an extensive, shrubby, wild, perennial climber distributed throughout tropical parts of India.

SYNONYMS -

Sansk.	:	Kuberākṣa, Kaṇṭakī Karañja
Beng.	:	Kaantaa Karanjaa, Naataa, Naataa Karanjaa
Eng.	:	Bonduc Nut, Fever Nut
Guj.	:	Kaanchakaa, Kaanka
Hindi	:	Karanja, Karanjuaa, Kaantaa Karanj
Kan.	:	Gajjike Kaayi, Gajkai
Mal.	:	Kalamchikuru, Kaalanchi, Kazhinch - Kai
Mar.	:	Saagar gotaa, Gajarghotaa, Gaajagaa
Ori.	:	Kotokolejaa
Tam.	:	Kajha shikke, Kalichchikkaai
Tel.	:	Gachchakaay
Urdu	:	Akitmakit

DESCRIPTION –

a) Macroscopic:

Seeds globose or rounded, smooth, shiny, 1.2 to 2.5 cm in diameter; slightly flattened on one side due to close pressing of adjacent seeds; hilum and micropyle close together; hilum surrounded by a dark area around 4 mm in diameter, usually with a whitish or yellowish remnant of funiculus; micropyle near the periphery of the dark area; seed coat greenish-grey to bluish-grey, lineate, shiny; 100 seeds weigh from 225 to 250 g.

b) Microscopic:

Testa shows an outer single row of radially elongated, very narrow, transluscent, compactly arranged cells forming a palisade layer (Malpighian layer) passing through which is the 'linea lucida'. These cells appear hexagonal in surface view and possess thick walls (rich in pectin as evident from Chloro-zinc Iodine Test); a sub-epidermal zone of 2 or 3 layers of thick walled bearer cells present, followed by multiple rows of osteosclereids, which progressively increase in size, elongate laterally and have more intercellular spaces towards the inner side; the outer few layers of these osteosclereids contain a brown substance; laterally elongated vascular tissues present in the lower region of this zone. The cells inner to vascular elements gradually compacted and rounded towards the inner margin; cotyledons show an outer single layer of epidermis made of small, isodiametric cells, and inner parenchymatous ground tissue cells rich in fixed oil, and having empty cavities uniformly distributed in them.

Powder - Colour light yellow through mustard to brown, coarse and free-flowing; bitter in taste and possessing tamarind -like odour. Parts of vessels showing scalariform thickenings and groups of narrow, palisade cells with light line are present; groups of cells of height from 150 to 250 μ the sub-epidermal layers of seed coat having 10 to 12 μ, squarish bearer cells and upto 150 μ long osteosclereids; cotyledon cells (upto 35 μ) showing fixed oil when mounted in Sudan III.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 5 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 26 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 4.0 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene: ethylacetate : acetic acid (5:4.5:0.5), shows under U.V. (366 nm) spots at Rf. 0.13 (Light Blue), 0.28 (Dark Blue), 0.63 (Pink), 0.92 (Pink); on spraying with anisaldehyde- sulphuric acid reagent and heating the plate for ten minutes at 110 ^{0} C spots appear at Rf 0.30(Brown), 0.64 (Bluish Purple), 0.72 (Purple), 0.80 (Purple), 0.89 (Grey).

T.L.C. of the hexane extract on precoated silica gel 'G' plate 0.2 mm thick using chloroform: ethylacetate (98:2), on spraying with anisaldehyde- sulphuric acid reagent and heating the plate for ten minutes at 110 ^{0} C spots appear at Rf 0.03 (Yellow), 0.11 (Greenish Blue), 0.21 (Greenish Yellow), 0.33 (Greenish Blue), 0.43 (Pale yellow), 0.55 (Greenish Blue).

CONSTITUENTS - Seeds contain bitter substance phytosterenin, bonducin, saponin, phytosterol, fixed oil, starch and sucrose. Seeds also contain α, β, γ, δ and ζ caesalpins.

PROPERTIES AND ACTION -

Rasa	:	Tikta, Kaṣāya
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Pittahara, Kaphahara, Dīpana, Vedanāsthāpaka, Ārtavajanana, Vraṇaropaṇa

IMPORTANT FORMULATIONS - Āragvadhādi Kvātha Cūrṇa, Kuberākṣādi Vaṭī

THERAPEUTIC USES – Viṣamajvara; Sūtikājvara; Śūla; Gulma; Kāsa; Meha; Vātavikāra; Tvakroga; Śotha; Vraṇa; Udarasūla; Śvāsa; Raktātisāra; Kuṣṭha; Āmavāta; Sandhivāta; Agnimāndya; Pravāhika; Arśa; Yakṛtplīhāroga; Chardi; Kṛmi

DOSE - 1-3 g.

LAVALĪPHALA (Fruit)

Lavalīphala consists of dried fruit of *Phyllanthus acidus* (Linn.) Skeels syn. *Cicca acida* Linn. Merrill (Fam. Euphorbiaceae), a small or medium sized tree cultivated in gardens, and also grown as a roadside tree.

SYNONYMS –

Sansk.	:	Sugandhamūlā, Lavalī, Pāṇḍuh, Komala Valkalā
Beng.	:	Noyaal, Harphal
Eng.	:	Star gooseberry, Country gooseberry
Guj.	:	Khaati Aawala, Raay aamali
Hindi	:	Harfaarevadi, Lavali
Kan.	:	Karinelli
Mar.	:	Raaya-aawal
Tam.	:	Arinelli
Tel.	:	Raachayusarike

DESCRIPTION -

a) Macroscopic :

Brownish green, globose, 1.5 to 1.8 cm dia obscurely 6 to 8 grooved, depressed at both ends; pieces show a highly shrivelled and wrinkled external surface, texture rough; odour characteristic; taste, acidic, followed by a delicately sweet taste; seed globose, 0.8 to 1.2 cm dia.

b) Microscopic :

T.S. of mature fruit shows the epicarp with a single layer of tabular epidermis, covered by a thin cuticle; numerous sunken stomata scattered on the epidermis; epidermal cells in surface view polygonal in shape with corner thickenings; mesocarp consists of 8 to 10 layers of polygonal cells and 6 to 8 layers of radially elongated large, rather thick walled parenchyma cells, most of which contain yellow pigments (mesocarp of *Emblica officinalis* consists of mostly large polygonal cells with corner thickenings and have a very few pigment cells); prisms of calcium oxalate crystal and starch grains present in a few epidermal cells and also in a few parenchyma cells; many of the cells contain yellow pigments; ramified vascular bundles scattered throughout the mesocarp consist of xylem and phloem, xylem composed of tracheids and fibres; testa have palisade like epidermis composed of tightly packed sclereids with pits.

Powder - Shows pieces of isodiametric-parenchymatous cells with yellow or brown colour pigment; prismatic crystals of calcium oxalate; fibres; sclereids with pits; starch grains are fairly abundant, small and simple.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 6 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 7 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 15 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on precoated silica gel 'G' (E. Merck grade) plate using Chloroform : Methanol : Formic acid (95 : 0.5 : 0.1) shows under UV (366 nm) three fluorescent zones at Rf. 0.14 (green), 0.28 (green) and 0.83 (green). On spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate for five minutes at 105°C six spots appear at Rf. 0.14 (orange), 0.17 (violet), 0.51 (orange), 0.66 (purple), 0.76 (violet) and 0.91 (purple).

CONSTITUENTS – Triterpenoids (β- amyrin, Phyllanthol) and Gallic acid.

PROPERTIES AND ACTION –

Rasa	:	Madhura, Amla, Kaṣāya
Guṇa	:	Rūkṣa, Guru, Viṣada
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Pittahara, Kaphahara, Vātakara, Grāhī, Rakta Stambhana, Hṛdya, Rucikara

IMPORTANT FORMULATIONS – Drākṣāsava

THERAPEUTIC USES – Aśmarī; Arśa; Aruci

DOSE – 10-20 g.

MADHŪLIKĀ (Root)

The drug consists of dried root of *Eleusine corocana* (L.) Gaertn. (Fam. Poaceae), an erect, stout, annual grass, cultivated throughout India.

SYNONYMS -

Sansk.	:	Rāgī, Madhūli, Markaṭahastatṛṇa
Beng.	:	Marua
Eng.	:	Finger Millet, Ragi
Guj.	:	Naagali-Baavato
Hindi	:	Manduaa, Makaraa, Raagi
Kan.	:	Raagi
Mal.	:	Muttari, Raagi
Mar.	:	Naachnee
Punj.	:	Madua; Koda, Kodra
Siddha	:	Kejhavaragu
Tam.	:	Raagi
Tel.	:	Raagulu, Tagidelu

DESCRIPTION –

a) Macroscopic :

Root fibrous, well branched, upto 25 cm long, 3.5 mm in thickness, gradually tapering, creamy white, rough and dirty; root hairs present, fracture, brittle, fibrous, centre hollow; taste, earthen; no odour.

b) Microscopic :

T.S. shows epiblema consisting of two layers, the cells of the outer layer giving rise to root hairs; the inner layer called rhizodermis has slightly thicker walled hexagonal cells, followed by a cortex traversed by trabeculae, giving rise to large air spaces; endodermis characterized by the presence of casparian strips on the radial walls, followed by a single layered pericycle of fibre and stone cells; stone cells circular, with radial canals, and a narrow or wide lumen; phloem and xylem patches present below this layer arranged radially; pith cells somewhat circular and parenchymatous.

Powder - Shows under the microscope, tracheids measuring between 115 and 285 μ in length and between 13 and 40 μ in breadth, circular pits present on the surface; vessels elongated, cross wall perforation plates simple; elongated pits present on the walls of vessel; thin walled parenchymatous cells and circular stone cells present.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2.5 per cent, Appendix 2.2.2.
Total ash	-	Not more than 5.5 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1.3 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 3 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 8 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of methanolic extract of the drug on precoated silica gel G plate, using methanol - chloroform (3 : 7) and on spraying with 10% sulphuric acid in ethyl alcohol followed by heating the plate for five minute at 110°C, three spots appeared at Rf. 0.82 (Pink colour) comparable to the spot of sitosterol glucoside, 0.23 (Blackish grey), 0.15 (Blackish grey).

CONSTITUENTS – Flavonoids, orientin, isoorientin, vitexin, isovitexin, violanthin, lucenin-1, tricin, keto acids; polysaccharide and the free sugars, β-sitosterol glucoside.

PROPERTIES AND ACTION -

Rasa	:	Madhura, Kaṣāya, Tikta
Guṇa	:	Laghu
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Pittahara, Tridoṣaśāmaka, Raktadoṣahara, Vṛṣya, Rasāyana

IMPORTANT FORMULATIONS- Amlapittāntaka modaka, Amṛta guggulu, Aśvagandhādi leha, Kuṣṭhādi kvātha, Kaṭutumbyādi taila

THERAPEUTIC USES – Tṛṣṇā; Karapāda dāha; Vṛkkāśmarī; Śvāsa; Kāsa; Jvaropdrava

DOSE - 5-10 g.

MAHĀMEDĀ (Rhizome & Root)

Mahāmedā consists of dried rhizome and root of *Polygonatum cirrhifolium* Royle (Fam. Liliaceae), a herb found in the temperate Himalayas.

SYNONYMS -

Sansk.	:	Mahāmeda, Vasucchidrā, Tridanti, Devamaṇī
Eng.	:	Mahameda
Hindi	:	Mahameda, Devarigaala
Kan.	:	Mahamedha
Mal.	:	Mahameda
Tam.	:	Mahameda
Tel.	:	Mahameda

DESCRIPTION –

a) Macroscopic :

Rhizome dirty brown in colour, 2 to 8 cm long and about 2.5 to 3 cm broad, having longitudinal markings on the surface and rough with irregular wrinkles; fracture, short and smooth; odour, distinct; taste, sweet with a slight bitter after-taste.

b) Microscopic :

Rhizome : T.S. shows a single layered cuticularized epidermis having actinocytic stomata followed by ground parenchymatous cortex of polygonal to isodiametric cells in which vascular bundles are scattered; in cortical cells starch grains, numerous idioblasts with raphides, and druses of calcium oxalate present; numerous round cavities present in the cortical region; endodermis between cortex and inner core absent; vascular bundles unevenly scattered, amphivasal; xylem elements represented by tracheids and xylem parenchyma; phloem composed of sieve tubes, companion cells and phloem parenchyma.

Root : T.S. shows a single layered epiblema, cells polygonal, bearing simple unicellular root hairs; a single layered hypodermis, cells larger, hexagonal, slightly thick walled; a broad cortex, cells thin walled and of varying shapes and sizes with very small intercellular spaces, and containing circular starch grains measuring between 10 to 40 μ in diameter; idioblasts with raphides present; endodermis single layered, characterized by the presence of casparian strips on their radial walls; pericycle single layered; stele exarch, polyarch, xylem consist of tracheids, vessels with simple perforation plate and reticulate thickenings, and xylem parenchyma; phloem consist of sieve tubes, companion cells and phloem parenchyma; small pith present in centre with parenchymatous cells.

Powder : Dark brown; under microscope shows epidermal cells with actinocytic stomata and cortical cells in surface view; starch grains ovoid with concentric striation, either singly or in groups; raphides and druses present; tracheids elongated with pointed ends, wall

slightly wavy towards tips, thickenings reticulate; vessels with simple, cross wall perforation, thickenings reticulate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 3 per cent, Appendix 2.2.2.
Total ash	-	Not more than 3.5 per cent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 per cent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 4.5 per cent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 70 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of methanolic extract of the roots/rhizome on a precoated silica gel G plate, using methanol : chloroform (3 : 7). On spraying with 10% sulphuric acid in ethyl alcohol and heating the plate for about 5 minute at 110°C, two spots appear at Rf. 0.42 and 0.30 showing blackish grey fluorescent were found comparable to the spots of glucose and sucrose respectively.

CONSTITUENTS - Glucose, Sucrose.

PROPERTIES AND ACTION -

Rasa	:	Madhura
Guṇa	:	Guru, Snigdha
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Kaphavardhaka, Vātahara, Pitahara, Vṛṣya, Śukravardhaka, Stanyajanna, Bṛṁhaṇa, Jīvanīya, Rucya

IMPORTANT FORMULATIONS - Daśamūlāriṣṭa, Śivāgutikā, Amṛtaprāśa Ghrta, Aśoka Ghṛta, Dhānvantara Taila, Bṛhatmāsa Taila, Mahānārāyaṇa Taila, Vāsācandanādi Taila

THERAPEUTIC USES – Jvara; Raktavikāra; Kṣaya; Dāha; Raktapitta; Bālaroga; Kāmalā; Kṣata; Kṣīṇa

DOSE - 3-6 g.

MADHUSNUHĪ (Tuberous Root)

Madhusnuhī consists of tuberous root of *Smilax china* Linn. (Fam. Liliaceae), a deciduous climber with sparsely prickled or unarmed stem. It is imported from China and Japan.

SYNONYMS -

Sansk.	:	Dvīpāntara Vacā
Beng.	:	Chopcheenee, Kumarika, Shukchin
Eng.	:	China root
Guj.	:	Chopcheenee
Hindi	:	Chopcheenee
Mal.	:	China Pairu
Mar.	:	Chopcheenee
Tam.	:	Parangichekkai
Tel.	:	Pirngichekka

DESCRIPTION –

a) Macroscopic :

Tubers about 6 to 12 cm long, 2 to 4 cm wide, rough, irregular, cylindrical, curved, slightly tapering with brownish or blackish scars; externally brownish-yellow in colour, and internally brown in colour; fracture, hard; odour not characteristic; taste, slightly bitter.

b) Microscopic :

Cortex shows several layers of thin-walled, polygonal, elongated mucilaginous parenchymatous cells, a few cells containing raphides of calcium oxalate; endodermis not distinguished; ground tissue having several vascular bundles consisting of usual elements; fibres long and aseptate; numerous simple and compound starch grains, measuring 16 to 38 μ in dia. with 2 to more than 9 components mostly spherical to ovoid, having hilum in centre.

Powder – Shows light brown, fragments of mucilaginous parenchymatous cells of cortex fibres and vessels with reticulate thickening; a few scattered needles of calcium oxalate from raphides; numerous simple and compound starch grains measuring 16 to 38 μ in dia. with 2 to more than 9 components, mostly spherical to ovoid having hilum in centre.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 0.6 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.06 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 0.8 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 5 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on precoated Silica gel 'G' plate (0.2 mm thick) using Toluene : Ethyl acetate : Methanol (10 : 10 : 4) as mobile phase and on spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate at 105°C for ten minutes ten spots appear at Rf. 0.09 (dark green), 0.17 (violet), 0.21 (dirty yellow), 0.26 (grey), 0.32 (yellow), 0.48, 0.55 and 0.58 (all violet), 0.73 (greenish blue) and 0.77 (violet).

CONSTITUENTS – Saponins, sarsaponin and parallin, which yield isomeric sapogenins, sarsapogenin and smilogenin. It also contains sitosterol and stigmasterol in the free form and as glucosides.

PROPERTIES AND ACTION -

Rasa	:	Tikta
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Tridoṣahara, Rasāyana, Śothahara, Vedanāsthāpana, Nadībalya, Dīpana, Anulomana, Raktaśodhaka, Vṛṣya, Śukraśodhaka, Mūtrala, Śvedajanana

IMPORTANT FORMULATIONS - Madhusnuhī Rasāyana, Copacīnyādi Cūrṇa

THERAPEUTIC USES – Vibandha; Ādhmāna; Śūla; Kṛmi; Kuṣṭha; Pūyameha; Śukravikāra; Vātavyādhi; Phiranga; Unmāda; Apasmāra; Sandhivāta; Kampavāta; Gaṇḍamālā

DOSE - 3-6 g powder.

MEDĀSAKAḤ (Stem Bark)

Medāsakaḥ consists of stem bark of *Litsea chinensis* Lam. syn. *L. glutinosa* (Lour.) C.B. Robins, *L. sebifera* Pers. (Fam. Lauraceae), an evergreen shrub or tree, upto 25 m in height and about 1.5 m in girth with a clean bole, found throughout India, ascending upto an altitude of 1350 m in outer Himalayas.

SYNONYMS -

Sansk.	:	Medāsakah
Beng.	:	Kukurchite
Guj.	:	Meda Lakdee
Hindi.	:	Maida Lakdee
Mar.	:	Meda Lakdee
Punj.	:	Medasaka
Tam.	:	Medalakavi
Tel.	:	Meda

DESCRIPTION -

a) Macroscopic:

Pieces of bark 1.5 to1.6 cm in length; 0.1 to 0.5 cm in width; external surface rough, corky, greenish - yellow to yellowish - brown; internal surface smooth, longitudinally striated, dark brown to black; fracture, short and uneven.

b) Microscopic:

T.S. shows broad zone of cork, 5 to 8 layered; secondary cortex consisting of patches of sclereids, fibres, parenchyma, occasionally containing rhomboidal crystals of calcium oxalate, abundant starch grains, cells containing tannins and mucilage; starch grains spherical to oval, single or in groups, simple or compound, measuring from 1.5 to 8 μ; fibres long, lignified with tapering ends, measuring from 370 to 630 μ in length and 23 to 35 μ in width.

Powder - Light brown in colour, odour strong, bitter and mucilaginous showing cork tissue, starch grains, sclereids, fibres, cells containing tannins and mucilage; sclereids round to oblong, laterally compressed, with narrow lumen, and showing radiating pit canals.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total Ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 5 percent, Appendix 2.2.6.

T. L. C. -

- T.L.C. of the alcoholic extract on silica gel 'G' plate (0.2 mm thick) using chloroform: methanol: acetic acid (80:20:2) shows Under UV (254 nm) three spots at Rf. 0.07 (brown), 0.15 and 0.23 (both violet). Under UV (366 nm) two fluorescent spots appear at Rf. 0.68 (pink) and 0.89 (blue). On exposure to iodine vapour five spots appear at Rf. 0.15, 0.20, 0.23, 0.30 and 0.82 (all yellowish brown). On spraying with 5% ferric chloride solution four spots appear at Rf. 0.07 (violet), 0.15 (blue), 0.23 and 0.30 (both faint green).

CONSTITUENTS - Alkaloids (Laurotetaline, actinodaphine, boldine, norboldine, sebiferine and litseferine).

PROPERTIES AND ACTION -

Rasa	:	Kaṭu, Tikta, Kaṣāya
Guṇa	:	Laghu, Snigdha
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Dīpana, Stambhana, Bhagnaprasādhaka

IMPORTANT FORMULATIONS - Asthisandhānaka Lepa

THERAPEUTIC USES – Śotha; Śūla; Vātavikāra; Agnimāndya; Atisāra; Raktasrāva; Asthibhanga

DOSE - 5-10 g powder.

MEDĀSAKAḤ (Wood)

Medāsakaḥ consists of wood of *Litsea chinensis* Lam. syn. *L. glutinosa* (Lour.) C.B. Robins, *L. sebifera* Pers. (Fam. Lauraceae), an evergreen shrub or tree, upto 25 m in height and about 1.5 m in girth with a clean bole, found throughout India, ascending upto an altitude of 1350 m in outer Himalayas.

SYNONYMS -

Sansk.	:	Medāsakah
Beng.	:	Kukurchite
Guj.	:	Meda Lakadee
Hindi.	:	Maida Lakdee
Mar.	:	Meda Lakadee
Tam.	:	Medalakavi
Tel.	:	Meda

DESCRIPTION -

a) Macroscopic:

Wood - Thick and thin pieces of wood, 14 to 21 cm in length and 0.5 to 2 cm in width; yellowish-white; surface rough with very fine longitudinal striations; fracture, hard, fibrous.

b) Microscopic:

T.S. shows vessels, either single or in groups of 2 or 3; xylem fibres arranged in radial rows with thick walls; medullary rays prominent, uni to tetraseriate, radially elongated, upto 30 cells in height as seen in tangential section and containing abundant spherical to oval starch grains, single or in groups, simple or compound, measuring from 3 to 9 µ; fibres long, linear, lignified with blunt ends, measuring in length from 530 to 1060 µ and from 13 to 24 µ in width.

Powder - Pale yellowish-brown, having characteristic odour, slightly bitter in taste; shows fragments of lignified fibres, starch grains, bordered pitted vessels and some vessels showing scalariform thickenings on their secondary wall.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 3 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 1.5 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 2 percent, Appendix 2.2.7.

T. L. C. -

T.L.C. of the alcoholic extract on silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (80:20) shows under UV (254 nm) three spots at Rf. 0.10 (violet), 0.29 (faint brown) and 0.52 (yellowish green). Under UV (366 nm) three fluorescent spots appear at Rf. 0.29 (brown), 0.52 (yellow) and 0.68 (blue). On exposure to iodine vapour eight spots appear at Rf. 0.10 (brown), 0.13, 0.16, 0.24, 0.29, 0.52, 0.68 and 0.74 (all yellowish brown). On spraying with 10% methanolic-sulphuric acid and heating the plate at 110°C for ten minutes ten spots appear at Rf. 0.10, 0.16 (both brown), 0.26 (grey), 0.31 (brown), 0.40 (purple), 0.44, 0.52, 0.57 (all brown), 0.68 (purple) and 0.77 (brown).

CONSTITUENTS - Alkaloids (Laurotetanine, actinodaphine, boldine, norboldine).

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Kaṣāya
Guṇa : Laghu, Snigdha
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Kaphahara, Dīpana, Stambhana

IMPORTANT FORMULATIONS – Aileyaka Tāila (Citrakādi Taila), Vātaghna Lepa (Cintāmaṇi Rasa)

THERAPEUTIC USES – Śotha; Śūla; Vātavikāra; Agnimāndya; Atisāra; Raktasrāva

DOSE - 1 to 3 g powder.

MEṢAŚṚNGĪ (Leaf)

Meṣaśṛngī consists of dried leaf of *Gymnema sylvestre* R.Br. (Fam. Asclepiadaceae), a large woody, much branched, climber, with pubescent young parts, found throughout India in dry forests upto 600 m.

SYNONYMS -

Sansk.	:	Madhunāśinī, Ajāśṛngī
Beg.	:	Medhasingi
Eng.	:	Periploca of the wood
Guj.	:	Kaavalee, Medhasinge
Hindi	:	Gudmaar, Medhaa Singee
Kan.	:	Kadhasige
Mal.	:	Cakkarakkolli, Madhunaashini
Mar.	:	Kaavalee, Medhaashingi
Tam.	:	Shirukurum Kaay, Shakkaraikkolli
Tel.	:	Podapatro

DESCRIPTION –

a) Macroscopic :

Leaf simple, opposite, elliptical or ovate, petiolate, petiole 6 to 12 mm long and pubescent; lamina 3 to 6 cm long and 1 to 3 cm broad; acute or shortly acuminate; more or less pubescent on both sides, base rounded or cordate, venation reticulate; odour, unpleasant; taste, bitter and acrid.

b) Microscopic :

Leaf –

Petiole - Nearly semi circular in outline having a deep furrow, shows a single layered epidermis covered with thick cuticle; multicellular uniseriate trichomes present; cortex composed of 3 or 4 layers of collenchyma and 3 or 4 layers of thin walled parenchymatous cells with intercellular spaces; vascular bundle bicollateral, conjoint and 3 in number, one central larger and crescent shaped and 2 lateral and smaller in size; a few rosette crystals of calcium oxalate present in cortical region.

Midrib – Epidermis and trichome as in petiole; epidermis followed by 2 or 3 layers of collenchyma adjacent to the lower surface; vascular bundle crescent shaped, bicollateral, conjoint and situated in centre; rest of the tissue between collenchyma and vascular bundles consisting of polygonal thin-walled parenchymatous cells with intercellular spaces, a few having rosette crystals of calcium oxalate.

Lamina – Shows dorsiventral structure; epidermis and trichome as in petiole and midrib; trichome cylindrical, consists of 3 to 6 cells nearly similar in width and variable in length, terminal cells blunt, most of them curved inwards from the leaf surface; palisade 1 or 2 layers; spongy parenchyma irregular, arranged with distinct intercellular spaces, rosette crystals of calcium oxalate present in this region; stomata paracytic, present only on lower surface; palisade ratio 7 or 8; stomatal index 20 to 25, vein islet number 7 to 10 per sq. mm.

Powder – Light green; under microscope shows epidermal cells having nearly straight wall, and paracytic stomata in surface view; rosette crystals of calcium oxalate; broken pieces of trichomes and spiral vessels.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than	.2 percent, Appendix 2.2.2.
Total ash	-	Not more than	12 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than	2 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than	7 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than	28 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica Gel 'G' plate using n-Hexane : Toluene : Ethylacetate (5:10:2) as mobile phase shows four fluorescent zones under U.V. (366 nm) at Rf. 0.24, 0.37 (both Red), 0.50 (blue) and 0.60 (Red). On spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate at 110° for ten minutes seven spots appear at Rf. 0.29 (green), 0.37, 0.47 (both violet), 0.55 (pink), 0.60 (green), 0.66 (violet) and 0.93 (pink).

CONSTITUENTS – Triterpenoid saponins of gymnemic acid A, B, C and D with sugar-residues such as glucuronic acid, galacturonic acid, ferulic and angelic acids attached as carboxylic acids. Several isopropylene derivatives of gymnemagenin, a hexahydroterpene, gymnemagenin, gymnemic acid. The leaves also contain betaine, choline, gymnamine alkaloids, inositol, d-quercitol. Hydrocarbons such as nonacosane, hentriacontane, tritriacontane, pentatriacontane, phytin, resin, tartaric acid, formic acid, butyric acid, amino acids such as leucine, isoleucine, valine, alanine, γ-butyric acid.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya
Guṇa : Rūkṣa, Laghu
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Kaphahara, Viṣaghna, Dīpana, Cakṣuṣya, Sramasāna

IMPORTANT FORMULATIONS - Ayaskrtī, Nyagrodhādi Cūrṇa, Mahāviṣagarbha Taila, Mṛtasanjivanī Surā

THERAPEUTIC USES – Śvāsa; Kāsa; Śūla; Kuṣṭha; Prameha; Kṛmi; Vrana; Śopha; Arś`2q 1a; Hṛdroga; Dantakṛmi; Netraroga

DOSE - 3-6 g.

MEṢAŚṚNGĪ (Root)

Meṣaśṛngī consists of root of *Gymnema sylvestre* R. Br. (Fam. Asclepiadaceae), a large woody, climber, much branched, with pubescent young parts, found throughout India in dry forests upto 600 m.

SYNONYMS -

Sansk.	:	Madhunāśinī, Ajaśṛngī
Beng.	:	Medhasingi
Eng.	:	Periploca of the woods
Guj.	:	Kaavalee, Meḍhasinge
Hindi	:	Gudmaar, Medhaasingee
Kan.	:	Kadhasige
Mal.	:	Cakkarakkolli, Madhunaashini
Mar.	:	Kaavalee, Medhaashingi
Tam.	:	Shirukurumkaay, Shakkaraikkolli
Tel.	:	Podapatro

DESCRIPTION –

a) Macroscopic :

Tap root branched, rough, longitudinally fissured, corky, soft and nodulose pieces, 2 to 7 cm long and 0.2 to 1.0 cm in thickness; external surface dark brown and cut surface showing a core cream in colour; fracture, splintery; odour, unpleasant; taste, bitter and acrid.

b) Microscopic :

Root - Shows 5 to 20 rows of tangentially elongated and radially arranged cork cells; secondary cortex a wide zone consisting of oval to polygonal cells somewhat irregular in shape and moderately thick walled, filled with rosette crystals of calcium oxalate and a few simple or compound starch grains; secondary phloem composed of sieve tubes, companion cells and phloem parenchyma, with mostly large and a few small rosette crystals and starch grains; medullary rays prominent, uni or multi seriate, generally tetra seriate, extending from primary xylem to secondary phloem; groups of oval to elongated, thick walled, lignified sclereids with clear striations and narrow lumen present in cortex and phloem region; secondary xylem consists of usual lignified elements; vessels simple pitted, single or 2 to 7 in radial groups and dispersed throughout the xylem region; fibres long with tapering ends and wide lumen; primary xylem present diarch.

Powder – Light yellow; shows thick walled cork cells; polygonal, thin walled parenchymatous cells, simple pitted fibres and vessels; groups of sclereids, large and a few small rosette crystals of calcium oxalate, simple and compound starch grains, measuring 5 to 11 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 6 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 5 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 14 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica Gel 'G' plate using Toluene : Ethylacetate : Methanol (10:10:4) as mobile phase shows on spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate at 110°C for ten minutes eight spots at Rf. 0.17 (brown), 0.25 (violet), 0.48 (grey), 0.57 (pink), 0.68, 0.80, 0.87 (violet) and 0.95 (pink).

PROPERTIES AND ACTION -

Rasa	:	Kaṣāya, Tikta
Guṇa	:	Laghu, Rukṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Mūtrala, Dīpana, Śirovirecaka, Sraṁśana

IMPORTANT FORMULATIONS – Mahā Viṣagarbha Taila, Nyagrodhādi Cūrṇa, Mṛtasanjīvanīsurā

THERAPEUTIC USES – Kuṣṭha; Prameha; Kāsa; Kṛmiroga; Vraṇa; Viṣavikāra; Mūtrakṛcchra; Śvāsa; Hṛdroga; Raktavikāra; Dāha; Akṣiśūla; Vidradhi; Vātahara

DOSE - 50 - 100 ml decoction.
1 - 2 g powder.

NANDĪ (Root)

Nandī consists of dried root of *Ficus arnottiana* Miq. (Fam. Moraceae), a glabrous tree or shrub without aerial roots, found throughout India in rocky hills up to 1350 m altitude.

SYNONYMS -

Sansk.	:	Pārśvapippala, Prarohī, Gardhabhāṇḍa, Gajapādapa, Sthālīdruma, Nandīvṛkṣa
Beng.	:	Kamru
Guj.	:	Naandrukheevad
Hindi	:	Beliya Peepal
Kan.	:	Kadarasu, Kallarase
Mal.	:	Kallarayal
Mar.	:	Nandee vruksh, Naandruk
Ori.	:	Plokhyo
Tam.	:	Kagoli, Kodiarasu, Kallarasu
Tel.	:	Kallaravi, Kondaravi

DESCRIPTION –

a) Macroscopic :

Drug available in cut pieces with or without bark of varying size, 0.5 to 2.0 cm in thickness; external surface brownish in colour and slightly rough due to exfoliation of cork, cut surface, yellowish-brown in colour; fracture, fibrous; odour and taste not characteristic.

b) Microscopic :

Transverse section of root shows thick cuticle, single layered epidermis, cells rectangular followed by 3 or 4 layers of cork cells; cork cambium 2 to 4 layered; secondary cortex wide consisting of rectangular to polygonal thin walled pitted cells, some filled with reddish-brown substance; circular to elongated, lignified, elliptical stone cells, a few showing concentric striations present in this region; a few prismatic crystals of calcium oxalate and abundant round to oval starch grains upto about 12 µ in dia. present in cortical cells; endodermis and pericycle not distinct; secondary phloem shows a wide zone consisting of sieve tubes, companion cells, fibres and ray cells; phloem parenchyma contains prismatic crystals of calcium oxalate and round to oval starch grains, laticiferous cells also present in this region; fibres non-lignified, thick walled with narrow lumen; secondary xylem elements thick walled and lignified; vessels and tracheids show bordered pits; medullary rays uni to multiseriate, wide towards peripheral region.

Powder – Light brown; under microscope shows groups of parenchyma; simple, round to oval starch grains, measuring upto 12 μ in dia. and crystals, fragments of fibres, circular to elongated, elliptical stone cells, a few laticiferous cells and border pitted vessels and tracheids.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 5 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 4 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 8 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Toluene : Chloroform (8:12 v/v) as mobile phase shows on exposure to Iodine vapour four spots at Rf. 0.25, 0.37, 0.75 and 0.89 (all yellow). On spraying with Anisaldehyde-sulphuric acid reagent and heating the plate for ten minutes at 105° C. The same four spots appear violet at Rf. 0.25, 0.37, 0.75 and 0.89.

PROPERTIES AND ACTION -

Rasa	:	Madhura, Tikta, Kaṣāya
Guṇa	:	Laghu
Vīrya	:	Uṣṇa (alpa)
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Grāhī, Medohara, Bhagnasandhāna

IMPORTANT FORMULATIONS - Nyagrodhādi Kvātha Cūrṇa

THERAPEUTIC USES – Raktapitta; Raktavikāra; Viṣavikāra; Dāha; Kaphavikāra; Vraṇa; Bhagna; Yonidoṣa

DOSE - 10 - 20 g powder.

30 - 50 g decoction.

NĪLAJHINṬĪ (Root)

Nīlajhinṭī consists of root of *Barleria strigosa* Willd. (Fam. Acanthaceae), a tall herb which is distributed throughout the upper gangentic plain and southern parts of India.

SYNONYMS –

Sansk.	:	Dāsī, Bāṇa, Kṛṣṇa, Saireyakah, Nīlasaireyakah
Beng.	:	Jhaati, Kaaraajaati
Guj.	:	Kaataseriyo
Hindi	:	Nili, Katsaraiya
Mal.	:	Nilakurnni
Mar.	:	Koraanti, Wahiti
Tam.	:	Shemmuli
Tel.	:	Mullugorant, Nilambaramu

DESCRIPTION –

a) Macroscopic:

Branched tap root, 2 to 10 mm in thickness; knotty and thicker at the transition zone with stem; dark brown; cut pieces of about 20 cm in length; cut or broken surface straw coloured and split; surface of fractured part smooth; bark sloughing off from broken areas; unpleasant odour; tasteless, texture rough.

b) Microscopic:

T.S. of root reveals a circular outline; outer layers generally sloughed off; but strips of cork, cork cambium and cortex with occasional stone cells may be present; phloem composed mostly of parenchyma and fibres and separated from xylem by a flattened layer of cambium; xylem composed of thick walled cells and vessel elements and interrupted by 1 to 3 seriate rays made of squarish or rectangular cells radiating from 8 to 12 points of primary xylem elements present at the periphery of the pith; 1 or 2 growth rings visible in the wood region; pith made of large, angular, compactly arranged, thin walled cells. In dried market samples the pith region usually shows radial fractures; some cells of the pith show dark contents.

Powder - Powder shows vascular elements with simple pitted thickenings, and tracheidal cells having pointed end walls. Stone cells, 60 to 120 μ present.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 6 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 6 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 1 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on slica gel 'G' plate (0.2 mm thick) using ethylacetate : methanol : water (9:0.5:0.5) as the mobile phase shows under U.V. (366nm) spots at Rf 0.13 (Blue); 0.20 (Bluish green); 0.35 (Fluorescent blue); 0.44 (Blue); 0.62 (Purplish blue); 0.82 (Blue); 0.91 (Orange).

PROPERTIES AND ACTION -

Rasa	:	Tikta, Madhura
Guṇa	:	Snigdha
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātakaphahara, Keśarañjana, Viṣaghna, Mūtrala, Keśya, Garbhavṛddhi Kara

IMPORTANT FORMULATIONS - Māṇikya Rasa

THERAPEUTIC USES – Kuṣṭha; Vātarakta; Kaṇḍu; Mūtrakṛcchra; Raktavikāra; Vātajanyakṣaya; Mūsikāviṣa; Śirāgranthī; Dantaroga; Kāsa; Śotha

DOSE - 10 - 20 ml swarasa.
50 - 100 ml kvātha.

NIMBA (Root Bark)

Nimba consists of dried root bark of *Azadirachta indica* A. Juss. syn. *Melia azadirachta* Linn. (Fam. Meliaceae), a medium to large evergreen tree attaining a height of 15 to 20 m or more under favourable conditions and found throughout the plains of India upto an altitude of 900 m.

SYNONYMS-

Sansk.	:	Picumaradah, Aristah, Picumandah, Prabhadrah
Beng.	:	Nim, Nimgaachh
Eng.	:	Margosa Tree, Neem Tree, Indian Lilac
Guj.	:	Leemado
Hindi	:	Neem
Kan.	:	Turakbevu, Huchchabevu, Chikkabevu
Mal.	:	Veppu, Aryaveppu, Aaruveppu
Mar.	:	Kadunimba, Nimb
Ori.	:	Neemo, Nimba
Punj.	:	Nimb, Nim
Tam.	:	Vempu, Veppu
Tel.	:	Vemu, Vepa
Urdu.	:	Neem

DESCRIPTION –

a) Macroscopic :

Root bark available in quilled or curved pieces of varying sizes with a thickness of 0.25 to 0.50 cm; outer surface irregular, rough, scaly, fissured, reddish-brown or greyish- brown; inner surface, yellowish-brown with parallel striations; fracture, splintery and fibrous; odour like that of saw dust; taste, bitter.

b) Microscopic :

Root bark shows cork, cortex and phloem; cork generally 6 or 7 layers of polygonal and thin walled cells with reddish-brown contents; outer cortex of tangentially elongated large rectangular cells with tangentially elongated sclereids, singly or in groups in isolated patches; sclereids vary in size and wall thickness, distinctly striated, pitted and often associated with cells containing crystal; inner cortex of polygonal parenchymatous cells with bundles of sclerenchymatous fibres, thick walled with irregular lumen; secondary phloem composed of alternating tangential bands of bast fibres and parenchymatous tissues intercepted by uni to biseriate phloem rays; abundant starch grains present in parenchymatous cells of cortex and phloem; starch grains simple, or more usually compound with 2 or 3 components, hilum cleft or radiate, individual grain 5 to 20 µ; abundant prismatic crystals of calcium oxalate in cortex, of 10 to 15 µ, also

associated with phloem fibres; idioblasts with reddish-brown contents seen in cortex; cells with fat droplets seen in inner cortex and phloem.

Powder - Reddish-brown; shows cork cells; numerous prismatic crystals of calcium oxalate both isolated, and in association with phloem fibres; individual fibres with narrow lumen and elongated tapering ends; pitted macrosclereids with wide lumen and distinct striations; simple, and compound starch grains with 2 or 3 components, of 5 to 20 μ in size; parenchymatous cells large and occasionally filled with brown contents.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 15 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 3 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 6 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 7 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using hexane : ethyl acetate (1:1) shows spots at Rf 0.08, 0.12, 0.19 (all violet), 0.25 (mustard yellow), 0.33, 0.39, 0.46 (all light violet) and 0.82 (purple) on spraying with 1% Vanillin-Sulphuric acid reagent followed by heating the plate at 105 °C for about ten minutes.

CONSTITUENTS - Tetranortriterpenoids, margocin, nimbidiol, nimbolicin, azadirinin.

PROPERTIES AND ACTION –

Rasa	:	Tikta
Guṇa	:	Laghu
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Śītagrāhī, Rucya Dīpana, Viṣaghna, Kaṇḍūghna, Ahṛdya, Vraṇaśodhana

IMPORTANT FORMULATIONS – Amṛtaṣṭaka, Aṣṭāngadasānga lanha

THERAPEUTIC USES – Chardi; Kuṣṭha; Raktapitta; Prameha; Hṛllāsa; DuṣtaVraṇa; Tṛṣā; Jvara; Dāha; Kāsa; Śvāsa; Śotha; Kaphavikāra; Kṛmiroga; Aruci; Grahaṇī; Yakṛtvikāra; Hṛdayavidāha; Vāmana

DOSE - 3 - 6 g.

NIMBA (Flower)

Nimba consists of dried flower and flower bud of *Azadirachta indica* A. Juss. syn. *Melia azadirachta* Linn. (Fam. Meliaceae), a medium to large size evergreen tree attaining a height of 15 to 20 m or more under favourable conditions and found throughout the plains of India upto an altitude of 900 m.

SYNONYMS –

Sansk.	:	Picumaradah, Ariṣṭah, Picumandah, Prabhadrah
Beng.	:	Nim, Nimgaachh
Eng.	:	Margosa Tree, Neem tree, Indian Lilac
Guj.	:	Leemado
Hindi	:	Neem
Kan.	:	Turakbevu, Huchchabevu, Chikkabevu
Mal.	:	Veppu, Aryaveppu, Aaruveppu
Mar.	:	Kadunimb, Nimb
Ori.	:	Neemo, Nimba
Punj.	:	Nimba, Nim
Tam.	:	Vempu, Veppu
Tel.	:	Vepa, Vemu
Urdu.	:	Neem

DESCRIPTION -

a) Macroscopic :

Dried flowers are brown to deep brown; individual flower 5 to 6 mm long and 6 to 11 mm wide, pentamerous, bisexual, regular and hypogynous; calyx 5, short, united at base; corolla 5, free, spathulate, spreading, 4.5 to 5.5 mm long 2 mm wide; stamens 10, monoadelphous, staminal tube inserted at base of corolla; gynoecium tricarpellary, syncarpous, superior, trilocular, two ovules in each locule, style 1, stigma 3-lobed; taste, mildly bitter: odour, indistinct.

b) Microscopic :

Calyx - Sepal shows thin walled polygonal papillose epidermis; elongated thin walled unicellular conical trichomes of varying lengths; rosette crystals in cells of epidermis.

Petals - Petal shows epidermis of rectangular cells papillose at margins, non-glandular unicellular trichomes, over 150 μ long, tubular and hyaline; glandular trichomes of about 20 μ, numerous rosette crystals in epidermal cells.

Androecium - Epidermis of staminal tube composed of thick walled rectangular parenchymatous cells and the endothecium of the anther walls.

Gynoecium - Stigma sticky, parenchymatous epidermal cells, elongated into extensive papillae, style thin walled, rectangular, ovary superior, trilocular.

Pollen Grain – Porous, 4-colporate, spherical 105 to161μ in dia., with a smooth exine.

Powder – Yellowish-brown, fragments of parenchymatous papillose epidermal cells, trichomes, numerous vessels, rosette calcium oxalate crystals, and yellowish-brown pollen grains.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 14 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 5 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 5 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 12 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : acetone (20:1) shows spots at Rf 0.12 (violet), 0.17 (light pink), 0.33 (violet), 0.51 (purple), 0.64 (dark purple), 0.80 (light purple), 0.85 (light purple), 0.92 (purple) on spraying with 1% Vanillin-Sulphuric acid reagent followed by heating the plate at 105 °C for about ten minutes.

CONSTITUENTS - 15-Acetoxy-7-deacetoxydihydroazadirone (neeflone), nonacosane (saturated hydrocarbon).

PROPERTIES AND ACTION -

Rasa	:	Tikta
Guṇa	:	Laghu
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Vātakara, Kuṣṭhaghna, Kṛmighna, Cakṣuṣya, Viṣaghna, Grāhī

IMPORTANT FORMULATIONS – Kuṣṭhakālāmla rasa, Kuṣṭha śailendra rasa, Kṛmīvināśana rasa

THERAPEUTIC USES – Kuṣṭha; Aruci; Prameha; Kṛmi; Kaphapittaja vikāra; Dāha; Jvara; Viṣamajvara; Netraroga; Raktavikāra; Phiranga; Śotha; Śrama; Tṛṣṇā; Kāsa; Vraṇa; Chardi; Kaṇdu; Vraṇa; Hṛllāsa; Hṛdayavidāha

DOSE - 2 - 4 g puṣpa curṇa.
10 - 20 ml puṣpa svarasa.

NIMBA (Fruit)

Nimba consists of whole dried fruit including seeds of *Azadirachta indica* A. Juss. syn. *Melia azadirachta* Linn. (Fam. Meliaceae), a medium to large size evergreen tree attaining a height of 15 to 20 m or more under favourable conditions and found throughout the plains of India upto an altitude of 900 m.

SYNONYMS -

Sansk.	:	Picumaradah, Ariṣṭah, Picumandah, Prabhadrah
Beng.	:	Nim, Nimgaachh
Eng.	:	Margosa tree, Neem tree, Indian Lilac
Guj.	:	Leemado
Hindi	:	Neem
Kan.	:	Turakbevu, Huchchabevu, Chikkabevu
Mal.	:	Veppu, Aryaveppu, Aaruveppu
Mar.	:	Kadunimb, Nimb
Ori.	:	Neemo
Punj.	:	Nimb, Nim
Tam.	:	Vempu, Vembu
Tel.	:	Vepa, Vemu
Urdu.	:	Neem

DESCRIPTION -

a) Macroscopic :

Fruit - Glabrous, dark reddish-brown, ovoid to ellipsoid drupes. 0.5 to 2 cm long, over one cm wide; indehiscent, deeply wrinkled, enclosing a single seed in a brownish leathery pulp; odour strong; taste, bitter.

Seed- Brownish, dorsally convex; upto 1.5 cm long and 0.6 cm wide; seed coat thin, brownish, shell-like, cracks to touch, inside of cracked pieces golden yellow; seed kernel, light brown, oily; odour, strong; taste, bitter.

b) Microscopic :

Fruit - Pericarp well differentiated into epicarp, mesocarp and endocarp; epidermis more than one layered; squarish to rectangular cells containing yellowish-brown contents and oil droplets; mesocarp, many layered of loosely packed cells with large elongated sclereids scattered in outer layers; endocarp of two distinct layers, outer of closely packed lignified stone cells, inner fibrous, loosely packed, lignified.

Seed - Seed kernel shows a thin brown testa, of isodiametric stone cells overlying integument of loosely packed parenchymatous cells; cotyledon consisting of parenchymatous cells containing abundant oil droplets.

Powder - Dark brown; shows abundant brachysclereids, columnar sclereids and pitted stone cells with wide lumen and distinct wall striations; groups of lignified fibres, thin-walled, arranged in network of loose strands; parenchymatous cells of cotyledon containing aleurone grains and oil globules; fragments of testa showing distinctly striated isodiametric stone cells; a few scattered rosette crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH-

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 16 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 19 percent, Appendix 2.2.7.

T.L.C.

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : acetone (18.5:1.5) shows spots at Rf 0.11 (greyish violet), 0.16 (yellow), 0.19 (green), 0.24 (violet), 0.29 (grey), 0.33 (mustard yellow), 0.42 (pink), 0.49 (greyish black), 0.57 (violet) and 0.76 (light purple) on spraying with 1% Vanillin-Sulphuric acid reagent and heating the plate at 105 °C for about ten minutes.

CONSTITUENTS – Fixed oil containing diterpenoids and triterpenoids (limonoids); nimbin, gedunin, azadirachtin; nimbidinin, salanin.

PROPERTIES AND ACTION -

Rasa	:	Tikta
Guṇa	:	Tīkṣṇa, Laghu, Snigdha
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Bhedanīya, Hṛdayadāhahara, Viṣaghna, Rasāyana, Pācana

IMPORTANT FORMULATIONS - Arśoghnivaṭī (seed), Palāśabījādi Cūrṇa (seed)

THERAPEUTIC USES – Kṛmi; Kuṣṭha; Prameha; Gulma; Arśa; Pālitya; Netrarujā; Raktapitta; Kṣata Kṣaya; Śiroroga; Jvara; Aruci; Dāha; Chardi; Hṛllāsa; Vraṇa; Śotha; Viṣavikāra; Vibandha; Khālitya; Gaṇḍamāla

DOSE - 1 - 2 g cūrṇa.
5 - 10 drops of oil.

PALĀŚAḤ (Seed)

Palāśaḥ consists of seed of *Butea monosperma* (Lam.) Kuntze, syn. *B. frondosa* Roxb. (Fam. Fabaceae), a moderate sized deciduous tree, commonly called "Flame of the Forest", found throughout India upto a height of 1250 m, except in the arid zones.

SYNONYMS –

Sansk.	:	Palāśah, Kiṁśukah, Raktapuṣpakah, Vātapotha
Beng.	:	Palaash
Eng.	:	Butea seed, Flame of the Forest, Bastard teak
Guj.	:	Khakharo
Hindi	:	Dhak, Palash, Tesoo
Kan.	:	Muttagamara, Muttug
Mal.	:	Plashu
Mar.	:	Palas, Palash paapada
Tam.	:	Purasu
Tel.	:	Moduga

DESCRIPTION –

a) Macroscopic :

Seeds reddish-brown, thin, flat, reniform, longer axis from 3 to 4 cm and shorter from 2 to 2.5 cm, raphe equal to antiraphe, micropyle inconspicuous; seed coat reddish brown, waxy; faint odour; taste, slightly acrid bitter; weight of 100 seeds 80 to115 g.

b) Microscopic :

Single layered epidermis of testa interrupted by balloon shaped cells; malphighian cells palisade like, thick-walled, red, unlignified, lumen large but not uniform; discontinuous transparent Linea lucida in upper half of Malphighian layer; osteosclereids irregular, nonlignified, highly thick walled, columnar, compressed and superposed; mesophyll occupies major portion of testa, upper and lower mesophyll cells small, isodiametric to elliptic, middle layers large, angular, condensed with small intercellular spaces; inner epidermis reddish brown, distinct with small thick walled elongated cells externally covered by thin culticle.

The transection of cotyledon shows single layered, thick-walled epidermis having angular cells, followed by beaded parenchymatous cells containing starch and protein in form of spiral, as revealed by freshly prepared Millon's Reagent; starch grains, rod shaped or ovoid, simple, 20 to 40 µm, hilum indistinct, lamellae distinct. Embryo is straight having a radicle with well-marked hypocotyl, epicotyl with a plumule and a pair of thick cotyledons.

Powder - Powder yellowish-brown; acrid and bitter with oily flavour and pleasant smell; small fragments of testa, broken and intact malphighian cells, osteosclereids, mesophyll cells isolated or in groups, cotyledonary parenchyma containing a few starch grains, abundant spiral protein bodies, mucilage and oil globules; when treated with 50% H_2SO_4, emits yellow fluorescence under UV-254 nm.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.5 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 20 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 25 percent, Appendix 2.2.7.
Protein	-	Not less than 18 percent, Appendix 2.2.17.
Fatty oil	-	Not less than 6 percent, Appendix 2.2.15.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene : ethylacetate : methanol (85 : 15 : 0.5) as solvent system shows after spraying with anisaldehyde-sulphuric acid and heating the plate for ten minutes at 120^0C, at Rf. 0.26 (magenta), 0.38 (greying green) and 0.56 (greyish green).

CONSTITUENTS – Fatty oil; amino acids.

PROPERTES AND ACTION –

Rasa	:	Kaṣāya, Tikta, Kaṭu
Guṇa	:	Laghu, Snigdha, Sara
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Tridoṣahara, Dīpana, Vṛṣya, Bhedana, Bhagnasandhānakara, Garbhanirodhaka, Rasāyana

IMPORTANT FORMULATIONS – Kṛmimudgara Rasa, Ayaskṛti

THERAPEUTIC USES – Kṛmi; Vraṇa; Gulma; Gudajaroga; Arśa; Raktavikāra; Vāta-Rakta; Udararoga; Kāsa; Kaṇḍu; Tvakroga; Prameha; Yonidoṣa; Sukradoṣa; Mūtrakṛcchra; Kuṣṭha; Pāmā; Dadru; Dāha; Plīharoga; Atisāra; Netraśukra; Śūla; Medoroga; Pāṇḍu; Aśmarī; Vṛścikaviṣa

DOSE – 0.5 to 1 g.

PALĀŚAḤ (Flower)

Palāśaḥ consists of dried flower of *Butea monosperma* (Lam.) Kuntze syn. *B. frondosa* Roxb. (Fam. Fabaceae), a moderate sized deciduous tree, commonly called "Flame of the Forest", flowering in March - May found throughout India upto a height of 1250 m, except in the arid zones.

SYNONYMS –

Sansk.	:	Kiṁśuka, Raktapuṣpaka, Kṣārśreṣṭha
Beng.	:	Palash
Eng.	:	Butea Seed, Bastard teak, Flame of the Forest
Guj.	:	Khaakharo
Hindi	:	Dhaak, Tesu, Palaash
Kan.	:	Muttug, Muttulu
Mal.	:	Plashu
Mar.	:	Palas, Palash paapda
Ori.	:	Porasu, Kijuko
Punj.	:	Tesh
Tam.	:	Purasu
Tel.	:	Moduga

DESCRIPTION –

a) Macroscopic :

Inflorescence raceme; flowers large, 4 to 6 cm long, alternate, with pubescent long, velvety, olive green peduncle; bright yellowish-red to orange red pedicels, 1.5 cm long, twisted, bracteate, bracts and bracteoles small, linear, velvety, orange green, deciduous; calyx campanulate, 5-partite, oblique, about 1 cm long, dark olive green, densely velvety outside, clothed with silky hairs within, two upper teeth connate, large, three lower ones unequal, the lowest being much shorter than the lateral ones; corolla 4 to 6 cm. long, orange red, covered outside with silky white hairs, papilionaceous; stamen diadelphous; anthers linear, yellow; ovary stipitate, silky, pubescent, style incurved, longer than the stamens.

b) Microscopic :

Pedicel: T.S. of pedicel circular in outline, bearing numerous 2 to 4 celled uniseriate hairs; cortex collenchymatous, differentiated in two zones- outer formed of smaller cells with some contents and inner zone of larger cells; cortex and stele separated by endodermis of barrel shaped cells containing starch grains; phloem parenchyma containing tannin; pith parenchymatous; vascular bundles separated by broad medullary rays and arranged in a ring; rhomboidal crystals of calcium oxalate present in cortex.

Sepals: Sepals on upper surface have one type of trichome 3 to 5 celled, with prominent basal cell; on lower surface two types of trichomes, (i) multicellular, uniseriate, long, thick walled with circular basal cell; (ii) a few multicellular, club-shaped, trichomes glandular in nature; stomata anomocytic type.

Petals: Upper surface of wing petal with profuse 2 to 6 celled hairs on its basal part and multicellular trichomes at the tip; lower surface of wing petal covered with multicellular uniseriate trichomes; papillate epidermal cells in the middle region of wing petal, in surface view shows striations radiating from the base of papilla; cells in apical region of wing petal without papillate, but narrow with random striation; upper surface of standard petal glabrous but margins hairy; multicellular, club shaped appendages and uniseriate 2 to 5 celled trichomes present at the apex. In the middle portion cells longer than broad, drawn out into papillae with striations radiating out from this; upper surface of keel petal cells polygonal, with irregular striations, trichomes profuse except at apical region.

Stamens diadelphous; pollen grain 3 pored, oblate, spheroidal; about 28 µm long and 30 µm broad, pore circular to elongate, 8 to 12.5 µm, exine wall surface foveolate.

Ovary with two types of trichomes, (i) thin walled having dense contents (ii) 2 to 3 celled trichome, placentation marginal; epidermal cells of style long, narrow in surface view, trichomes uniseriate multicellular and thick walled in stylar region.

Powder – Brownish-yellow, slightly bitter in taste, no characteristic odour; shows pieces of various types of trichomes, vascular tissue, epidermal cells with characteristic papillae, polygonal cells with linear striations, pollen grains, and styloid crystals of calcium oxalate; powder treated with 1N HCl followed by one drop of nitrocellulose in amylacetate becomes orange yellow under UV 365 nm and with 1N NaOH in methanol becomes, yellowish-black under UV 254 nm.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 10 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 15 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 32 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using ethyl acetate : methanol : water (100 : 15 : 5) shows under UV (366 nm) fluorescent zones at Rf. 0.17 (yellow), 0.26 (yellow), 0.53 (light brown), 0.58 (greenish yellow) and 0.63 (greenish yellow). On spraying with 5% KOH reagent spots at Rf. 0.17 (yellow), 0.26 (yellow), 0.58 (green) and 0.63 (green).

CONSTITUENTS – Coumarins and glycosides, cumaranone glycosides, butrin, isobutrin, monospermoside, isomonospermoside, carbomethoxy-3, 6-dioxo-5-hydro-1, 2, 4-triazine, coreopsin, isocoreopsin.

PROPERTIES AND ACTION –

Rasa	:	Kaṭu, Tikta, Kaṣāya, Madhura
Guṇa	:	Laghu, Rūkṣa, Sara
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Pittahara, Kaphahara, Dīpana, Trsnāśāmaka, Rakta Stambhana, Mūtrala, Kuṣṭhaghna, Sandhānīya, Dāhapraśamana, Grāhī

IMPORTANT FORMULATIONS – Kunkumādi Taila, Vaṅga Bhasma (Jāraṇa (b)

THERAPEUTIC USES – Raktavikāra; Mūtrakrcchra; Dāha; Vātarakta; Kuṣṭha; Trṣṇā; Raktapitta; Plīhāroga; Gulma; Grahaṇī; Krmi; Kaṇḍu; Arśa; Pittābhiṣyanda; Netraśukra

DOSE – 3-6 g.

PĀRASĪKAYAVĀNĪ (Seed)

Pārasīkayavānī consists of the seed of *Hyoscyamus niger* Linn. (Fam. Solanaceae), an annual or biennial herb, native to the Mediterranean region and temperate Asia, occurring in Western Himalayas from Kashmir to Kumaon at an altitude of 1600 to 4000 m, imported into India.

SYNONYMS-

Sansk.	:	Khurāsānī yavānī, Yawanī, Turuṣakā, Madakāriṇī
Beng.	:	Khorasani ajwan
Eng.	:	Henbane
Guj.	:	Khurasanee ajma, Khurasanee ajmo
Hindi	:	Khurasanee ajvayan,
Kan.	:	Khurasanee, Ajawaana
Mal.	:	Khurasaanee, Paarasika, Yavaani
Mar.	:	Khurasanee ova
Punj.	:	Khurasanee ajvain, Bangidewana
Tam.	:	Kuraasanee Yomam
Tel.	:	Kurasanee vamu, Khurasanee omam
Urdu.	:	Ajvayanee Khursanee

DESCRIPTION –

a) Macroscopic :

Seeds irregularly reniform or sub-quadrate, slightly over a mm in size, dark grey, surface concave, odour pleasantly aromatic, taste bitter, mucilaginous and pungent, aromatic.

b) Microscopic :

Transverse section of seed shows the presence of thick cuticle, testa with two layers, outer one with a row of osteosclereids size ranging from 50 to 80 μ, inner one with crushed parenchyma, endosperm cells thin walled, containing oil globules, embryo coiled; starch absent.

Powder - Dark brown aromatic smell, bitter mucilagenous taste and an oily texture; a number of flask-shaped or dumb-bell shaped osteosclereids seen; fragments of testa in surface view, showing cells with sinuous walls; powder when treated with Sudan IV and mounted in glycerine shows the presence of oil globules which turn orange red; powder cleared with dilute nitric acid shows surface view of sculpturing on testa.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total Ash	-	Not more than 4 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 16 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 10 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the methanolic extract on silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate : diethyl amine (70:20:10) shows under UV (366 nm) one fluorescent spot at Rf. 0.49 (blue). After spraying with anisaldehyde-sulphuric acid reagent and heating the plate at 105 °C for ten minutes spots appear at Rf. 0.09 (Brown), 0.49 (brown), 0.69 (greenish brown). After spraying with modified Dragendorff's reagent spots appear at Rf. 0.90, 0.77, 0.61, 0.23 and 0.10.

CONSTITUENTS – Tropane alkaloids hyoscyamine, (its racemic mixture and atropine) and hyoscine.

PROPERTIES AND ACTION -

Rasa	:	Tikta, Kaṭu
Guṇa	:	Rūkṣa, Guru
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Pittakara, Mādaka, Vedanāsthāpana, Pāçaka, Grāhī, Dīpana, Nidrākara

IMPORTANT FORMULATIONS- Sarpagandhāghana Vaṭī

THERAPEUTIC USES – Rajahkṛcchra; Śīghrapātana; Svpanadoṣa; Udaraśūla; Ānāha; Gulma; Kṛmi; Aśmarī; Kāsa; Śvāsa; Anidrā; Unmāda; Śūla; Sandhiśūla

DOSE - 125 - 500 mg.

PAṬṬŪRA (Whole Plant)

Paṭṭūra consists of whole plant of *Aerva lanata* (Linn.) Juss. (Fam. Amaranthaceae), an erect or prostrate branched herb, 30 to 60 cm in height, found throughout India in waste lands.

SYNONYMS -

Sansk.	:	Gorakṣagañja, Bhadrā
Beng.	:	Chaya
Guj.	:	Gorakhganjo
Hindi	:	Gorakhaganja
Kan.	:	Bilihindisoppu
Mal.	:	Cherula
Mar.	:	Kapurphutee, Kumrapindee
Punj.	:	Bhuikallan
Tam.	:	Cherupoolai
Tel.	:	Pindichettu, Kanda pindi

DESCRIPTION –

a) Macroscopic :

Root – Tap-root, laterally branched, cylindrical, up to 0.8 cm in thickness and about 25 cm long pieces, externally light brown and rough but cut surface white and smooth; fracture, fibrous and hard.

Stem – Nearly cylindrical, branching alternate, external surface shows slight ridges and furrows, hairy and light brown in colour; cut surface white; fracture, granular.

Leaf – Simple, opposite, alternate, shortly petiolate, lamina 2.0 to 2.5 cm long and 1.0 to 1.6 cm broad, elliptic-orbicular or ovate, acute, reticulate veined, margin entire, densely pubescent on both surfaces.

Flower – Minute cluster as axillary spike; greenish-white; perianth 5, bracteolate; actinomorphic, bisexual; stamen 5, opposite to perianth, anthers 2 lobed; stigma bifid, superior ovary, unilocular with campylotropous ovule.

Fruit – A greenish, roundish, compressed membranous, utricle or circumscissile capsule with a coriaceous upper part or lid and containg a single seed.

Seed – Seed minute, 0.5 to 0.7 cm in dia., black, polished and kindney shaped; taste, pungent.

b) Microscopic :

Root – Shows 5 to 7 layers of cork cells, upper 2 or 3 layers filled with brownish content; secondary cortex a wide zone consisting of circular to oval, elongated, thin walled parenchymatous cells, most of the cells containing rosette crystals of calcium oxalate; endodermis not distinct; pericycle present in the form of interrupted ring of pericyclic fibres; anamolous secondary growth present; secondary xylem and phloem tissues in form of 3 or 4 alternating rings; medullary bundles present; phloem consisting of sieve tubes, companion cells and phloem parenchyma; xylem consists of vessels, tracheids, fibres and xylem parenchyma; vessels circular to oval having simple pits; pith cells circular in shape containing rosette crystals of calcium oxalate.

Stem – Shows slightly wavy outline, corresponding to ridges and furrows; epidermis single layered covered with thick cuticle; trichomes multicellular, end cells pointed or vesicular, warty and thick walled; cortex 6 or 7 layers with 3 or 4 layers below ridges being collenchymatous and 3 or 4 layers below furrows chlorenchymatous; rest of the cells oval to elongated, elliptical, thin walled and parenchymatous, with a few cells containing rosette crystals of calcium oxalate; endodermis single layered; pericycle present in the form of a ring, single or groups of 2 to 4 fibres; anamolous secondary growth present; vascular bundles arranged in 2 or 3 rings showing included phloem alternating with parenchymatous tissue; phloem consists of sieve tubes, companion cells and phloem parenchyma; xylem composed of vessels, tracheids, wood fibres and xylem parenchyma; vessels round to oval having simple pits; pith wide consisting of circular to polygonal having intercellular spaces, rosette crystals of calcium oxalate present in this region.

Leaf –

Petiole – Shows single layered epidermis covered with cuticle; trichomes multicellular present on both surfaces; cortex consisting of 2 or 3 layers, upper collenchymatous and lower parenchymatous; vascular bundle collateral and 3 in number; rosette crystals of calcium oxalate present in cortical cells.

Midrib – Epidermis, cuticle and trichomes, similar to those in petiole; cortex 5 to 7 layers, upper 3 collenchymatous and lower 3 or 4 circular, thin walled and parenchymatous; vascular bundles 3 in number, 2 accessory and one middle; xylem towards the upper and phloem towards lower epidermis; rosette crystals of calcium oxalate present in cortical region.

Lamina – Epidermis, cuticle and trichomes similar as in petiole and midrib; palisade 1 or 2 layers; spongy parenchyma 3 to 5 layers composed of thin walled parenchymatous cells with intercellular spaces, a few rosette crystals of calcium oxalate present in spongy parenchyma; anomocytic stomata present on both surfaces; palisade ratio 2 or 3; stomatal index on upper surface 12 to 15 and on lower surface 16 to 18; vein islet number 4 or 5 per square mm.

Powder – Yellowish-green; under microscope shows straight walled epidermal cells, multicellular trichomes and anomocytic stomata in surface view; simple pitted vessels, cork cells, tracheids, fibres and rosette crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 17 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 2 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 11 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on silica gel 'G' plate using Toluene: Ethylacetate : Methanol (50: 50: 20) as mobile phase shows under UV (366 nm) ten fluorescent zones at Rf. 0.11 (sky blue), 0.27 (red), 0.47 (red), 0.51 (sky blue), 0.73 (sky blue), 0.82 (pink), 0.87 (sky blue), 0.91 (red), 0.94 (red) and 0.97 (dark red). On spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate for about ten minutes at 105°C ten spots appear at Rf. 0.11, 0.23, 0.37, 0.51, 0.61,0.73, 0.85, 0.92 and 0.94 (all violet) and 0.97 (dark violet).

CONSTITUENTS – α - Amyrin and β - sitosterol, β - sitosterol palmitate, compesterol, chrysin, flavonoid glycosides and tannins.

PROPERTIES AND ACTION -

Rasa	:	Tikta, Kaṣāya
Guṇa	:	Laghu, Tīkṣṇa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Mūtravirecana, Kṛmighna

IMPORTANT FORMULATIONS - Śatāvaryādi Ghṛta

THERAPEUTIC USERS – Aśmarī; Mūtrakṛcchra

DOSE - 50-100 ml in the form of decoction.

PĪLŪḤ (Fruit)

Pīlūḥ consists of fruit of *Salvadora persica* Linn. var.*wightiana* (Planch.ex Thw.) Verdc, syn. *S. persica* Linn. (Fam. Salvadoraceae), a perennial, woody, glabrous shrub, distributed in the arid tracts of Punjab and north western parts of India.

SYNONYMS -

Sansk.	:	Guḍaphala, Srānsī, Pilū
Assam.	:	Arak, Irak
Beng.	:	Peelugachh, Jhal
Eng.	:	Salt bush, Toothbrush Tree
Guj.	:	Peelu, Khareejal
Hindi	:	Pilu, Jhak, Peelu, Kharjal
Kan.	:	Gonimara, Kankhina, Genumar
Mal.	:	Uka
Mar.	:	Pilu, Khakhan
Punj.	:	Peelu
Tam.	:	Kotumaavali, Chittuva, Perungoli, Udhaiputtai
Tel.	:	Gogu, Varagogu, Gunia

DESCRIPTION -

a) Macroscopic:

Fruits are 3 to 5 mm in diameter, ellipsoid-ovoid, occasionally with a small pedicel attached; surface greenish or greenish-brown to dark brown in colour, with irregular wrinkles, sometimes shrunken; pericarp thin, easily separable, exhibiting creamish to dull brown seed, odour characteristic and taste bitter.

b) Microscopic:

The epidermis is single layered consisting of thick walled, radially elongated cells covered externally with cuticle, the mesocarp differentiated into three zones, the outer and inner zone exhibiting thin walled parenchyma cells while a continuous zone of sclerenchymatous tissue with vascular bundles embedded in it is present in the middle region; testa shows single layered epidermis of thin walled cells followed by parenchymatous cells of the embryo containing aleurone grains and occasional oil globules.

Powder - Powder shows fragments of parenchymatous cells with aleurone grains and oil globules; scalariform, reticulate as well as border-pitted vascular elements; thick walled epidermal cells in surface view and sclereids.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 15 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 4 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 12 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 40 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on precoated Silica gel 'G' plate (Merck), using n-Butanol; Acetic acid; water (4:1:5), in visible light shows three spots at Rf.0.23, 0.80 (both light green) and 0.46 (light yellow); under UV (366 nm) two white spots appear at Rf.0.37 and 0.46; under UV (254nm) three spots appear at Rf.0.37 (white), 0.46 and 0.80 (both pink), on exposure to Iodine vapours four yellow spots appear at Rf.0.10, 0.37, 0.46 and 0.80, on spraying with vanillin sulphuric acid and heating the plate at 110^0C for 10 minutes, six spots appear at Rf. 0.10, 0.23 (both violet), 0.37, 0.40, 0.46 and 0.80 (all orange).

CONSTITUENTS - β-sitosterol, sterol glycoside, benzyle isothioagnate, traces of alkaloid, fixed oil, sugar and fat, non-saponifiable portion of oil consists of dibenzylurea and dibenzlethiourea.

PROPERTIES AND ACTION -

Rasa	:	Madhura, Tikta, Katu
Guṇa	:	Laghu, Snigdha, Tīkṣṇa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Bhedana, Virecana, Śothahara, Vednāsthāpana, Śirovirccaka, Dīpana, Vidāhi, Rasāyana

IMPORTANT FORMULATIONS - Miśrakasneha

THERAPEUTIC USES – Gulma; Aśmarī; Mūtrakṛcchra; Jvara; Sarpaviṣa; Arśa; Bastivikāra; Udararoga; Viṣavikāra; Ānāha

DOSE - 3-6 g.

PĪLŪḤ (Leaf)

Pīlūḥ consists of leaf of *Salvadora persica* Linn. var. *wightiana* (Planch. ex Thw.) Verdc, syn. *S. persica* Linn. (Fam. Salvadoraceae), a perennial, woody, glabrous shrub, distributed in the arid tracts of Punjab and north western parts of India.

SYNONYMS –

Sansk.	:	Guḍaphalah, Sransī, Pilukah
Beng.	:	Peelugaach, Jhaal
Eng.	:	Salt bush, Tooth brush Tree
Guj.	:	Peelu, Khaaree jaal
Hindi	:	Pilu, Jhak, Peelu, Kharjaal
Kan.	:	Gonimara, Kankhina, Genumar
Mal.	:	Uka
Mar.	:	Pilu, Khakhan
Ori.	:	Kotungo, Toboto
Punj.	:	Peelu
Tam.	:	Kotumaavali, Chittuva, Perungoli, Uthaiputtai
Tel.	:	Gogu, Varagogu, Gunia

DESCRIPTION -

a) Macroscopic:

Leaves are 3 to 10 cm in length and 1 to 4 cm in breadth, green, simple, stipulate, petiolate, oblong, ovate, margin entire, broad at base and acute at apex; veins prominent and raised on lower surface; both surfaces glabrous; taste and odour characteristic.

b) Microscopic:

Petiole - Petiole somewhat circular in outline with a large crescent-shaped vascular bundle and two small vascular bundles fused together to form a central core of vascular tissue; the presence of interxylary phloem indicates anomalous growth; epidermis single layered, covered externally with thick cuticle; cortex a wide zone consisting of circular to oval parenchyma cells; pericycle represented by small patches of thick walled and lignified fibres; phloem consists of usual elements traversed by uni or biseriate medullary rays; xylem consists of vessels, tracheids, fibres and parenchyma; vessels show scalariform thickening and border pitted walls, tracheids are bordered as well as simple pitted, parenchyma cells and fibres are simple pitted; interxylary phloem present in the central xlyem region; pith composed of thin walled parenchyma cells; rosettes of calcium oxalate crystals and starch grains present in the parenchyma cells of the cortex and pericyclic region.

Midrib - Midrib shows single layered epidermis covered externally with thin cuticle on both the surfaces, except at a few places where a periclinal division is seen; cortex is a wide zone of thin walled parenchyma cells, the centre of midrib is occupied by a vascular cylinder consisting of a large crescent-shaped vascular bundle, the pericycle is represented by small patches of fibres, the phloem consists of usual elements, the xylem is represented by vessels, tracheids, parenchyma and fibres; interxylary phloem is present in the xylem region; the xylem is traversed by uniseriate medullary rays which become bi or tri seriate in the phloem region; rosettes of calcium oxalate crystals and a few starch grains are present in the parenchymatous cells of cortex and pericyclic region.

Lamina - Lamina shows isobilateral structure; cuticle present, both epidermises are single layered, except for occasional periclinal division; in surface view both the surfaces shows anisocytic and paracytic stomata; 2 or 3 layers of palisade cells are present below the upper and above the lower epidermis, remaining area being occupied by thin walled cells of pongy parenchyma; a number of small vascular bundle and vascular strand are distributed in the mesophyll of the lamina; idioblasts containing large rosettes of calcium oxalate crystals are present beneath both the epidermises; rosettes of calcium oxalate crystals are also present in spongy parenchyma and palisade cells; stomatal index 9 to 11 (upper surface) and 8 to 10 (lower surface); palisade ratio 5 to 6 (upper surface) and 4 to 5 (lower surface); vein islet number 4 to 6 (upper surface) and 5 to 7 (lower surface).

Powder - Pale green, shows presence of thin walled parenchyma cells several containing rosettes of calcium oxalate crystals and a few simple starch grains; fragments of epidermal cells showing anisocytic and paracytic stomata; fragment of scalariform and bordered pitted vessels, border and simple pitted tracheid, simple pitted parenchyma cells and thick walled fibres.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	- Not more than	2 percent, Appendix 2.2.2.
Total ash	- Not more than	27 percent, Appendix 2.2.3.
Acid insoluble ash	- Not more than	1 percent, Appendix 2.2.4.
Alcohol soluble extractive	- Not less than	5 percent, Appendix 2.2.6.
Water-soluble extractive	- Not less than	40 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica gel 'G' plate (Merck), using Toluene; Methanol (86:14), shows in visible light nine spots at Rf.0.21, 0.25, 0.28(all green), 0.45 (bright yellow), 0.60 (faint green), 0.72(dark green), 0.79, 0.85 and 0.94 (all green); under UV (254nm) twelve spots appear at Rf.0.14 (faint orange), 0.21, 0.25, 0.28 (all orange), 0.36, 0.45 (both light orange), 0.53 (faint orange), 0.60, 0.72, 0.79 (all light orange), 0.85 and 0.94 (both orange); on exposure to Iodine vapours ten spots appear at Rf 0.14 (yellow), 0.21, 0.25, 0.28 (all green), 0.53, 0.60, 0.72, 0.79 (all faint yellow), 0.85, 0.94 (both bluish green), on spraying with sulphuric acid and heatin'G' plate at 110^0C for 30 minutes, twelve pots appear at Rf. 0.14 (yellow), 0.21, 0.25, 0.28 (all dark

green), 0.36 (faint brown), 0.45 (brown), 0.53 (faint brown), 0.60 (violet), 0.72, 0.79 (both faint brown), 0.85 (dark green) and 0.94 (blackish green).

CONSTITUENTS - β-sitosterol, glucotropaeolin, terpenes and flavonoids.

PROPERTIES AND ACTION -

Rasa	:	Kaṭu, Tikta
Guṇa	:	Laghu, Snigdha, Tīkṣṇa, Sara
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Bhedana, Virecana, Śothahara, Vedanāsthāpana, Śirovirecaka, Dīpana, Vidāhī, Rasāyana

IMPORTANT FORMULATIONS - Pīlū Taila

THERAPEUTIC USES – Gulma; Aśmarī; Mūtrakṛcchra; Jvara; Śarpavisa, Arśa; Bastivikāra; Ānāha; Udararoga; Udāvarta; Vātarakta; Yonivyāpat; Kṛmi; Nāḍīvraṇa; Duṣṭavrana; Vraṇa; Vraṇśotha; Mukhapāka; Madyaja Tṛṣṇā; Plihāroga; Sarva Kuṣṭha; Bhagandara; Apacī

DOSE - 3-6 g.

PĪLŪḤ (Root Bark)

Pīlūḥ consists of root bark of *Salvadora persica* Linn. var. *wightiana* (Planch.ex Thw.) Verdc, syn. *S. persica* Linn. (Fam.Salvadoraceae), a perennial, woody, glabrous shrub, distributed in the arid tracts of Punjab and north western parts of India.

SYNONYMS -

Sansk.	:	Guḍaphalah, Sransī, Pilukah
Beng.	:	Peelugaach, Jhaal
Eng.	:	Saltbush, Tooth brush Tree
Guj.	:	Peelu, Khaaree jaal
Hindi	:	Pilu, Jhak, Peelu, Kharjaal
Kan.	:	Gonimara, Kankhina, Genumar
Mal.	:	Uka
Mar.	:	Pilu, Khakhan
Ori.	:	Kotungo, Toboto
Punj.	:	Peelu
Tam.	:	Kotumaavali, Chittuva, Perungoli, Uthaiputtai
Tel.	:	Gogu, Varagogu, Gunia

DESCRIPTION -

a) Macroscopic:

The root bark is 2 to 3 mm thick, woody, channeled; pale brown with longitudinal wrinkles, exhibiting scars of roots and rootlets; inner surface creamish to yellowish-brown; fracture, short and smooth; odour, foetid and taste characteristic.

b) Microscopic:

The bark shows a wide zone of cork occupying half of the transection; cork cells differentiated into two zones, outer zone consisting of small rectangular cells whereas the lower cells are larger, rectangular and tangentially elongated; phellogen single layered; the phelloderm consist of 10 to 20 layers of thin walled tangentially elongated parenchyma cells with small intercellular spaces; it is followed by a wide phloem being traversed by 2 to 5 seriate medullary rays; the phloem consists of usual element, a few fibres and isolated stone cells; several parenchyma cells are thick walled and arranged in somewhat radial rows in which stone cells and fibres are scattered; prismatic crystals of calcium oxalate are present in the parenchyma cells of outer phloem and phelloderm regions.

Powder - Powder shows fragments of cork cells, thin walled parenchyma cells, thick walled and pitted parenchyma cells, prisms of calcium oxalate, fragment of thin walled fibres and stone cells, with thick walled and narrow central lumen.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 15 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 6 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 2 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 25 percent, Appendix 2.2.7.

T. L. C. -

T.L.C. of alcoholic extract on Silica gel 60 plate (Merck), using Chloroform: Toluene; Methanol (10:75:15), shows under UV (254nm) one yellow fluorescence spot at Rf.0.46; on exposure to Iodine vapours four yellow spots appear at Rf. 0.17, 0.30, 0.46 and 0.67; on spraying with vanillin sulphuric acid and heating the plate at 110^0C for 10 minutes, seven spots appear at Rf. 0.11 (blue), 0.17, 0.23 (both violet), 0.30 (yellow), 0.35, 0.46 and 0.67 (all blue).

CONSTITUENTS - β-sitosterol and elementral γ–monoclinic sulphur (S-8) and glucotropaeolin isolated from root.

PROPERTIES AND ACTION -

Rasa	:	Kaṭu, Tikta, Madhura
Guṇa	:	Laghu, Snigdha, Tīkṣṇa, Sara
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Bhedana, Virecana, Śothahara, Vedanāsthāpana, Śirovirecaka, Dīpana, Vidāhī, Rasāyana

IMPORTANT FORMULATIONS – Arśakuṭhāra Rasa, Vaidūrya Rasayana, Chitrakhadiya Taila, Triphalādi Guṭika, Naracaka Cūrṇa, Vilvakhadhi Lepa, Pippalyādi Guṭika

THERAPEUTIC USES – Gulma; Aśmarī; Mūtrakrcchra; Jvara; Sarpaviṣa; Arśa; Bastivikāra; Ānāha; Udararoga; Udāvarta; Vātarakta; Yonivyāpat; Kṛmi; Nādivraṇa; Duṣṭavraṇa; Vrana; Vranaśotha; Mukhapāka; Madyaja Tṛṣṇā; Plīhāroga; Sarva Kuṣṭha; Bhagandara; Apacī

DOSE - 10-20 g for decoction.

POṬAGALA (Root)

Poṭagala consists of dried root of *Typha elephantina* Roxb. (Fam.Typhaceae), a perennial grass-like shrub, about 1.5-3.0 m in height and found throughout plains of India, in stagnant water and the sides of streams and marshes.

SYNONYMS -

Sansk.	:	Erakā
Beng.	:	Hogalaa
Eng.	:	Elephant grass
Guj.	:	Ghaabaajariyu
Hindi	:	Pateraa, Erakaa
Kan.	:	Apu, Jambuhullu
Mar.	:	Raamabaan
Ori.	:	Hogala
Punj.	:	Boj, Bori, Patiraa
Tam.	:	Anaikkoria, Anaippul
Tel.	:	Enugajammu, Jammuguddi

DESCRIPTION -

a) Macroscopic:

The roots are upto 15 cm long and about 4 mm thick, arising in groups from the base of the stem; pale brown to light brown in colour, irregularly flattened with longitudinal fissures giving rise to several secondary and tertiary rootlets from its lower end, transversely cut surface shows creamish to pale yellow central core; taste and odour indistinct.

b) Microscopic:

T.S. shows single layered epidermis, followed by wide cortex which can be differentiated into three zones; the outer cortical cells, below the epidermis consist of 5 to 7 layers of parenchyma cells arranged compactly followed by second zone consisting of circular to oval and tangentially elongated parenchyma cells; the central cortical region exhibits large air cavities lined by 1 or 2 layers of thin walled, compressed, narrow and radially elongated parenchyma cells – the trabiculae; the centre of the root exhibits a typical monocotyledonous structure consisting of alternating bands of xylem and phloem surrounded externally by endodermis and pericycle; the cells of endodermis show thickening on radial and lower tangential walls; except phloem cells all the cells below the pericycle are thick walled and lignified; the vascular cylinder exhibits presence of numerous very long fibres with narrow to negligible lumen; the vessels show scalariform thickening whereas the tracheids have scalariform thickening or border pits; the parenchyma cells are radially elongated and simple pitted.

Powder - The powdered drug exhibits fragments of thin walled circular to oval and also radially elongated parenchyma cells; fragments of trabeculae; fragments of fibres showing negligible to narrow lumen; scalariform vessels; scalariform and border-pitted tracheids and simple pitted thick walled parenchyma cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than	2 percent, Appendix 2.2.2.
Total ash	-	Not more than	5 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than	2 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than	7 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than	20 percent, Appendix 2.2.7.

T. L. C. -

T.L.C. of alcoholic extracts on precoated Silica Gel 60 plate (Merck), using Chloroform: Toluene: Ethyl acetate: Formic acid (6:4:0.5), shows in visible light two spots at Rf. 0.89(light green) and 0.64(pale green); under U.V. (254nm) four spots appear at Rf.0.28(pinkish orange), 0.64(light orange), 0.78 and 0.81(both whitish); on exposures to iodine vapours 8 spots appear at Rf. 0.10, 0.19, 0.28, 0.45, 0.57, 0.64, 0.78 and 0.93 (all yellow); on spraying with 5% ethanolic sulphuric acid and heating the plate at 110°C for 30 minutes 10 spots appear at Rf. 0.10(light violet), 0.19(violet), 0.28, 0.45(both faint brown), 0.57(violet), 0.64(dark brown), 0.78(blue), 0.81, 0.89 and 0.93(all faint brown).

CONSTITUENTS - β-sitosterol, cholestrol, quercetin and lanosterol

PROPERTIES AND ACTION -

Rasa	:	Madhura, Kaṣāya, Tikta
Guṇa	:	Laghu, Snigdha
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Pittahara, Kaphahara, Vṛṣya, Cakṣuṣya, Mūtrala, Grāhī, Vraṇaropaṇa

IMPORTANT FORMULATIONS - Sukumāra Ghṛta

THERAPEUTIC USES – Dāha; Raktavikāra; Vātarakta; Visarpa; Raktapitta; Bastiśotha; Mūtrakṛcchra; Aśmarī; Śopha; Śukradaurbalya; Vraṇa

DOSE - 10-20 g for decoction.

PUDĪNĀḤ (Aerial Part)

Pudīnāḥ consists of the aerial part of *Mentha viridis* Linn. syn. *M. spicata* var. *viridis* Linn. (Fam. Lamiaceae) a perennial, creeping aromatic herb of 30 to 90 cm high, widely cultivated throughout the plains of India for culinary and medicinal purposes.

SYNONYMS -

Sansk.	:	Pūtihā, Rocanī, Podīnakah
Beng.	:	Pudinaa
Eng.	:	Spear-Mint, Garden Mint
Guj.	:	Phudino
Hindi	:	Pudeenaa
Mar.	:	Pudinaa
Punj.	:	Parari pudina
Tam.	:	Pudeenaa
Tel.	:	Pudeenaa

DESCRIPTION –

a) Macroscopic:

Drug consists of small chopped twigs; leaves opposite, decussate, shortly petiolate, petioles 2-mm long; mature leaves 2.5 to 3.5 cm long and 1.5 to 2.0 cm broad, very minutely hairy, ovate, apex acute, coarsely dentate, comparatively smoother and darker upper surface; stem square, minutely hairy, light brown to brown; flowers in loose cylindrical, slender spikes; awl like, throat of calyx naked, corolla smooth; seeds small, mucilaginous; aromatic odour and slightly pungent taste.

b) Microscopic:

Stem - T.S. shows quadrangular outline with corner ridges and thin cuticle; epidermal cells tabular, multicellular uniserate trichomes present, cortex 8 to 9 cells deep below ridges, while 2 to 3 cells deep elsewhere, variable in size; endodermis single layer; pericycle broken, consisting of sclerenchymatous cells; phloem 2 to 4 cells deep and made up of irregular shaped cells; xylem vessels 26 to 46 μ in dia; pith present.

Leaf –

Midrib: T.S. shows protruded mid rib towards the lower surface; compact parenchymatous cells enclose a crescent-shaped vascular bundle; collenchymatous cells are absent.

Lamina: Dorsiventral, epidermal cell walls of both the surfaces in the surface view are wavy, stomata diacytic; covering trichomes present on the lower surface, uniseriate, 1 to 4 cells long, 42 to 350 μ in size with pointed apex; glandular trichomes 64 to 80 μ in

diam. with a single basal cell and a head of 8 cells, found in depression of the epidermis; a single row of palisade cells towards the upper side followed by spongy parenchyma 3 to 4 cells deep; palisade ratio 6 to 8; vein islet number 18 to 20; stomatal index for upper epidermis 10 to 20, lower epidermis 15 to 30.

Powder – Blackish-brown, fibrous, free flowing, characterized by the presence of uniseriate non-glandular hairs (112 to 350 μ), glandular trichomes 64 to 80 μ in diam, diacytic stomata, epidermal cell walls wavy.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 14 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 4 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 2 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 7 percent, Appendix 2.2.7.
Essential oil	-	Not less than 0.2 percent, Appendix 2.2.10.

T.L.C. –

T.L.C. of essential oil on silica gel 'G' plate using hexane : ethyl acetate (90:10) shows eight spots at Rf 0.28, 0.33, 0.38, 0.49, 0.55, 0.66, 0.80 and 0.88 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110^0C.

CONSTITUENTS – Essential oil (0.2 to 0.8 percent) containing terpene such as carvone (60%) and limonene (10%) as major constituents.

PROPERTIES AND ACTION –

Rasa	:	Kaṭu
Guṇa	:	Laghu, Rūkṣa, Tīkṣṇa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Dīpana, Mūtrala, Rocana, Balya

IMPORTANT FORMULATIONS - Pudīnārka

THERAPEUTIC USES – Ādhmāna; Śūla; Chardi; Kṛmi; Jvara; Jīrṇa Jvara; Mūtrakṛcchra; Kaṣṭārtava; Prasūtījvara; Aruci; Kāsa; Hikkā; Śvāsa; Mada; Agnimāndya; Visucikā; Atisāra; Grahaṇi; Ajīrṇa; Vaktrajāḍya

DOSE - 5-10 ml patra svarasa.
20-40 ml phāṇṭa.
1-3 drops taila.

PULLĀNĪ (Leaf)

Pullānī consists of leaf of *Calycopteris floribunda* Lam. (Fam. Combretaceae), a scandent shrub, distributed in the deciduous forests of western Peninsula.

SYNONYMS -

Sansk.	:	Pullānī, Toyavallī, Kāravelli
Hindi	:	Kokkarai
Kan.	:	Marsadabaguli, Enjarige Kubsa
Mal.	:	Pullaani, Varavalli
Mar.	:	Ukshi, Bogull
Tam.	:	Minnaarukoti, Pillani, Theṟulankodl
Tel.	:	Bandimurududu

DESCRIPTION -

a) Macroscopic:

The leaves are 7 to 12 cm by 4 to 6 cm ovate-lanceolate or elliptic-oblong, acute or acuminate, petiole 0.5 cm to 1.0 cm long; upper surface dull green, lower pale brown with prominent veins, both surfaces hairy; taste, astringent and odour characteristic.

b) Microscopic:

Leaf –

Petiole - The transverse section exhibits a single layered epidermis with numerous unicellular covering as well as short stalked or sessile glandular trichomes with 12 to 16 celled head; wide cortex consisting of thin walled parenchymatous cells; a crescent shaped vascular bundle consisting of usual elements, surrounded dorsally as well as laterally by a sheath of fibres is present in the centre of petiole; rosettes of calcium oxalate crystals are seen in some of the cortical cells.

Midrib - The transverse section shows single layered epidermis covered externally with cuticle; long, unicellular covering as well as short stalked or sessile glandular hairs with 12 to 16 heads present on both the surfaces; cortex consisting of thin walled parenchyma cells; a crescent shaped vascular bundle consisting of usual elements surrounded by a continuous ring of fibres present in the center of the cortex, rosettes of calcium oxalate crystals found in some of the cortical parenchyma cells.

Lamina - The epidermal cells have wavy outline in surface view; anamocytic stomata present on lower surface only; unicellular, long covering trichomes as well as glandular hair similar to those described under petiole, present on both surfaces but more pronounced on lower side.

The transverse section shows dorsiventral structure with two layers of palisade cells below the upper epidermis; mesophyll represented by cells of spongy parenchyma and small vascular bundles and vascular strands; rosettes of calcium oxalate crystals seen in some of the cells of spongy parenchyma; stomatal index 23 to 29; palisade ratio 4 to 7 and vein islet number 5 or 6.

Powder - Pale green; shows fragments of upper epidermal cells with covering as well as glandular trichomes; lower epidermal cells with stomata, covering and glandular trichomes, fragments of fibres, reticulate and scalariform vascular elements; scattered covering and glandular trichomes and parenchyma cells with rosettes of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than	2 percent, Appendix 2.2.2.
Total ash	-	Not more than	6 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than	1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than	7 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than	8 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on precoated Silica gel 'G' plate (Merck), using Ethyl acetate: Methanol: Water (8:11:8) shows in visible light six spots at Rf. 0.13 (light brown), 0.49 (yellow), 0.61 (pale yellow), 0.71 (light yellow), 0.92 (dark yellow) and 0.96 (light orange); under U.V. (254 nm) four spots appear at Rf. 0.61, 0.71 (both white), 0.92 (yellow) and 0.96 (orange); on exposure to Iodine vapours five spots appear at Rf. 0.44, 0.61, 0.71 (all yellow), 0.92 (brown) and 0.96 (dark yellow); on spraying with vanillin sulphuric acid and heating the plate at 110^0C for 10 minutes, six spots appear at Rf.0.13, 0.44 (both faint brown), 0.61 (violet), 0.71 (faint brown), 0.92 (black) and 0.96 (dark green).

CONSTITUENTS - Octacesanol, sitosterol, calycopterin, 3'0-Methylcalycopterin, 4-0 methylcalycopterin, ellagic acid quercetin and proanthocyanidin.

PROPERTIES AND ACTION -

Rasa	:	Tikta
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Bhedini, Vibandhahara

IMPORTANT FORMULATIONS - Marma Guṭikā

THERAPEUTIC USES – Kṛmi; Pāṇḍu; Kuṣṭha; Jvara

DOSE - 3-6 g.

PULLĀNĪ (Root)

Pullānī consists of root of *Calycopteris floribunda* Lam (Fam. Combretaceae), a scandent shrub, distributed in the deciduous forests of western peninsula.

SYNONYMS -

Sansk.	:	Pullānī, Toyavallī, Kāravelli
Hindi	:	Kokkarai
Kan.	:	Marsadabaguli, Enjarige Kubsa
Mal.	:	Pullaani, Varavalli
Mar.	:	Ukshi, Bogull
Tam.	:	Minnaarukoti, Pillani, Therulankodl
Tel.	:	Bandimurududu

DESCRIPTION -

a) Macroscopic:

The roots are upto 3 cm. in diameter occasionally with attached rootlets, surface with fine longitudinal wrinkles, buff brown to greyish-brown, bark very thin; fracture, tough and fibrous; taste and odour indistinct.

b) Microscopic:

T.S. shows narrow cork consisting of tangentially elongated cells, phelloderm is a narrow zone represented by thin walled and tangentially elongated parenchyma cells; phloem is composed of soft tissues; xylem is a solid cylinder consisting of vessels and tracheids showing bordered pits and reticulate thickening, simple pitted parenchyma cells and fibres; patches of interxylary phloem of soft tissues are seen in xylem region, the medullary rays are uniseriate; rosettes of calcium oxalate crystals are present in some of the parenchyma cells of phloem and interxylary phloem.

Powder - Powder shows fragments of cork cells, parenchyma cells containing rosettes of calcium oxalate crystals, scattered rosettes of calcium oxalate crystals and fragments of vessels and tracheids showing bordered pits and reticulate thickening.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 2.5 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.5 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 4 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 3 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica gel 'G' precoated plates (Merck), using Ethyl acetate:Methanol;Water (8:11:8) shows under UV (254nm) two spots at Rf.0.39 and 0.71(both faint blue); on spraying with 5% ethanolic sulphuric acid and heating the plate at 110^0C for 30 minutes, three spots appear at Rf. 0.39, 0.71 (both faint brown) and 0.88 (violet).

CONSTITUENTS - Octacesanol, sitosterol, calycopterin, 3'0-methylcalycopterin, 4-0 methylcalycopterin, ellagic acid, gossoypol and quercetin.

PROPERTIES AND ACTION -

Rasa	:	Tikta
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Bhedini, Vibandhahara

IMPORTANT FORMULATIONS - Marma Guṭikā

THERAPEUTIC USES – Kṛmi; Pāṇḍu; Kuṣṭha; Jvara

DOSE - 3-6 g.

PULLĀNĪ (Stem)

Pullānī consists of stem of *Calycopteris floribunda* Lam. (Fam. Combretaceae), a scandent shrub, distributed in the deciduous forests of western peninsula.

SYNONYMS -

Sansk.	:	Pullānī, Toyavallī, Kāravelli
Hindi	:	Kokkarai
Kan.	:	Marsadabaguli, Enjarige Kubsa
Mal.	:	Pullaani, Varavalli
Mar.	:	Ukshi, Bogull
Tam.	:	Minnaarukoti, Pillani, Therulankodl
Tel.	:	Bandimurududu

DESCRIPTION -

a) Macroscopic:

Pieces of stem cylindrical, about 8 to 10 mm thick, surface light brown, smooth; bark thin, easily separable; fracture hard and fibrous; taste and odour indistinct.

b) Microscopic:

T.S. of stem shows narrow cork consisting of rectangular and tangentially elongated cells, phelloderm exhibits 5 to 8 layers of thin walled parenchymatous cells; phloem is composed of soft tissues being traversed by uniseriate medullary rays; xylem is a wide zone consisting of scalariform and reticulate vessels with transverse or lateral wall perforations and tracheids, simple pitted fibres and parenchyma cells; medullary rays are uniseriate; patches of interxylary phloem made up of soft tissues are seen in this region; intraxylary phloem is present at the periphery of pith; the pith consists of thin walled parenchyma cells with isolated stone cells; rosettes of calcium oxalate crystals scattered in phloem and interxylary phloem.

Powder - Light brown; shows fragments of vascular elements, scalariform and reticulate vessels and tracheids, stone cells, pitted fibres and parenchyma, thin walled parenchyma cells, parenchyma cells with rosettes of calcium oxalate crystals and isolated rosettes of calcium oxalate crystals.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 5 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 2 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 2.5 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica gel 'G' precoated plates (Merck), using Ethyl acetate:Methanol:Water (8:11:8) shows in visible light two spots at Rf. 0.89 (light yellow) and 0.94 (dark yellow); under UV (254nm) four spots appear at Rf.0.30, 0.51, 0.58 (all light blue) and 0.89 (yellow); on exposure to Iodine vapours four spots appear at Rf. 0.34, 0.51, 0.58 and 0.89 (all yellow); on spraying with 5% ethanolic sulphuric acid and heating the plate at 110^0C for 30 minutes, five spots appear at Rf.0.34, 0.51, 0.58, 0.89 (all faint brown) and 0.94 (black).

CONSTITUENTS - Octacesanol, sitosterol, calycopterin, 3'0-Methylcalycopterin, 4-0 methylcalycopterin, ellagic acid.

PROPERTIES AND ACTION -

Rasa	:	Tikta
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Bhedini, Vibandhahara

IMPORTANT FORMULATIONS - Marma Guṭikā

THERAPEUTIC USES – Kṛmi; Pāṇḍu; Kuṣṭha; Jvara

DOSE - 3-6 g.

PŪTĪKARAÑJA (Stem Bark)

Pūtīkarañja is the dried stem bark of *Caesalpinia crista* Linn. (Fam. Caesalpiniaceae); a prickly, shruby climber found throughout India upto an altitude of 1200 m.

SYNONYMS -

Sansk.	:	Cirabilvah, Pūtīkah, Prakiryah
Eng.	:	Indian elm
Gur.	:	Kanajho, Charela
Hindi	:	Chilbil, Kanju, Banchillaa, Paapari
Kan.	:	Tapasigida
Mal.	:	Avil, Nettavil
Mar.	:	Baavalaa
Punj.	:	Chirbil
Tam.	:	Avali, Aapa
Tel.	:	Tapasi, Nemalinara

DESCRIPTION -

a) Macroscopic:

Bark curved, 0.8 to 1.5 mm thick, dark reddish or nearly blackish in colour with a number of sharp prickles; inner surface light brown to dark brown and smooth; fracture, short; odourless; slightly astringent in taste.

b) Microscopic:

Stem bark- T.S. of stem bark consists of layers of radially tiered cork, covered by degenerated dark layers of dead cells of cork, followed by 16 to 22 layers of phelloderm; phelloderm cells are thin walled, parenchymatous; some cells are filled with starch grains that are spherical, variable in size measuring from 1.5 to 5 µm, with a centric hilum; rosettes or prismatic crystals of calcium oxalate also present; stone cells are present in the form of a continuous ring; secondary phloem consists of companion cells, sieve cells; phloem parenchyma and thick walled phloem fibres in groups, traversed by medullary rays; simple, rarely compound starch grains and clusters crystals of calcium oxalate also found in secondary phloem region.

Powder- Light brown, easily flowable, taste-slightly astringent, odourless; shows the presence of simple to compound starch grains composed of 2 to 4 components; prismatic and rosettes of calcium oxalate crystals; cork in surface view, sclereids, phloem fibres, parenchymatous cells contains prismatic and clusters of calcium oxalate.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 6 percent, Appendix 2.2.3.
Acid–insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 7 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 10 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract of stem bark powder on Silica gel 'G' plate using Toluene: Formic acid: Glacial acetic acid (82: 14.5: 4.5) under UV light (365 nm) shows one fluorescent zone at Rf. 0.70 (green). On exposure to iodine vapour, six spots appear at Rf. 0.06, 0.25, 0.68, 0.72, 0.86 and 0.95 (all yellow).

CONSTITUENTS - Flavonoid, Saponins and Alkaloids.

PROPERTIES AND ACTION –

Rasa	:	Tikta, Kaṣāya, Kaṭu
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Śleṣmasaṁśamana, Śothahara, Dīpana, Anulomana, Lekhanīya, Bhedanīya, Kṛmighna, Viṣaghna, Apārāpatana

IMPORTANT FORMULATIONS - Indukānta Ghṛta, Viṣṇu Taila, Pramehamihira Taila

THERAPEUTIC USES – Kuṣṭha; Prameha; Arśa; Kaṇḍu; Pakva-Śopha; Vraṇa; Tvak-roga; Slīpada; Vātaja Śula; Udara; Gulma; Śula; Masūrikā; Amlapitta; Śvitra; Śarira-durgandha

DOSE – 50-100 ml. in the form of decoction.

REṆUKĀ (Fruit)

Reṇukā consists of dried fruit of *Vitex negundo* Linn. (Fam. Verbenaceae) a small tree with triplicate to pentafoliate leaves and bluish inflorescence, found throughout India.

SYNONYMS –

Sansk.	:	Rājaputrī, Nandinī, Kapilā, Dvijā, Bhasmagandhā, Pāṇḍupatrī, Hareṇukā
Beng.	:	Renuka, Kauntee, Renuka Beej
Eng.	:	Chaste-Tree, Hemp-Tree
Guj.	:	Harenu, Renuka
Hindi	:	Renukaa, Renuka, Sambhaalooka Beej
Kan.	:	Renuka
Mar.	:	Renuka Beej
Tam.	:	Yettee

***Note :** 'Renuka' is the fruit of *Vitex agnus-castus* Linn., a plant of foreign origin according to the AFI. However, since they are not available in the market, the recognised substitute fruits of *Vitex negundo* have been taken here as Renuka. 'Nirgundi' is the dried leaf of *Vitex negundo*

DESCRIPTION –

a) Macroscopic:

The fruit is a rounded drupe, 1 to 3 mm in diameter, 1/3 rd to ¾ th of its size surrounded by a dull grey cup like, persistent calyx alongwith pedicel; calyx cup may show one or two vertical splits; fruit colour light brown to black; locules two, each containing two seeds; texture smooth, taste and odour not characteristic.

b) Microscopic:

Fruit shows a circular outline; the outermost layer consists of compact, rounded or barrel shaped epidermals cells; epidermis bears abundant, characteristic bicelled, bent or wavy trichomes; distal cell of the trichomes generally broken; the subepidermal ground tissue comprising the mesocarp, composed of thin walled, angular cells which overarch between the two loculi of the fruit at the distal end; mesocarp also contains a ring of vascular strands; thick walled lignified cells inner to mesocarp comprise the endocarp; each loculus contains 1 or 2 flattened seeds; calyx consists of an outer epidermal layer of small cells followed by a central tissue of thin walled angular cells.

Powder -The powder shows stone cells, bicellular trichomes and groups of vessels with scalariform thickenings beside tissue fragments comprising both thin and thick walled cells.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 5 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 3 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 2 per cent, Appendix 2.2.7.

T.L.C.-

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (8-2), shows under U.V. (366nm) spots at Rf. 0.36 (Blue), 0.52 (Yellowish green), 0.57 (Bluish green), 0.63 (Bluish green), 0.71 (Blue), 0.84 (Blue), 0.93 (Bluish green); on spraying with anisaldehyde- sulphuric acid reagent and heating the plate for ten minutes at110^{0}C under U.V. (366nm) spots appear at Rf. 0.04 (Greyish Black), 0.58 (Blue), 0.73 (Blue), 0.90 (Blue), 0.97 (Yellow).

T.L.C. of the n-Hexane extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : ethylacetate (95:5) shows under U.V. (366nm) spots at Rf 0.13 (Green), 0.27 (Green), 0.34 (Green), 0.44 (Green), 0.51 (Green), 0.66 (Green), 0.77 (Green), 0.84 (Green), 0.90 (Dark Green); on spraying with anisaldehyde: sulphuric acid reagent and heating the plate for ten minutes at 110^0 C under U.V. (366nm) spots appear at Rf 0.13 (Yellow), 0.27 (Yellow), 0.34 (orange yellow), 0.44 (Light yellow), 0.51 (Greenish Yellow), 0.65 (Pale yellow), 0.77 (pale yellow), 0.84 (Yellow), 0.90 (Yellow).

CONSTITUENTS - Seeds contain hydrocarbons such as *n*-tritriacontane, *n*-hentriacontane, *n*-pentatriacontane and nonacosane. Other constituents of the seeds include β-sitosterol, *p*-hydroxybenzoic acid and 5 oxyisophthalic acid.

PROPERTIES AND ACTION -

Rasa	:	Tikta, Kaṭu
Guṇa	:	Laghu
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittakara, Vātahara, Kaphahara, Dīpanī, Medhya, Pācanī, Garbhapātinī, Mukhavaimalyakara, Viṣaghna

IMPORTANT FORMULATIONS - Candanādi Taila, Pramehamihira Taila, Daśamūlāriṣṭa, Sārsvatāriṣṭa, Mahāyogarāja Guggulu, Aṇutaila, Balāśvagandha lākṣādi Taila, Vāsācandanādi Taila

THERAPEUTIC USES – Tṛṣṇā; Kaṇḍu; Dāha; Kāsa; Netraroga; Daurbalya; Dadru; Klaibya; Gulma

DOSE - 1-3 g.

RIDDHI (Tuber)

Riddhi consists of dried tuber of *Habenaria intermedia* D.Don (Fam. Orchidaceae); a glabrous, small, erect, herbaceous plant found in temperate Himalayas, upto 2000 m commercial samples are usually processed in steam or boiling water and dried before marketing.

SYNONYMS -

Sansk. : Aśvāsinī

DESCRIPTION -

a) Macroscopic:

Unprocessed tubers are 1.5 to 3.5 cm long and 1.0 to 2.5 cm thick, oval, obovate or oblong in shape; buff to yellowish brown, with shrunken surface, covered with numerous fine hairs; internally white to creamish in colour; showing scars of aerial portion at the apex and beaked or sometime round base; odourless; taste, palatable and mucilaginous.

Processed tubers; with scar or attached stem on top; 1.5 to 3.0 cm in length and 0.5 to 1.5 cm in width, conical, tapering to a beaked base, surface rough, occasionally grooved, grayish-brown; very hard to break; fractured surface show creamy interior; taste palatable and mucilaginous; odourless.

b) Microscopic:

T.S. of unprocessed tuber shows 2 to 3 layered epidermis with long uniceilular hairs, followed by a distinct exodermis and 15 to 20 layers of cortical parenchyma, cells of which in proximity of exodermis are smaller as compared to the remaining cells of cortex region; a few parenchymatous cells of outer cortex contain bundles of rephides. It is followed by a typical polystelic condition consisting of 14 to 16 diarch steles arranged in a ring and 7 to 10 steles distributed among the parenchyma in the central region; schizogenous mucilage canals lined by an epithelium of usually 6 to 9 cells are found distributed throughout the parenchymatous tissue; small and large starch grains mostly of simple type are found distributed in abundance throughout the parenchyma as well as in the epithelial cells of mucilage canals; the smaller ones are mostly found with hilum as a point or cleft and large one are round to oval with centrally situated hilum in the form of a point or cleft or triangular or 2 to 3 stellate cleft.

The processed tubers show no anatomical changes except the gelatinized starch grains.

Powder - The powder shows the presence of a large number of starch grains, long needle shaped raphides in bundles or isolated; fragments of root hairs, mucilage canals, parenchymatous cells and vessels with scalariform thickening.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	- Not more than	2 percent, Appendix 2.2.2.
Total ash	- Not more than	5 percent, Appendix 2.2.3.
Acid insoluble ash	- Not more than	1 percent, Appendix 2.2.4.
Alcohol soluble extractive	- Not less than	14 percent, Appendix 2.2.6.
Water-soluble extractive	- Not less than	22 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica gel 'G' precoated plates (Merck), using Toluene : Methanol (84:16) shows in visible light four spots at Rf. 0.41, 0.35 (both light yellow, 0.22 and 0.16 (both pink); under UV rays (254nm) three spots appear at Rf.0.79 (white), 0.67 (dark blue) and 0.39 (yellow), on exposure to iodine vapours five spots appear at Rf.0.79, 0.41, 0.35, 0.22 and 0.16 (all yellow); on spraying with 5% vanillin sulphuric acid and heating the plate at 110^0C for 10 minutes, nine spots appear at Rf.0.79, 0.67, 0.61, 0.41, 0.39, 0.35, 0.22 and 0.19 (all pink) and 0.16 (violet).

PROPERTIES AND ACTION -

Rasa	:	Madhura
Guṇa	:	Guru, Snigdha, Picchila
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Vātahara, Pittahara, Rasāyana, Śukrajanana, Vṛṣya, Ojovardhaka, Tridoṣaśāmaka

IMPORTANT FORMULATIONS - Amṛtaprāśa Ghṛta, Aśoka Ghṛta, Chāgalādya Ghṛta, Daśamūlāriṣṭa

THERAPEUTIC USES – Kṣaya; Raktavikāra; Jvara; Mūrcchā

DOSE - 3-6 g.

ROHĪṢA (Whole Plant)

Rohīṣa consists of dried leaf, stem and root of *Cymbopogon martinii* (Roxb.) Wats. (Fam. Poaceae) a perennial, sweet scented grass, 1.5 to 3.5 m high, occurs wild in dry localities and cultivated in many parts of India.

SYNONYMS –

Beng.	:	Agam ghaas, Agiyaa ghaas
Eng.	:	Rosha Grass, Rusa grass
Guj.	:	Rondso, Ronsdo
Hindi	:	Rohis, Roosaa, Roosaaghaas, Mirchagandha
Kan.	:	Dunllu, Harehullu
Mal.	:	Sambhaarppullu
Mar.	:	Rohish gavat
Punj.	:	Agya ghass
Tem.	:	Kaavattampillu, Munkipul, Chooraippul
Tel.	:	Kaamakchhi - Kassuvu

DESCRIPTION -

a) Macroscopic:

Root - Short, stout and woody; roots fibrous; many culms arise from root stumps.

Culm - Erect, terete, smooth shiny, upto 6 mm in dia., internodes 5 to 16 cm long, solid.

Leaf - Blades linear-lanceolate or lanceolate tapering to long filiform acuminate point, cordate and amplexicaul at base, upto 50 cm long and 3.5 cm broad; upper leaves are smaller, leaf surface glabrous, margin scabrid; midrib prominent and protruded on the lower surface; leaf sheath shorter than the internodes, glabrous, striate, auriculate, tight and clasping the culm, ligules membranous, 2 to 3 cm long.

Inflorescence - Spathate panicle, compound, upto 30 cm long; primary axis bears 2 or 3 branches at each node, these end in a spatheole which bears a pair of racemes, spatheole 1.8 mm long become reddish at maturity; racemes 1.5-2.0 cm long become subsessile or shortly pedicelled, lower raceme base and lower most pedicel swollen; sessile spikelet about 3.5 mm long, lower glume 1 mm wide, ovate, with deep median groove, broadly winged, 2 nerved; awn 12 to 18 mm long; pedicellate spikelet about 4 mm long, glabrous; lower glume lanceolate, 8 nerved, flower hermaphrodite or male, stamens-3, anthers 1 or 2 mm long, style 2, stigma pilose.

b) Microscopic:

Root – T.S. shows thin walled epiblema with unicellular root hairs; cortex composed of thin walled, parenchymatous cells; large air chambers present in the cortex; endodermis

single layered and pericycle two cell layered; central vascular strand has outer 2 or 3 layers of sclerenchymatous cells followed by 3 to 5 cells deep zones of thin walled phloem with a row of circular cavities of 12 to 25 μ diam.; 5 to 10 cell layer thick zone encloses xylem vessels; which are 35 to 50 μ in diam.; pith cells thick walled and devoid of any cell contents.

Stem – T.S. shows thick cuticle; epidermis devoid of any appendages; hypodermis 6 to 10 cells deep and composed of sclerenchymatous cells; vascular bundles scattered throughout the ground tissue with a row of smaller vascular bundles in the hypodermis; cells of ground tissue thin walled, parenchymatous; vascular bundles present in the ground tissue enclosed by 2 or 3 layers of sclerenchymatous cells.

Leaf – T.S. shows isobilateral structure, with a spongy mesophyll between; outline showing a slightly concave upper surface and a convex lower surface; midrib protruded towards lower side; cells of upper epidermis interrupted by the presence of bulliform or motor cells; lower epidermal cells are more uniform in size and smaller; stomata present on both surfaces, characteristically placed in a straight line between veins, mesophyll consists of chlorenchymatous cells placed radially around smaller vascular bundles; bundle sheath present around smaller vascular bundles, on either side of the midrib vascular bundle; group of sclerenchymatous fibres are found and may extend upto bundle sheath; vascular bundle of midrib usually has two conspicuous metaxylem vessels.

Lower epidermis can be distinguished from the upper epidermis by its having more number of stomata, smaller epidermal cells and presence of microhairs and papillae; stomata of the lower epidermis - oval, mostly with low dome shaped long cells present between the veins; long cells of lower epidermis possess 1 or 2 papillae, while papillae are absent on the long cells of upper epidermis; short cells over the veins in rows of more than 5 cells and may be in pairs; silica bodies abundant over the veins mostly dumbbell shaped, occasionally cross-shaped, narrow and crenate; prickle and micro hairs present; micro hairs two celled, observed only on lower epidermis; the basal cell of micro hairs is wide as compared to distal cell; distal cell tapers to an acutely pointed apex.

Powder - Brown, fibrous, free flowing; shows debris from leaves showing characteristic graminaceous stomata, silica bodies, and micro hairs; also contains pitted parenchyma and fiber.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 14 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 7 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 5 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 7 percent, Appendix 2.2.7.
Essential oil	-	Not less than 0.2 percent, Appendix 2.2.10.

T.L.C. –

T.L.C. of essential oil on silica gel 'G' plate using hexane : ethyl acetate (90:10) shows seven spots at Rf 0.25, 0.38, 0.47, 0.57, 0.64, 0.71 and 0.78 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110^0C.

CONSTITUENTS - Essential oil (0.5 percent) containing terpenes such as geraniol, geranyl acetate, citronellol, linalool, geranyl butyrate, myrcene, α- and β-pinene.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta
Guṇa : Laghu, Rūkṣa, Tikṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Pittahara, Kaphavātaśāmaka, Bālagrahahara, Puṁstvaghna

IMPORTANT FORMULATIONS - Balā Taila, Māsabalādi Kvātha Cūrṇa

THERAPEUTIC USES – Kāsa; Hṛdroga; Śūla; Raktapitta; Apasmāra; Pinasa; Kaphajvara; Kaṇṭha roga; Jvara; Aruci; Kuṣṭha; Kaṭiśūla; Prameha; Vṛṣcika-Viṣa

DOSE - 10-20 g.

RŪMĪMASTAGĪ (Resin)

Rūmīmastagī is a resin obtained from *Pistacia lentiscus* Linn. (Fam. Anacardiaceae), a shrub or small tree indigenous to the countries bordering on the Mediterranean.

SYNONYMS -

Beng.	:	Rumi-Mastungi
Eng.	:	Mastic
Guj.	:	Rumi Mastagee
Hindi	:	Rumi Mastagee, Rumi Mastiki, Mastagee
Mar.	:	Rumaa Mastakee
Urdu.	:	Rumee Mastagee

DESCRIPTION -

The resin occurs in small, hard, pear shaped, ovoid or nearly globular, sometimes elongated tears, about 2 to 8 mm in diameter; pale yellow in colour; brittle, breaking into clear glossy fracture, interior transparent, crushing to a sandy powder, taste, slightly agreeable; odour, aromatic.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 2.6 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.34 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 94.0 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 0.5 percent, Appendix 2.2.7.

ASSAY - The drug on steam distillation yields colourless oil (1.5-2.0% v/w), which is heavier than water. (Method in Appendix 2.2.10.).

T.L.C. -

T.L.C. of alcoholic extract on Silica gel 'G' precoated plates (Merck), using Toluene : Methanol (95:5); under UV (254nm) shows one spot at Rf. 0.17 (blue fluorescence): on spraying with Vanillin-sulphuric acid and heating the plate at 110^0C for 30 minutes, twelve spots appear at Rf.0.12, 0.17, 0.23 (all violet), 0.40 (blue), 0.41 (purple), 0.44, 0.46, 0.49, 0.56, 0.69, 0.80 and 0.86 (all blue).

CONSTITUENTS - Resin, volatile oil, a bicyclic terpenoid and fatty acids.

PROPERTIES AND ACTION -

Rasa	:	Madhura
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Madhura
Karma	:	Kaphahara, Mūtrala, Vṛṣya, Vājīkaraṇa, Rakta Saṁgrāhika, Dīpana, Varṇya, Mukhadurgandhanāśaka, Daśansthiratākara

IMPORTANT FORMULATIONS – Eladi, Kameda, Sukrama Vati

THERAPEUTIC USES – Mūtrakṛcchra; Kāsa; Śvāsa; Ādhmāna; Agṇimāndya; Grahaṇī; Raktasrāva; Vātapittaja Vikāra; Śotha

DOSE - 1-2 g.

SARALA (Exudate)

Sarala is an exudate obtained by tapping the wood of *Pinus roxburghii* Sargent syn. *P. longifolia* Roxb. (Fam. Pinaceae), a monoecious conifer found in north-western Himalayas at an altitude between 460 and 1500 m.

SYNONYMS -

Sansk.	:	Śrih, Śrīveṣṭaka, Śrīvāsah, Śriniketah, Śryāhvhah, Vṛkṣadhūpakah
Beng.	:	Sarala gaachh
Eng.	:	Oleo-resine of Pine
Guj.	:	Teliyo devdaar, Pilo berajo
Hindi	:	Cheed-Ka-Gond, Gandhabirojaa
Kan.	:	Saral, Sriveshtaka
Mal.	:	Charalam, Saralam
Mar.	:	Sarala deeka
Ori.	:	Sidhaa, Saral
Punj.	:	Cheed
Tam.	:	Pinaimaaru
Tel.	:	Saral
Urdu.	:	Cheed

DESCRIPTION –

Macroscopic:

Blackish brown in colour, semi solid, mostly associated with debris from needles, wood chips and bark of the source tree; odour, terebinthene.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 0.6 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.40 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 74 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 0.15 percent, Appendix 2.2.7.
Volatile oil	-	Not less than 18 percent, Appendix 2.2.10.

G.L.C. –

G.L.C. of Turpentine oil on the Gas Chromatograph Model NUCON – 5765, Column & Stationary phase : 30m fused silica capillary column walls coated with FFAP, Carrier Gas : Helium, 1.5 ml. min^{-1}, Column Temperature : 90^0 C for 2 min. then programmed at the rate of 7^0 C min^{-1} to 220^0 C, Injection port Temperature : 220^0 C, Detector Temperature : 240^0 C, Recorder : 2mV, signal attenuation 1:100, Chart speed : 1

$cm.min^{-1}$, Sample size : 0.10 ml (For GC analyses, pure (0.1ml) is injected with a 1.0 ml syringe).

The identification of compounds is done by comparing the retention time of peaks and by peak enrichment technique with standard samples run under similar operating conditions such as l-α-pinene (Rt = 6.31 min.); l-ß-pinene (Rt = 7.18 min.); car-3-ene (Rt = 7.76 min.); longifolene (Rt = 15.46 min.).

T.L.C. –

T.L.C. of rosin (Material left after separation of essential oil) on a precoated silica gel G plate, using methaṇol : hexane (5:95). One spot at Rf. 0.80 on spraying with 2% vanillin in sulfuric acid (dark pink to purple flourescent) and on spray with 0.04 per cent bromocresol green solution shows yellow spot.

CONSTITUENTS - l-α-pinene, l-β-pinene, car-3-ene, longifolene and other mono & sesquiterpenes.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Kaṣāya
Guṇa : Laghu, Tīkṣṇa, Snigdha
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Kaphahara, Dīpana, Durgandhahara, Duṣṭavraṇaśodhaka, Viṣaghna, Varṇaprasādana, Rakṣoghna

IMPORTANT FORMULATIONS – Amṛtaprasa Cūrṇa, Kuṣṭadi Taila

THERAPEUTIC USES – Jatrūrdhavaroga; Sveda-daurgandhya; Vātavyādhi; Agnimāndya; Ādhmāna; Kṛmiroga; Mūrcchā; Kuṣṭha; Tvakroga; Karṇaśūla; Kaṇṭharoga; Sotha; Nāḍivrana; Kaṇḍu; Koṭha; Piḍakā; Urustambha; Yūkaroga; Grahabādhā; Yoni-doṣa

DOSE - 1-3 g.

SARPAGANDHĀ (Root)

Sarpagandhā consists of air dried root of *Rauwolfia serpentina* (Linn.) Benth. ex Kurz (Fam. Apocynaceae); a perennial undershrub widely distributed in India in the sub-Himalayan tracts upto 1,000 m as well as, in the lower ranges of the Eastern and Western Ghats and in the Andamans.

SYNONYMS -

Sansk.	:	Nākuli, Candrikā, Chandramārah
Beng.	:	Chaandar
Eng.	:	Rauvolfia Root, Serpentina Root
Guj.	:	Amelpodee
Hindi	:	Chhotaa Chaand, Dhavalbaruaa
Kan.	:	Sutranaabhu
Mal.	:	Amalpori
Mar.	:	Adkai, Chandra
Ori.	:	Dhanbarua, Sanochado
Tam.	:	Sarppaganti
Tel.	:	Sarpagandhi

DESCRIPTION -

a) Macroscopic:

Pieces of roots mostly about 8 to 15 cm long and 0.5 to 2 cm in thickness, sub-cylindrical, curved, stout, thick and rarely branched; outer surface greyish-yellow to brown with irregular longitudinal fissures; rootlets 0.1mm in dia; fracture, short, slight odour and bitter taste.

b) Microscopic :

Root- Root comprises of stratified cork of about 18 layers, of which the cells of 8 to 12 layers are smaller, suberized and unlignified; cells of remaining layers large, suberized and lignified; phelloderm parenchymatous, some cells packed with starch grains and prismatic and clusters crystals of calcium oxalate; secondary phloem tissue consists of sieve cells, companion cells and parenchymatous cell containing starch grains and crystals of calcium oxalate; phloem fibres absent; phloem parenchyma occasionally filled with granular substances; starch grains mostly simple but compound granules also occur with 2 to 4 components; individual granules spherical, about 5 to 15 µm in diameter, with well marked hilum simple or split in a radiate form; stone cells are absent (distinction from many other species such as *R. canescens, R. micrantha, R. densiflora, R. perakensis and R. vomitoria*); secondary xylem is traversed by well developed lignified medullary rays of about 1 to 5 cell wide but uniseriate rays are more prominent; vessels singly or in pairs; xylem parenchyma cells lignified; fibres present; cells of medullary rays thick walled also filled with starch grains and calcium oxalate prisms.

Powder - Coarse to fine, yellowish-brown, free flowing, odour slight, bitter in taste; characterized by spherical, simple to compound starch grains, calcium oxalate prisms and clusters; vessels with simple perforation, occasionally tailed; tracheids lignified; xylem fibres irregular in shape, occurs singly or in small groups, walls lignified, tips occasionally forked or truncated; wood parenchyma cells are filled with calcium oxalate crystals and starch grains; stone cells phloem fibres absent.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid–insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 4 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 10 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the methanol and Ammonia extract of root powder on silica gel 'G' plate using Toluene : Ethyl acetate : Diethylamine (70 : 20: 10) shows eight spot on spraying with Dragendorff reagent at Rf. 0.11, 0.13, 0.25, 0.37, 0.47, 0.51, 0.61 and 0.82 (all reddish brown). The spot at Rf. 0.82 is of reserpine.

CONSTITUENTS - Rauwolfia contains indole alkaloids, such as reserpinine, serpentinine and ajmalicine.

PROPERTIES AND ACTION -

Rasa	:	Tikta, Kaṭu
Guṇa	:	Rūkṣa, Laghu
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Mūtral, Dīpanī, Rucya, Pācanī, Nidrāprada, Viṣaghna, Kāmāvasādaka, Hṛdavasādaka

IMPORTANT FORMULATIONS - Sarpagandhādi Cūrṇa, Sarpagandhāyoga, Sarpagandhā Vaṭi, Sarpagandhā Ghana Vaṭī

THERAPEUTIC USES – Madaroga; Yoniśūla; Jvara; Śūla; Kṛmiroga; Anidrā; Unmāda; Apasmāra; Bhrama; Raktavāta; Bhūtabādhā; Mānasaroga; Visūcikā; Vraṇa

DOSE - 1-2 g.

ŚVETAPUNARNAVĀ (Root)

Śvetapunarnavā consists of root of *Boerhaavia verticillata* Poir. (Fam. Nyctaginaceae), a herbaceous weed with a tendency to climb, widely distributed in the plains throughout India during rainy season.

SYNONYMS -

Sansk.	:	Vṛscīva
Beng.	:	Shatapunyaa
Eng.	:	Horse purslene, Blunt leaved Hogweed
Guj.	:	Vasedo, Vasedee
Hindi	:	Safed Punarnavaa, Gada Poornaa
Kan.	:	Maachchugoni, Vinleey Duvelladkilu
Mar.	:	Pundharighentuli
Punj.	:	Itsita
Tam.	:	Sharunnai, Mukkarattai-Kirai

DESCRIPTION –

a) Macroscopic:

Roots occur in small pieces of 5 to 7.5 cm in length and upto 2 cm in thickness; texture rough; lenticels dot like or slightly transversely elongated, arranged in transverse rows; colour brown, freshly cut surface creamish to light brown; odour and taste not distinctive.

b) Microscopic:

Root shows anamolous secondary growth; periderm present and consisting of phellem, phellogen and phelloderm; part of phellem and phellogen sloughed off and phelloderm mostly crushed but forms a continuous layer around the stelar region; the phellogen consists of 4 or 5 layers of rectangular and tangentially elongated cells; cortex composed of parenchymatous cells that are usually crushed; raphides present in some cells of cortex; centre of the root occupied by xylem consisting mostly of vessels, fibres and tracheids; concentric but irregular rings of cambium, patches of xylem and phloem, and parenchyma alternate in turn towards the periphery; medullary rays are not distinct; starch abundant in parenchyma; most of the starch grains rounded or hemispherical in shape; the compound starch grains, however, are scanty.

Powder - The powder show raphides (usually broken) and fragments of fibres, and vessel members showing scalariform thickenings; starch present.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 16 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 4 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 7 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 2 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene:ethylacetate:acetic acid (5:4.5:0.5), shows under U.V. (366nm) spots at Rf 0.37, 0.59, 0.80 (All Blue). On spraying with anisaldehyde: sulphuric acid reagent and heating the plate for ten minutes at 110^0 C spots appear at Rf 0.19(Greyish Black), 0.59 (Greyish Black), 0.69 (Blue), 0.79 (Purple).

PROPERTIES AND ACTION -

Rasa	:	Tikta, Madhura
Guṇa	:	Rūkṣa, Laghu
Vīrya	:	Uṣṇa
Vipāka	:	Madhura
Karma	:	Vātahara, Kaphahara, Pittaśāmaka, Agnidīpaka, Viṣaghna, Jvarahara

IMPORTANT FORMULATIONS - Kumāryāsava (A), Punarnavādyariṣṭa, Dhānvantara Ghṛta, Dādhika Ghṛta

THERAPEUTIC USES – Pāṇḍu; Viṣavikāra; Śotha; Śopha; Udararoga; Hṛdroga; Kāsa; Urahkṣata; Sūla; Rakta Vikāra; Paittika Jvara; Cāturthikajvara; Śrāva; Plīhāroga; Vātakaṇṭaka; Vidradhi Alarkaviṣa; Vṛṣcikaviṣa; Sarpaviṣa; Mūṣakaviṣa

DOSE - 5-15 g.

TAILAPARṆAḤ (Leaf)

Tailaparṇaḥ consists of mature leaf of *Eucalyptus globulus* Labill. (Fam. Myrtaceae) a large tree attaining a height of 90 m or more, native to Australia, but planted world wide and introduced in Nilgiris, Anamalai and Palni hills, Simla and Shillong at an altitude of 1500-2500 m.

SYNONYMS –

Sansk.	:	Nīlaniryāsa, Ekaliptah, Sugandha patrah
Eng.	:	Blue gum, Eucalyptus
Hindi	:	Yukeliptas
Mal.	:	Yukkaalimaram
Mar.	:	Nilgiri
Tam.	:	Yukkaalimaram

DESCRIPTION -

a) Macroscopic:

Drug consists of mature leaves, more or less scimitar shaped, thick, leathery, greyish-green, petiolate, upto 26 cm long and 4 cm broad; petioles 2.0 to 3.5 cm long and 0.5 to 1.5 mm thick, sometimes twisted; apex acute to acuminate, base obtuse; midrib prominent, particularly on the lower surface; margin of leaf entire and somewhat thickened, brittle and possess numerous brown to dark brown corky warts. In transmitted light, numerous oil glands can be seen as transluscent dots; upper surface smooth, lower surface slightly rough due to the presence of projecting veins; venation - unicostate reticulate; lateral veins anastamose near the margin forming a continuous line; odour strong and characteristic.

b) Microscopic:

Leaf - T.S. shows typical isobilateral structures with two or three rows of palisade cells on both upper and lower sides, surfaces show thick cuticle; numerous sunken stomata and large ovoid schizogenous oil cavities of 160 to 200 μ diam.; idioblasts present with rosettes or prismatic calcium oxalate crystals; rosette crystals 25 to 35 μ in size, prismatic crystals 15 to 25 μ in size; vascular bundle of midrib are crescent shaped with one vascular strand present on each side, all having interrupted patches of sclerenchyma; corky warts comprising of 10 or more layers of cells; laminary bundles enclosed in bundle sheath, the cells of which extend to the epidermis on both sides; upper and lower epidermal cells have straight walls; stomata anomocytic; stomatal index on both upper and lower surface 5 to 10; the palisade ratio on upper surface 5 to 17 and lower surface 3 to 6.

Powder - Yellowish brown, free flowing, characterized by the presence of cluster and prismatic crystals of calcium oxalate; epidermis straight walled with sunken stomata; fibers present.

IDENTITY, PRUITY AND STRENGTH –

Foreign matter	-	Not more than	1 percent, Appendix 2.2.2.
Total ash	-	Not more than	9 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than	1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than	14 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than	21 percent, Appendix 2.2.7.
Essential oil	-	Not less than	2 percent, Appendix 2.2.10.

T.L.C. –

T.L.C. of hexane extract on silica gel 60 F 254 plate using Toluene : Acetone (95:05) shows four spots at Rf 0.22, 0.35, 0.41 and 0.49 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110^0C.

CONSTITUENTS – Essential oil containing terpenes such as 1,8 – cineole, camphene, sabinene, myrcene, p-menthone, α-and y-terpinene, fenchone, α-β-thujone, citral, verbenone.

PROPERTIES AND ACTION -

Rasa	:	Kaṭu, Tikta, Kaṣāya
Guṇa	:	Laghu, Snigdha
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Dīpana, Pācana, Hṛdya, Mūtrala, Durgandhināśaka, Agnimāndya, Balaprada

IMPORTANT FORMULATIONS – Ekādaśaśatikaprasāniṇī Failam, Mahāsugandhika Taila, Pañcavaktra Rasa, Pañcaguṇa Taila, Mārtaṇdabhairava Rasa, Jvaramāri Rasa

THERAPEUTIC USES – Kṛmi; Jīrṇakāsa; Pratiśyāya; Svarabheda; Viṣamajvara; Jvara; Śūla; Pūyameha; Kṣaya; Śvāsa; Bastiroga; Pravāhikā; Plīhāroga; Hṛdroga; Agnimāndya

DOSE - 1-2 g.

TINIŚAḤ (Wood)

Tiniśaḥ consists of wood of *Ougeinia oojeinensis* (Roxb.) Hochr. syn. *O. dalbergioides* Benth. (Fam. Fabaceae), a small to medium sized deciduous tree, found in the outer Himalayas and sub Himalayan tracts from Jammu to Bhutan up to an altitude of 1500 m and extending through the whole of the northern and central India into greater part of Deccan Peninsula.

SYNONYMS –

Sansk.	:	Tinih, Syandanah, Rathadru
Beng.	:	Tinish
Eng.	:	Sandan
Guj.	:	Tanacha
Hindi	:	Sandan, Saanana, Tinisaa
Kan.	:	Karimutale, Kalabangaa
Mal.	:	Totukara, Malavenna
Mar.	:	Timas, Syandan
Ori.	:	Vanjan
Tam.	:	Narivengai, Naiponai
Tel.	:	Tellamotuku, Dargu

DESCRIPTION -

a) Macroscopic:

Wood pieces are roughly cubic and about 2 to 3 cm in size; outer part yellow or cream, internal part light to dark brown in colour; cut surfaces are fibrous, wood pieces devoid of any odour.

b) Microscopic:

Sap wood - Diffuse porous, vessels in cross sections solitary, in short radial multiples or in clusters, forming oblique chains, about 30 to 220 μ in diam. with reticulate thickenings and simple pits, without gummy deposits; frequency of vessels per sq. mm is 14 to 18; axial parenchyma is paratracheal, aliform, confluent - broad and filled with simple starch grains 4 to 21 μ in dia. with prominent striations and slit like centric hilum; fibres present in patches; marginal fibres possess abundant prismatic crystals of calcium oxalate, 4 to 10 μ in size; fibres are occasionally septate; rays uni- to multiseriate, heterogenous, usually homocellular, some cells may contain minute starch grains of about 8 μ diam.; cells contain no tannin.

Heart wood – T.S. shows vessels of same size as those of sap wood but are usually filled with brownish gummy material and possess bordered pits; frequency of vessels per sq. mm is 6 to 8; axial parenchyma is paratracheal, aliform and is usually filled with brownish substance but lack starch grains; marginal fibres contain abundant prismatic

crystals of same size as observed in the sapwood, ray, axial parenchyma and fibres contain tannins.

Powder - Brown, fibrous, free flowing, characterized by the presence of several lumps of brown gummy material, xylem parenchyma, medullary ray cells, simple starch grains, xylem vessels with several small slit like pits and fibres containing crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 7 percent, Appendix 2.2.3.
Acid–insoluble ash	-	Not more than 1.5 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 5 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 2 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of methanol extract on silica gel 'G' plate using diethyl ether : hexane (78:22) shows six spots at Rf 0.47, 0.50, 0.62, 0.65, 0.72 and 0.86 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110^0C.

CONSTITUENTS – Flavonoids mainly homoferreirin and ougeinin.

PROPERTIES AND ACTION -

Rasa	:	Kaṣāya
Guṇa	:	Laghu Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Rasāyana, Pittahara, Kaphaśoṣaṇa, Medohara, Kuṣthaghna, Viṣaghna, Vraṇaropaṇa, Śoṇitasthāpana

IMPORTANT FORMULATIONS - Ayaskṛti

THERAPEUTIC USES – Śotha; Kuṣṭha; Atiśara; Raktātisāra; Pravāhikā; Raktavikāra; Raktapitta; Prameha; Śvitra; Vraṇa; Kṛmi; Pāṇduroga; Medoroga; Dāha

DOSE - 50 - 100 ml kvātha.

TINTIḌĪKAḤ (Aerial Part)

Tintiḍīkaḥ consists of mature dried aerial part of *Rhus parviflora* Roxb. (Fam. Anacardiaceae), an evergreen or sub-deciduous shrub commonly found on the dry hot slopes of Himalayas from Punjab to Nepal and in the hills of Peninsular India at an altitude of 600-2100 m.

SYNONYMS -

Sansk.	:	Tintiḍīka
Eng.	:	Sumac
Hindi	:	Samakadana, Raitung, Tungalaa
Punj.	:	Khatte Masoor, Raitung, Tungaa
Urdu	:	Sumaak

DESCRIPTION -

a) Macroscopic:

Stem - Young stem branched, reddish-brown, tomentose; stem pieces 10 to 15 cm long and upto 4 cm in diam., old ones woody with longitudinal striations and glandular protuberances, greenish-brown, bark separable from wood, inner surface of bark reddish-brown, wood light brown in colour; fracture, hard and fibrous.

Leaf - Trifoliate when intact, leaflets elliptic, oblong, obovate, petiolate, petiole 2.5 to 3.5 cm in length, tomentose, terminal leaflet large, obovate, 7 to 8.5 cm in length, 3 or 4 cm broad, rather thick, basal margin entire and cuneate, upper coarsely and irregularly crenate, pubescent, laterals relatively broader and more rounded at base, sessile, pubescent and smooth.

Fruit - Drupe, oval, yellowish-green to brownish-green, glabrous, shining, fruits present on panicles; calyx persistent; fruit wrinkled.

b) Microscopic:

Stem - T.S. shows cork, cortex and stele; patches of cortical fibres, secretory canals and rhomboid crystals of calcium oxalate, measuring about 13 μ well distributed in the cortex; xylem in the form of a continuous cylinder traversed by uni or biseriate medullary rays; border pitted and scalariform vessels present; lignified fibres septate, measuring 300 to 770 μ in length and upto 50 μ in width; pith parenchymatous, possessing tannins, starch grains and rhomboid crystals of calcium oxalate.

Petiole - T.S. shows a single layered epidermis covered with cuticle; abundant unicellular and multicellular, uniseriate trichomes measuring 30 to 360 μ in length and 10 to 20 μ in width; cortex consisting of 3 or 4 layers of collenchymatous cells and 5 or 6 layers of parenchymatous cells, some cells of collenchyma and parenchyma contain rhomboidal

crystals of calcium oxalate, measuring upto 20 μ; collateral vascular bundles 15 to 17 in number, surrounding a central parenchymatous pith and capped by an arch of pericyclic fibres; secretory canals present in phloem region.

Midrib - T.S. shows single layered epidermis, covered with cuticle; nonglandular, unicellular and uniseriate, multicellular trichomes abundantly present on the epidermis, followed by collenchymatous tissue; vascular bundles 5 to 7 in number, arranged in a circle, conjoint, collateral, each capped by an arch of fibres; secretory canals present in phloem region; pith consists of parenchymatous cells.

Lamina - T.S. shows dorsiventral structure, epidermal cells composed of cubical to slightly elongated and rectangular cells, externally covered with cuticle; below upper epidermis 2 or 3 layers of palisade parenchyma present; lower epidermis single layered with thick cuticle; unicellular and uniseriate, multicellular trichomes present on both surfaces, measuring upto 200 μ in length and about 30 μ in width; palisade parenchyma followed by loosely arranged spongy parenchyma cells; mesophyll traversed by vascular bundles; each vascular bundle surrounded by bundle sheath, extending from upper epidermis to lower epidermis as bundle sheath extension. In surface view lower epidermis shows anomocytic type of stomata while upper epidermis is devoid of stomata; stomatal index 6 to 10 on lower epidermis; vein islet number 12 to 15; palisade ratio 2 to 4.

Powder - Brown, odour slightly strong, somewhat acrid in taste; fragments of palisade tissue, calcium oxalate crystals, trichomes, starch grains, bordered pitted vessels and vessels having scalariform thickenings.

IDENTITY, PURITY AND STRENGTH –

Foreign Matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 5 per cent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 0.7 per cent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 10 per cent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 12 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the alcoholic extract on silica gel 'G' plate (0.2 mm thick) using chloroform : methanol: acetic acid (80:20:2) shows under UV (254 nm) six spots at Rf. 0.11, 0.18, 0.29, 0.54 (all brown), 0.80 and 0.91 (both yellowish green). Under UV (366nm) seven fluorescent spots appear at Rf. 0.11, 0.18, 0.29, 0.54, 0.70 (all brown), 0.80 and 0.91 (both pink). On exposure to iodine vapour eight spots appear at Rf. 0.11(pinkish brown), 0.15, 0.22 (brown), 0.38, 0.64, 0.74, 0.80 and 0.91 (all yellowish brown). On spraying with 5% ferric chloride solution seven spots appear at Rf. 0.15, 0.24 (both green), 0.41 (faint brown), 0.54 (blue), 0.73 (faint brown) 0.83 and 0.91 (both brown).

CONSTITUENTS - Tannins (Gallic acid); flavones (myricetin, quercetin, myricitrin, quercitrin, kampferol); glycosides (isorhmnetin-3-α-L-arabinoside).

PROPERTIES AND ACTION -

Rasa	:	Amla
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Amla
Karma	:	Vātahara, Kaphavātahara, Piṭtakara, Rocana, Dīpana, Grāhī, Jvaraghna

IMPORTANT FORMULATIONS - Yavāni Ṣāḍava, Hinguvacādi Cūrṇa, Srī Rāmabāṇa Rasa

THERAPEUTIC USES – Vātavikāra; Atisāra; Agnimāndya; Aruci; Tṛṣṇā; Pravāhikā

DOSE - 3 - 6 g.

TRAPUṢAṀ (Seed)

Trapuṣaṁ consists of dried seed of *Cucumis sativus* Linn. (Fam. Cucurbitaceae), an annual trailing or climbing plant, numerous varieties widely cultivated throughout India upto an altitude of 1200 m. The seeds are devoid of mucilagenous outer layer.

SYNONYMS-

Sansk.	:	Śvetakarahaṭakaṁ, Sudhāvāsah, Mutralaṁ, Kaṇṭakiphalaṁ
Beng.	:	Ksheeraa, Shashaa
Eng.	:	Cucumber
Guj.	:	Taanslee
Hindi	:	Kheeraa
Kan.	:	Mullusavte, Santekaayi
Mal.	:	Vellari
Mar.	:	Tause, Khiraa
Ori.	:	Kantiaali Kaakudi
Punj.	:	Khiraa
Tam.	:	Vellarikkaay, Pippinkaay
Tel.	:	Khirakaya
Urdu.	:	Kheeraa

DESCRIPTION-

a) Macroscopic :

Seeds compressed, elongated, ellipsoid, dorsiventrally convex and laterally ridged; size variable, about a cm or occasionally more in length and upto 0.5 cm wide; micropyle pointed, distinctly visible; outer surface glossy, brittle, peelable; yellowish-white; kernel, oily, creamish-white; taste, mildly sweet, oily; not slippery to touch when moistened: odour, nil.

b) Microscopic :

Outermost layer of testa absent; hypodermis sclerenchymatous, two layered, outer layer of small, circular, stone cells, inner layer of large, oval, thick walled, striated, lignified sclereids placed at right angle to outer layer; a large zone of aerenchyma filled with loosely packed parenchymatous cells; cotyledon lined by compact layer of cuticularized thin walled epidermis, cotyledon of several layers of elongated, closely packed parenchymatous cells, largely hexagonal, packed with aleurone grains, starch and fat globules; innermost two layers much more elongated, palisade like, and distinct; each cotyledon shows five distinct patches of small, thin walled, polygonal cells present midway, in a roughly trapezial shape.

Powder - Creamish-white to light-green, oily, shows groups of yellowish, wavy-walled sclereids from testa in surface view, also isolated ones; fragments of parenchymatous

cells; annular or spiral xylem vessels in groups; abundant oil globules, aleurone grains, and starch grains.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 6 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 5 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 7 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (20:0.5) shows spots at Rf 0.31 (purple), 0.40 (brown), 0.48 (purple), 0.52 (light purple), 0.60 (purple), 0.70 (light grey) and 0.78 (pinkish brown) on spraying with vanillin-sulphuric acid reagent and heating the plate at 105 °C for about ten minutes.

CONSTITUENTS – Fixed oil and sugars.

PROPERTIES AND ACTION –

Rasa	:	Tikta, Madhura
Guṇa	:	Snigdha, Guru
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Vātapittahara, Kaphakara, Mūtrala, Balya, Abhiṣyandī, Mūtrabastiviśodhaka, Agnisādana

IMPORTANTFORMULATIONS - Dādhika Ghṛta

THERAPEUTIC USES – Mūtraghāta; Mūtrakṛcchra; Raktapitta; Daurbalya; Dāha; Raktavikāra; Anidrā; Śirahśūla; Chardi; Śītajvara

DOSE -3-6 g powder.

TŪNĪ (Stem Bark)

Tūnī consists of stem bark of *Cedrela toona* Roxb. (Fam. Meliaceae), a large, rapidly growing, nearly evergreen tree attaining a height upto 18 m, and distributed in tropical Himalayas from the Indus eastward, ascending to 1000 m and also throughout the hills of Central and Southern India.

SYNONYMS -

Sansk.	:	Tuni, Nandīvṛkṣa, Tūna, Nandī
Beng.	:	Toongaachha
Eng.	:	Toon, Red ceder
Guj.	:	Toonee
Hindi	:	Tun, Toonee, Tuni
Kan.	:	Mandurike, Kempu Gandagheri
Mal.	:	Madagirivempu, Ikana, Patukarana
Mar.	:	Toonee, Kurak
Tam.	:	Karamusuli, Shevagil Malavembu
Tel.	:	Nandichettu, Galimanu

DESCRIPTION-

a) Macroscopic :

Bark available in long pieces, channelled, of varying thickness; external surface, rough and rugged due to exfoliation and vertical cracks, fissured, dark grey having lenticels, inner surface, red, laminated and fibrous; fracture, fibrous and splintery; odour, very mild and pleasant; taste, sharp and acrid.

b) Microscopic :

Stem bark shows exfoliating cork, 8 to 10 layers consisting of tangentially elongated, radially arranged, thin-walled cells; cortex, 12 to 15 layers of rectangular parenchymatous cells, outer layers having cells filled with small rosette crystals of calcium oxalate at regular intervals; inner layers of cortex of isodiametric cells having abundant larger rosette crystals; occasionally stone cells may be present in outer cortex; phloem fibres abundant in patches, thick walled; medullary rays narrow, generally biseriate; starch grains, simple or compound, present in cortical region.

Powder - Light reddish-brown; shows occasional fragments of cork cells; fibres, large, abundant in groups, a few isolated, lignified with distinct lumen, tips bluntly pointed or having distinct indentation; stone cells, few, of varying shapes, elongated to isodiametric; phloem parenchyma, thin-walled, containing calcium oxalate rosettes and prisms; abundant prismatic and rosette calcium oxalate crystals, rosettes of varying sizes measuring 11 to 60 μ, prisms, small; starch grains, simple or compound having 2 to 6

components, 3-component grains most common, round and oval measuring upto 10 μ in dia., cleft hilum.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2
Total ash	-	Not more than 14 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 12 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 9 percent, Appendix 2.2.7.

T.L.C.-

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using petroleum ether : hexane : ethyl acetate : formic acid (10:30:15:1) shows spots at Rf 0.34, 0.44, 0.57 and 0.88 (all purple) on spraying with vanillin-sulphuric acid reagent and heating the plate at 105 °C for about ten minutes.

CONSTITUENTS - Triterpenoids.

PROPERTIES AND ACTION -

Rasa	:	Tikta, Kaṣāya, Madhura
Guṇa	:	Laghu
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Grāhī, Bhagnasandhānaka, Medohara

IMPORTANT FORMULATIONS - Nyagrodhādi Kvātha Cūrṇa

THERAPEUTIC USES- Bāla Pravāhikā; Vraṇa; Dāha; Yoniroga; Kaṇḍu; Kuṣṭha; Gaṇḍamālā; Raktavikāra; Raktapitta; Śvetakuṣṭha; Prameha; Viṣavikāra; Medovikāra

DOSE- 3-6 g kvātha-10-20 ml.

VANDĀ (Leaf)

Vandā consists of the dried leaf of *Dendrophthoe falcata* (Linn. f.) Ettingsh. syn. *Loranthus falcatus* Linn. f. (Fam. Loranthaceae), an epiphyte, mostly on fruit trees, and distributed throughout India.

SYNONYMS -

Sansk.	:	Vṛkṣādanī, Bandāka, Vṛkṣaruhā, Saṁharṣā
Beng.	:	Maandaa
Eng.	:	Mistletoe
Guj.	:	Baando
Hindi	:	Bandaa
Kan.	:	Bandanike, Bandhulu
Mal.	:	Ittikkanni, Itil
Mar.	:	Baandagul, Banda
Ori.	:	Vrudhongo
Tam.	:	Pulluri
Tel.	:	Baadanikaa, Jiddu

DESCRIPTION –

a) Macroscopic:

Leaves petiolate, exstipulate, opposite, decussate, simple, ovate to oblanceolate, glabrous, soft and leathery when young, brittle when dry; margin entire; base decurrent; apex acute; slightly astringent; odour resembling those of tealeaves.

b) Microscopic:

Transverse section of the leaf shows a thick cuticle, upper and lower epidermis composed of squarish cells with convex periclinal outer walls; surface views of upper and lower nearly similar; stomata paracytic, present on both surfaces; mesophyll of lamina consisting of 2 to 4 layers inner to upper and lower epidermis made up of compactly arranged short rectangular cells and irregularly arranged parenchyma cells of middle layers but possesing a few intercellular spaces; occassional vascular strands passing through this middle portion; isolated sclereids about 50 μ thick containing prismatic crystals of about 12 μ present in parenchyma; midrib buldging prominently on both the surfaces and containing a group of 3 to 5 vascular bundles; xylem of vascular bundles oriented towards upper epidermis and consisting of tracheids, vessels and parenchyma; phloem present towards lower epidermis and consisting of thin walled cells; bundle sheath absent; each vascular bundle associated with patch of collenchymatous cells outside the phloem; tannin (ranging from yellow to brown in colour) abundant in parenchyma cells of midrib and lamina region, especially in the 2 or 3 subepidermal layers; stomatal index 9 to 13 on upper surface and 10 to 14 on lower surface.

Powder - The powder shows angular epidermal cells and groups of thin walled, rectangular, closely packed parenchyma cells many of which contain tannins.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 14 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 4 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 3 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 3 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcohol soluble extract on Silica gel 'G' plate (0.2 mm thick) using toluene : ethyl formate : formic acid (5:4:1) as mobile phase shows under U.V. (366 nm) spots at Rf 0.06 (Brown); 0.39(Blue); 0.46 (Blue); 0.55 (Red); 0.81 (Pink). On spraying with anisaldehyde: sulphuric acid reagent and heating the plate for ten minutes at 110^0 C two spots appear at Rf 0.35(Light Green), 0.45 (Orange).

CONSTITUENTS - Leaves contain flavonoids such as Quercetin, quercetrin;Tannins comprising of gallic and chebulinic acid.

PROPERTIES AND ACTION -

Rasa	:	Kaṣāya, Tikta, Madhura
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Vātahara, Mūtravirecanīya, Śukrajanana, Vṛṣya, Rasāyana, Grāhī, Vraṇaropaṇa, Rakṣoghna, Śramahara, Netrya, Grahanāśana, Maṅgalakara, Garbhasthāpana

IMPORTANT FORMULATIONS – No formulation

THERAPEUTIC USES – Raktapitta; Vraṇa; Viṣaroga; Vandhyatva; Hikkā; Viṣamajvara; Bhagandara; Vātā-śmarī; Mūtraroga

DOSE - 10 - 20 ml juice.

VANDĀ (Stem)

Vandā consists of the dried stem of *Dendrophthoe falcata* (Linn. f.) Ettingsh. syn. *Loranthus falcatus* Linn. f. (Fam. Loranthaceae), an epiphyte, mostly on fruit trees, and distributed throughout India.

SYNONYMS -

Sansk	:	Vṛkṣādanī, Bandāka, Vṛkṣaruhā, Saṁharṣā
Beng.	:	Maandaa
Eng.	:	Mistletoe
Guj.	:	Baando
Hindi	:	Bandaa
Kan.	:	Badanike, Bandhulu
Mal.	:	Ittikkanni, Itil
Mar.	:	Baandagul, Banda
Ori.	:	Vrudhongo
Tam.	:	Pulluri
Tel.	:	Baadanikaa, Jiddu

DESCRIPTION –

a) Macroscopic:

Small twigs of aerial branches ranging from 2 mm to 2.5 cm in thickness; the bark of stem thin, dark brown and specked with lighter brown, uniformly distributed lenticles; the wood reddish-brown after removal of thin bark; stem slightly rough to touch; fracture irregular; fractured surface dark brown; no distinct taste or odour.

b) Microscopic:

A transverse section of stem reveals a circular outline with a thick cuticle, and epidermis made up of squarish or barrel shaped cells with convex outer periclinal walls and interrupted here and there by lenticular openings; cork made up of thin-walled, crushed rectangular cells; cortex consisting of many layers of tangentially elongated and rounded cells interspersed with sclereids upto 85 μ in size and in groups of 2 to 4; many cells of cortex, especially those of outer few layers contain tannins ranging in colour from yellow, orange to dark brown; groups of pericyclic fibres form a ring outside phloem; cambium present; xylem surrounding the central pith and composed of well developed vessels, fibre and parenchyma, 1 to 4 seriate medullary rays composed of radially elongated cells present; pith consists of thin walled, rounded or polygonal parenchymatous cells; small groups of sclereids, up to 85 μ each in size present in both pith and medullary rays;. prismatic crystals present in association with sclereids and medullary ray cells.

Powder - Powder shows vessel elements with simple pitted thickenings, groups of sclereids containing prismatic crystals (size of crystal 30 to 35 μ long and 15 to 17 μ wide) and fragments of parenchyma cells containing tannins.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 5 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 3 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 3 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcohol soluble extract of the drug in chloroform as a mobile phase shows under UV (366 nm) spots Rf 0.13 (Grey); 0.24 (Green); 0.35 (Blue); 0.56 (Yellow); 0.76 (Grey); 0.85 (Orange Pink); 0.96 (Pink).

CONSTITUENTS - Young shoots contain nearly 10 per cent tannins and the stem contains *β*-amyrin-0-acetate, oleonolic acid its methyl ester acetate, *β*-sitosterol and stigmasterol.

PROPERTIES AND ACTION -

Rasa	:	Kaṣāya, Tikta, Madhura
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Vātahara, Mūtravirecanīya, Śukrajanana, Vṛṣya, Rasāyana, Grāhī, Vraṇaropaṇa, Rakṣoghna, Śramahara, Netrya, Grahanāśana, Maṅgalakara, Garbhasthāpana

IMPORTANT FORMULATIONS – No formulation

THERAPEUTIC USES – Raktapitta; Vraṇa; Viṣaroga; Vandhyatva; Hikkā; Viṣamajvara; Bhagandara; Vātā-śmarī; Mūtraroga

DOSE - 10 - 20 ml juice.

VANDĀ (Aerial Root)

Vandā consists of the dried aerial root of *Dendrophthoe falcata* (Linn. f.) Ettingsh. syn. *Loranthus falcatus* Linn. f. (Fam. Loranthaceae), an epiphyte, mostly on fruit trees, and distributed throughout India.

SYNONYMS -

Sansk.	:	Vṛkṣādanī, Bandāka, Vṛkṣaruhā, Saṁharṣā
Beng.	:	Maandaa
Eng.	:	Mistletoe
Guj.	:	Baando
Hindi	:	Bandaa
Kan.	:	Badanike, Bandhulu
Mal.	:	Ittikkanni, Itil
Mar.	:	Baandagul, Banda
Ori.	:	Vrudhongo
Tam.	:	Pulluri
Tel.	:	Baadanikaa, Jiddu

DESCRIPTION –

a) Macroscopic:

Adventitious root greyish brown outside, yellowish to brown inside, slender, contorted and knotty in appearance, sending out haustoria into the host plant or, also into its own branches; rarely branched; fracture, irregular; odour and taste not distinct.

b) Microscopic:

A transverse section of adventitious root is circular in outline; cuticle and epidermis sloughed off; outermost zone consists of broken tissue of cork and cortex followed by cork cambium made of rectangular cells; cortex wide, many layered, made of thin walled rounded cells and selereids upto 50 μ size, present singly or in groups of 2 to 4; many cells of cortex contain tannin; patches of pericyclic fibres surround the vascular ring; phloem composed of small thin walled cells present outside the xylem and separated from it by the vascular cambium; xylem interrupted by short, 1 or 2 seriate medullary rays composed of radially elongated cells; xylem composed of scattered vessels, parenchyma and fibres; pith wide, composed of rounded parenchymatous cells interspersed with thick walled fibres of about 5 μ in dia.

Powder - Powder shows tracheids and vessel members with simple pitted thickenings, broken fibres; stone cells with faint incomplete radial striations, upto 50 μ in size and containing prismatic crystals.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 6 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 12 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 1 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcohol soluble extract of the drug on silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (80:20) as mobile phase shows under U.V. (at 366 nm) spots at Rf 0.35 (Blue); 0.58 (Blue); 0.90 (Blue).

CONSTITUENTS - Catechin and leucocynidin in the bark.

PROPERTIES AND ACTION -

Rasa	:	Kaṣāya, Tikta, Madhura
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Vātahara, Mūtravirecanīya, Śukrajanana, Vṛṣya, Rasāyana, Grāhī, Vraṇaropaṇa, Śramahara, Netrya, Grahanāśana, Maṅgalakara, Garbhasthāpana

IMPORTANT FORMULATIONS - Mūtravirecanīya Kaṣāya Cūrṇa

THERAPEUTIC USES – Raktapitta; Vraṇa; Viṣaroga; Vandhyatva; Hikkā; Viṣamajvara; Bhagandara; Vātā-śmarī; Mūtraroga

DOSE - 10 - 20 ml juice.

VANDĀ (Flower)

Vandā consists of flowers of *Dendrophthoe falcata* (Linn.f.) Ettingsh. syn. *Loranthus falcatus* Linn. f. (Fam. Loranthaceae), a semi-parasite, mainly on fruit trees, and distributed throughout India.

SYNONYMS -

Sansk.	:	Vṛkṣādanī, Bandāka, Vṛkṣaruhā, Saṁharṣā
Beng.	:	Maandaa
Eng.	:	Mistletoe
Guj.	:	Baando
Hindi	:	Bandaa
Kan.	:	Badanike, Bandhulu
Mal.	:	Ittikanni, Itil
Mar.	:	Baandagul, Banda
Ori.	:	Vrudhongo
Tam.	:	Pulluri
Tel.	:	Baadanikaa, Jiddu

DESCRIPTION –

a) Macroscopic:

Flowers actinomorphic, bisexual, regular, complete, coloured, apetalous, epigynous with cup or disc shaped receptacle, pentamerous; perianth-tepals 5, free and strap shaped towards the distal end and in the form of a sickle-shaped tube towards the basal end; surrounded at the base by a cup-shaped calyx; the perianth tube measures about 40 to 55 mm in length; it is narrow at the base and gradually widens towards the upper part; the perianth lobes become strongly reflexed at maturity. Inside the perianth tube are 5 cushion shaped nectarines; androecium stamens 5, epiphyllous, starting from two-thirds of length of perianth tube and continuing to the tip of perianth lobes, appressed to the style in young flowers; filaments orange coloured; anthers monothecous, dark, basifixed; gynoecium ovary 1, inferior, obscurely unilocular; style long, filamentous; stigma capitate; placentation basal, one ovule in each locule.

Powder - The powder shows characteristically triradiate, smooth walled, pollen grains upto 45 μ in size and having a depression in the centre at distal end of each arm, and endothelial tissue.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 20 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 4 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate (0.2 mm thick) using toluene : ethylformate : formic acid (5:4:1) as mobile phase shows under U.V. (at 366 nm) spots at Rf value 0.11, 0.16, 0.26 (Blue), 0.45 (Pink). On spraying with anisaldehyde : sulphuric acid reagent and on heating the plate for ten minutes at 110^0C spots at Rf. 0.07 (Black); 0.12 (Green Black); 0.22 (Blue); 0.31 (Yellow); 0.40 (Yellow); 0.88 (Green) appear.

PROPERTIES AND ACTION -

Rasa	:	Kaṣāya, Tikta, Madhura
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Vātahara, Mūtravireçanīya, Śukrajanana, Vṛṣya, Rasāyana, Grāhī, Vraṇaropaṇa, Rakṣoghna, Śramahara, Netrya, Grahanāśana, Garbhasthāpana

IMPORTANT FORMULATIONS – No formulation

THERAPEUTIC USES – Raktapitta; Vraṇa; Viṣaroga; Vandhyatva; Hikkā; Viṣamajvara; Bhagandara; Vātā-śmarī; Mūtraroga

DOSE - 10 - 20 ml juice.

VANDĀ (Fruit)

Vandā consists of the dried fruit of *Dendrophthoe falcata* (Linn. f.) Ettingsh. syn. *Loranthus falcatus* Linn. f. (Fam. Loranthaceae), an epiphyte, mostly on fruit trees, and distributed throughout India.

SYNONYMS -

Sansk.	:	Vṛkṣādanī, Bandāka, Vṛkṣaruhā, Saṁharṣā
Beng.	:	Maandaa
Eng.	:	Mistletoe
Guj.	:	Baando
Hindi	:	Bandaa
Kan.	:	Badanike, Bandhulu
Mal.	:	Ittikkanni, Itil
Mar.	:	Baandagul, Banda
Ori.	:	Vrudhongo
Tam.	:	Pulluri
Tel.	:	Baadanikaa, Jiddu

DESCRIPTION –

a) Macroscopic:

The fruit is an ovate pseudo berry, upto 3 mm in thickness and 3 to 8 mm in length; greenish-yellow when mature and turning brown when dry; the top of the fruit is crowned by a persistent calyculus; the fruit contains an elongated, flask-shaped seed upto 5 mm long and 2 mm thick, rugose, brown, hard, and enclosed in a shiny, viscid film.

b) Microscopic:

T.S. of the pseudoberry shows the outer tissues of thalamus separated by a zone of viscid mass from the inner tissues of the seed. Fruit tissue consist of an outer epicarp formed of a single layer of epidermis composed of squarish or rounded, thickly cuticularized cells followed by 3 or 4 layers of thick walled, larged sized, squarish cells containing tannins; mesocarp consist of multiple layers of small relatively clear cells with interspersed groups of stone cells. Fruit wall delimited inside by multiple layers of large, rounded, thin walled parenchymatous cells containing yellow to dark brown tannins; the seed consists of an outer viscid zone delimited towards inside by a ring of tissues made of several layers of isodiametric cells mostly containing brown pigment in outer 2 or 3 layers and a ring of vascular bundles. Inner to this is a zone comprising of radially elongated, compactly arranged thin-walled cells rich in starch towords the center; centre of the seed occupied by a mass of uniform, isodiametric, parenchymatous embryonic cells.

Powder - Cellular debris and stone cells with circular striations 20 to 35 μ are seen, groups of cells containing tannins also present.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 1 percent, Appendix 2.2.2.
Total ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 17 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 5 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on silica gel 'G' plate (0.2 mm thick) using toluene: ethylacetate: acetic acid (5:4.5:0.5), shows under U.V. (366nm) spots at Rf 0.23 (Greyish Black), 0.57, 0.72 (Pink), 0.81 (Blue), 0.89 (Pink). On spraying with anisaldehyde-sulphuric acid reagent and on heating the plate for ten minutes at 110^0 C spots appear at Rf 0.22, 0.37 (Blue), 0.52 (Purple), 0.57 (Greyish Black), 0.67, 0.72 (Dark Blue), 0.75 (Purple).

PROPERTIES AND ACTION -

Rasa	:	Kaṣāya, Tikta, Madhura
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Śīta
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Vātahara, Viṣaghna, Vṛṣya, Rasāyana, Grāhī, Vraṇaropaṇa, Rakṣoghna, Śramahara, Grahanāśana,

IMPORTANT FORMULATIONS – No formulation

THERAPEUTIC USES – Raktapitta; Vrana; Arśa; Vātavikāra; Aśmarī; Mūtraśarkarā; Mūtrakṛcchra; Mūtraghāta; Mūtrarujā; Garbhasrāva; Kaṇṭharoga; Vātarakta; Sopharoga; Āmātisāra; Netraroga; Viṣamjvara; Slīpada

DOSE - 10 - 20 ml.

VANYAJĪRAKA (Fruit)

Vanyajīraka consists of dried fruit of *Centratherum anthelminticum* (L.) Kuntze (Fam. Asteraceae), an annual, robust, erect herb, found throughout India upto 1850 m in Himalaya and Khasi hills and often cultivated.

SYNONYMS -

Sansk.	:	Āraṇyajīrakah, Bṛhatpālī, Somarājī, Vanajīrakah
Beng.	:	Somaraaj
Eng.	:	Purple Flebane, Worm Seed Fleabane
Guj.	:	Kaaleejeeree, Kadavijeeree
Hindi	:	Kaalijeeree, Karajiri, Soharaai
Kan.	:	Kaadujeerage, Kaarijirige
Mal.	:	Krimishatru, Kattujirakam
Mar.	:	Kadujire
Tam.	:	Kaattuchirakam, Chittilai
Tel.	:	Adavijilakaroa, Garetikamma

DESCRIPTION -

a) Macroscopic:

The fruits are cypsela, indehiscent, 3 to 5 mm long and 1 to 2 mm in diameter; tapering towards base, pappus present over flattened upper end; surface exhibits about 20 longitudinal ridges, hairy, blackish-brown to black in colour; taste, bitter and odour indistinct.

b) Microscopic:

T.S. of fruit exhibits about 20 ridges and furrows; the epidermis is single layered, covered externally with thick cuticle; trichomes are of two types – covering and glandular; covering trichomes unicellular, elongated with tapering ends, present mostly on the ridges; glandular hairs, sessile with unicellular heads are seen in the furrows; rest of the pericarp consists of thin walled parenchymatous cells; vascular bundles are present below the ridges, followed by discontinuous and laterally extending arches of thick walled and lignified sclerenchymatous tissues; testa is single layered followed by thin walled parenchymatous cells of the cotyledon, most of them consisting of aleurone grains and a few exhibit oil globules.

Powder - The powder exhibits fragments of fibres, fibre sclereids, scalariform vascular elements, thin walled parenchymatous cells with aleurone grains and oil globules, covering as well as glandular trichomes thin walled radially elongated cells of pappus.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2.0 percent, Appendix 2.2.2.
Total ash	-	Not more than 7.5 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 4.5 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 20 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 14 percent, Appendix 2.2.7.

T.L.C. -

T.L.C. of petroleum ether extract on Silica Gel G 60 precoated plate (Merck) using Petroleum ether (60-80^{0}C); Diethyl ether: Acetic acid (70:32:2), shows under UV (366 nm) one spot at Rf 0.48 (light blue); on exposure to iodine vapours 4 spots appear at Rf 0.48 (dark orange), 0.57, 0.68 and 0.84 (all faint orange); after spraying with 5% ethanolic sulphuric acid and heating the plate at 110^{0}C for 30 minutes, 4 spots appear at Rf 0.48 (black) 0.57, 0.68 and 0.84 (all faint brown).

CONSTITUENTS - Sterols, avenasterol and vernosterol, a bitter principle, essential oil, resins and fixed oil consisting of myristic, palmitic, stearic, oleic, linoleic and vernolic acids.

PROPERTIES AND ACTION -

Rasa	:	Tikta, Kaṭu, Kaṣāya
Guṇa	:	Laghu, Tīkṣṇa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Vātahara, Kaphahara, Jantunāśaka, Mūtrala, Dīpana, Stambhana, Netrya

IMPORTANT FORMULATIONS - Madhusnuhī Rasāyana

THERAPEUTIC USES – Śvāsa; Kāsa; Hikkā; Jvara; Kuṣṭha; Vraṇa; Kaṇḍū; Svitrakuṣṭha; Kṛmi; Śopha; Śūla; Gulma; Mūtraghāta; Raktavikāra.

DOSE - 1-3 g.

VIDĀRĪKANDA (Tuber)

Vidārīkanda is the dried tuber of *Pueraria tuberosa* DC. (Fam. Fabaceae), a large, perennial climber with tuberous roots, upto 60 cm long and 30 cm thick, even weighing upto 35 kg, from about 5 or 10 kg; they are distributed nearly throughout India.

SYNONYMS –

Sansk.	:	Vidārī, Ikṣugandhā
Beng.	:	Shimiya, Shimiabatraji, Bhui Kumdo
Eng.	:	Indian Kudju
Guj.	:	Khakharvel, Vidaree, Vidareekand
Hindi	:	VidareeKand, Bilaikand, Sural, Patal Kand
Mar.	:	Bendriya bel, Bindree, Vendrichavel
Punj.	:	Siali
Tam.	:	Nilpushni Kezhugu
Tel.	:	Nelagummudu

DESCRIPTION –

a) Macroscopic :

Dried cut pieces of tuber, 3 to 5 cm large, 2 to 4 cm broad and fibrous; outer surface where present, light brown in colour; outer surface, where epidermis is present, is light brown with transverse warts and ridges; cut surface creamy; fleshy, transverse small warts and ridges are found on the surface, texture smooth; sweet in taste, no particular smell (cut pieces of the tubers of *Ipomoea digitata,* substitute of *P. tuberosa,* are cubical, smooth, light cream in colour and can easily be distinguished).

b) Microscopic :

T.S. of whole root tuber is slightly wavy in outline, epidermis not discernible; 3 to 4 layers of cork cells, followed by 5 to7 layers of parenchymatous cells present; cork cambium–brown in colour and 2 or 3 cells thick, endodermis well developed; pericycle fibrous followed by 2 layers of stone cells filled with sandy crystals; phloem consist of sieve tubes, companion cells, patches of bast fibres and phloem parenchyma; xylem pentarch in young root, consist of vessels with scalariform cross perforation, tracheids, xylem fibres and parenchyma; medullary rays broad and parenchymatous. The medullary rays and phloem cells are filled with starch grains which are polygonal, 2 to 5 μm in diameter, simple or two to many-compound, hilum usually indistinct, occasionally a central cleft, lamellae indistinct. In macerated preparation crystal fibres are multicellular, articulated, each cell carrying a crystal of calcium oxalate, some of the articulated fibres are swollen in the middle like a bulb pipette.

Powder – Greyish-brown, no characteristic odour, bitter in taste; shows parenchyma filled with starch, septate fibres in the form of crystals fibres as well as shaped bulb like

pipette; vessels with simple and scalariform cross perforation plates, stone cells, and starch as described under microscopy; powder treated with 1N NaOH in methanol and nitro-cellulose in amylacetate gives light green fluorescence under UV 254 nm.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Moisture content	-	Not more than 10 percent, Appendix 2.2.9.
Total ash	-	Not more than 11 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 13 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 22 percent, Appendix 2.2.7.
Starch	-	Not less than 14 percent, Appendix 2.2.13.

T.L.C. –

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate : methanol (80 : 20 : 0.5) shows under UV (366 nm) blue fluorescent zones at Rf. 0.19, 0.25, 0.34, 0.38. On spraying with anisaldehyde-sulphuric acid reagent and heating for ten minutes at 120^0C, spots appear at Rf. 0.19 (green), 0.34 (Magenta), 0.45 (green), 0.48 (blue), 0.62 (blue), 0.67 (red) and 0.92 (dark pink).

CONSTITUENTS – Pterocarpan-tuberosin, pterocarpanone-hydroxytuberosone, two pterocarpenes-anhydrotuberosin and 3-O-methylanhydro-tuberosin, and a coumestan tuberostan. An isoflavone-puerarone and a coumestan-puerarostan.

PROPERTIES AND ACTION –

Rasa	:	Madhura
Guṇa	:	Guru, Snigdha
Vīrya	:	Śīta
Vipāka	:	Madhura
Karma	:	Vātahara, Pittahara, Hṛdya, Bṛhaṇa, Vṛṣya, Mūtral, Balya, Stanyadu, Svarya, Vājīkaraṇa, Varṇya, Jīvanīya, Rasāyanī

IMPORTANT FORMULATIONS - Marmagutikā, Nityānanda Rasa, Sārasvatāriṣṭa, Śatāvaryādi Ghṛta, Aśvagandhādyariṣṭa, Mahāviṣagarbha Taila

THERAPEUTIC USES – Raktapitta; Śukrakṣaya; Raktadoṣa; Dāha; Kṣaya; Kāsa; Śūla; Mūtrakṛcchra; Visarpa; Viṣamajvara

DOSE - 3-6 g.

VIRALĀ (Stem Bark)

Viralā consists of dried stem bark of *Diospyros exsculpta* Buch. - Ham. syn. *D. tomentosa* Roxb. (Fam. Ebenaceae), a small or occasionally large tree found distributed in sub-Himalyan tract, Rajasthan, Madhya Pradesh, Bihar and Orissa.

SYNONYMS –

Sansk.	:	Tindukah, Tinduki
Beng.	:	Kend, Gaab
Eng.	:	Gaub Persimon, Indian Persimon
Guj.	:	Timbaru
Hindi	:	Gaabh, Tendu, Kendu
Kan.	:	Holitupare, Kushaarta
Mal.	:	Panchchi, Pananchi, Panachcha
Mar.	:	Temburani
Punj.	:	Tendu
Tam.	:	Panichchai, Tumbika
Tel.	:	Tinduki, Tumikechettu

DESCRIPTION -

a) Macroscopic :

Bark available in pieces of variable lengths, usually 1 to 1.5cm thick, light brown in colour, surface uneven with exfoliating rectangular scales, slightly curved, outer surface ash coloured, inner surface brownish, striate but smooth; fracture, granular; odour, characteristic, taste, sweet and astringent.

b) Microscopic :

T.S. shows a thick portion of rhytidome; cork consists of 5 or 6 layers of tangentially elongated rectangular, dorsoventrally compressed thin walled cells, a few strongly liginified and filled with reddish brown masses; cortex consists of 4 to 6 layers of thin walled parenchymatous cells, many containing prismatic calcium oxalate crystals, measuring 20 to 70 μ and starch grains about 6 to 10 μ; tanniniferous cells present; phloem traversed by uniseriate medullary rays; sieve tube associated with companion cells; phloem parenchyma consists of cells with thin, dark reddish brown walls many of the cells contain calcium oxalate crystals mostly prismatic type but a few clusters also observed; patches of fibres present with a fairly large lumen; sclereids occur in groups of 8 to 10, oval to elongate in shape, measuring 45 to 175 μ in length with thick striated walls, the lumen is very small often reduced to a line; pit canals present.

Powder -Ash colour, coarse; fragments of thick-walled cork cells with dense brown content; sclereids elongated and oval shaped showing pit canals with narrow lumen; calcium oxalate crystal in the form of prisms and clusters; a few yellowish tannin cells.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 15 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 5 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 1.5 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 2 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on precoated silica gel 'G' (E . Merck grade) plate using Chloroform : Acetone (98 : 2) shows under UV (366 nm) two fluorescent zones at Rf. 0.88 (blue) and 0.93 (green). On spraying with Anisaldehyde - Sulphuric acid reagent and heating the plate for five minutes at 105°C six spots appear at Rf. 0.32 (pink), 0.49 (pink), 0.56 (grey), 0.71(dark pink), 0.88 (pink) and 0.93 (pink).

CONSTITUENTS – Triterpenoids (Lupeol, Betulin, Betulinic acid, Oleanolic acid) and Sterol.

PROPERTIES AND ACTION –

Rasa	:	Madhura, Kaṣāya, Tikta
Guṇa	:	Guru, Snigdha
Vīrya	:	Uṣṇa
Vipāka	:	Madhura
Karma	:	Pittahara, Kaphahara, Grāhī, Jihvājāḍyakara, Vraṇaropaṇa, Savarṇakara

IMPORTANT FORMULATIONS – Nayagrodhādi Kvātha Cūrṇa

THERAPEUTIC USES – Udarda; Prameha; Raktapitta; Aruci; Atisāra; Vibandha; Pittaroga; Karṇasrāva; Vraṇa; Agnidagdha Vraṇa; Atidagdha Vraṇa; Bhagna; Tṛṣa; Daha; Yoniroga; Medoroga

DOSE – 5 - 10 g.

VIŚĀLĀ (Root)

Viśālā consists of dried root of *Trichosanthes bracteata* (Lam.) Voigt (Fam. Cucurbitaceae), a large perennial, upto 9 m in height, dioecious, branched, woody tendril climber, commonly growing in moist thickets from the Himalayas to the south, ascending upto an altitude of 2,500 m.

SYNONYMS -

Sansk.	:	Mahākāla, Gavādanī
Beng.	:	Maakaal
Guj.	:	Raataan Indraayan
Hindi	:	Maakaal, Mahar Kaundala, Lal Indraayan, Mahakaal
Kan.	:	Avagudehannu
Mal.	:	Kaaḳkattonti
Mar.	:	Kaundal, Kavandal
Ori.	:	Mahaakaal
Punj.	:	Kaehree, Aankorattai
Tam.	:	Korattai
Tel.	:	Erraa Chedupucca

DESCRIPTION-

a) Macroscopic :

Well developed fibrous roots, pale yellow to creamish-brown, available in pieces, 4 to 15 cm long, 0.3 to 2 cm thick; cylindrical and slightly curved; deeply grooved longitudinally; external surface, dusty, shrivelled, rough due to exfoliating cork, longitudinal fissures and root scars; fracture, fibrous; taste, bitter and astringent.

b) Microscopic :

Root- Root shows multi-layered cork, outer layers exfoliating, inner of rectangular cells, cortex narrow with a row of sclereids externally and shows presence of patches of fibres; phloem, narrow of small polygonal cells; bulk of root composed of large rounded vessels arranged in radiating rows interspersed by dominant strands of multiseriate medullary rays filled completely with starch grains; pith absent.

Powder- Deep creamish-brown; abundant sclereids of various shapes; mostly in groups, isodiametric sclereids 20 to 30 μ, thick-walled with round lumen, strongly striated; fibres, singly and in groups; cork cells; well developed reticulately thickened and border-pitted vessels; starch grains, mostly simple.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 14 percent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 3 percent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 1 percent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 4 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (9:1) shows spots at Rf 0.16, 0.42, 0.63, 0.69, 0.77 and 0.83 (all purple) on spraying with vanillin-sulphuric acid reagent and heating the plate at 105 °C for about ten minutes.

CONSTITUENTS - Saponins, trichosanthin.

PROPERTIES AND ACTION –

Rasa	:	Kaṭu, Tikta
Guṇa	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Pittahara, Kaphahara, Prasūtikṛta, Vāmaka, Viṣaghna

IMPORTANT FORMULATIONS – Pānīya Kalyaṇaka Ghṛta, Viśālādi Cūrṇa,

THERAPEUTIC USES – Jvara; Āmadoṣa; Prameha; Antarvṛddhi; Kuṣṭha; Stanapiḍā; Kāmalā; Slīpada; Vṛddhi; Plīhodara; Svāsa; Kāsa; Gulma; Gaṇḍamaya; Granthi; Vraṇa; Mūḍhagarbha

DOSE - 1 -3 g.

VYĀGHRANAKHA (Fruit)

Vyāghranakha consists of mature fruit of *Capparis sepiaria* Linn. syn. *C. zeylanica* Linn. f. (Fam. Capparidaceae), a perennial climbing shrub with hooked stipular spines, distributed throughout India, in the plains.

SYNONYMS -

Sansk.	:	Ahiṁsrā, Vyāghrāyudha
Hindi	:	Kareruaa, Baghanai, Kanthari
Kan.	:	Mulhukallari, Kathiramullu
Mar.	:	Wag, Wagati, Vyaghranakh, Ardanti
Tam.	:	Atandai, Marandan, Thoratti, Kattukathiri
Tel.	:	Nalla uppi

DESCRIPTION –

a) Macroscopic -

Subglobose, many seeded berry; green when young, red brown when ripe, 3 to 4 cm in diameter, on a greatly thickened stalk; seeds are trigonal, 4 to 5 mm long, 3 to 4 mm wide, 2 to 3 mm thick with white thin covering; seed coat hard.

b) Microscopic –

Fruit – Epicarp shows thick cuticle covering the single layered epidermal cells followed by thick walled parenchyma, filled with yellow contents, mesocarp composed of thick walled parenchyma, having groups of pitted sclereids at places along with some vascular strands, endocarp contains collapsed cells, abundant oil globules present.

Seed – T.S. shows testa having thick cuticle; with a single layered, laterally elongated, loosely packed, pigmented, epidermal cells, followed by 8 to 10 layers of compactly arranged circular pitted stone cells with very thick wall and narrow lumen; tegmen consists of collapsed cells; endosperm parenchyma filled with oil and aleurone grains, oil cells with yellowish oil at some places.

Powder – Reddish brown, sticky, shows sclereids, parenchymatous cells filled with oil and cells filled with aleurone grains.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 percent, Appendix 2.2.2.
Total ash	-	Not more than 8 percent, Appendix 2.2.3.
Acid insoluble ash	-	Not more than 1 percent, Appendix 2.2.4.
Alcohol soluble extractive	-	Not less than 30 percent, Appendix 2.2.6.
Water soluble extractive	-	Not less than 26 percent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on silica gel 'G' (0.2 mm thick ness) plate using toluene : methanol (6:3) shows nine bands at Rf. 0.12, 0.23, 0.32, 0.53, 0.56, 0.61, 0.64, 0.71, 0.86 (all brown), on spraying with 5% Ethanolic-sulphuric acid reagent and heating the plate for ten minutes at 105^0 C.

CONSTITUENTS – Thioglucoside glucocapparin, n-triacontane, α-amyrin and fixed oil.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Kaṣāya, Madhura
Guṇa : Rūkṣa, Laghu
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Kaphahara, Varṇya, Viṣaghna, Kaṇḍughna

IMPORTANT FORMULATIONS - Balā Taila

THERAPEUTIC USES – Viṣavikāra; Sarpaviṣa; Kaṇḍu; Pīdaka; Koṭha; Bhrama; Pravāhikā; Raktapradara; Kuṣṭha; Vraṇa; Jvara; Graharoga; Vātavikāra; Mukhadurgandha

DOSE - 2-6 g.

APPENDICES

APPENDIX-I

1.1. APPARATUS FOR TESTS AND ASSAYS

1.1.1 Nessler Cylinders

Nessler cylinders which are used for comparative tests are matched tubes of clear colourless glass with a uniform internal diameter and flat, transparent base. They comply with Indian Standard 4161-1967. They are of transparent glass with a nominal capacity of 50 ml. The overall height is about 150 mm, the external height to the 50 ml mark 110 to 124 mm, the thickness of the wall 1.0 to 1.5 mm and the thickness of the base 1.5 to 3.0 mm. The external height to the 50 ml mark of the cylinder used for a test must not vary by more than 1 mm.

1.1.2 Sieves

Sieves for pharmacopoeial testing are constructed from wire cloth with square meshes, woven from wire of brass, bronze, stainless steel or any other suitable material. The wires should be of uniform circular cross-section and should not be coated or plated. There must be no reaction between the material of the sieve and the substance being sifted.

Sieves conform to the following specifications –

Approximate sieve number*	Nominal mesh aperture size mm	Tolerance average aperture size ± mm
4	4.0	0.13
6	2.8	0.09
8	2.0	0.07
10	1.7	0.06
12	1.4	0.05
16	1.0	0.03
--	µm	±µm
22	710	25
25	600	21
30	500	18
36	425	15
44	355	13
60	250	13(9.9) **
85	180	11(7.6)
100	150	9.4(6.6)
120	125	8.1(5.8)
150	106	7.4(5.2)
170	90	6.6(4.6)
200	75	6.1(4.1)
240	63	5.3(3.7)
300	53	4.8(3.4)
350	45	4.8(3.1)

* Sieve number is the number of meshes in a length of 2.24 cm. In each transverse direction parallel to the wires.
** Figures in brackets refer to close tolerances, those without brackets relate to full tolerances.

1.1.3 Thermometers

Unless otherwise specified, thermometers suitable for pharmacopoeial tests conform to Indian Standard 4825-1968 and are standardised in accordance with the `Indian Standard Method of Calibrating Liquid-in-Glass Thermometers', 6274-1971.

The thermometers are of the mercury-in-glass type and are filled with a dried inert gas, preferably nitrogen. They may be standardised for total immersion or for partial immersion. Each thermometer should be employed according to the condition of immersion under which it was standardised. In the selection of the theremometer it is essential to consider the conditions under which it is to be used.

1.1.4 Volumetric Glassware

Volumetric apparatus is normally calibrated at 27°. However, the temperature generally specified for measurements of volume in the analytical operations of the pharmacopoeia, unless otherwise stated, is 25°. The discrepancy is inconsequential as long as the room temperature in the laboratory is reasonably constant and is around 27°.

Pharmacopoeial assays involving volumetric measurements rcquirc thc use of accurately calibrated glassware. Volumetirc apparatus must be suitably designed to assure accuracy. The design, construction and capacity of volumetric glassware should be in accordance with those laid down by the Indian Standards Institution. The tolerances on capacity for volumetric flasks, pipettes and burettes, as laid down in the relevant Indian Standards, are set out in the following table.

Volumetric Flask : I.S. 915-1975

Nominal capacity, ml	5	10	25	50	100	250	500	1000
Tolerance, ± ml	0.02	0.02	0.03	0.04	0.06	0.1	0.15	0.2

One Mark Pipettes : I.S. 1117 -1975

Nominal capacity, ml	1	2	5	10	20	25	50	100
Tolerance, ± ml	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.06

Graduated Pipettes : I.S. 4162-1967

Nominal capacity, ml	1	2	5	10	25
Subdivision, ml	0.01	0.02	0.05	0.10	0.2
Tolerance, ± ml	0.006	0.01	0.03	0.05	0.1

Burettes : I.S. 1997 – 1967

Nominal capacity, ml	10	25	50	10
Subdivision, ml	0.05	0.05	0.1	0.1
Tolerance, ± ml	0.01	0.03	0.05	0.1

1.1.5 Weights and Balances

Pharmacopoeial tests and assays require the use of analytical balances that vary in capacity, sensitivity and reproducibility. The accuracy needed for a weighing should dictate the type of balance. Where substances are to be "accurately weighed", the weighing is to be performed so as to limit the error to

not more than 0.1 per cent. For example, a quantity of 50 mg is to be weighed to the nearest 0.05 mg; a quantity of 0.1 g is to be weighed to the nearest 0.1 mg; and quantity of 10 g is to be weighed to the nearest 10 mg. A balance should be chosen such that the value of three times the standard deviation of the reproducibility of the balance, divided by the amount to be weighed, does not exceed 0.001.

APPENDIX-2

2.1 TESTING OF DRUGS

2.1.1.-Systematic Study of Crude Drugs

In the Indian Systems of Medicine comprising of Ayurveda, Unani and Siddha, drugs of plant, animal and mineral origin, are used in their natural or so called "Crude" forms singly or in their mixture or in combination, to make a compound preparation of formulation. Nearly 90 per cent of the Crude Drugs are obtained from the plant sources while about 10 per cent of the drugs are derived from animal and mineral sources. The drugs of plant origin especially of herbaceous nature are frequently used as whole plant; otherwise their parts such as Root, Stem, Leaf, Flower, Seed, Fruit modifications of Stem and Root, Bark of a Stem or Root, Wood, and their Exudates or Gums etc. constitute single drugs in the Indian Systems of Medicine. These vegetable drugs are either used in dried forms or some times as whole fresh or their juice. The study of these crude drugs made with a view to recognise them is called Pharmacognosy (Pharmakon = Drug; Gignosco = to acquire knowledge of), meaning the knowledge or science of Drugs. In Pharmacognosy a complete and systematic study of a drug is done, which comprises of (I) origin, common names, scientific nomenclature and family, (ii) geographical source (and history), (iii) cultivation, collection, preservation and storage, (iv) Macroscopical, Microscopical and sensory (organoleptic) characters, (v) Chemical composition wherever possible, (vi) Identity, Purity, Strength and Assay, (vii) substitute and adulterants etc. Such systematic study of a drug as complete as possible, is claimed to be the scientific or pharmacognositical evaluation.

As mentioned above each crude drug derived from the vegetable kingdom consists of a definite part of plant e.g., leaf, stem, fruit, seed, wood, bark, root etc. Morphological or Macroscopical details of the respective part are given by observing it with a naked eye or with the aid of a magnifying lens. In this description general conditions of the drug, size, shape, outer surface, inner surface etc are referred to. Drugs can be identified with the aid of the above, only if they are available in entire condition. Sensory or Organoleptic characters describe colour, odour, taste, consistency etc. The microscopic examination of different parts of the drug provides several diagnostic characters. In case of leaves, surface preparation and transverse section, preferably through midrib, are made and nature of epidermis, trichomes, stomata, arrangement of tissues like palisade cells, vascular bundles and nature of cell content are studied. Similarly in case of bark, root, rhizome and wood, transverse and longitudinal sections are made and from characteristic arrangements of tissues of each drug and from diagnostic elements like stone cells, fibres, vessels etc. as also from the study of the cell deposits like crystals, starch etc., the drugs are identified. The studies of diagnostic elements are helpful especially when the drugs are in powdered condition and give clues in the identification of drugs. Linear measurements and other methods of quantitative microscopy give further aid in the identification of the drugs. The sections or the powdered drugs samples are cleared by clearing agents, mostly chloral-hydrate solution, before mounting on the slide.

The basic chemical nature of cell-wall of almost all the plants is cellulosic, However, lignin, suberin, cutin or mucilage are deposited on the cellulose. Cellulose gives blue colour with chlorzinc-iodine solution or with cuoxam. (Copper-oxide-ammonia) reagent. Lignin present in the middle lamella and secondary cell-well of many vessels, fibres and sclerieds gives red colour with phloroglucinol and concentrated hydrochloric acid. Suberin is present in cork and endodermis cells while cutin in the cuticle of leaf. Both are fatty in nature and when heated with Sudan Red-III give red colour.

Mucilage gives red colour with ruthenium red. The chemical constituents present in the drugs can be identified by chemical or microchemical tests e.g., Rhubarb rhizomes give with 5% potassium hydroxide red colour because of anthraquinone derivatives, strychnine present in Nux-vomica gives purplish-red colour with ammonium vanadate and concentrated sulphuric acid.

Paper and Thin Layer Chromotography are now utilised in identification of drugs, their adulterant and their chemical constituents. Methods have been developed for quantitative estimation of the chemical constituents from Paper and Thin Layer Chromatography (TLC).

2.1.2. –Microscopical Methods of Examining Crude Vegetable Drugs

Methods of preparing specimens of crude materials of vegetable drugs for microscopical studies vary, depending on the morphological groups of drugs to be examined and also on the natures of the material i.e., entire, cut or powdered.

I. LEAVES, HERBS AND FLOWERS

For examining leaves, herbs and flowers (entire or cut) under microscope, following methods are employed for clarification :

A. Entire and cut materials

(i) ***Entire materials*** – When examining entire leaves, herbs and flowers, take pieces of leaf (margin and vein of leaves only), herbs (only leaf) and flowers (only calyx and corolla) in test tube. Add a solution of caustic alkali or nitric acid to the test tube and boil for 1-2 minutes, pour the contents into a porcelain dish, drain off the liquid, wash the material with water and leave for sometimes. Remove the pieces of the material from the water with a spatula and put on the slide, add a few drops of the solution of *glycerol or chloral hydrate.* Crush the material with scalpel and cover with cover slip before examining.

(ii) ***Cut materials*** –For examining cut leaves, herbs and flowers, take several pieces in a test tube and employ the same methods as described for entire materials.

Other methods employed for clarification of the material (leaf and stem) are described below :-

(a) Leaf –Boil pieces of leaves in a test tube with chloral hydrate for several minutes until completely clarified and then examine them in chloral hydrate solution. After clarification, leaf pieces are divided into two parts with the help of a scalpel or needle, and carefully turn one part. The leaf can be examined from both the dorsal and ventral surfaces.

(b) Stem –To examine stem material (without leaf) boil pieces in a solution of *caustic alkali* or in *nitric acid.* Remove the epidermis with a scalpel or a needle for examining the surface. For examining pressed specimen of stem, take separate tissue and press them with a scalpel on the slide.

B. Powder

For examining characters of the powder take sufficient amount of powder in Chloral-hydrate solution on a slide and cover it with a cover slip, warm over a low flame for a short time.

II. FRUITS AND SEEDS

A. Entire materials

For microscopical examination of fruit and seed take the specimens or outer coat of seed or fruit and examine as described below :

(i) ***Outer Coat*** –For examining the outer coat boil 3 or 4 seeds or fruits in caustic alkali solution in a test tube for 1-2 minutes (outer coat specimens with intensive pigmentation are boiled for longer period). After boiling, place the pieces on slide, remove the layers of the coat and examine them after mounting in glycerol solution.

(ii) ***Section*** –If fruits or seeds are too hard to cut then boil them for 15-30 minutes or more depending on their hardness or keep them in moistening chamber or absorb in water and chloroform solution or soften them with stem and then cut the specimen for examining purpose. For cutting small, flat seeds (which are difficult to hold) place them in a pith or potato slit for section cutting. Small, round or smooth seeds cannot be cut into section in the pith, then in such cases, they may be embedded in paraffin wax blocks for section cutting. For this, a block of paraffin (0.6 × 0.5 × 1.5 cms. in size) is made and the seed is embedded in the block by making a cavity or a pit in the block with a hot teasing needle. Cut the section with a sharp razor (through the object) together with the paraffin, place them on to the slide, remove paraffin with a needle or wash it with xylene and examine the section in *chloral-hydrate solution.*

B. Powder

For examining the structure of the cells of the seed coat and the cells of the embryo take a small amount of powder of the material on a slide in glycerol and cover it with a cover slip and examine.

1. ***Starch*** – For examining the presence of starch in the seed, take two specimens, one in iodine solution and the other in water. With iodine solution starch turns blue. Shape and the structure of starch grains can be seen in water and their size is measured.

When examining objects containing starch, prepare specimen by slightly warming in chloral-hydrate solution.

2. ***Fixed Oil*** – For examining the presence of fixed oil, prepare a specimen in a solution of Sudan III droplets of fixed oil are coloured orange pink. When examining objects containing small amount of fixed oil, prepare a specimen by slightly warming in chloral-hydrate solution, and when examining objects containing large amount of fixed oil, then the powder is de-fatted and clarified as follows :

Place 0.5 g. of the powder in a porcelain dish, add 5-10 ml. of dilute nitric acid and boil for 1 minute, then strain off the liquid through a cloth, wash the residue with hot water and return it to the porcelain dish with a spatula, boil it with 5-10 ml of *caustic alkali solution* for 1 minute and again strain it through the cloth and wash with water. Examine the residue in a glycerol solution, after the treatment the structure of the layers of the coat and their cells can be seen very distinctly.

3. ***Mucilage*** –Prepare a specimen in Ruthenium Red and examine it under a low power microscope or under dissecting microscope. Mucilage appears as pinkish-red or yellow coloured masses.

III. BARKS

A. Entire material

Prepare transverse or longitudinal section of bark. To soften bark break it into pieces of about 1-2 cm long and 0.5-1 cm wide and boil with in a test tube for 1-3 minutes. Soft pieces are then straightened with a scalpel so as to have a exact transverse or longitudinal direction. Cut the section with razor, moisten the surface of the bark with glycerol solution. Remove the sections with a brush and place them on the slide. Thin pieces of the bark are cut by placing them in the pith (potato or carrot). The sections are treated with various reagents before examining.

1. ***Lignified elements*** –For testing lignin add several drops of *phloroglucinol* and a drop of *concentrated hydrochloric acid* to the section on a slide then draw off the liquid, immerse the section in *chloral hydrate solution* and cover with a cover slip (the specimen should not be heated); the lignified elements are coloured crimson. *Phloroglucinol* can be substituted by *saffranine*, and the lignified elements are coloured pink. The excessive stain can be washed out with acidified alcohol.

2. ***Starch*** – Starch is detected by treating with iodine solution.

3. *Tannin* –Tannin is detected by treating with *ferric ammonium sulphate solution* (blue-black or green black colour shows the presence of Tannin) or with *potassium-bi-chromate solution* (brown colour indicates the presence of Tannin).

4. *Anthraquinone derivatives* –Anthraquinone derivatives are detected by treating with alkali solution (blood-red colour shows the presence of anthraquinone derivatives).

B. Cut materials

Prepare small pieces or scraping of bark and boil them for 3-5 minutes in a solution of *caustic alkali* or *potassium hydroxide* or in *nitric acid solution* and then mount in *glycerin* for examination on a slide covered with a cover slip.

C. Powder

Prepare specimen for examination by placing a little amount of powder on a slide, add 1-2 drops of *phloroglucinol* and a drop of concentrated *hydrochloric acid*, cover it with a cover slip, draw off the liquid from one side of the slide with filter paper, and then apply 1-2 drops of *chloral-hydrate solution* from the other side of the slide, lignified elements are stained crimson-red. Specimen may also be prepared with *caustic alkali or ferric ammonium sulphate* for this purpose.

IV. ROOTS AND RHIZOMES

A. Entire materials

For anatomical examination of entire roots and rhizomes cut transverse and longitudinal sections. For this, soften small pieces of roots without heating in *glycerol solution* for 1-3 days, depending on their hardness. The softened roots are straightened with the help of a scalpel in the right direction and then cut a section with the razor. First, cut thicker entire slices and then make thin, smaller sections. Stain the entire slices with *phloroglucinol* and *concentrated hydrochloric acid* or with *safranin* examine the specimen under a dissecting microscope. For micro-chemical test the small and thin sections are examined under microscope, as follows :

1. *Starch* – Starch is detected with iodine solution. For this, prepare specimen with water to measure the granule of starch with an occular micrometer.

2. *Inulin* –Inulin is detected with Molish's reagent. For this place a little powder on a slide and apply 1-2 drops of naphthol and a drop of concentrated sulphuric acid, if inulin is present, the powder will appear reddish-violet coloured. Starch also gives this test, so the test for inulin can be done in the absence of starch.

3. *Lignified elements* –Lignified elements (fibrovascular bundles, mechanical tissue etc.) are detected with *phloroglucinol* and concentrated *hydrochloric acid* or *safranine solution* as mentioned above for barks.

4. *Fixed oil* –For fixed oil detection use Sudan IV, as mentioned above for fruits and seeds.

If required for tannin, anthraquinone derivatives, test as mentioned above.

B. Cut material

Make small pieces or scrapping of roots or rhizomes and boil them for 3-5 minutes in *caustic alkali,* or in *nitric acid* and then make pressed specimen and immerse them in *glycerol.*

Microchemical tests can be performed with scrapings for various chemicals as mentioned above.

C. Powder

Prepare several specimens of the powder on slides in *chloral hydrate solution* and perform the above mentioned standard tests for detection of starch, fixed oil, inulin, lignified elements, anthraquinone derivatives, tannins, mucilage, etc.

2.1.3. –Types of Stomata

There are several types of stomata, distinguished by the form and arrangement of the surrounding cells. The following descriptions apply to mature stomata.

1. Anomocytic (irregular-celled) –Previously known as ranunculaceous. The stoma is surrounded by a varying number of cells in no way differing form those of the epidermis generally.

2. Anisocytic (unequal-celled) –Previously known as cruciferous or solanaceous. The stoma is usually surrounded by three subsidiary cells, of which one is markedly smaller than the others.

3. Diacytic (cross-celled) –previously known as caryophyllaceous. The stoma is accompanied by two subsidiary cells whose common wall is at right angles to the guard cells.

4. Paracytic (parallel-celled) –Previously known as rubiaceous. The stoma has one each side one or more subsidiary cells parallel to the long axis of the pore and guard cells.

Fig. 1 Various types of stomata

2.1.4 – Determination of Stomatal Index

The stomatal index is the percentage of the number of stomata formed by the total number of epidermal cells, including the stomata, each stoma being counted as one cell.

Place leaf fragments of about 5 × 5 mm in size in a test tube containing about 5 ml of *chloral hydrate solution* and heat in a boiling water-bath for about 15 minutes or until the fragments become transparent. Transfer a fragment to a microscopic slide and prepare the mount, the lower epidermis uppermost, in chloral hydrate solution and put a small drop of glycerol-ethanol solution on one side of the cover-glass to prevent the preparation from drying. Examine with a 40x objective and a 6x eye piece, to which a microscopical drawing apparatus is attached. Mark on the drawing paper a cross (x) for each epidermal cell and a circle (o) for each stoma. Calculate the result as follows :

$$\text{Stomatal index} = \frac{S \times 100}{E + S}$$

Where S = the number of stomata in a given area of leaf ; and
E = the number of epidermal cells (including trichomes) in the same area of leaf.

For each sample of leaf make not fewer than ten determinations and calculate the average index.

2.1.5. – Determination of Palisade Ratio

Palisade ratio is the average number of palisade cells under one epidermal cell.

Place leaf fragments of about 5 × 5 mm in size in a test-tube containing about 5 ml of chloral hydrate solution and heat in a boiling water-bath for about 15 minutes or until the fragments become transparent. Transfer a fragment to a microscopical slide and prepare the mount of the upper epidermis in chloral hydrate solution and put a small drop of glycerol solution on one side of the cover-glass to prevent the preparation from drying. Examine with a 40x objective and a 6x eye piece, to which a microscopical drawing apparatus is attached. Trace four adjacent epidermal cells on paper; focus gently downward to bring the palisade into view and trace sufficient palisade cells to cover the area of the outlines of the four epidermal cells. Count the palisade cells under the four epidermal cells. Where a cell is intersected, include it in the count only when more than half of it is within the area of the epidermal cells. Calculate the average number of palisade cells beneath one epidermal cell, dividing the count by 4; this is the "Palisade ratio" (See Fig. 2).

For each sample of leaf make not fewer than ten determinations and calculate the average number.

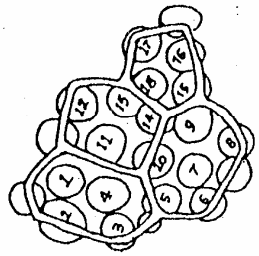

Fig. 2 Palisade ratio $\frac{18.4}{4} = 4.5$

2.1.6 –Determination of Vein-Islet Number

The mesophyll of a leaf is divided into small portions of photosynthetic tissue by anastomosis of the veins and veinlets; such small portions or areas are termed "Vein-Islets". The number of vein-islets per square millimeter is termed the "Vein-Islet number". This value has been shown to be constant for any given species and, for full-grown leaves, to be unaffected by the age of the plant or the size of the leaves. The vein-islet number has proved useful for the critical distinction of certain nearly related species. The determination is carried out as follows :

For Whole or Cut leaves —Take pieces of leaf lamina with an area of not less than 4 square millimeters from the central portion of the lamina and excluding the midrib and the margin of the leaf. Clear the pieces of lamina by heating in a test tube containing *chloral hydrate solution* on a boiling water-bath for 30 to 60 minutes or until clear and prepare a mount in *glycerol-solution* or, if desired, stain with *safranin solution* and prepare the mount in *Canada Balsam.* Place the stage micrometer on the microscope stage and examine with 4x objective and a 6x eye piece. Draw a line representing 2 mm on a sheet of paper by means of a

microscopical drawing apparatus and construct a square on the line representing an area of 4 square millimeters. Move the paper so that the square is seen in the centre of the field of the eyepiece. Place the slide with the cleared leaf piece on the microscope stage and draw in the veins and veinlets included within the square, completing the outlines of those vein-islets which overlap two adjacent sides of the square. Count the number of vein-islets within the square including those overlapping on two adjacent sides and excluding those intersected by the other two sides. The result obtained is the number of vein-islets in 4 square millimeters. For each sample of leaf make not fewer than three determinations and calculate the average number of vein-islets per square millimeter.

For Leaf Fragments having an area less than 4 square millimeters – Take fragments of leaf lamina each with an area of not less than 1 square millimeter, excluding the midrib and the margin of the leaf. Clear and prepare a mount as stated above. Use a 10x objective and a 6x eyepiece and draw a line representing 1 mm on a sheet of paper by means of a microscopial drawing apparatus and construct a square on this line representing an area of 1 square millimetre. Carry out the rest of the procedure as stated above. The result obtained is the number of vein-islets in 1 square millimetre. For each sample of leaf make no less than 12 determinations and calculate the average number.

2.1.7 Determination of Stomatal Number

Place leaf fragments of about 5x5 mm in size in a test tube containing about 5 ml of chloral hydrate solution and heat in a boiling water-bath for about 15 minutes or until the fragments become transparent. Transfer a fragments to a microscopic slide and prepare the mount the lower epidermis uppermost, in chloral hydrate solution and put a small drop of glycerol-ethanol solution on one side of the cover glass to prevent the preparation from drying. Examine with a 40 x objective and a 6x eye piece, to which a microscopical drawing apparatus is attached. Mark on the drawing paper a cross (x) for each stomata and calculate the average number of stomata per square millimetre for each surface of the leaf.

2.2. DETERMINATION OF QUANTITATIVE DATA OF VEGETABLE DRUGS

2.2.1 – Sampling of Vegetable Drugs

Original Samples

(a) Samples of crude vegetable drugs in which the component parts are 1 cm or less in any dimension; and of powdered or ground drugs may be taken by means of sampling device that removes a core from the top to the bottom of the container. Not less than two cores are taken in opposite directions.

When the total weight of the drug to be sampled is less than 100 Kg, at least 250 g are withdrawn to constitute an original sample.

When the total weight of the drug to be sampled is more than 100 Kg, several samples are taken in the manner described, mixed and quartered, two of the diagonal quarters being rejected, and the remaining two quarters being combined and carefully mixed, and again subjected to a quartering process in the same manner until each of the quarters weigh at least 125 g; two such quarters then constitute an original sample.

(b) Samples of crude vegetable drugs in which the component parts are over 1 cm in any dimension may be taken by hand.

When the total weight of the drug to be sampled is less than 100 Kg, samples are taken from different parts of the container or containers. Not less than 500 g of samples so taken constitute an original sample.

When the total weight of the drug to be sampled is more than 100 Kg, several samples are taken in the manner described, mixed and quartered, two of the diagonal quarters being rejected, and the remaining two quarters being combined and carefully mixed, and again subjected to a quartering process in the same

manner until each of the quarters weigh not less than 250 g; two such quarters then constitute an original sample.

NOTE :- Where the total weight of crude drug to be sampled is less than 10 Kg, the preceding methods may be followed but somewhat smaller quantities are to be withdrawn but in no case shall the original samples weight less than 125 g.

Test sample

Withdraw as much as may be necessary of the original sample by quartering, taking care to see that the portion is representative of the gross sample. In the case of unground or unpowdered drugs, grind the sample so that it will pass through a No. 22 sieve. If the sample cannot be ground, it should be reduced to as fine a state as possible. Mix by rolling it in paper or cloth, spread it out in a thin layer, and withdraw the portion for analysis.

2.2.2 –Foreign Matter and Determination of Foreign Matter

A. FOREIGN MATTER

Drugs should be free from moulds, insects, animal faecal matter and other contaminations such as earth, stones and extraneous material.

Foreign matter is material consisting of any or all of the following :-

(1) In particular, parts of the organ or organs from which the drug is derived other than the parts named in the definition or for which a limit is prescribed in the individual monograph.

(2) Any organ or part of organ, other than those named in the definition and description.

The amount of foreign matter shall not be more than the percentage prescribed in the monograph.

B. DETERMINATION OF FOREIGN MATTER

Weigh 100 –500 g of the drug sample to be examined, or the minimum quantity prescribed in the monograph, and spread it out in a thin layer. The foreign matter should be detected by inspection with the unaided eye or by the use of a lens (6x). Separate and weigh it and calculate the percentage present .

2.2.3. –Determination of Total Ash

Incinerate about 2 to 3 g accurately weighed, of the ground drug in a tared platinum or silica dish at a temperature not exceeding 450° until free from carbon, cool and weigh. If a carbon free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the residue on an ashless filter paper, incinerate the residue and filter paper, add the filtrate, evaporate to dryness, and ignite at a temperature not exceeding 450°. Calculate the percentage of ash with reference to the air-dried drug.

2.2.4. –Determination of Acid Insoluble Ash

Boil the ash obtained in (2.2.3) for 5 minutes with 25 ml of *dilute hydrochloric acid;* collect the insoluble matter in a Gooch crucible, or on an ashless filter paper, wash with hot water and ignite to constant weight. Calculate the percentage of acid-insoluble ash with reference to the air dried drug.

2.2.5. –Determination of Water Soluble Ash

Boil the ash for 5 minutes with 25 ml of water; collect insoluble matter in a Gooch crucible, or on an ashless filter paper, wash with hot water, and ignite for 15 minutes at a temprature not exceeding 450°.

Substract the weight of the insoluble matter from the weight of the ash; the difference in weight represents the water-soluble ash. Calculate the percentage of water-soluble ash with reference to the air-dried drug.

2.2.6. –Determination of Alcohol Soluble Extractive

Macerate 5 g of the air dried drug, coarsely powdered, with 100 ml of Alcohol of the specified strength in a closed flask for twenty-four hours, shaking frequently during six hours and allowing to stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105°, to constant weight and weigh. Calculate the percentage of alcohol-soluble extractive with reference to the air-dried drug.

2.2.7. –Determination of Water Soluble Extractive

Proceed as directed for the determination of Alcohol-soluble extractive, using *chloroform water* instead of ethanol.

2.2.8. –Determination of Ether Soluble Extractive (Fixed Oil Content)

Transfer a suitably weighed quantity (depending on the fixed oil content) of the air dried, crushed drug to an extraction thimble, extract with *Solvent ether* (or petroleum *ether,* b.p. 40° to 60°) in a continuous extraction apparatus (Soxhlet extractor) for 6 hours. Filter the extract quantitatively into a tared evaporating dish and evaporate off the solvent on a water bath. Dry the residue at 105° to constant weight. Calculate the percentage of ether-soluble extractive with reference to the air-dried drug.

2.2.9. –Determination of Moisture Content (Loss on Drying)

Procedure set forth here determines the amount of volatile matter (i.e., water drying off from the drug). For substances appearing to contain water as the only volatile constituent, the procedure given below, is appropriately used.

Place about 10 g of drug (without preliminary drying) after accurately weighing (accurately weighed to within 0.01 g) it in a tared evaporating dish. For example, for underground or unpowderdd drug, prepare about 10 g of the sample by cutting shredding so that the parts are about 3 mm in thickness.

Seeds and fruits, smaller than 3 mm should be cracked. Avoid the use of high speed mills in preparing the samples, and exercise care that no appreciable amount of moisture is lost during preparation and that the portion taken is representative of the official sample. After placing the above said amount of the drug in the tared evaporating dish dry at 105° for 5 hours, and weigh. Continue the drying and weighing at one hour interval until difference between two successive weighings corresponds to not more than 0.25 per cent. Constant weight is reached when two consecutive weighings after drying for 30 minutes and cooling for 30 minutes in a desiccator, show not more than 0.01 g difference.

2.2.10. –Determination of Volatile Oil in Drugs

The determination of volatile oil in a drug is made by distilling the drug with a mixture of *water* and *glycerin,* collecting the distillate in a graduated tube in which the aqueous portion of the distillate is automatically separated and returned to the distilling flask, and measuring the volume of the oil. The content of the volatile oil is expressed as a percentage v/w.

The apparatus consists of the following parts (See Fig. 3) . The apparatus described below is recommended but any similar apparatus may be used provided that it permits complete distillation of the volatile oil. All glass parts of the apparatus should be made of good quality resistance glass.

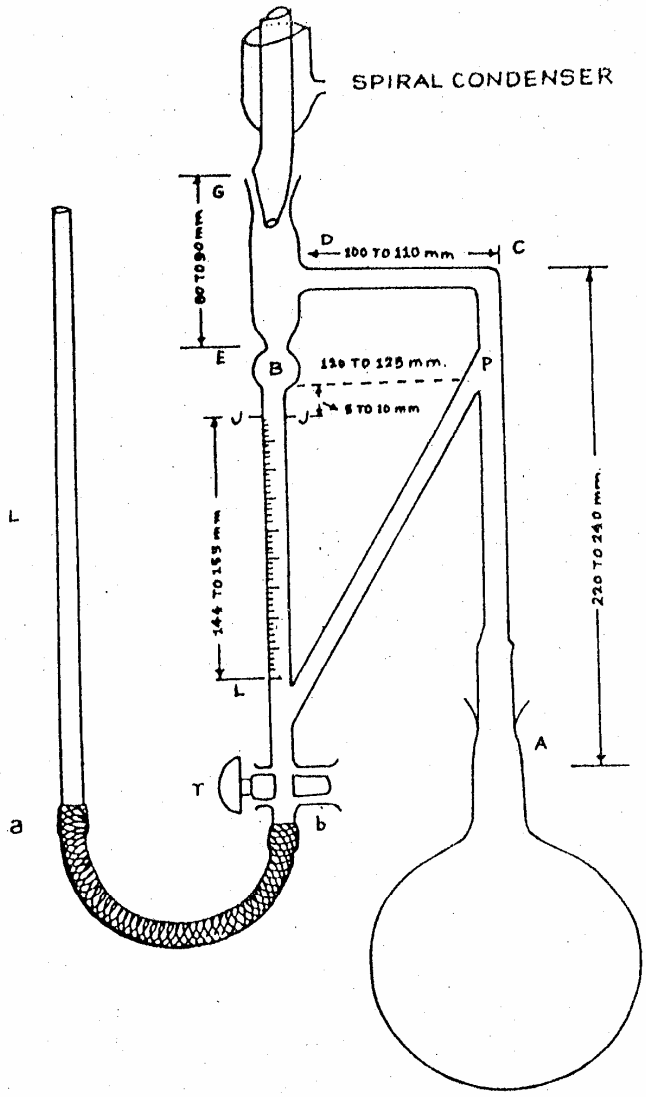

Fig. 3 Apparatus for volatile oil determination

(a) Distilling Flask –A spherical flask, 1,000 ml capacity with ground neck, taper of ground socket 1 in 10, internal diameter of larger end 34.35 to 34.65 mm

(b) Still head –graduated measuring tube, and return flow tube made in one piece, in accordance with the following specifications. External diameter of the smaller end 31.0 to 31.2 mm. Minimum length of the ground zone –34 mm.

Tube AC, length –220 to 240 mm.
Internal diameter –13 to 15 mm.

Bulb CD, length –100 to 110 mm.
Internal diameter –13 to 15 mm.

Spiral condenser –ground joint accurately fitting in the ground neck of the tube EG, taper 1 in 10.

Tube EG, length –80 to 90 mm.
Internal Diameter –30 to 40 mm.
Bulb B –length 20 to 22 mm.
Internal diameter –15 to 20 mm.

The distance between B and P is 120 to 125 mm.

Junction P and the centre of the bulb B must be in the same horizontal plane.

Measuring tube JL –length of the graduated portion 144 to 155 mm capacity 2 millilitres graduated into fifths and fiftieths of a millilitre.

Tube PL –return flow tube –Internal diameter –7 to 8 mm.
Levelling tube I, length –450 to 500 mm. Internal diameter 10 to 12 mm tapering at the lower end with a wide top (20 to 25 mm diameter).
Rubber tubing a—b length 450 to 500 mm. Internal diameter 5 to 8 mm.

(c) **Burner** – A luminous Argand burner with chimney and sensitive regulative tap.

(d) **Stand** –A retort stand with asbestos covered ring and clamp carrying a piece of metal tubing connected by a short length of rubber tubing with the water inlet tube of the condenser jacket.

The Whole of the apparatus is effectively screened from draught.

The apparatus is cleaned before each distillation by washing successively with *acetone* and *water,* then inverting it, filling it with *chromic sulphuric acid* mixture, after closing the open end at G, and allowing to stand, and finally rinsing with water.

Method of determination

A suitable quantity of the coarsely powdered drug together with 75 ml of *glycerin* and 175 ml of *water* in the one litre distilling flask, and a few pieces of porous earthen ware and one filter paper 15 cm cut into small strips, 7 to 12 mm wide, are also put in the distilling flask, which is then connected to the still head. Before attaching the condenser, water is run into the graduated receiver, keeping the tap T open until the water overflows, at P. Any air bubbles in the rubber tubing a—b are carefully removed by pressing the tube. The tap is then closed and the condenser attached. The contents of the flask are now heated and stirred by frequent agitation until ebullition commences. The distillation is continued at a rate which keeps the lower end of the condenser cool. The flask is rotated occasionally to wash down any material that adheres to its sides.

At the end of the specified time (3 to 4 hours) heating is discontinued, the apparatus is allowed to cool for 10 minutes and the tap T is opened and the tube L_1 lowered slowly; as soon as the layer of the oil completely enters into the graduated part of the receiver the tap is closed and the volume is read.

The tube L_1 is then raised till the level of water in it is above the level of B, when the tap T is slowly opened to return the oil to the bulb. The distillation is again continued for another hour and the volume of oil is again read, after cooling the apparatus as before. If necessary, the distillation is again continued until successive readings of the volatile oil do not differ.

The measured yield of volatile oil is taken to be the content of volatile oil in the drug.

The dimensions of the apparatus may be suitably modified in case of necessity.

2.2.11. –Special processes used in Alkaloidal Assays

2.2.11.a –CONTINUOUS EXTRACTION OF DRUG –

Where continuous extraction of a drug of any other substance is recommended in the monograph, the process consists of percolating it with a suitable solvents at a temperature approximately that of the boiling point of the solvent. Any apparatus that permits the uniform percolation of the drug and the continuous flow of the vapour of the solvent around the percolator may be used. The type commonly known as the Soxhlet apparatus is suitable for this purpose.

A simple apparatus is shown in the accompanying illustraion. A is an outer tube of stout glass; the wider part is about 18 cm in length and has an internal diameter of 4.8 to 5 cm; the lower end C is about 5 cm in length and has an external diameter of about 1.6 cm . B is a straight glass tube open at both ends, about 9 cm in length and having an external diameter of about 3.8 cm; over its lower flanged end is tied firmly with a piece of calico or other suitable material. D is a glass coil, which supports the margin of the tube B and prevents it from resting in contact with the outer tube A. The lower end C of the outer tube A is fitted by a cork to the distilling flask E, in which a suitable quantity of the solvent has been placed. The substance to be extracted, previously moistened with the solvent or subjected to any preliminary treatment required, is introduced into the inner tube B, which is supported so that the percolate drops into the outer tube. A pad of cotton wool G is placed on the top of the drug, the inner tube is lowered into position and the outer tube connected by means of a suitable cork with the tube of a reflux condenser F. The flask is heated and the extraction continued as directed (See Fig. 4).

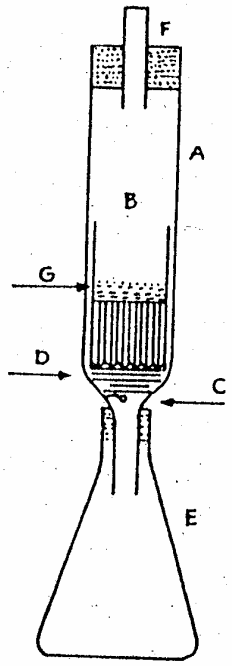

Fig. 4 Apparatus for the continuous extraction of Drugs

2.2.11.b –TESTS FOR COMPLETE EXTRACTION OF ALKALOIDS–Complete extraction is indicated by the following tests :

When extracting with an aqueous or alcoholic liquid –After extracting at least three times with the liquid, add to a few drops of the next portion, after acidifying with 2 *N hydrochloric acid* if necessary, 0.05 ml of potassium mercuri-iodide solution or for solanaceous alkaloids 0.05 ml of *potassium iodobismuthate solution;* no precipitate or turbidity, is produced.

When extracting with an immiscible solvent –After extracting at least three times with the solvent, add to 1 to 2 ml of the next portion 1 to 2 ml of 0.1 *N hydrochloric acid,* remove the organic solvent by evaporation, transfer the aqueous residue to a test tube, and add 0.05 ml of *potassium mercuri-iodide solution* for solanaceous alkaloids 0.05 ml of *potassium iodobismuthate solution* or for emetine, 0.05 ml of *iodine solution;* not more than a very faint opalescenece is produced.

2.2.12 Thin-Layer Chromatography (TLC)

Thin-layer chromatography is a technique in which a solute undergoes distribution between two phases, a stationary phase acting through adsorption and a mobile phase in the form of a liquid. The adsorbent is a relatively thin, uniform layer of dry finely powdered material applied to a glass, plastic or metal sheet or plate. Glass plates are most commonly used. Separation may also be achieved on the basis of partition or a combination of partition and adsorption, depending on the particular type of support, its preparation and its use with different solvent.

Identification can be effected by observation of spots of identical R_f value and about equal magnitude obtained, respectively, with an unknown and a reference sample chromatographed on the same plate. A visual comparison of the size and intensity of the spots usually serves for semi-quantitative estimation.

Apparatus

(a) Flat glass plates of appropriate dimensions which allow the application at specified points of the necessary quantities of the solution being examined and appropriate reference solutions and which allow accommodation of the specified migration path-length. The plates are prepared as described below; alternatively, commercially prepared plates may be used.

(b) An aligning tray or a flat surface on which the plates can be aligned and rested when the coating substance is applied.

(c) The adsorbent or coating substance consisting of finely divided adsorbent materials, normally 5 µm to 40 µm in diameter, is suitable for chromatography. It can be applied directly to the plate or can be bonded to the plate by means of Plaster of Paris (Hydrated Calcium Sulphate) or with any other suitable binders. The adsorbent may contain fluorescing material to help in visualising spots that absorb ultra-violet light.

(d) A spreader which, when moved over the glass plate, will apply a uniform layer of adsorbent of desired thickness over the entire surface of the plate.

(e) A storage rack to support the plates during drying and transportation.

(f) A developing chamber that can accommodate one or more plates and can be properly closed and sealed. The chamber is fitted with a plate support rack that supports the plates, back to back, with lid of the chamber in place.

(g) Graduated micro-pipettes capable of delivering microlitre quantities say 10 µl and less.
(h) A reagent sprayer that will emit a fine spray and will not itself be attacked by the reagent.

(i) An ultra-violet light, suitable for observation at short (254 nm) and long (365 nm) ultra-violet wavelengths.

Preparation of plates –Unless otherwise specified in the monograph, the plates are prepared in the following manner. Prepare a suspension of the coating substance in accordance with the instructions of the supplier and, using the spreading device designed for the purpose, spread a uniform layer of the suspension, 0.25 to 0.30 mm thick, on a flat glass plate 20 cm long. Allow the coated plates to dry in air, heat at 100° to 105° for at least 1 hour (except in the case of plates prepared with cellulose when heating for 10 minutes is normally sufficient) and allow to cool, protected from moisture. Store the plates protected from moisture and use within 3 days of preparation. At the time of use, dry the plates again, if necessary, as prescribed in the monographs.

Method

Unless unsaturated conditions are prescribed, prepare the tank by lining the walls with sheets of filter paper; pour into the tank, saturating the filter paper in the process, sufficient of the mobile phase to form a layer of solvent 5 to 10 mm deep, close the tank and allow to stand for 1 hour at room temperature. Remove a narrow strip of the coating substance, about 5 mm wide, from the vertical sides of the plate. Apply the solutions being examined in the form of circular spots about 2 to 6 mm in diameter, or in the form of bands (10 to 20 mm x 2 to 6 mm unless otherwise specified) on a line parallel with, and 20 mm from, one end of the plate, and not nearer than 20 mm to the sides; the spots should be 15 mm apart. If necessary, the solutions may be applied in portions, drying between applications. Mark the sides of the plate 15 cm, or the distance specified in the monograph, from the starting line. Allow the solvent to evaporate and place the plate in the tank, ensuring that it is as nearly vertical as possible and that the spots or bands are above the level of the mobile phase. Close the tank and allow to stand at room temperature, until the mobile phase has ascended to the marked line. Remove the plate and dry and visualise as directed in the monograph; where a spraying technique is prescribed it is essential that the reagent be evenly applied as a fine spray.

For two-dimensional chromatography dry the plate after the first development and carry out the second development in a direction perpendicular to the first.

When the method prescribed in the monograph specified 'protected from light' or 'in subdued light' it is intended that the entire procedure is carried out under these conditions.

Visualisation

The phrases *ultra-violet light (254 nm)* and *ultra-violet light (365 nm)* indicate that the plate should be examined under an ultra-violet light having a maximum output at about 254 or at about 365 nm, as the case may be.

The term *secondary spot* means any spot other than the principal spot. Similarly, a *secondary band* is any band other than the principal band.

Rf. Value

Measure and record the distance of each spot from the point of its application and calculate the Rf. value by dividing the distance travelled by the spots by the distance travelled by the front of the mobile phase.

2.2.13 - Starch estimation (Mont Gomery 1957) [Spectrophotometric method]

Prepare 10% homogenate of the plant tissue in 80% Ethanol. Centrifuge at 2000 rpm for 15 minutes. To the residue thus obtained, add 4 ml of distilled water, heat on a water bath for 15 minutes and macerate with the help of glass rod. To each of the samples, add 3 ml of 52% perchloric acid and centrifuge at 2000 rpm for 15 minutes. The supernatant thus obtained is made upto known volume (generally upto 10 ml or depending on the expected concentration of starch). Take 0.1 ml aliquot, add 0.1 ml of 80% phenol and 5 ml conc. H_2SO_4. Cool and then read the absorbance at 490 nm.

2.2.14. - Sugar estimation (Mont Gomery 1957) [Spectrophotometric method]

Prepare 10% homogenate of the plant tissue in 80% Ethanol. Centrifuge at 2000 rpm for 15 minutes. The supernatant obtained is made upto known volume (generally upto 10 ml or depending on the expected concentration of sugar). Take 0.1 ml aliquot, add 0.1 ml of 80% phenol and 5 ml conc. H_2SO_4. Cool and then read the absorbance at 490 nm.

2.2.15 - Fatty oil estimation

To estimate fatty oils, extract accurately weighed air dried powdered plant material with petroleum ether (40-60^{0}C) in Soxhlet apparatus. Dry the extract over anhydrous sodium sulphate and remove the solvent under vacuum at 40^{0}C. Weigh the residue and calculate the percentage with reference to the weight of plant material used.

2.2.16 - Determination of foaming index

Reduce about 1 g of the plant material to a coarse powder (sieve size no. 150), weigh accurately and transfer to a 500-ml conical flask containing 100 ml of boiling water. Maintain at moderate boiling for 30 minutes. Cool and filter into a 100-ml volumetric flask and add sufficient water through the filter to dilute the volume to 100 ml.

Place the above decoction into 10 stoppered test-tube (height 16 cm. diameter 16 mm) in a series of successive portions of 1, 2, 3, upto 10 ml and adjust the volume of the liquid in each tube with water to 10 ml. Stopper the tubes and shake them in a lengthwise motion for 15 seconds, 2 frequencies per second. Allow to stand for 15 minutes. Note 1 cm height of the foam and calculate the foaming index by following formula.

$$\text{Foaming index} = \frac{1000}{a}$$

Where is the volume in ml, of decoction used for preparing dilution in tube where foaming is observed.

2.2.17 - Protein estimation (Lowry et al 1951)

Homogenise 100 mg plant material with 3 ml of 10% Trichloroacetic acid. Centrifuge the homogenate at 10,000 rpm. discard the supernatant. Treat the pellets obtained after centrifugation with 3 ml 1N NaOH, heat on water bath for 7 minutes and cool. Centrifuge the solution again for five to ten minutes at 5000 rpm. To 0.5 ml of supernatant thus obtained after centrifugation, add 5 ml reagent containing 100 parts of 2% solution of sodium carbonate and one part of 2% solution of sodium potassium tartrate. Allow it to stand for ten to fifteen minutes. Then add 5 ml Folin and Ciocalteu's Phenol reagent (diluted with distilled water in ratio of 1:1) and allow to stand for half-hour for development of colour and then finally measure the absorbance at 700 nm.

2.2.17A - Isolation of Forskohlin (Shah *et al,* 1980)

Extract the powdered air dried roots (500 g) in percolator at room temperature successively with petroleum ether ($60 - 80^0$) [3x2L] and ethyl alcohol [4 x 2L]. Concentrate the petroleum ether and the ethyl alcohol extracts under reduced pressure to give 10 g of petroleum ether extractive and 22 g of ethyl alcohol extractive. Combine the two extractives and fraction it first with hexane [4 x 250 ml] and then with benzene [5 x 250 ml]. A dark brown material will be obtained. Dry it under vacuum and subject to column chromatography over silica gel [300 g] using benzene with increasing amount of ethyl acetate, in order of 20%, as eluent. Collect fractions, of 100 ml and check for coleonol by TLC (Benzene : Methanol :: 95 : 5). Fractions 1–40 did not show spots corresponding to coleonol whereas fractions 41–42 were found to contain coleonol (0.15%).

2.2.18 - Method for Alkaloid estimation

Macerate the plant material with 2% acetic acid in water, filter and concentrate the filtrate under reduced pressure at 45^0C to one third of the original volume. Adjust the pH to 2 by 4 M HCl. The yellow precipitate will be separated from the solution (A). Dissolve in it 0.1 M HCl to give solution (B). Add Mayer's reagent to the solution A and B to give precipitate of Alkaloid Mayer complex. Dissolve it again in acetone - methanol - water (6 : 2 : 10). to give solution of Alkaloid Mayer Complex. Pass this complex finally through Amberlite IRA 400 anion exchange resin (500 g) to give an aqueous solution of alkaloid chlorides.

2.3. LIMIT TESTS

2.3.1 Limit Test for Arsenic

In the limit test for arsenic, the amount of arsenic present is expressed as arsenic, As

Apparatus –

A wide-mouthed bottle capable of holding about 120 ml is fitted with a rubber bung through which passes a glass tube. The latter, made from ordinary glass tubing, has a total length of 200 mm and an internal diameter of exactly 6.5 mm (external diameter about 8 mm). It is drawn out at one end to a diameter of about 1 mm and a hole not less than 2 mm in diameter is blown in the side of the tube, near the constricted part. When the bung is inserted in the bottle containing 70 ml of liquid, the constricted end of the tube is above the surface of the liquid, and the hole in the side is below the bottom of the bung. The upper end of the tube is cut off square, and is either slightly rounded or ground smooth.

Two rubber bungs (about 25 mm X 25 mm), each with a hole bored centrally and true, exactly 6.5 mm in diameter, are fitted with a rubber band or spring clip for holding them tightly together. Alternatively the two bungs may be replaced by any suitable contrivance satisfying the conditions described under *the General Test.*

Reagents –

Ammonium oxalate AsT : *Ammonium oxalate* which complies with the following additional test :

Heat 5 g with 15 ml of *water,* 5 ml of *nitric acid AsT,* and 10 ml of *Sulphuric acid AsT* in narrow necked, round-bottomed flask until frothing ceases, cool, and apply the General Test; no visible stain is produced.

Arsenic solution, dilute, AsT :

Strong Arsenic solution AsT		1 ml
Water	sufficient to produce	100 ml

Dilute arsenic solution AsT must be freshly prepared.
1 ml contains 0.01 mg of arsenic, As.

Arsenic solution, strong, AsT :

Arsenic trioxide		0.132 g
Hydrochloric acid		50 ml
Water	sufficient to produce	100 ml

Brominated hydrochloric acid AsT :

Bromine solution AsT	1 ml
Hydrochloric acid AsT	100 ml

Bromine solution AsT :

Bromine		30 g
Potassium bromide		30 g
Water	sufficient to produce	100 ml

It complies with the following test :

Evaporate 10 ml on a water-bath nearly to dryness, add 50 ml of water, 10 ml of *hydrochloric acid AsT* and sufficient *stannous chloride solution AsT* to reduce the remaining bromine and apply the General Test; the stain produced is not deeper than 1 ml *standard stain,* showing that the proportion of arsenic present does not exceed 1 part per million.

Citric acid AsT : *Citric acid* which complies with the following additional tests : Dissolve 10 g in 50 ml of water add 10 ml of *stannated hydrochloric acid AsT* and apply the General Test; no visible stain is produced.

Hydrochloric acid AsT : *Hydrochloric acid* diluted with *water* to contain about 32 per cent w/w of HCI and complying with the following additional tests :

(i) Dilute 10 ml with sufficient water to produce 50 ml, add 5 ml of *ammonium thiocyanate solution* and stir immediately; no colour is produced.

(ii) To 50 ml add 0.2 ml of *bromine solution AsT,* evaporate on a water-bath until reduced to 16 ml adding more *bromine solution AsT,* if necessary, in order that an excess, as indicated by the colour, may be present throughout the evaporation; add 50 ml of *water* and 5 drops of *stannons chloride solution AsT,* and apply the General Test; the stain producted is not deeper than a 0.2 ml *standard stain* prepared with the same acid, showing that the proportion of arsenic present does not exceed 0.05 part per million.

Hydrochloric acid (constant-boiling composition) AsT : Boil *hydrochloric acid AsT to constant boiling Composition* in the presence of *hydrazine hydrate,* using 1 ml of 10 per cent w/v solution in *water* per litre of the acid.

Mercuric chloride paper – Smooth white filter paper, not less than 25 mm in width, soaked in a saturated solution of *mercuric chloride,* pressed to remove superfluous solution, and dried at about 60°, in the dark. The grade of the filter paper is such that the weight is between 65 and 120 g per sq. mm; the thickness in mm of 400 papers is approximately equal numerically, to the weight in g per sq. mm.

Nitric acid AsT : *Nitric acid* which complies with the following additional test :

Heat 20 ml in a porcelain dish with 2 ml of *sulphuric acid AsT,* until white fumes are given off. Cool, add 2 ml of water, and again heat until white fumes are given off; cool, add 50 ml of water and 10 ml of *stannated hydrochloric acid AsT,* and apply the General Test; no visible stain is produced.

Potassium chlorate AsT : *Potassium chlorate* which complies with the following additional test :

Mix 5 g in the cold with 20 ml of *water* and 22 ml of *hydrochloric acid AsT;* when the first reaction has subsided, heat gently to expel chlorine, remove the last traces with a few drops of *stannous chloride solution AsT,* add 20 ml of water, and apply the General Test; no visible stain is produced.

NOTE –Murcuric chloride paper should be stored in a stoppered bottle in the dark. Paper which has been exposed to sunlight or to the vapour of ammonia affords a lighter stain or no stain at all when empolyed in the limit test for arsenic.

Potassium iodide AsT : *Potassium iodide* which complies with the following additional test :

Dissolve 10 g in 25 ml of *hydrochloric acid AsT* and 35 ml of *water,* add 2 drops of *stannous chloride solution AsT* and apply the General Test; no visible stain is produced.

Sodium carbonate, anhydrous AsT : *Anhydrous sodium carbonate* which complies with the following additional test :

Dissolve 5 g in 50 ml of *water,* add 20 ml of *brominated hydrochloric acid AsT,* remove the excess of bromine with a few drops of *stannous chloride solution AsT,* and apply the General Test; no visible stain is produced.

Stannated hydrochloric acid AsT :

Stannous chloride solution AsT	1ml
Hydrochloric Acid AsT	100 ml

Stannous chloride solution AsT : Prepared from *stannous chloride solution* by adding an equal volume of *hydrochloric acid,* boiling down to the original volume, and filtering through a fine-grain filter paper.

It complies with the following test :

To 10 ml add 6 ml of water and 10 ml of *hydrochloric acid AsT,* distil and collect 16 ml. To the distillate and 50 ml of *water* and 2 drops of *stannuous chloride solution AsT* and apply the General Test; the stain produced is not deeper than a 1-ml *standard stain,* showing that the proportion of arsenic present does not exceed 1 part per million.

Sulphuric acid AsT : *Sulphuric acid* which complies with the following additional test :

Dilute 10 g with 50 ml of water, add 0.2 ml of *stannous chloride solution AsT,* and apply the General Test; no visible stain is produced.

Zinc AsT : *Granulated zinc* which complies with following additional test :

Add 10 ml of *stannated hydrochloric acid AsT* to 50 ml of *water,* and apply the General Test, using 10 of the zinc and allowing the action to continue for one hour; no visible stain is produced (limit of arsenic). Repeat the test with the addition of 0.1 ml of *dilute arsenic solution AsT;* a faint but distinct yellow stain is produced (test for sensitivity).

General Method of Testing – By a variable method of procedure suitable to the particular needs of each substance, a solution is prepared from the substance being examined which may or may not contain that substance, but contains the whole of the arsenic (if any) originally present in that substance. This solution, referred to as the `test solution', is used in the actual test.

General Test – The glass tube is lightly packed with cotton wool, previously moistened with *lead acetate solution* and dried, so that the upper surface of the cotton wool is not less than 25 mm below the top of the tube. The upper end of the tube is then inserted into the narrow end of one of the pair of rubber bungs, either to a depth of about 10 mm when the tube has a rounded-off end, or so that the ground end of the tube is flush with the larger end of the bung. A piece of *mercuric chloride paper* is placed flat on the top of the bung and the other bung placed over it and secured by means of the rubber band or spring clip in such a manner that the borings of the two bungs (or the upper bung and the glass tube) meet to form a true tube 6.5 mm in diameter interrupted by a diaphragm of *mercuric chloride paper.*

Instead of this method of attaching the *mercuric chloride paper,* any other method may be used provided (1) that the whole of the evolved gas passes through the paper; (2) that the portion of the paper in contact with the gas is a circle 6.5 mm in diameter; and (3) that the paper is protected from sunlight during the test. The test solution prepared as specified, is placed in the wide-mouthed bottle, 1 g of *potassium iodide AsT* and 10 g of *zinc AsT* added, and the prepared glass tube is placed quickly in position. The action is allowed to proceed for 40 minutes. The yellow stain which is produced on the *mercuric chloride paper* if arsenic is present is compared by day light with the *standard stains* produced by operating in a similar manner with known quantities of *dilute arsenic solution AsT* . The comparison of the stains is made immediately at the completion of the test. The *standard stains* used for comparison are freshly prepared; they fade on keeping.

By matching the depth of colour with *standard stains*, the proportion of arsenic in the substance may be determined. A stain equivalent to the 1-ml *standard stain*, produced by operating on 10 g of substance indicates that the proportion of arsenic is 1 part per million.

NOTE – (1) The action may be accelerated by placing the apparatus on a warm surface, care being taken that the mercuric chloride paper remains dry throughout the test.

(2) The most suitable temperature for carrying out the test is generally about 40° but because the rate of the evoluion of the gas varies somewhat with different batches zinc AsT, the temperature may be adjusted to obtain a regular, but not violent, evolution of gas.

(3) The tube must be washed with *hydrochloric acid AsT*, rinsed with water and dried between successive tests.

Standard Stains – Solutions are prepared by adding to 50 ml of water, 10 ml of *stannated hydrochloric acid AsT* and quantities of *dilute arsenic solutions AsT* varying from 0.2 ml to 1 ml. The resulting solutions, when treated as described in the General Test, yield stains on the *mercuric chloride paper* referred to as the standard stains.

Preparation of the Test Solution

In the various methods of preparing the test solution given below, the quantities are so arranged unless otherwise stated, that when the stain produced from the solution to be examined is not deeper than the 1-ml *standard stain,* the proportion of arsenic present does not exceed the permitted limit.

Ammonium chloride – Dissolve 2.5 g in 50 ml of *water,* and 10 ml of *stannated hydrochloric acid AsT.*

Boric acid – Dissolve 10 g with 2 g of *citric acid AsT* in 50 ml water, and add 12 ml of *stannated hydrochloric acid AsT.*

Ferrous sulphate – Dissolve 5 g in 10 ml of *water and 15 ml of stannated hydrochloric* acid *AsT and* disitil 20 ml; to the distillate add a few drops of *bromine solution AsT.* Add 2 ml of *stannated hydrochloric acid AsT,* heat under a reflux condenser for one hour, cool, and add 10 ml of *water* and 10 ml of *hydrochloric acid AsT.*

Glycerin – Dissolve 5 g in 50 ml of water, and add 10 ml of *stannated hydrochloric acid AsT.*

Hydrochloric acid – Mix 10 g with 40 ml of water and 1 ml of *stannous chloride solution AsT.*

Magnesium sulphate – Dissolve 5 g in 50 ml of *water* and add 10 ml of *stannated hydrochloric acid AsT.*

Phosphoric acid – Dissolve 5 g in 50 ml of *water* and add 10 ml of *stannated hydrochloric acid AsT*

Potassium iodide – Dissolve 5 g in 50 ml of *water* and add 2 ml of *stannated hydrochloric acid AsT.*

Sodium bicarbonate – Dissolve 5 g in 50 ml of *water* and add 15 ml of *brominated hydrochloric acid AsT,* and remove the excess of bromine with a few drops of *stannous chloride solution AsT.*

Sodium hydroxide – Dissolve 2.5 g in 50 ml of *water,* add 16 ml of *brominated hydrochloric acid AsT,* and remove the excess of *bromine* with a few drops of *stannous chloride solution AsT.*

2.3.2 –Limit Test for Chlorides

Dissolve the specified quantity of the substance in *water* or prepare a solution as directed in the text and transfer to a *Nessler cylinder.* Add 10 ml of *dilute nitric acid,* except when nitric acid is used in the preparation of the solution, dilute to 50 ml with water, and add 1 ml of *silver nitrate solution.* Stir immediately with a glass rod and allow to stand for 5 minutes. The opalescence produced is not greater than the *standard opalescence,* when viewed transversely.

Standard Opalescence

Place 1.0 ml of a 0.05845 percent w/v solution of *sodium chloride* and 10 ml of *dilute nitric acid* in a *Nessler cylinder.* Dilute to 50 ml with water and add 1 ml of *silver nitrate solution.* Stir immediately with a glass rod and allow to stand for five minutes.

2.3.3 –Limit Test For Heavy Metals

The test for heavy metals is designed to determine the content of metallic impurities that are coloured by sulphide ion, under specified conditions. The limit for heavy metals is indicated in the individual monographs in terms of the parts of lead per million parts of the substance (by weight), as determined by visual comparison of the colour produced by the substance with that of a control prepared from a standard lead solution.

Determine the amount of heavy metals by one of the following methods and as directed in the individual monographs. Method A is used for substances that yield clear colourless solutions under the specified test conditions. Method B is used for substances that do not yield clear, colourless solutions under the test conditions specified for method A, or for substances which, by virtue of their complex nature, interfere with the precipitation of metals by sulphide ion. Method C is used for substances that yield clear, colourless solutions with *sodium hydroxide solutions.*

Special Reagents –

Acetic acid Sp. – *Acetic acid* which complies with the following additional test : Make 25 ml alkaline with *dilute ammonia solution Sp.,* add 1 ml of *potassium cyanide solution Sp.,* dilute to 50 ml with *water* and add two drops of *sodium sulphide* solution; no darkening is produced.

Dilute acetic acid Sp. – *Dilute acetic acid* which complies with the following additional test – Evaporate 20 ml in a porcelain dish, nearly to dryness on a water-bath. Add to the residue 2 ml of the acid and dilute with water to 25 ml, add 10 ml of *hydrogen sulphide solution.* Any dark colour produced is not more than that of a control solution consisting of 2 ml of the acid and 4.0 ml of *standard lead solution* diluted to 25 ml with *water.*

Ammonia solution Sp. – *Strong ammonia solution* which complies with the following additional test : Evaporate 10 ml to dryness on a water-bath; to the residue add 1 ml of *dilute hydrochloric acid Sp.* and evaporate to dryness. Dissolve the residue in 2 ml of dilute acetic acid Sp. Add sufficient water to produce 25 ml.

Add 10 ml of *hydrogen sulphide solution.* Any darkening produced is not greater than in a blank solution containing 2 ml of dilute acetic acid Sp. 1.0 ml of *standard lead solution* and sufficient *water* to produce 25 ml.

Dilute ammonia solution Sp. – *Dilute ammonia solution* which complies with the following additional test : To 20 ml add 1 ml of *potassium cyanide solution Sp.,* dilute to 50 ml with *water,* and add two drops of *sodium sulphide solution;* no darkening is produced.

Hydrochloric acid – *Hydrochloric acid* which complies with the following additional test : Evaporate off the acid in a beaker to dryness on a water-bath. Dissolve the residue in 2 ml of *dilute acid Sp.,* dilute to 17 ml with water and add 10 ml of *hydrogen sulphide solution;* any darkening produced is not greater than in a blank solution containing 2.0 ml of *standard lead solution,* 2 ml of *dilute acetic acid Sp.* and dilute to 40 ml with water.

Dilute hydrochloric acid Sp. – *Dilute hydrochloric acid,* which complies with the following additonal test: Treat 10 ml of the acid in the manner described under *Hydrochloric acid Sp.*

Lead nitrate stock solution – Dissolve 0.1598 g of *lead nitrate* in 100 ml of *water* to which has been added 1 ml of *nitric acid,* then dilute with *water* to 1000 ml.

This solution must be prepared and stored in polyethylene or glass containers free from soluble lead salts.

Standard lead solution – On the day of use, dilute 10.0 ml of *lead nitrate stock solution* with *water* to 100.0 ml. Each ml of *standard lead solution* contains the equivalent of 10 µg of lead. A control comparison solution prepared with 2.0 ml of standard lead solution contains, when compared to a solution representing 1.0 g of the substance being tested, the equivalent of 20 parts per million of lead.

Nitric acid Sp. –*Nitric acid* which complies with the following additional test : Dilute 10 ml with 10 ml of *water,* make alkaline with *ammonia solution Sp.,* add 1 ml of *potassium cyanide solution Sp.,* dilute to 50 ml with water, and add two drops of *sodium sulphide solution;* no darkening is produced.

Potassium cyanide solution Sp. – See Appendix 2.3.5.

Sulphuric acid Sp. – Sulphuric acid which complies with following additional test : Add 5 g to 20 ml of *water* make alkaline with *ammonia solution Sp.,* add 1 ml of *potassium cyanide solution Sp.,* dilute to 50 ml with *water* and add two drops of *sodium sulphide solution;* no darkening is produced.

Method A

Standard solution – Into a 50 ml *Nessler cylinder,* pipette 2 ml of *standard lead solution* and dilute with *water* to 25 ml. Adjust with *dilute acetic acid Sp.* or *dilute ammonia solution Sp* to a pH between 3.0 and 4.0, dilute with *water* to about 35 ml, and mix.

Test solution – Into a 50 ml *Nessler cylinder,* place 25 ml of the solution prepared for the test as directed in the individual monogrpah, or using the stated volume of acid when specified in the individual monograph, dissolve and dilute with *water* to 25 ml the specified quantity of the substance being tested. Adjust with *dilute acetic acid Sp.* or *dilute ammonia solution Sp.* to a pH between 3.0 and 4.0, dilute with *water* to about 35 ml and mix.

Procedure – To each of the cylinders containing the *standard solution* and *test* solution respectively add 10 ml of freshly prepared *hydrogen sulphide solution,* mix, dilute with *water* to 50 ml, allow to stand for five minutes, and view downwards over a white surfac; the colour produced in the *test solution* is not darker than that produced in the *standard solution.*

Method B

Standard solution – Proceed as directed under Method A.

Test solution – Weigh in a suitable crucible the quantity of the substance specified in individual monograph, add sufficient *sulphuric acid Sp.* to wet the sample, and ignite carefully at a low temperature until thoroughly charred. Add to the charred mass 2 ml of *nitric acid Sp.* and five drops of *sulphuric acid Sp.* and heat cautiously until white fumes are no longer evolved. Ignite, preferably in a muffle furnace, at 500° to 600° until the carbon is completely burnt off . Cool, add 4 ml of *hydrochloric acid Sp.,* cover, digest on a water bath for 15 minutes, uncover and slowly evaporate to dryness on a water-bath. Moisten the residue with one drop of *hydrochloric acid Sp.,* add 10 ml of hot water and digest for two minutes. Add *ammonia solution Sp.,* dropwise, until the solution is just alkaline to *litmus paper,* dilute with *water* to 25 ml and adjust with dilute acetic acid Sp. to a pH between 3.0 and 4.0. Filter if necessary, rinse the crucible and the filter with 10 ml of water, combine the filtrate and washings in a 50 ml *Nessler cylinder,* dilute with *water,* to about 35 ml, and mix. Procedure : Proceed as directed under Method A.

Method C

Standard solution – Into a 50 ml *Nessler cylinder,* pipette 2 ml of *standard lead solution,* add 5 ml of *dilute sodium hydroxide solution.,* dilute with *water* to 50 ml and mix.

Test solution – Into a 50 ml *Nessler cylinder,* place 25 ml of the solution prepared for the test as directed in the individual monograph; or, if not specified otherwise in the individual monograph, dissolve the specified quantity in a mixture of 20 ml of *water* and 5 ml of *dilute sodium hydroxide solution.* Dilute 50 ml with water and mix.

Procedure –To each of the cylinders containing the *standard solution* and the *test solution,* respectively add 5 drops of *sodium sulphide solution,* mix, allow to stand for five minutes and view downwards over a white surface; the colour produced in the *test solution* is not darker than that produced in the *standard solution.*

2.3.4. Limit Test For Iron

Standard iron solution – Weigh accurately 0.1726 g of *ferric ammonium sulphate* and dissolve in 10 ml of 0.1 *N sulphuric acid* and sufficient *water* to produce 1000.0 ml. Each ml of this solution contains 0.02 mg of Fe.

Method

Dissolve the specified quantity of the substance being examined in 40 ml of *water,* or use 10 ml of the solution precribed in the monograph, and transfer to a *Nessler cylinder.* Add 2 ml of a 20 per cent w/v solution of *iron-free citric acid* and 0.1 ml of *thioglycollic acid,* mix, make alkaline with *iron-free ammonia solution,* dilute to 50 ml with *water* and allow to stand for five minutes. Any colour produced is not more intense than the standard colour.

Standard colour – Dilute 2.0 ml of *standard iron solution* with 40 ml of *water* in a *Nessler cylinder.* Add 2 ml of a 20 per cent w/v solution of *iron-free citric acid* and 0.1 ml of *thioglycollic acid,* mix, make alkaline with *iron-free ammonia solution,* dilute to 50 ml with *water* and allow to stand for five minutes.

2.3.5. Limit Test for Lead

The following method is based on the extraction of lead by solutions of dithizone. All reagents used for the test should have as low a content of lead as practicable. All reagent solutions should be stored in containers of borosilicate glass. Glassware should be rinsed thoroughly with warm *dilute nitric acid,* followed by *water.*

Special Reagents

(1) **Ammonia-cyanide solution Sp.** – Dissolve 2 g of *potassium cyanide* in 15 ml of *strong ammonia solution* and dilute with *water* to 100 ml.

(2) **Ammonium citrate solution Sp.** – Dissolve 40 g of *citric acid* in 90 ml *water.* Add two drops of *phenol red solution* then add slowly *strong ammonia solution* until the solution acquires a reddish colour. Remove any lead present by extracting the solution with 20 ml quantities of *dithizone extraction solution* until the dithizone solution retains its orange-green colour.

(3) **Dilute standard lead solution** – Dilute 10.0 ml of *standard lead solution* with sufficient 1 per cent v/v solution of nitric acid to produce 100.0 ml. Each ml of this solution contains 1 µg of lead per ml.

(4) **Dithizone extraction solution** –Dissolve 30 mg of *diphenylthiocarbazone* in 1000 ml of *chloroform* and add 5 ml of *alcohol.* Store the solution in a refrigerator. Before use, shake a suitable volume of the solution with about half its volume of 1 per cent v/v solution of *nitric acid* and discard the acid.

(5) **Hydroxylamine hydrochloride solution Sp.** – Dissolve 20 g of *hydroxylamine hydrochloride* in sufficient *water* to produce about 65 ml. Transfer to separator, add five drops of *thymol blue solution,* add *strong ammonia solution* until the solution becomes yellow. Add 10 ml of a 4 per cent w/v solution of *sodium diethyldithiocarbamate* and allow to stand for five minutes. Extract with successive quantities, each of 10 ml, of *chloroform* until a 5 ml portion of the extract does not assume a yellow colour when shaken with dilute copper sulphate solution. Add *dilute hydrochloric acid* until the solution is pink and then dilute with sufficient water to produce 100 ml.

(6) **Potassium cyanide solution Sp.** – Dissolve 50 g of potassium cyanide in sufficient *water* to produce 100 ml. Remove the lead from this solution by extraction with successive quantities, each of 20 ml of *dithizone extraction solution* until the dithizone solution retains its orange-green colour. Extract any dithizone remaining in the cyanide solution by shaking with *chloroform.* Dilute this cyanide solution with sufficient *water* to produce a solution containing 10 g of *potassium cyanide* in each 100 ml.

(7) **Standard dithizone solution** – Dissolve 10 ml of *diphenylthiocarbazone* in 1000 ml of *chloroform.* Store the solution in a glass-stoppered, lead-free bottle, protected from light and in a refrigerator.

(8) **Citrate-cyanide wash solution** – To 50 ml of *water* add 50 ml of *ammonium citrate solution Sp.* and 4 ml of *potassium cyanide solution Sp.,* mix, and adjust the pH, if necessary, with strong *ammonia solution* to 9.0.

(9) **Buffer solution pH 2.5** – To 25.0 ml of 0.2 *M potassium hydrogen phthalate add* 37.0 ml of 0.1 N *hydrochloric acid.* and dilute with sufficient *water* to produce 100.0 ml.

(10) **Dithizone-carbon tetrachloride solution** –Dissolve 10 mg of *diphenylthiocarbazone* in 1000 ml of carbon tetrachloride. Prepare this solution fresh for each determination.

(11) **pH 2.5 wash solution** – To 500 ml of a 1 per cent v/v *nitric acid* add *strong ammonia solution* until the pH of the mixture is 2.5, then add 10 ml of *buffer solution* pH 2.5 and mix.

(12) **Ammonia-cyanide wash solution** – To 35 ml of pH 2.5 *wash solution* add 4 ml of *ammonia-cyanide solution Sp.,* and mix.

Method

Transfer the volume of the prepared sample directed in the monograph to a separator, and unless otherwise directed in monograph, add 6 ml of *ammonium citrate solution Sp.,* and 2 ml *hydroxylamine hydrochloride solution Sp.,* (For the determination of lead in iron salts use 10 ml of *ammonium citrate*

solution Sp.). Add two drops of *phenol red solution* and make the solution just alkaline (red in colour) by the addition *of strong ammonnia solution.* Cool the solution if necessary, and add 2 ml of *potassium cyanide solution Sp.* Immediately extract the solution with several quantities each of 5 ml, of *dithizone extraction solution,* draining off each extract into another separating funnel, until the dithizone extraction solution retains its green colour. Shake the combine dithizone solutions for 30 seconds with 30 ml of a 1 per cent w/v solution of *nitric acid* and discrad the chloroform layer. Add to the solution exactly 5 ml of *standard dithizone solution* and 4 ml of *ammonia-cyanide solution Sp.* and shake for 30 seconds; the colour of the chloroform layer is of no deeper shade of violet than that of a control made with a volume of *dilute standard lead solution* equivalent to the amount of lead permitted in the sample under examination.

2.3.6 Sulphated Ash

Heat a silica or platinum crucible to redness for 10 minutes, allow to cool in a desiccator and weigh. Put 1 to 2 g of the substance, accurately weighed, into the crucible, ignite gently at first, until the substance is thoroughly charred. Cool, moisten the residue with 1 ml of *sulphuric acid,* heat gently until white fumes are no longer evolved and ignite at 800° ± 25° until all black particles have disappeared. Conduct the ignition in a place protected from air currents. Allow the crucible to cool, add a few drops of *sulphuric acid* and heat. Ignite as before, allow to cool and weigh. Repeat the operation until two successive weighings do not differ by more than 0.5 mg.

2.3.7 –Limit Test for Sulphates

Reagents –

Barium sulphate reagent – Mix 15 ml of 0.5 *M barium chloride,* 55 ml of *water,* and 20 ml of *sulphate free alcohol,* add 5 ml of a 0.0181 per cent w/v solution of potassium sulphate, dilute to 100 ml with *water,* and mix. Barium sulphate reagent must be freshly prepared.

0.5 M Barium chloride – *Barium chloride d*issolved in *water* to contain in 1000 ml 122.1 g of $BaCl_2$, $2H_2O$.

Method

Dissolve the specified quantity of the substance in *water* , or prepare a solution as directed in the text, transfer to a *Nessler cylinder,* and add 2 ml of *dilute hydrochloric acid,* except where *hydrochloric acid* is used in the preparation of the solution. Dilute to 45 ml with *water,* add 5 ml of barium sulphate reagent. Stir immediately with a glass rod, and allow to stand for five minutes. The turbidity produced is not greater than the *standard turbidity,* when viewed transversely. Standard turbidity : Place 1.0 ml of 0.1089 per cent w/v solution of potassium sulphate and 2 ml of *dilute hydrochloric acid* in a *Nessler cylinder,*dilute to 45 ml with *water,* add 5 ml of barium sulphate reagent, stir immediately with a glass rod and allow to stand for five minutes.

APPENDIX –3

3.1 PHYSICAL TESTS AND DETERMINATIONS

3.1.1 Powder Fineness

The degree of coarseness or fineness of a powder is expressed by reference to the nominal mesh aperture size of the sieves for measuring the size of the powders. For practical reasons, the use of sieves, Appendix 1.2, for measuring powder fineness for most pharmaceutical purposes, is convenient but device other than sieves must be employed for the measurement of particles less than 100 mm in nominal size.

The following terms are used in the description of powders :

Coarse powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 1.70 mm and not more than 40.0 per cent through a sieve with a nominal mesh aperture of 355 μm.

Moderately coarse powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 710 μm and not more than 40.0 per cent through a sieve with a nominal mesh aperture of 250 μm.

Moderately fine powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 355 μm and not more than 40.0 per cent through a sieve with a nominal mesh aperature of 180 μm.

Fine powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 180 μm.

Very fine powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 125 μm .

When the fineness of a powder is described by means of a number, it is intended that all the particles of the powder shall pass through a *sieve* of which the nominal mesh aperture, in μm, is equal to that number.

When a batch of a vegetable drug is being ground and sifted, no portion of the drug shall be rejected but it is permissible except in the case of assays, to withhold the final tailings, if an approximately equal amount of tailings from a preceding batch of the same drug has been added before grinding.

Sieves – Sieves for testing powder fineness comply with the requirements stated under sieves, Appendix 1.2.

Method

(1) For coarse and moderately coarse powders – Place 25 to 100 g of the powder being examined upon the appropriate sieve having a close fitting receiving pan and cover. Shake the sieve in a rotary horizontal direction and vertically by tapping on a hard surface for not less than twenty minutes or until sifting is practically complete. Weigh accurately the amount remaining on the sieve and in the receiving pan.

(2) For fine and very fine powder – Proceed as described under coarse and moderately coarse powders, except that the test sample should not exceed 25 g and except that the sieve is to be shaken for not less than thirty minutes, or until sifting is practically complete.

NOTE – Avoid prolonged shaking that would result in increasing the fineness of the powder during the testing.

With oily or other powders which tend to clog the openings, carefully brush the screen at interval during siftings. Break up any lumps that may form. A mechanical sieve shaker which reproduces the circular and tapping motion given to sieves in hand sifting but has a uniform mechanical action may be employed.

3.1.2 Refractive Index

The refractive index (n) of a substance with reference to air is the ratio of the sine of the angle of incidence to the sine of the angle of refraction of a beam of light passing from air into the substance. It varies with the wavelength of the light used in its measurement.

Unless otherwise prescribed, the refractive index is measured at 25°(±0.5) with reference to the wavelength of the D line of sodium (ψ =589.3 nm). The temperature should be carefully adjusted and maintained since the refractive index varies significantly with temperature.

The Abbe refractometer is convenient for most measurements of refractive index but other refractometer of equal or greater accuracy may be used. Commercial refractometers are normally constructed for use with white light but are calibrated to give the refractive index in terms of the D line of sodium light.

To achieve accuracy, the apparatus should be calibrated against *distilled water :* which has a refractive index of 1.3325 at 25° or against the reference liquids given in the following table :-

TABLE

Reference Liquid	$n_D^{20°}$	Temperature Co-efficient $\Delta n/\Delta t$
Carbon tetrachloride	1.4603	-0.00057
Toluene	1.4969	-0.00056
a-Methylnaphthalene	1.6176	-0.00048

* Reference index value for the D line of sodium, measured at 20°

The cleanliness of the instrument should be checked frequently by determining the refractive index of distilled water which at 25° is 1.3325.

3.1.3 Weight Per Millilitre and Specific Graveity

Weight per millilitre – The weight per millilitre of a liquid is the weight in g of 1 ml of a liquid when weighed in air at 25°, unless otherwise specified.

Method

Select a thoroughly clean and dry pycnometer. Calibrate the pycnometer by filling it with recently boiled and cooled *Water* at 25° and weighing the contents. Assuming that the weight of 1 ml of *water* at 25° when weighed in air of density 0.0012 g per ml, is 0.99602 g. Calculate the capacity of the pycnometer. (Ordinary deviations in the density of air from the value given do not affect the result of a determination significantly). Adjust the temperature of the substance to be examined, to about 20° and fill the pycnometer

with it. Adjust the temperature of the filled pycnometer to 25°, remove any excess of the substance and weigh. Substract the tare weight of the pycnometer from the filled weight of the pycnometer. Determine the weight per milliliter dividing the weight in air, expressed in g, of the quantity of liquid which fills the pycnometer at the specified temperature, by the capacity expressed in ml, of the pycnometer at the same temperature.

Specific gravity –The specific gravity of a liquid is the weight of a given volume of the liquid at 25° (unless otherwise specified) compared with the weight of an equal volume of water at the same temperature, all weighings being taken in air.

Method

Proceed as described under Wt. Per ml. Obtain the specific gravity of the liquid by dividing the weight of the liquid contained in the pycnometer by the weight of water contained, both determined at 25° unless otherwise directed in the individual monograph.

APPENDIX –4

4.1 REAGENTS AND SOLUTIONS

Acetic Acid – Contains approximately 33 per cent w/v of $C_2H_4O_2$. Dilute 315 ml of glacial acetic acid to 1000 ml with *water*.

Acetic Acid, x N – Solutions of any normality xN may be prepared by diluting 60x ml of glacial acetic acid to 1000 ml with water.

Acetic Acid, Dilute – Contains approximately 6 per cent w/w of $C_2H_4O_2$. Dilute 57 ml of glacial acetic acid to 1000 ml with water.

Acetic Acid, Glacial – CH_3COOH =60.05.

Contains not less than 99.0 per cent w/w of $C_2H_4O_2$. About 17.5 N in strength.

Description – At temperature above its freezing point a clear colourless liquid, odour, pungent and characteristic; crystallises when cooled to about 10° and does not completely re-melt until warmed to about 15°.

Solubility – Miscible with *water,* with *glycerin* and most fixed and volatile oils.

Boiling range –Between 117° and 119°.

Congealing temperature –Not lower than 14.8°.

Wt. per ml –At 25° about 1.047 g.

Heavy metals –Evaporate 5 ml to dryness in a porcelain dish on water-bath, warm the residue with 2 ml of 0.1 *N hydrochloric acid* and water to make 25 ml; the limit of heavy metals is 10 parts per million, Appendix 2.3.3.

Chloride –5 ml complies with the limit test for chlorides, Appendix 2.3.2.

Sulphate –5 ml complies with the limit test for sulphates, Appendix 2.3.7.

Certain aldehydic substances – To 5 ml add 10 ml of *mercuric chloride solution* and make alkaline with *sodium hydroxide solution,* allow to stand for five minutes and acidify with dilute *sulphuric acid*; the solution does not show more than a faint turbidity.

Formic acid and oxidisable impurities – Dilute 5 ml with 10 ml of water, to 5 ml of this solution add 2.0 ml of 0.1 *N* potassium dichromate and 6 ml of sulphuric acid, and allow to stand for one minute, add 25 ml of water, cool to 15°, and add 1 ml of freshly prepared potassium iodide solution and titrate the liberated iodine with 0.1 *N* sodium thiosulphate, using starch solution as indicator. Not less than 1 ml of 0.*N sodium thiosulphate* is required.

Odorous impurities –Neutralise 1.5 ml with *sodium hydroxide solution*; the solution has no odour other than a faint acetous odour.

Readily oxidisable impurities – To 5 ml of the solution prepared for the test for Formic Acid and Oxidisable Impurities, add 20 ml of water and 0.5 ml of 0.1 *N potassium permanganate;* the pink colour does not entirely disappear within half a minute.

Non-volatile matter – Leaves not more than 0.01 per cent w/w of residue when evaporated to dryness and dried to constant weight at 105°.

Assay –Weigh accurately about 1 g into a stoppered flask containing 50 ml of *water* and titrate with *N sodium hydroxide,* using *phenolphthalein solution* as indicator. Each ml of *sodium hydroxide* is equivalent to 0.06005 g of C2H4O2.

Acetic Acid, Lead-Free –Acetic acid which complies with following additional test, boil 25 ml until the volume is reduced to about 15 ml, cool make alkaline with lead-free ammonia solution, add 1 ml of lead free *potassium cyanide solution, dilute* to 50 ml with water, add 2 drops of *sodium sulphide solution;* no darkening is produced.

Acetone – Propan 2-one; $(CH_3)_2CO$ = 58.08

Description – Clear, colourless, mobile and volatile liquid; taste, pungent and sweetish; odour characteristic; flammable.

Solubility –Miscible with *water,* with alcohol, with *solvent ether,* and with *chloroform,* forming clear solutions.

Distillation range – Not less than 96.0 per cent distils between 55.5° and 57°.

Acidity– 10 ml diluted with 10 ml of freshly boiled and cooled water; does not require for neutralisation more than 0.2 ml of 0.1 *N sodium hydroxide,* using phenolphthalein solution as indicator.

Alkalinty – 10 ml diluted with 10 ml of freshly boiled and cooled water, is not alkaline to litmus solution.

Methyl alcohol –Dilute 10 ml with water to 100 ml. To 1 ml of the solution add 1 ml of *water* and 2 ml of *potassium permanganate* and *phosphoric acid solution.* Allow to stand for ten minutes and add 2 ml of *oxalic acid* and *sulphuric acid solution;* to the colourless solution add 5 ml of *decolorised magenta solution* and set aside for thirty minutes between 15° and 30°; no colour is produced.

Oxidisable substances –To 20 ml add 0.1 ml of 0.1 *N potassium permanganate,* and allow to stand for fifteen minutes; the solution is not completely decolorised.

Water – Shake 10 ml with 40 ml of *carbon disulphide*; a clear solution is produced.

Non-volatile matter –When evaporated on a water-bath and dried to constant weight at 105°, leaves not more than 0.01 per cent w/v residue.

Acetone Solution, Standard – A 0.05 per cent v/v solution of acetone in water.

Alcohol –

Description –Clear, colourless, mobile, volatile liquid, odour, characteristic and spirituous; taste, burning, readily volatilised even at low temperature, and boils at about 78°, flammable. Alcohol containing not less than 94.85 per cent v/v and not more than 95.2 per cent v/v of C_2H_5OH at 15.56°.

Solubility –Miscible in all proportions with *water,* with *chloroform* and with *solvent ether.*

Acidity or alkalinity – To 20 ml add five drops of *phenolphthalein solution*; the solution remains colourless and requires not more than 2.0 ml of 0.1*N sodium hydroxide* to produce a pink colour.

Specific gravity –Between 0.8084 and 0.8104 at 25°.

Clarity of solution –Dilute 5 ml to 100 ml with *water* in glass cylinder; the solution remains clear when examined against a black background. Cool to 10° for thirty minutes; the solution remains clear.

Methanol – To one drop add one of water, one drop of *dilute phosphoric acid,* and one drop of *potassium permanganate solution.* Mix, allow to stand for one minute and add sodium bisulphite solution dropwise, until the permanganate colour is discharged. If a brown colour remains, add one drop of *dilute phosphoric* acid. To the colourless solution add 5 ml of freshly prepared *chromotropic acid* solution and heat on a water-bath at 60° for ten minutes; no violet colour is produced.

Foreign organic substances – Clean a glass-stoppered cylinder thoroughly with *hydrochloric acid,* rinse with water and finally rinse with the alcohol under examination. Put 20 ml in the cylinder, cool to about 15° and then add from a carefully cleaned pipette 0.1 ml 0.1 *N potassium permanganate.* Mix at once by inverting the stoppered cylinder and allow to stand at 15° for five minutes; the pink colour does not entirely disappear.

Isopropyl alcohol and t-butyl alcohol – To 1 ml add 2 ml of water and 10 ml of *mercuric sulphate solution* and heat in a boiling water-bath; no precipitate is formed within three minutes.

Aldehydes and ketones – Heat 100 ml of *hydroxylamine hydrochloride solution* in a loosely stoppered flask on a water-bath for thirty minutes, cool, and if necessary, add sufficient 0.05 *N sodium hydroxide* to restore the green colour. To 50 ml of this solution add 25 ml of the alcohol and heat on a water bath for ten minutes in a loosely stoppered flask. Cool, transfer to a Nesseler cylinder, and titrate with 0.05 *N sodium hydroxide* until the colour matches that of the remainder of the *hydroxylamine hydrochloride solution* contained in a similar cylinder, both solutions being viewed down the axis of the cylinder. Not more than 0.9 ml of 0.05 *N sodium hydroxide* is required.

Fusel oil constituents – Mix 10 ml with 5 ml of *water* and 1 ml of *glycerin* and allow the mixture to evaporate spontaneously from clean, odourless absorbent paper; no foreign odour is perceptible at any stage of the evaporation.

Non-volatile matter – Evaporate 40 ml in a tared dish on a water-bath and dry the residue at 105° for one hour; the weight of the residue does not exceed 1 mg.

Storage – Store in tightly-closed containers, away from fire.

Labelling – The label on the container states "Flammable".

Dilute Alcohols : Alcohol diluted with water to produce dilute alcohols. They are prepared as described below :

Alcohol (90 per cent)
Dilute 947 ml of alcohol to 1000 ml with water.
Specific Gravity –At 15.56°/15.56°, 0.832 to 0.835.

Alcohol (80 per cent)
Dilute 842 ml of alcohol to 1000 ml with water.
Specific Gravity –At 15.56°/15.56°, 0.863 to 0.865,

Alcohol (60 per cent)
Dilute 623 ml of alcohol to 1000 ml with water.
Specific Gravity –At 15.56°/15.56°, 0.913 to 0.914,

Alcohol (50 per cent)
Dilute 526 ml of alcohol to 1000 ml with water
Specific Gravity –At 15.56°/15.56°, 0.934 to 0.935.

Alcohol (25 per cent)
Dilute 263 ml of alcohol to 1000 ml with water.
Specific Gravity –At 15.56°/15.56°, 0.9705 to 0.9713.

Alcohol (20 per cent)
Dilute 210 ml of alcohol to 1000 ml with water.
Specific Gravity –At 15.56°/15.56°, 0.975 to 0976.

Alcohol, Aldehyde-free. –Alcohol which complies with the following additional test :

Aldehyde – To 25 ml, contained in 300 ml flask, add 75 ml of *dinitrophenyl hydrazine solution,* heat on a water bath under a reflux condenser for twenty four hours, remove the alcohol by distillation, dilute to 200 ml with a 2 per cent v/v solution of sulphuric acid, and set aside for twenty four hours; no crystals are produced.

Alcohol, Sulphate-free. –Shake alcohol with an excess of anion exchange resin for thirty minutes and filter.

Ammonia, xN. –Solutions of any normality xN may be prepared by diluting 75 x ml of strong ammonia solution to 1000 ml with water.

Ammonia-Ammonium Chloride Solution, Strong. –Dissolve 67.5 g of *ammonium chloride* in 710 ml of strong *ammonia solution* and add sufficient *water* to produce 1000 ml.

Ammonia Solution, Dilute. – Contains approximately 10 per cent w/w of NH_3.

Dilute 425 ml of *strong ammonia solution* to 1000 ml with *water.*

Wt. per ml – At 25°, about 0.960 g.

Storage – Dilute ammonia solution should be kept in a well-closed container, in a cool place.

Ammonia Solution 2 per cent –Ammonia solution 2 per cent is the ammonia solution strong diluted with purified water to contain 2 per cent v/v of Ammonia solution strong.

Ammonia Solution, Strong –Contains 25.0 per cent w/w of NH3 (limit, 24.5 to 25.5). About 13.5 N in strength.

Description –Clear, colourless liquid; odour, strongly pungent and characteristic.

Solubility –Miscible with *water* in all proportions.

Wt. per. ml – At 25°, about 0.91g.

Heavy metals –Evaporate 5 ml to dryness on a water-bath. To the residue, add 1 ml of *dilute hydrochloric acid* and evaporate to dryness. Dissolve the residue in 2 ml of *dilute acetic acid* and add *water* to make 25 ml; the limit of heavy metals is 15 parts per million, Appendix 2.3.3.

Iron –Evaporate 40 ml on a water-bath to about 10 ml. The solution complies with the *limit test for iron,* Appendix 2.3.4

Chloride –Evaporate 40 ml on a water-bath to about 5 ml. The solution complies with the *limit test for chlorides*, Appendix 2.3.2.

Sulphate –Evaporate 20 ml on a water-bath to about 5 ml. The solution complies with *the limit test for sulphates*; Appendix 2.3.7.

Tarry matter – Dilute 5 ml with 10 ml of *water*, mix with 6 g of powdered *citric acid* in a small flask, and rotate until dissolved; no tarry or unpleasant odour is perceptible.

Non-volatile residue –Evaporate 50 ml to dryness in a tared porcelain dish and dry to constant weight at 105°, not more than 5 mg of residue remains.

Assay –Weigh accurately about 3 g in flask containing 50 ml of *N sulphuric acid* and titrate the excess of acid with *N sodium hydroxide*, using *methyl red solution* as indicator. Each ml of *N sulphuric acid* is equivalent to 0.01703 g of NH_3.

Storage –Preserve strong Ammonia Solution in a well-closed container, in a cool place.

Ammonia Solution, Iron-free –Dilute ammonia solution which complies with the following additional test :-

Evaporate 5 ml nearly to dryness on a water-bath add 40 ml of water, 2 ml of 20 per cent w/v *solution of iron free citric acid* and 2 drops of *thioglycollic acid*, mix, make alkaline with *iron-free ammonia solution and dilute* to 50 ml with *water*, no pink colour is produced.

Ammonia Buffer pH 10.00 –Ammonia buffer solution. Dissolve 5.4 g of *ammonium chloride* in 70 ml of 5 *N ammonia and dilute* with *water* to 100 ml.

Ammonium Chloride –NH_4Cl = 53.49

Description – Colourless crystals or white crystalline powder; odourless; taste, saline.

Solubility – Freely soluble in *water*, sparingly soluble in alcohol.

Arsenic – Not more than 4 parts per million, Appendix 2.3.1.

Heavy metals –Not more than 10 parts per million, determined by method A, on 2.0 g dissolved in 25 ml of water, Appendix 2.3.3.

Barium – Dissolve 0.5 g in 10 ml of *water* and add 1 ml of *dilute sulphuric acid*; no turbidity is produced within two hours.

Sulphate – 2 g complies with the limit test for sulphates, Appendix 2.3.7

Thiocyanate – Acidify 10 ml of a 10 per cent w/v solution with *hydrochloric acid* and add a few drops of *ferric chloride solution*; no red colour is produced.

Sulphated ash – Not more than 0.1 per cent, Appendix 2.3.6.

Assay – Weigh accurately about 0.1 g, dissolve in 20 ml of water and add a mixture of 5 ml of *formaldehyde solution*, previously neutralised to *dilute phenolphthalein solution* and 20 ml of water. After two minutes, titrate slowly with 0.1 *N sodium hydroxide*, using a further 0.2 ml of *dilute phenolphthalein solution*. Each ml of 0.1N *sodium hydroxide* is equivalent to 0.005349 g of NH_4Cl.

Ammonium Chloride Solution –A 10.0 per cent w/v solution of *ammonium chloride* in water.

Ammonium Citrate Solution –Dissolve with cooling, 500 g *citric acid* in a mixture of 200 ml of *water* and 200 ml of 13.5 M ammonia, filter and dilute with water to 1000 ml.

Ammonium Nitrate – NH_4NO_3 =80.04

Description – Colourless crystals

Solubility – Freely soluble in water

Acidity – A solution in water is slightly acid to litmus *solution.*

Chloride – 3.5 g complies with the limit test for chloride, Appendix 2.3.2.

Sulphate – 5 g complies with the limit test for sulphates, Appendix 2.3.7.

Sulphated ash – Not more than 0.05 per cent, Appendix 2.3.6.

Ammonium Oxalate – $(CO_2NH_4)_2.H_2O$ =142.11.

Description –Colourless crystals

Solubility – Soluble in water

Chloride –2 g, with an additional 20 ml of *dilute nitric acid,* complies with the limit test for chlorides, Appendix 2.3.2.

Sulphate –Dissolve 1 g in 50 ml of water, add 2.5 ml of hydrochloric acid and 1ml of *barium chloride solution* and allow to stand for one hour; no turbidity or precipitate is produced.

Sulphated ash – Not more than 0.005 percent, Appendix 2.3.6.

Ammonium Oxalate Solution –A 2.5 per cent w/v solution of *ammonium oxalate* in water.

Ammonium Phosphate – $(NH_4)_2HPO_4$ –

Description –White crystals or granules.

Solubility –Very soluble in wate; insoluble in alcohol.

Reaction – 1 g dissolved in 100 ml of *carbon dioxide-free water* has a reaction of about pH 8.0, using solution of cresol red as indicator.

Iron –2 g complies with the limit test for iron, Appendix 2.3.4.

Chloride – 2 g with an additional 3.5 ml of nitric acid complies with the limit test for chlorides, Appendix 2.3.2.

Sulphate –2.5 g with an additional 4ml of hydrochloric acid, complies with the limit test for sulphate, Appendix 2.3.2.

Ammonium Phosphate, Solution –A 10.0 per cent w/v solution of ammonium phosphate in water.

Ammonium Thiocyanate – NH_4SCN = 76.12.

Description –Colourless crystals.

Solubility – Very soluble in water, forming a clear solution, readily soluble in alcohol.

Chloride –Dissolve 1 g in 30 ml of solution of hydrogen peroxide, add 1 g of *sodium hydroxide*, warm gently, rotate the flask until a vigorous reaction commences and allow to stand until the reaction is complete; add a further 30 ml of *hydrogen peroxide solution* boil for two minutes, cool, and add 10 ml of *dilute nitric acid* and 1 ml of *silver nitrate solution*; any opalescence produced is not greater than that obtained by treating 0.2 ml of 0.01 *N hydrochloric acid* in the same manner.

Sulphated ash –Moisten 1 g with *sulphuric acid* and ignite gently, again moisten with sulphuric acid and ignite; the residue weighs not more than 2.0 mg.

Ammonium Thiocyanate, 0.1N – NH_4SCN = 76.12; 7.612 in 1000 ml. Dissolve about 8 g of *ammonium thiocyanate* in 100o ml of water and standardise the solution as follows :

Pipette 30 ml of standardised 0.1 *N silver nitrate* into a glass stoppered flask, dilute with 50 ml of *water* then add 2 ml of *nitric acid* and 2 ml of *ferric ammonium sulphate solution* and titrate with the *ammonium thiocyanate solution* to the first appearance of a red brown colour. Each ml of 0.1N silver nitrate is equivalent to 0.007612 g of NH_4SCN.

Ammonium Thiocyanate Solution – A 10.0 per cent w/v solution of *ammonium thiocyanate solution.*

Anisaldehyde-Sulphuric Acid Reagent – 0.5 ml *anisaldehyde* is mixed with 10 ml *glacial acetic acid*, followed by 85 ml methanol and 5 ml concentrated *sulphuric acid* in that order.

The reagent has only limited stability and is no longer usable when the colour has turned to redviolet.

Arsenic Trioxide –As_2O_3 = 197.82. Contains not less than 99.8 per cent of As_2O_3..

Description – Heavy white powder

Solubility –Sparingly soluble in water; more readily soluble in water on the addition of *hydrochloric acid*, or solutions of alkali hydroxides or carbonates.

Arsenious sulphide – Weigh accurately 0.50 g and dissolve in 10 ml of *dilute ammonia sulution;* forms a clear colourless solution which, when diluted with an equal volume of water and acidified with *hydrochloric acid*, does not become yellow.

Non-volatile matter –Leaves not more than 0.1 per cent of residue when volatilised.

Assay –Weigh accurately about 0.2 g and dissolve in 20 ml of boiling water and 5 ml of *N sodium hydroxide*, cool, and 5 ml of *N hydrochloric acid* and 3 g of *sodium bicarbonate,* and titrate with 0.1 *N iodine.* Each ml of 0.1N iodine is equivalent to 0.004946 g of As_2O_3.

Barium Chloride - $BaCl_2$, $2H_2O$ =244.27.

Description – Colourless crystals.

Solubility –Freely soluble in water.

Lead –Dissolve 1 g in 40 ml of recently boiled and cooled water, add 5 ml of *lead free acetic acid.* Render alkaline with *lead-free ammonia solution* and add 2 drops of *lead-free sodium sulphide solution;* not more than a slight colour is produced.

Nitrate –Dissolve 1 g in 10 ml of *water*, add 1 ml of *indigo carmine solution* and 10 ml of *nitrogen free sulphuric acid* and heat to boiling; the blue colour does not entirely disappear.

Barium Chloride Solution –A 10.0 per cent w/v solution of *barium chloride* in *water.*

Bismuth Oxynitrate – Bismuth Oxide Nitrate, Contains 70.0 to 74.0 per cent of Bi.

Description –White, microcrystalline powder.

Solubility –Practically insoluble in water, in alcohol; freely soluble in *dilute nitric acid* and in *dilute hydrochloric acid.*

Assay –Weigh accurately about 1 g and dissolve in a mixture of 20 ml of *glycerin* and 20 ml of water. Add 0.1 g of *sulphamic acid* and titrate with 0.05 M *disodium ethylenediamine tetraacetate*, using *catechol violet solution* as indicator. Each ml of 0.05 M disodium ethylenediamine tetra-acetate is equivalent to 0.01045 g of Bi.

Borax -Sodium Tetraborate , $Na_2B_4O_7.\ 10H_2O$ = 381.37. Contains not less than 99.0 per cent and not more than the equivalent of 103.0 per cent of $Na_2B_4O_7.\ 10H_2O$.

Description –Transparent, colourless crystals, or a white, crystalline powder; odourless, taste, saline and alkaline. Effloreces in dry air, and on ignition, loses all its water of crystallisation.

Solubility –Soluble in water, practically insoluble in alcohol.

Alkalinity –A solution is alkaline to litmus solution.

Heavy metals –Dissolve 1 g in 16 ml of water and 6 ml of *N hydrochloric acid* and add *water* to make 25 ml; the limit of heavy metals is 20 parts per million, Appendix 2.3.3.

Iron –0.5 g complies with the *limit test for iron*, Appendix 2.3.4

Chlorides –1 g complies with the *limit test for chlorides,* Appendix 2.3.2

Sulphates –1g complies with the *limit test for sulphates,* Appendix 2.3.7.

Assay –Weigh accurately about 3 g and dissolve in 75 ml of *water* and titrate with 0.5 *N hydrochloric acid*, using *methyl red solution* as indicator. Each ml of 0.5 *N* hydrochloric acid is equivalent to 0.09534 g of $Na_2B_4O_7.10.H_2O$.

Storage – Preserve Borax in well-closed container.

Boric Acid –H_3BO_3 = 61.83.

Description –Colourless plates or white crystals or white crystalline powder, greasy to touch; odourless; taste, slightly acid and bitter with a sweetish after taste.

Solubility –Soluble in *water* and in *alcohol*; freely soluble in boiling *water*, in boiling *alcohol* and in *glycerin.*

Sulphate –Boil 3 g with 30 ml of *water* and 1 ml of *hydrochloric acid*, cool, and filter; 25 ml of the filtrate complies with the *limit test for sulphates*, Appendix 2.3.7.

Arsenic –Not more than 10 parts per million, Appendix 2.3.1.

Heavy metals –Not more than 20 parts per million, determined by Method A on a solution obtained by dissolving 1.0 g in 2 ml of *dilute acetic acid* and sufficient *water* to produce 25 ml, Appendix 2.3.3.

Assay –Weigh accurately about 2 g, and dissolve in a mixture of 50 ml of *water* and 100 ml of *glycerine*, previously neutralised to *phenolphthalein solution*. Titrate with *N sodium hydroxide*, using *phenolphthalein solution* as indicator. Each ml of *N sodium hydroxide* is equivalent to 0.06183 g of H_3BO_3.

Storage –Store in well-closed containers.

Labelling –The label on the container states "Not for internal use".

Boric Acid Solution –Dissolve 5 g of boric acid in a mixture of 20 ml of *water* and 20 ml of *absolute ethanol* and dilute with *absolute ethanol* to 250 ml.

Bromine – Br2 =159.80.

Description –Reddish-brown, fuming, corrosive liquid.

Solubility –Slightly soluble in *water*, soluble in most organic solvents.

Iodine –Boil 0.2 ml with 20 ml of *water*, 0.2 ml of *N sulphuric acid* and a small piece of marble until the liquid is almost colourless. Cool, add one drop of *liquified phenol*, allow to stand for two minutes, and then add 0.2 g of *potassium iodide* and 1 ml of *starch solution*; no blue colour is produced.

Sulphate –Shake 3 ml with 30 ml of *dilute ammonia solution* and evaporate to dryness on a water bath, the residue complies with the *limit test for sulphates*, Appendix 2.3.7.

Bromine Solution – Dissolve 9.6 ml of *bromine* and 30 g of *potassium bromide* in sufficient *water* to produce 100 ml.

Bromocresol Purple – 4,4' –(3H-2, 1-Benzoxathiol-3-ylidene) bis-(2,6-dibromo-o-cresol) SS-dioxide; $C_{21}H_{14}Br_2O_4S$ =540.2.

Gives a yellow colour in weakly acid solutions and a bluish-violet colour in alkaline, neutral and extremely weakly acid solutions (pH range, 5.2 to 6.8).

Bromocresol Purple Solution –Warm 0.1 g of *bromocresol purple* with 5 ml of *ethanol* (90 per cent) until dissolved, add 100 ml of ethanol (20 per cent), 3.7 ml of 0.05 M *sodium hydroxide*, and sufficient *ethanol (20 per cent)* to produce 250 ml.

Complies with the following test :

Sensitivity –A mixture of 0.2 ml of the solution and 100 ml of *carbon dioxide-free water* to which 0.05 ml of 0.02 M *sodium hydroxide* has been added is bluish-violet. Not more than 0.20 ml of 0.02 M *hydrochloric acid* is required to change the colour to yellow.

Bromophenol Blue –4, 4/, -(3H-2, 1-Benzoxathiol-3-ylidene) bis-(2-6-dibromophenol) SS-dioxide C19H19Br4O5S = 670.

Gives a yellow colour in moderately acid solutions, and a bluish-violet colour in weakly acid and alkaline solutions (pH range, 2.8 to 4.6).

Bromophenol Blue Solution – Warm 0.1 g of *bromophenol blue* with 3.0 ml of 0.05 *N sodium hydroxide* and 5 ml of *alcohol* (90 per cent); after solution is effected, add sufficient *alcohol* (20 per cent) to produce 250 ml.

Complies with the following test :

Sensitivity –A mixture of 0.05 ml of the solution and 20 ml of *carbon dioxide-free water* to which 0.05 ml of 0.1*N hydrochloric acid* has been added is yellow. Not more than 0.10 ml of 0.1 *N sodium hydroxide* is required to change the colour to bluish-violet.

Bromothymol Blue –6, 6′–(3H-2, 1–Benzoxathiol–3–ylidene) bis –(2 –bromothymol) SS–dioxide $C_{27}H_{28}Br_2O_5S = 624$.

Gives a yellow colour in weakly acid solutions and a blue colour in weakly alkaline solutions. Neutrality is indicated by a green colour (pH range, 6.0 to 7.6).

Bromothymol Blue Solution –Warm 0.1 g of *bromothymol blue* with 3.2 ml of 0.05 *N sodium hydroxide* and 5 ml of alcohol (90 per cent); after solution is effected, add sufficient alcohol (20 per cent) to produce 250 ml.

Complies with the following test :

Sensitivity –A mixture to 0.3 ml of the solution and 100 ml of *carbon dioxide-free water* is yellow. Not more than 0.10 ml of 0.02 *N sodium hydroxide* is required to change the colour to blue.

Cadmium Iodide – $CdI_2 = 366.23$

Description –Pearly white flakes or a crystalline powder.

Solubility –Freely soluble in water.

Iodate –Dissolve 0.2 g in 10 ml of *water*, and add 0.5 g of *citric acid* and 1 ml of *starch solution*, no blue colour is produced.

Cadmium Iodide Solution – A 5.0 per cent w/v solution of *cadmium iodide* in *water*.

Calcium Carbonate – $CaCO_3 = 100.1$

Analytical reagent grade of commerce.

Calcium Chloride – $CaCl_2\ H_2O = 147.0$.

Analytical reagent grade of commerce.

Calcium Chloride Solution –A 10 per cent w/v solution of calcium chloride in water.

Calcium Hydroxide – $Ca(OH)_2 = 74.09$

Analytical reagent grade of commerce.

Calcium Hydroxide Solution –Shake 10 g of calcium hydroxide repeatedly with 1000 ml of water and allow to stand until clear.

Calcium Sulphate – $CaSO_4, 2H_2O = 172.17$.

Description –White powder.

Solubility –Slightly soluble in *water*.

Chloride –Boil 5 g with 50 ml of *water* and filter while hot. The filtrate, after cooling complies with the limit test for chlorides, Appendix 2.3.2.

Acid-insoluble matter –Boil 2 g with 100 ml of *N hydrochloric acid*; and then with *water*, dry, ignite, and weigh; the residue weighs not more than 2 mg.

Alkalinity –Boil 1 g with 50 ml of water, cool, and titrate with *0.1 N hydrochloric acid, using bromo thymol blue solution* as indicator; not more than 0.3 ml of 0.1 *N hydrochloric acid* is required.

Carbonate –Boil 1 g with 10 ml of *water* and 1 ml of *hydrochloric acid,* no carbon dioxide is evolved.

Residue on ignition –When ignited, leaves not less than 78.5 per cent and not more than 80.0 per cent of residue.

Camphor –C10H16O = 152.23

Camphor is a ketone, obtained from *Cinnamomum camphora* (Linn.) Nees and Eberm. (Fam. Lauraceae) and *Ocimum kilimandscharicum Guerke* (Fam. Labiatae) (Natural Camphor) or produced synthetically (Synthetic Camphor). It contains not less than 96.0 per cent of $C_{10}H_{16}O$.

Description – Colourless or white crystals, granules or crystalline masses or colourless to white, translucent tough masses; odour, penetrating and characteristic; taste, pungent, aromatic, and followed by a sensation of cold. Readily pulverisable in the presence of a little *alcohol, chloroform*, or solvent ether.

Solubility –Slightly soluble in water, very soluble in *alcohol, in chloroform* and in *solvent ether*, freely soluble in fixed oils and in volatile oils.

Melting range –174° to 179°.

Specific optical rotation – + 41° to + 43°, determined in a 10 per cent w/v solution of Natural Camphor in alcohol. Synthetic Camphor is the optically inactive, racemic form.

Water – A 10 per cent w/v solution in light petroleum (boiling range 40° to 60°) is clear.

Non-volatile matter – Leaves not more than 0.05 per cent of residue when volatilised at 105°.

Assay – Weigh accurately about 0.2 g and dissolve in 25 ml of *aldehyde-free alcohol*, in a 300-ml flask. Slowly add while stirring 75 ml of *dinitrophenylhydrazine* solution and heat on a water-bath for four hours under a reflux condenser. Remove the alcohol by distillation, allow to cool, dilute to 200 ml with a 2 per cent v/v solution of *sulphuric acid* in water. Set aside for twenty-four hours, filter in a tared Gooch crucible, and wash the precipitate with successive quantities of 10 ml of cold water until the washings are neutral to *litmus paper*. Dry to constant weight at 80° and weigh. Each g of precipitate is equivalent to 0.458 g of C10H16O.

Storage –Preserve Camphor in a well-closed container in a cool place.

Canada Balsam Reagent –General reagent grade of commerce.

Carbon Dioxide – CO_2 = 44. 01.

Commercially available carbon dioxide.

Carbon Disulphide – CS_2 = 76.14

Description –Clear, almost colourless, flammable liquid.

Distillation range – Not less than 95 per cent distils between 46° and 47°.

Wt. per ml – At 25°, about 1.263 g.

Non-volatile matter –When evaporated to dryness on a water bath, and dried to constant weight at 105°. Leaves not more than 0.005 per cent w/v of residue.

Carbon Tetrachloride – CCl_4 = 153.82

Description –Clear, colourless, volatile, liquid; odour, characteristic.

Solubility –Practically insoluble in water; miscible with ethyl alcohol, and with solvent ether.

Distillation range –Not less than 95 per cent distils between 76° and 77°.

Wt per ml – At 20°, 1.592 to 1.595 g.

Chloride, Free acid –Shake 20 ml with 20 ml of freshly boiled and cooled water for three minutes and allow separation to take place; the aqueous layer complies with the following test :

Chloride – To 10 ml add one drop of nitric acid and 0.2 ml of *silver nitrate solution*; no opalescence is produced.

Free acid –To 10 ml add a few drops of *bromocresol purple solution;* the colour produced does not indicate more acidity than that indicated by the addition of the same quantity of the indicator to 10 ml of freshly boiled and cooled *water.*

Free chlorine –Shake 10 ml with 5 ml of *cadmium iodide solution* and 1 ml *of starch solution,* no blue colour is produced.

Oxidisable impurities –Shake 20 ml for five minutes with a cold mixture of 10 ml of *sulphuric acid* and 10 ml of 0.1 *N potassium dichromate,* dilute with 100 ml of water and add 3 g of *potassium iodide* : the liberated iodine requires for decolourisation not less than 9 ml of 0.1 *N sodium thiosulphate.*

Non-volatile matter –Leaves on evaporation on a water-bath and drying to constant weight at 105° not more than 0.002 per cent w/v of residue.

Caustic Alkali Solution, 5 per cent –

Dissolve 5 g of *potassium or sodium hydroxide* in *water* and dilute to 100 ml.

Charcoal, Decolourising –General purpose grade complying with the following test.

Decolourising powder –Add 0.10 g to 50 ml of 0.006 per cent w/v solution of *bromophenol blue* in ethanol (20 per cent) contained in a 250 ml flask, and mix. Allow to stand for five minutes, and filter; the colour of the filterate is not deeper than that of a solution prepared by diluting 1 ml of the *bromophenol blue solution* with *ethanol* (20 per cent) to 50 ml.

Chloral Hydrate –$CCl_3.CH(OH)_2$ = 165.40.

Description –Colourless, transparent crystals, odour, pungent but not acrid; taste, pungent and slightly bitter, volatilises slowly on exposure to air.

Solubility –Very soluble in *water,* freely soluble in *alcohol,* in chloroform and in *solvent ether.*

Chloral alcoholate – Warm 1 g with 6 ml of *water* and 0.5 ml of *sodium hydroxide solution* : filter, add sufficient 0.*1 N iodine* to impart a deep brown colour, and set aside for one hour; no yellow crystalline precipitate is produced and no smell of iodoform is perceptible.

Chloride – 3 g complies with the limit test for chlorides, Appendix 2.3.2.

Assay – Weigh accurately about 4 g and dissolve in 10 ml of *water* and add 30 ml of *N sodium hydroxide.* Allow the mixture to stand for two minutes, and then titrate with *N sulphuric acid* using *phenolphthalein solution* as indicator. Titrate the neutralised liquid with 0.1 *N silver nitrate* using solution of *potassium chromate* as indicator. Add two-fifteenth of the amount of 0.1 *N silver nitrate* used to the amount of *N sulphuric acid* used in the first titration and deduct the figure so obtained from the amount of *N sodium hydroxide* added. Each ml of *N sodium hydroxide,* obtained as difference; is equivalent to 0.1654 g of $C_2H_3Cl_3O_2$.

Storage – Store in tightly closed, light resistant containers in a cool place.

Chloral Hydrate Solution –Dissolve 20 g of *chloral hydrate* in 5 ml of water with warming and add 5 ml of *glycerin.*

Chloral Iodine Solution –Add an excess of crystalline *iodine* with shaking to the *chloral hydrate solution*, so that crystals of undissolved iodine remain on the bottom of bottle. Shake before use as the iodine dissolves, and crystals of the iodine to the solution. Store in a bottle of amber glass in a place protected from light.

Chlorinated Lime –Bleaching powder. Contains not less than 3.0 per cent of available chlorine.

Description –A dull white powder; odour characteristic. On exposure to air it becomes moist and gradually decomposes.

Solubility –Slightly soluble in water and in alcohol.

Stability –Loses not more than 3.0 per cent of its available chlorine by weight when heated to 100° for two hours (The available chlorine is determined by the Assay described below).

Assay –Weigh accurately about 4 g, triturate in a mortar with successive small quantities of water and transfer to a 1000 ml flask. Add sufficient water to produce 1000 ml and shake thoroughly. To 100 ml to this suspension add 3 g of *potassium iodide* dissolved in 100 ml of *water*, acidify with 5 ml of *acetic acid* and titrate the liberated iodine with 0.1 *N sodium thiosulphate*. Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.003545 g of available chlorine.

Storage –Preserve in a well-closed container.

Chlorinated Lime Solution. –Mix 100 g of *chlorinated lime* with 1000 ml of *water;* transfer the mixture to a stoppered bottle; set aside for three hours, shaking occasionally; filter through calico.

Chlorinated lime solution must be recently prepared.

Chloroform – $CHCl_3$ = 119.38

Description –Colourles, volatile liquid; odour, characteristic, taste, sweet and burning.

Solubility –Slightly soluble in water; freely miscible with ethyl alcohol and with solvent ether.

Wt. Per ml. : Between 1.474 and 1.478 g.

Boiling range – A variable fraction, not exceeding 5 per cent v/v, distils below 60° and the remainder distils between 50° to 62°.

Acidity –Shake 10 ml with 20 ml of freshly boiled and cooled water for three minutes, and allow to separate. To a 5 ml portion of the aqueous layer add 0.1 ml of *litmus solution*; the colour produced is not different from that produced on adding 0.1 ml of *litmus solution* to 5 ml of freshly boiled and cooled water.

Chloride –To another 5 ml portion of the aqueous layer obtained in the test for Acidity, add 5 ml of water and 0.2 ml of *silver nitrate solution*; no opalescence is produced.

Free chlorine –To another 10 ml portion of the aqueous layer, obtained in the test for Acidity, add 1 ml of *cadmium iodide solution* and two drops of starch solution; no blue colour is produced.

Aldehyde –Shake 5 ml with 5 ml of water and 0.2 ml of *alkaline potassium mercuri-iodide solution* in a stoppered bottle and set aside in the dark for fifteen minutes; not more than a pale yellow colour is produced.

Decomposition products – Place 20 ml of the *chloroform* in a glass-stoppered flask, previously rinsed with *sulphuric acid,* add 15 ml of *sulphuric acid* and four drops of *formaldehyde solution*, and shake the mixture frequently during half an hour and set aside for further half an hour, the flask being protected from light during the test; the acid layer is not more than slightly coloured.

Foreign organic matter – Shake 20 ml with 10 ml of *sulphuric* acid in a stoppered vessel previously rinsed with *sulphuric acid* for five minutes and set aside in the dark for thirty minutes, both the acid and chloroform layers remain colourless. To 2 ml of the acid layer add 5 ml of water; the liquid remains colourless and clear, and has no unpleasent odour. Add a further 10 ml of water and 0.2 ml of *silver nitrate solution*; no opalescence is produced.

Foreign odour –Allow 10 ml to evaporate from a large piece of filter paper placed on a warm plate; no foreign odour is detectable at any stage of the evaporation.

Non volatile matter – Not more than 0.004 per cent w/v determined on 25 ml by evaporation and drying at 105°.

Storage : Store in tightly-closed, glass-stoppered, light-resistant bottles.

Note :- Care should be taken not to vaporise Chloroform in the presence of a flame because of the production of harmful gases.

Chloroform Water –

Chloroform	:	2.5 ml
Purified Water	:	sufficient to produce 1000 ml

Dissolve the *Chloroform* in the purified water by shaking.

Chromic-Sulphuric Acid Mixture –A saturated solution of Chromium trioxide in sulphuric acid .

Chromium Trioxide – $CrO_3 = 99.99$

Analytical reagent grade.

Chromotropic Acid – $C_{10}H_8O_8S_2.2H_2O = 356.32$

Description –White to brownish powder. It is usually available as its sodium salt, $C_{10}H_8O_8S_2Na_2$, which is yellow to light brown in colour.

Solubility –Soluble in water; sodium salt is freely soluble in water.

Sensitivity –Dilute exactly 0.5 ml *formaldehyde solution* with water to make 1000 ml. Disslove 5 mg of *chromotropic acid* or its sodium salt, in a 10 ml of a mixture of 9 ml *of sulphuric acid* and 4 ml of water. Add 5 ml of this solution to 0.2 ml of the *formaldehyde solution*, and heat for 10 minutes at 60°; a violet colour is produced.

Chromotropic Acid Solution –Dissolve 5 mg of *chromotropic acid sodium* salt in 10 ml of a mixture of 9 ml of *sulphuric acid* and 4 ml of water.

Citric Acid – $C_6H_8O_7$, H_2O =210.1

Colourless, translucent crystals, or a white, crystalline powder, slightly hygroscopic in moist air and slightly efflorescent in warm dry air; odourless; taste, strongly acid.

Analytical reagent grade.

Citric Acid, Iron-Free –Citric acid which complies following additional test :

Dissolve 0.5 g in 40 ml of water, add 2 drops of thioglycollic acid, mix, make alkaline with iron free ammonia solution and dilute to 50 ml with water; no pink colour is produced.

Copper Acetate –$Cu(C_2H_3O_2)_2$, H_2O =199.65

Contains not less than 98.0 per cent of $C_4H_6O_4Cu$, H_2O

Description –Blue-green crystals or powder, having a faint odour of acetic acid.

Solubility – Soluble in water, yielding a clear solution.

Chloride –3g complies with the *limit test for chlorides*, Appendix 2.3.2.

Sulphate –3g complies with the *limit test for sulphates*, Appendix 2.3.7.

Assay –Weigh accurately about 0.8 g and dissolve in 50 ml of water, add 2 ml of *acetic acid* and 3 g of *potassium iodide*, and titrate the liberated iodine with 0.1 *N sodium thiosulphate*, using starch solution as indicator, until only a faint blue colour remains; add 2 g of *potassium thiocyanate* and continue the titration until the blue colour disappears. Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.01997 g of $C_4H_6O_4Cu$, H_2O

Copper Acetate, Solution –0.5 per cent w/v of copper acetate in water.

Copper Sulphate – $CuSO_4$, $5H_2O$ = 249.68

Contains not less than 98.5 per cent and not more than the equivalent of 101.0 per cent of $CuSO_4$, $5H_2O$.

Description –Blue triclinic prisms or a blue, crystalline powder.

Solubility –Soluble in *water*, very solube in boiling water, almost insoluble in *alcohol*; very slowly soluble in *glycerin.*

Acidity and clarity of solution – 1 g, dissolved in 20 ml of water,forms a clear blue solution, which becomes green on the addition of 0.1 ml of *methyl orange solution.*

Iron – To 5 g, add 25 ml of water, and 2 ml of nitric acid, boil and cool. Add excess of *strong ammonia solution*, filter, and wash the residue with *dilute ammonia solution* mixed with four times its volumes of water. Dissolve the residue, if any, on the filter with 2 ml of *hydrochloric acid*, diluted with 10 ml of water; to the acid solutions add *dilute ammonia solution* till the precipitation is complete; filter and wash; the residue after ignition weighs not more than 7 mg.

Copper Sulphate, Anhydrous –$CuSO_4$ =159.6

Prepared by heating copper sulphate to constant weight at about 230°.

Copper Sulphate Solution –A10.0 per cent w/v solution of *copper sulphate* in *water.*

Catechol Violet – 4,4′ –(3H-2, I-Benzoxathiol-3-ylidene) diphyrocatechol SS-dioxide.

Gives a blue colour with bishmuth ions in moderately acid solution. When metal ions are absent, for example, in the presence of an excess of *disodium ethylenediamine tetra-acetate*, the solution is yellow.

Catechol Violet Solution –Dissolve 0.1 g of catechol violet in 100 ml of water.

Cresol Red – 4,4′, –(3H-2, 1-Benzoxathiol-3 ylidene) di-o-cresol SS-dioxide; $C_{12}H_8O_5S$ = 382.4.

Gives a red colour in very strongly acid solutions, a yellow colour in less strongly acid and neutral solutions, and a red colour in moderately alkaline solutions (pH ranges, 0.2 to 1.8, and 7.2 to 8.8).

Cresol Red Solution –Warm 50 ml of *cresol red* with 2.65 ml of 0.05 M s*odium hydroxide* and 5 ml of *ethanol (90 per cent);* after solution is effected, add sufficient ethanol (20 per cent) to produce 250 ml.

Sensitivity –A mixitue of 0.1 ml of the solution and 100 ml of *carbon dioxide-free water* to which 0.15 ml of 0.02 M s*odium hydroxide* has been added is purplish-red.Not more than 0.15 ml of 0.02 *M hydrochloric acid* is required to change the colour to yellow.

Dimethyl Yellow – 4 –Dimethyl aminoazobenzene ; $C_{14}H_{15}5N_3$ = 225.3

Gives a red colour in moderately acid alcoholic solutions, and a yellow colour in weakly acid and alkaline solution (pH range, 2.8 to 4.0).

Dimethyl Yellow Solution –A 0.2 per cent w/v solution of *dimethyl yellow* in alcohol (90 per cent).

Sensitivity – A solution containing 2 g of ammonium chloride in 25 ml of *carbon dioxide-free water,* to which is added 0.1 ml of the *dimethyl yellow solution,* is yellow. Not more than 0.10 ml of 0.1 *N hydrochloric acid* is required to change the colour to red.

Dinitrophenylhydrazine –2,4–Dinitrophenylhydrazine; $(NO_2)_2C_6H_3$, NH, NH_3 = 198.14.

Description –Orange-red crystals or a crystalline powder.

Solubility –Practically insoluble in *water,* slightly soluble in alcohol.

Clarity and colour of solution – 0.5 g yields a clear yellow solution on heating with a mixture of 25 ml of water and 25 ml of h*ydrochloric acid.*

Melting range –197° to 200°, with decomposition.

Sulphated ash –Not more than 0.5 per cent, Appendix 2.3.6.

Dinitrophenylhydrazine Solution –Dissolve 1.5 gm of *dinitrophenylhydrazine* in 20 ml of sulphuric acid (50 per cent v/v). Dilute to 100 ml with *water* and filter.

Dinitrophenylhydrazine solution must be freshly prepared.

Diphenylbenzidine –$(C_6H_5.\ NH.\ C_6H_4)_2$ = 336.42.

Description – White for faintly grey coloured, crystalline powder.

Melting range –246° to 250°.

Nitrate –Dissolve 8 mg in a cooled mixture of 45 ml of *nitrogen free sulphuric acid* and 5 ml of water; the solution is colourless or not more than very pale blue.

Sulphated ash –Not more than 0.1 per cent, Appendix 2.3.6.

Diphenylcarbazide –1,5-Diphenylcarbazide : $(C_6H_5NH.\ NH)_2\ CO$ = 242.27.

Description' –White crystalline powder which gradually acquires a pink tint on exposure to air.

Solubility –Practically insoluble in *water*; soluble in alcohol.

Diphenylcarbazide Solution –A 0.2 per cent w/v solution of *diphenylcarbazide* in a mixture of 10 ml of glacial acetic acid and 90 ml of *alcohol (90 per cent).*

Diphenylthiocarbazone –Dithizone : 1,5–Diphenylthiocarbazone; C_6H_5N : NCS. NH. NH. C_6H_5 = 256.32.

Description –Almost black powder.

Solubility –Practically insoluble in *water*; soluble in *chloroform*, in carbon tetrachloride and in other organic solvents, yielding solutions of an intense green colour.

Lead –Shake 5 ml of 0.1 per cent w/v solution in *chloroform* with a mixture of 5 ml of *water*, 2 ml of *lead free potassium cyanide solution,* and 5 ml of *strong ammonia solution*; the chloroform layer may remain yellow but has no red tint.

Sulphated ash –Not more than 0.5 per cent, Appendix 2.3.6.

Disodium Ethylenediamine tetraacetate –(Disodium Acetate) $C_{10}H_{14}N_2Na_2O_8,\ 2H_2O$ = 372.2

Analytical reagent grade.

Dragendorff Reagent –

Solution 1 –Dissolve 0.85 g of *bismuth oxy nitrate* in 40 ml of water and 10 ml of acetic acid.

Solution 2 –Dissolve 8 g of *potassium iodide* in 20 ml of water.

Mix equal volumes of solution 1 and 2, and to 10 ml of the resultant mixture add 100 ml of water and 20 ml of acetic acid.

Eosin – Acid Red 87; Tetrabromofluorescein disodium salt; $C_{20}H_6O_5Br_4Na_2$ =691.86.

Description – Red powder, dissolves in water to yield a yellow to *purplish-red* solution with a greenish-yellow fluorescence.

Solubility –Soluble in *water* and in alcohol.

Chloride –Dissolve 50 mg in 25 ml of *water*, add 1 ml of *nitric acid*, and filter; the filtrate complies with *the limit test for chlorides*, Appendix 2.3.2.

Sulphated ash –Not more than 24.0 per cent, calculated with reference to the substance dried at 110° for two hours, Appendix 2.3.6.

Eosin Solution –A 0.5 per cent w/v solution of eosin in water.

Eriochrome Black T –Mordant Black 11; Sodium 2(1-hydroxy-2-naphthylazo) 5-nitro-2-naphtol-4-sulphonate; $C_{20}H_{12}N_3NaO_7S$ = 461.38.

Brownish black powder having a faint, metallic sheen, soluble in alcohol, in *methyl alcohol* and in hot water.

Ether, Diethyl Ether – $(C_2H_5)_2O$ = 74.12.

Analytical reagent grade.

A volatile, highly flammable, colourless liquid, boiling point, about 34°; weight per ml about 0.71g .

Warning –It is dangerous to distil or evaporate ether to dryness unless precautions have been taken to remove peroxides.

Ethyl Acetate –$CH_3.CO_2C_2H_5$ = 88.11.

Analytical reagent grade.

A colourless liquid with a fruity odour; boiling point, about 77°; weight per ml about 0.90g.

Ethyl Alcohol –C_2H_5OH = 46.07.

Absolute Alcohol; Dehydrated Alcohol.

Description –Clear, colourless, mobile, volatile liquid; odour, characteristic and spirituous; taste, burning; hygroscopic. Readily volatilisable even at low temperature and boils at 78° and is flammable.

Solubility –Miscible with water, with solvent ether and with chloroform.

Contains not less than 99.5 per cent w/w or 99.7 per cent v/v of C_2H_5OH..

Identification –Acidity or Alkalinity : Clarity of Solution; Methanol; Foreign organic substances; Isopropyl alcohol and butyl alcohol; Aldehydes and ketones; fusel oil constituents; Non-volatile matter; complies with the requirements described under Alcohol.

Specific gravity –Between 0.7871 and 0.7902, at 25°.

Storage –Store in tightly closed containers in a cool place away from fire and protected from moisture.

Labelling –The label on the container states "Flammable".

Ferric Ammonium Sulphate –Ferric Alum, Fe (NH_4) $(SO_4)_2$, $12H_2O$ = 482.18

Contains not less than 99.0 per cent and not more than the equivalent of 101.0 per cent of $Fe(NH_4)$ $(SO_4)_2$, 12 H_2O.

Description –Pale violet crystals, or a nearly colourless crystalline powder.

Solubility –Soluble in water, yielding a clear yellow or brown solution.

Ferrous iron –Dissolve 1 g in 50 ml of *water*, add 1 ml of *dilute hydrochloric acid* and 1 ml of *potassium ferricyanide solution*; no green or blue colour is produced.

Assay –Weigh accurately about 2 g, dissolve in 10 ml of *dilute hydrochloric acid* and dilute to 50 ml with water, add 3 g of *potassium iodide*, allow to stand for ten minutes titrate the liberated iodine with 0.1 *N sodium thiosulphate*, using starch solution as indicator added towards the end of titrations. Each. ml of 0.1 *N sodium thiosulphate* is equivalent to 0.04822 g of $Fe(NH_4)$ $(SO_4)_2$. $12H_2O$.

Ferric Ammonium Sulphate 0.1N – $FeNH_4(SO_4)_2$, $12H_2O$ = 482.18; 48,22 g in 1000 ml.

Dissolve 50 g of *ferric-ammonium sulphate* in a mixture of 300 ml of water and 6 ml of *sulphuric acid,* dilute with water to 1000 ml, and mix. Standardise the solution as follows :-

Measure accurately about 30 ml of the solution into a glass-stoppered flask, add 5 ml of *hydrochloric acid*, mix, and add a solution of 3 g of *potassium iodide* in 10 ml of *water*. Insert the stopper, allow to stand for ten minutes in the dark, then titrate the liberated iodine with standardised *0.1N sodium thiosulophate*, adding 3 ml of *starch solution* as the end-point is approached. Perform a blank determination and make any necessary correction. Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.04822 g of $FeNH_4(SO_4)_2$, $12H_2O$.

Note –Store 0.1 N Ferric Ammonium Sulphate in tightly-closed, light resistant containers.

Ferric Chloride –Anhydrous Ferric Chloride; $FeCl_3$ = 162.22

Description –Greenish-black crystals or a crystalline powder, free from the orange colour of the hydrated salt, which is readily acquired by exposure to atmospheric moisture.

Solubility –Soluble in *water*, yielding an orange coloured opalescent solution.

Ferrous salts –Dissolve 2.0 g in 100 ml of water, add 2 ml of *phosphoric acid* and titrate with 0.1 *N potassium permanganate* until a pink colour is produced, not more than 0.1 ml is required.

Free chloride –Dissolve 5 g in 10 ml of water and boil the solution; no blue colour is prroduced on a starch iodide paper exposed to the vapours.

Ferric Chloride Solution –Contains not less than 14.25 per cent and not more than 15.75 per cent w/v of $FeCl_3$.

Description –Clear, Yellowish-brown liquid.

Assay –Dilute 2 ml with 20 ml of water, add 1 ml of *sulphuric acid* and *0.1 N potassium permanganate* drop by drop until a pink colour persists for five seconds. Add 15 ml of *hydrochloric acid* and 2 g of *potassium iodide*, allow to stand for three minutes, and titrate with 0.1 *N sodium thiosulphate*, using starch solu-

tion as indicator added towards the end of titration. Each ml of 0.*1 N sodium thiosulphate* is equivalent to 0.01622 g of FeCl3.

Ferrous Sulphate – FeSO4. 7H2O = 278.0

Description –Transparent, green crystals, or a pale bluish-green, crystalline powder; odourless; taste, metallic and astringent, Efflorescent in dry air. On exposure to moist air, the crystals rapidly oxidise and become coated with brownish yellow basic ferrous sulphate.

Solubility –Freely soluble in water, very soluble in boiling water, practically insoluble in alcohol.

pH-Between 3.0 and 4.0, determined in a 5.0 per cent w/v solution.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Copper – Dissolve 2 g in 50 ml of *water*, acidify with 1 ml of *dilute sulphuric acid,* saturate with *solution of hydrogen sulphide;* no darkening or precipitate is produced.

Ferrous Sulphate Solution –A 2.0 per cent w/v solution *of ferrous sulphate* in freshly boiled and cooled water.

Ferrous sulphate solution must be freshly prepared.

Ferrous Sulphate Solution, Acid –A 0.45 per cent w/v solution of *ferrous sulphate* in freshly boiled and cooled *water containing* 0.5 ml of hydrochloric acid.

Formaldehyde Solution –Formalin; HCHO =30.03

Formaldehyde Solution is a solution of formaldehyde in water with *methyl alcohol* added to prevent polymerisation. It contains not less than 34.0 per cent w/w and not more than 38.0 per cent w/w of CH2O.

Description –Colourless liquid; odour, characteristic, pungent and irritating; taste, burning. A slight white cloudy deposit is formed on long standing, especially in the cold, due to the separation of paraformaldehyde. This white deposit disappears on warming the solution.

Solubility –Miscible with *water*, and with *alcohol.*

Acidity –To 10 ml add 10 ml of *carbon dioxide free water* and titrate with 0.1 *N sodium hydroxide* using *bromothymol blue solution* as indicator; not more than 5 ml of 0.1 *N sodium hydroxide* is required.

Wt. per ml – At 20°, 1.079 to 1.094 g.

Assay –Weigh accurately about 3 g and add to a mixture of 50 ml of *hydrogen peroxide solution* and 50 ml of *N sodium hydroxide*, warm on a water-bath until effervescence ceases and titrate the excess of alkali with *N sulphuric acid* using *phenolphthalein solution* as indicator. Repeat the experiment with the same quantities of the same reagents in the same manner omitting the formaldehyde solution. The difference between the titrations represents the sodium hydroxide required to neutralise the formic acid produced by the oxidation of the formaldehyde. Each ml of N sodium hydroxide is equivalent to 0.03003 g of CH_2O.

Storage–Preserve Formaldehyde Solution in well-closed container preferably at a temperature not below 15°

Formaldehyde Solution, Dilute –

Dilute 34 ml of *formaldehyde solution* with sufficient water to produce 100 ml.

Glycerin –$C_3H_8O_3$ = 82.09.

Description – Clear, colourless liquid of syrupy consistency; odourless, taste sweet followed by a sensation of warmth. It is hygroscopic.

Solubility –Miscible with water and with *alcohol*; practically insoluble in chloroform, in solvent ether and in fixed oils.

Acidity –To 50 ml of a 50 per cent w/v solution add 0.2 ml of *dilute phenolphthalein solution*; not more than 0.2 ml of 0.1 *N sodium hydroxide* is required to produce a pink colour.

Wt. per ml –Between 1.252 g and 1.257 g, corresponding to between 98.0 per cent and 100.0 per cent w/w of $C_3H_8O_3$.

Refractive index –Between 1.470 and 1.475 determined at 20°.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Copper –To 10 ml add 30 ml of *water*, and 1 ml of *dilute hydrochloric acid*, and 10 ml of *hydrogen sulphide solution*; no colour is produced.

Iron – 10 g complies with the *limit test* for iron, Appendix 2.3.4.

Heavy metals – Not more than 5 parts per million, determined by Method A on a solution of 4 g in 2 ml of 0.1 *N hydrochloric acid* and sufficient water to produce 25 ml, Appendix 2.3.3.

Sulphate –1 ml complies with the *limit test* for sulphates, Appendix 2.3.7.

Chloride –1 ml complies with the *limit test* for chloride, Appendix 2.3.2.

Acraldehyde and glucose –Heat strongly; it assumes not more than a faint yellow, and not a pink colour. Heat further; it burns with little or no charring and with no odour of burnt sugar.

Aldehydes and related substances – To 12.5 ml of a 50 per cent w/v solution in a glass-stoppered flask add 2.5 ml of *water* and 1 ml of *decolorised magenta solution*. Close the flask and allow to stand for one hour. Any violet colour produced is not more intense than that produced by mixing 1.6 ml of 0.1 *N potassium permanganate* and 250 ml of *water*.

Sugar –Heat 5 g with 1 ml of *dilute sulphuric acid* for five minutes on a water-bath. Add 2 ml of *dilute sodium hydroxide solution* and 1 ml of *copper sulphate solution*. A clear, blue coloured solution is produced. Continue heating on the water-bath for five minutes. The solution remains blue and no precipitate is formed.

Fatty acids and esters –Mix 50 ml with 50 ml of freshly boiled *water* and 50.0 ml of 0.5N *sodium hydroxide*, boil the mixture for five minutes. Cool, add a few drops of *phenolphthalein solution* and titrate the excess alkali with 0.5 *N hydrochloric acid*. Perform a blank determination , not more than 1 ml of 0.5 *N sodium hydroxide* is consumed.

Sulphated ash –Not more than 0.01 per cent, Appendix 2.3.6.

Storage –Store in tightly-closed containers.

Glycerin Solution –Dilute 33 ml of glycerin to 100 ml with water and add a small piece of camphor or liquid phenol.

Hexamine – $(CH_2)_6N_4$ = 140.2

Analytical reagent grade.

Hydrazine Hydrate –NH_2. NH_2. H_2O = 50.06

Analytical reagent grade.

A colourless liquid with an ammonical odour; weight per ml. about 1.03 g.

Hydrochloric Acid –HCl = 36.46

Concentrated Hydrochloric Acid

Description –Clear, colourless, fuming liquid; odour, pungent.

Arsenic –Not more than 1 part per million, Appendix 2.3.1.

Heavy metals –Not more than 5 parts per million, determined by Method A on a solution prepared in the following manner : Evaporate 3.5 ml to dryness on a water-bath, add 2 ml of *dilute acetic acid* to the residue, and add water to make 25 ml, Appendix 2.3.3.

Bromide and iodide –Dilute 5 ml with 10 ml of *water*, add 1 ml of *chloroform*, and add drop by drop, with constant shaking, *chlorinated lime solution*; the chloroform layer does not become brown or violet.

Sulphite –Dilute 1 ml with 10 ml of water, and add 5 drops of *barium chloride solution* and 0.5 ml of 0.001 *N iodine*; the colour of the iodine is not completely discharged.

Sulphate –To 5 ml add 10 mg of sodium bicarbonate and evaporate to dryness on a water bath; the residue, dissolved in *water*; complies with the *limit test for sulphates*, Appendix. 2.3.7.

Free chlorine –Dilute 5 ml with 10 ml of freshly boiled and cooled *water*, add 1 ml of cadmium *iodide solution*, and shake with 1 ml of *chloroform*; the chloroform layer does not become violet within one minute.

Sulphated ash –Not more than 0.01 per cent, Appendix 2.3.6.

Assay –Weigh accurately about 4 g into a stoppered flask containing 40 ml of water, and titrare with *N sodium hydroxide*, using *methyl orange solution* as indicator. Each ml of *N sodium hydroxide* is equivalent to 0.03646 g of HCl.

Storage –Store in glass-stoppered containers at a temperature not exceeding 30°.

Hydrochloric Acid, x N –Solution of any normality x N may be prepared by diluting 84 x ml of *hydrochloric acid* to 1000 ml with *water*.

Hydrochloric Acid –(1 per cent w/v)

Dilute 1 g of *hydrochloric acid* to 100 ml with *water*.

Dilute Hydrochloric Acid –

Description –Colourless liquid.

Arsenic, heavy metals bromoide and iodide, sulphate, free chlorine –Complies with the tests described under Hydrochloric Acid, when three times the quantity is taken for each test.

Assay –Weigh accurately about 10 g and carry out the Assay described under Hydrochloric Acid.

Storage –Store in stoppered containers of glass or other inert material, at temperature below 30°.

Hydrochloric Acid, N – HCl = 36.460

36.46 g in 1000 ml

Dilute 85 ml of hydrochloric acid with water to 1000 ml and standardise the solution as follows :

Weigh accurately about 1.5 g of anhydrous sodium carbonate, previously heated at about 270° for one hour. Dissolve it in 100 ml of *water* and add two drops of *methyl red solution*. Add the acid slowly from a burette with constant stirring, until the solution becomes faintly pink. Heat again to boiling and titrate further as necessary until the faint pink colour no longer affected by continued boiling. Each 0.5299 g of *anhydrous* sodium carbonate is equivalent to 1 ml of N hydrochloric acid.

Hydrochloric Acid, Iron-Free –Hydrochloric acid which complies with the following additonal test. Evaporate 5 ml on a water-bath nearly to dryness, add 40 ml of water, 2 ml of a 20 per cent w/v solution of citric acid and two drops of thioglycollic acid, mix, make alkaline with *dilute ammonia solution*, and dilute to 50 ml with water; no pink colour is produced.

Hydrogen Peroxide Solution – (20 Vol.) H_2O_2 = 34.02

Analytical reagent grade of commerce or *hydrogen peroxide solution* (100 Vol.) diluted with 4 volumes of water.

A colourless liquid containing about 6 per cent w/v of H_2O_2; weight per ml, about 1.02 g.

Hydrogen Sulphide – H_2S =34.08

Use laboratory cylinder grade, or prepare the gas by action of hydrochloric acid, diluted with an equal volume of *water*, on iron sulphide, the resulting gas is washed by passing it through water.

A colourless, poisonous gas, with a characteristic unpleasant odour.

Hydrogen Sulphide Solution –A recently prepared, saturated solution of hydrogen sulphide in water at 20°.

Hydrogen Sulphide solution contains about 0.45 per cent w/v of H_2S.

Hydroxylamine Hydrochloride; Hydroxylammonium Chloride – NH_2OH, HCl = 69.49

Contains not less than 97.0 per cent w/w of NH_2OH, HCl

Description –Colourless crystals, or a white, crystalline powder.

Solubility –Very soluble in water; soluble in alcohol.

Free acid –Dissolve 1.0 g in 50 ml of *alcohol*, add 3 drops of *dimethyl yellow solution* and titrate to the full yellow colour with *N sodium hydroxide*; not more than 0.5 ml of *N sodium hydroxide* is required.

Sulphated ash –Not more than 0.2 per cent, Apendix 2.3.6.

Assay –Weigh accurately about 0.1 g and dissolve in 20 ml of water, add 5 g of ferric ammonium sulphate dissolve in 20 ml of water, and 15 ml of *dilute sulphuric acid*, boil for five minutes, dilute with 200 ml of water, and titrate with 0.1 *N potassium permanganate*. Each ml of 0.1 *N potassium permanganate* is equivalent to 0.003475 g of NH_2OH, HCl.

Hydroxylamine Hydrochloride Solution –Dissolve 1 g of *hydroxylamine hydrochloride* in 50 ml of *water* and add 50 ml of *alcohol*, 1 ml of *bromophenol blue solution* and 0.1 *N sodium hydroxide* until the solution becomes green.

***Indigo Carmine** – $C_{16}H_8N_2Na_2O_8S_2$ =466.4

Analytical reagent grade.

A deep blue powder, or blue granules with a coppery lustre.

Indigo Carmine Solution –To a mixture of 10 ml of *hydrochloric acid* and 990 ml of a 20 per cent w/v solution of sulphuric acid in water, add sufficient indigo carmine to produce a solution which complies with the following test.

Add 10 ml to a solution of 1.0 mg of potassium nitrate in 10 ml of *water*, add, rapidly, 20 ml of sulphuric acid and heat to boiling; the blue colour is just discharged in one minute.

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*Indian ink –General purpose grade.

Iodine – I2 = 253.8

Description – Heavy, bluish-black, brittle, rhombic prisms or plates with a metallic lustre; odour characteristic; volatile at ordinary temperatures.

Solubility – Very slightly soluble in *water*; soluble in *alcohol*, freely soluble in carbon disulphide and in *chloroform*, in *solvent ether*, *in carbon tetrachloride* and in concentrated aqueous solutions of iodides.

Chloride and Bromide –Triturate 3.5 g thoroughly with 35 ml of *water*, filter and decolorise the filtrate by the addition of a little *zinc powder*. To 25 ml of the filtrate so obtained, add 5 ml of d*ilute ammonia solution*, and then 5 ml of *silver nitrate solution* added gradually, filter; dilute the filtrate to 50 ml, and acidify gradually with 4 ml of nitric acid; the opalescence in the *limit test* for chloride, Appendix 2.3.1.

Cyanides – To 5 ml of the filtrate obtained in the test for *chloride* and *bromide* add a few drops of *ferrous sulphate solution* and 1 ml of *sodium hydroxide solution*, warm gently and acidify with hydrochloric acid, no blue or green colour is produced.

Non-volatile matter –Leaves not more than 0.1 per cent as residue when volatilised on a water-bath.

Assay –Weigh accurately about 0.5 g and dissolve in a solution of 1 g of *potassium iodide* in 5 ml of *water*. Dilute to 250 ml with *water*, add 1 ml of *dilute acetic acid*, and *titrate* with 0.1 *N sodium thiosulphate, using starch solution* as indicator. Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.01269 g of I.

Storage –Store in glass-stoppered bottles or in glass or earthen-ware containers with well waxed bungs.

Iodine, 0.1N – I = 126.90; 12.69 g in 1000 ml.

Dissolve about 14 g of *iodine* in a solution of 36 g of *potassium iodide* in 100 ml of water, add three drops of *hydrochloric* acid, dilute with water to 100 ml and standardise the solution as follows :

Weigh accurately about 0.15 g of *arsenic trioxide*, previously dried at 105° for one hour, and dissolve in 20 ml of *N Sodium hydroxide* by warming, if necessary. Dilute with 40 ml of water, add two drops of *methyl orange solution* and follow with *dilute hydrochloric acid* until the yellow colour is changed to pink. Then add 2 g of *sodium bicarbonate*, dilute with 50 ml of water, and add 3 ml of starch solution, slowly add the iodine solution from a burette until a permanent blue colour is produced. Each 0.004946 g of arsenic trioxide is equivalent to 1 ml of 0.1*N iodine*.

Iodine Solution. –Dissolve 2.0 g of iodine and 3 g of *potassium iodide* in water to produce 100 ml.

Kieselguhr –A natural diatomaceous earth, purified by heating with dilute hydrochloric acid, washing with water and drying.

Lactic Acid –$CH_3CH(OH).COOH$ = 90.08

Analytical reagent grade of commerce

Lactophenol –Dissolve 20 g of *phenol* in a mixture of 20 g of *lactic acid*, 40 g of *glycerol*, and 20 ml of water.

Lead Acetate –Sugar of lead; $(CH_3CO_2)_2$ Pb, $3H_2O$ = 379.33

Contains not less than 99.5 per cent and not more than the equivalent of 104.5 per cent of C4H6O4Pb, $3H_2O$.

Description –Small, white, transparent, monoclinic prisms, or heavy, crystalline masses; odour, acetous, taste, sweet and astringent. Efflorescent in warm air. Becomes basic when heated.

Solubility –Freely soluble in *water*, and in *glycerin*; sparingly soluble in *alcohol*.

Water-insoluble matter –Dissolve 1 g in 10 ml of recently boiled and cooled *water; a* solution is produced which is, at most, faintly opalescent and becomes clear on the addition of one drop of *acetic acid*.

Chloride –1 g complies with the *limit test* for chlorides, Appendix 2.3.1.

Copper, iron, silver, and zinc – Dissolve 0.5 g in 10 ml of *water*, add 2 ml of dilute *sulphuric acid*, allow to stand for thirty minutes, and filter; to the filtrate add an excess of *potassium ferrocyanide solution;* no precipitate or colour is produced.

Assay –Weigh accurately about 0.8 g and dissolve in a mixture of 100 ml of *water* and 2 ml of *acetic acid*, add 5 g of hexamine, titrate with 0.05 *M disodium ethylenediaminetetraacetate*, using 0.2 *ml of xylenol orange solution* as indicator, until the solution becomes pale bright yellow. Each ml of 0.05 *M disodium ethylenediaminetetraacetate* is equivelent to 0.01897 g of $C_4H_6O_4Pb$, $3H_2O$.

Storage –Preserve Lead Acetate in a well-closed container.

Lead Acetate Solution –A 10.0 per cent w/v solution *of lead acetate in carbon dioxide-free water*.

Lead Nitrate – $Pb(NO_3)_2$ = 331.21

Contains not less than 99.0 per cent of $Pb(NO_3)_2$

Description –Colourless or white crystals, or a white crystalline powder.

Solubility –Soluble in water, forming a clear, colourless solution.

Assay –Weigh accurately about 0.3 g and dissolve in 150 ml of water. Add 5 ml of dilute *acetic acid*, heat to boiling, add a slight excess of *potassium chromate solution*, and boil gently until the precipitate becomes granular; collect the precipitate in a Gooch crucible, wash it with hot water, and dry to constant weight at 120°. Each g of residue is equivalent to 1.025 g of $Pb(NO_3)_2$.

Lead Solution, Standard –See limit test for heavy metals, Appendix 2.3.3.

Liquid Paraffin –General reagent grade.

Liquid paraffin is a mixture of liquid hydrocarbons obtained from petroleum.

A transparent, colourless, oily liquid, free or nearly free from fluorescence by day light; odourless and tasteless when cold, and develops not more than a faint odour of petroleum when heated.

Solubility –Practically insoluble in water, and in alcohol; soluble in chloroform, in solvent ether and in volatile oils.

Wt. per ml. –At 25°, 0.860 to 0.904 g.

Litmus –Fragments of blue pigment prepared from various species of *Rocella lecanora* or other *lichens*. It has a characteristic odour.

Partly soluble in water and in alcohol. Gives a red colour with acids and a blue colour with alkalies (pH range, 5.0 to 8.0).

Litmus Solution –Boil 25 g of coarsely powdered litmus with 100 ml of *alcohol (90 per cent)* under a reflux condenser for one hour, and pour away the clear liquid; repeat this operation using two successive quantities, each of 75 ml, of *alcohol (90 per cent)*. Digest the extracted litmus with 250 ml of water.

Litmus Paper, Blue –Boil 10 parts of coaresely powdered litmus under reflux for one hour with 100 parts of alcohol, decant the alcohol and discard. Add to the residue a mixture of 45 parts of alcohol and 55 parts of water. After two days decant the clear liquid. Impregnate the strips of filter paper with the extract and allow to dry the paper; complies with the following test –

Sensitivity–Immerse a strip measuring 10 mm x 60 mm in 100 ml of a mixture of 10 ml of 0.02 *N hydrochloric acid* and 90 ml of *water*. On shaking the paper turns red within forty five seconds.

Litmus Paper, Red – To the extract obtained in the preparation of blue litmus paper add 2 *N hydrochloric acid* drop-wise until the blue colour becomes red. Impregnate strips of filter paper with the solution and allow to dry. The paper complies with the following test :

Sensitivity–Immerse a strip measuring 10 mm x 60 mm in 100 ml of 0.002 *N sodium hydroxide*. On shaking the paper turns blue within forty-five minutes.

Magenta Basic – Fuchsin; Rosaniline hydro-chloride; $[(H_2N.\ C_6H_4)_2C : C_6H_3(CH_3) : NH_2+]Cl$ – = 337.85.

The hydrochloride of rosaniline of such a purity that when used in the preparation of decolourised solution of magenta, a nearly colourless solution is obtained.

Description –Dark red powder, or green crystals with a metallic lustre.

Solubility –Soluble in water, giving a deep reddish-purple solution.

Sulphated ash –Not more than 5.0 per cent, Appendix 2.3.6.

Magenta Solution, Decolorised –Dissolve 1 g of basic *magenta* in 600 ml of water and cool in an ice bath; add 20 g of *sodium sulphite* dissolved in 100 ml of water; cool in an ice-bath and add, slowly with constant stirring, 10 ml of hydrochloric acid; dilute with water to 1000 ml.

If the resulting solution is turbid, it should be filtered and if brown in colour, it should be shaken with sufficient decolourising charcoal (0.2 to 0.3 g) to render it colourless and then filtered immediately. Occasionally it is necessary to add 2 to 3 ml *of hydrochloric acid*, followed by shaking, to remove the little residual pink colour. The solution resulting from any of the foregoing modifications should be allowed to stand over-night before use.

Decolourised magenta solution should be protected from light.

Magnesium Carbonate –Light hydrated basic grade of commerce, containing 42 to 45 per cent of MgO and complying with the following test :

Ammonia –Dissolve 0.50 g in 4 ml of 2 M hydrochloric acid, boil to remove carbon dioxide, and dilute with *water* to 95 ml. Add 5 ml of 5 *M sodium hydroxide* and allow to stand for one hour. Dilute 40 ml of the clear liquid to 50 ml with water and add 2 ml of *alkaline potassium-mercuric iodide solution.* Any yellow colour produced is not deeper than that produced by adding 2 ml of *alkaline potassium mercuric iodide solution* to a mixture of 44 ml of water, 2 ml of *ammonium chloride solution*, 2 ml of 2 *M hydrochloric acid* and 2 ml of 5 *M sodium hydroxide.*

Magnesium Sulphate – $MgSO_4, 7H_2O = 246.47$

Description –Colourless, crystals, usually needle-like; odourless, taste, cool, saline and bitter. Effloresces in warm dry air.

Solubility –Freely soluble in water; sparingly soluble in alcohol. Dissolves slowly in glycerin.

Acidity or alkalinity – 1 g dissolved in 10 ml of water is neutral to *litmus solution.*

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Iron –2 g dissolved in 20 ml of water complies with the limit test for iron, Appendix 2.3.4.

Heavy metals –Not more than 10 parts per million, determined by Method A on a solution prepared by dissolving 2.0 g in 10 ml of water, 2.0 ml of *of dilute acetic acid* and sufficient *water* to make 25 ml, Appendix 2.3.3.

Zinc –Dissolve 2 g in 20 ml of water and acidify with 1 ml of *acetic acid.* No turbidity is produced immediately on the addition of few drops of *potassium ferrocyanide solution.*

Chloride –1 g complies with the *limit test for chlorides*, Appendix 2.3.2.

Loss on ignition –Between 48.0 per cent and 52.0 per cent, determined on 1.0 g by drying in an oven at 105° for two hours and igniting to constant weight at 400°.

Assay –Weigh accurately about 0.3 g and dissolve in 50 ml of *water.* Add 10 ml of *strong ammonia-ammonium chloride solution*, and titrate with 0.05 *M disodium ethylenediaminetetraacetate* using 0.1 g of *mordant black* II mixture as indicator, until the pink colour is discharged from the blue. Each ml of 0.05 *M disodium ethylenediaminetetraacetate* is equivalent to 0.00602 g of $MgSO_4$.

Storage –Store in well-closed containers.

Magnesium Sulphate, Dried, – $MgSO_4$

Dried, general reagent grade of commerce.

Magnesium Sulphate Solution, Ammoniacal –Dissolve 10 g of *magnesium sulphate* and 20 g of *ammonium chloride* in 80 ml of *water*, and add 42 ml of *5 M ammonia*. Allow to stand for a few days in a well closed container; decant and filter.

Mercuric Chloride –$HgCl_2$ =271.50.

Contains not less than 99.5 per cent of HgCl2;

Description –Heavy, colourless or white, crystalline masses, or a white crystalline powder .

Solubility –Soluble in *water*; freely soluble in *alcohol*.

Non-volatile matter –When volatilised, leaves not more than 0.1 per cent of residue.

Assay –Weigh accurately about 0.3 g and dissolve in 85 ml of *water* in a stoppered-flask, add 10 ml of *calcium chloride solution*, 10 ml of *potassium iodide solution*, 3 ml of *formaldehyde solution and* 15 ml of *sodium hydroxide solution*, and shake continuously for two minutes. Add 20 ml of acetic acid and 35 ml of 0.1 *N iodine*. Shake continuously for about ten minutes, or until the precipitated mercury is completly redissolved, and titrate the excess of iodine with 0.1 *N sodium thiosulphate*. Each ml of 0.1 *N iodine* is equivalent to 0.01357 g of $HgCl_2$.

Mercuric Chloride, 0.2 M –

Dissolve 54.30 g of *mercuric chloride* in sufficient water to produce 1000 ml.

Mercuric Chloride Solution –A 5.0 per cent w/v solution of *mercuric chloride* in water.

Mercuric Oxide, Yellow – HgO = 216.59.

Contains not less than 99.0 per cent of HgO, calculated with reference to the substance dried at 105° for one hour.

Description – Orange-yellow, heavy, amorphous powder; odourless, stable in air but becomes discoloured on exposure to light.

Solubility –Practically insoluble in water and in *alcohol*; freely soluble in *dilute hydrochloric acid* and in dilute *nitric acid*, forming colourless solutions.

Acidity or alkalinity –Shake 1 g with 5 ml of *water* and allow to settle; the supernatant liquid is neutral to *litmus solution*.

Mercurous salts –A solution of 0.5 g in 25 ml of *dilute hydrochloric acid* is not more than slightly turbid.

Chloride – To 0.2 g add 1 g of zinc powder and 10 ml of *water*. Shake occasionally during ten minutes and filter; the solution complies with the *limit test* for chlorides, Appendix 2.3.2.

Sulphated ash –When moistened with *sulphuric acid* in a silica dish and heated strongly to constant weight, leaves not more than 0.5 per cent of residue.

Assay –Weigh accurately about 0.4 g, dissolve in 5 ml of nitric acid and 10 ml of *water* and *dilute* with *water* to 150 ml. Titrate with 0.1 *N ammonium thiocyanate*, using *ferric ammonium sulphate solution* as indi-

cator. Carry out the titration at a temperature not above 20°. Each ml of 0.*1 N ammonium thiocyanate* is equivalent to 0.01083 g of HgO.

Storage –Preserve Yellow Mercuric Oxide in a well-closed container, protected from light.

Mercuric Potassium Iodide Solution –

See Potassium-Mercuric Iodide solution.

Mercuric Sulphate –Mercury (II) Sulphate $HgSO_4$= 296.68

Contains not less than 99.0 per cent of $HgSO_4$

Description- A white; crystalline powder, hydrolyses in water.

Solubility – Soluble in *dilute sulphuric acid.*

Chloride –Dissolve 2.0 g in a mixture of 2 ml of *dilute sulphuric acid* and 10 ml of *water.* Add 2 g of zinc powder, shake frequently for five minutes and filter. The filtrate complies with the *limit test* for *chlorides,* Appendix 2.3.2.

Nitrate –Dissolve 0.40 g in a mixture of 9 ml of water and 1 ml of dilute sulphuric acid, add 1 ml of indigo carmine solution and 10 ml of *nitrogen-free sulphuric acid* and heat to boiling, the blue colour is not entirely discharged.

Assay –Dissolve 0.6 g in a mixture of 10 ml of *dilute nitric acid* and 40 ml of *water.* Titrate with 0.1 *N ammonium thiocyanate,* using *ferric ammonium sulphate solution* as indicator. Each ml of 0.1 *N ammonium thiocyanate* is equivalent to 0.01483 g of $HgSO_4$.

Mercury Sulphate Solution – Mix 5 g of *yellow mercuric oxide* with 40 ml of *water,* and while stirring add 20 ml of *sulphuric acid,* and 40 ml of *water,* and stir until completely dissolved.

Methyl Alcohol : Methanol : CH_3OH = 32.04.

Description –Clear, Colourless liquid with a characteristic odour.

Solubility –Miscible with water, forming a clear colourless liquid.

Specific Gravity – At 25°, not more than 0.791.

Distillation range – Not less than 95 per cent distils between 64.5° and 65.5°.

Refractive Index –At 20°, 1.328 to 1.329.

Acetcone –Place 1 ml in a *Nessler cylinder,* add 19 ml of water, 2 ml of a 1 per cent w/v solution of *2-nitrobenzaldehyde* in *alcohol (50 per cent),* 1 ml of 30 per cent w/v *solution of sodium hydroxide* and allow to stand in the dark for fifteen minutes. The colour developed does not exceed that produced by mixing 1 ml of standard acetone solution, 19 ml of water, 2 ml of the solution of *2-nitrobenzaldehyde* and 1 ml of the *solution of sodium hydroxide* and allowing to stand in the dark for fifteen minutes.

Acidity –To 5 ml add 5 ml of *carbon dioxide-free water,* and titrate with 0.1 *N sodium hydroxide,* using *bromothymol blue solution* as indicator; not more than 0.1 ml is required.

Non-volatile matter – When evaporated on a water-bath and dried to constant weight at 105°, leaves not more than 0.005 per ceant w/v of residue.

Methyl Alcohol, Dehydrated –Methyl alcohol which complies with the following additional requirement.

Water –Not more than 0.1 per cent w/w.

Methylene Blue –$C_{16}H_{18}ClN_3S$, $3H_2O$. Tetramethylthionine chloride.

A dark green or bronze crystalline powder, freely soluble in water, soluble in alcohol.

Loss on drying –Not less than 18 per cent and not more than 22 per cent, determined by drying in an oven at 100° to 105°.

Methylene Blue Solution – Dissolve 0.18 g of *methylene blue* in 100 ml of *water*. To 75 ml of this solution, add 5 ml of 0.1 *N sodium hydroxide* and 20 ml of water.

Methyl Orange –Sodium-p-dimethylamineazobenzene sulphate, $C_{14}H_{14}O_3N_3SNa$.

An orange-yellow powder or crystalline scales, slightly soluble in cold water; insoluble in alcohol; readily soluble in hot water.

Methyl Orange Solution –Dissolve 0.1 g of methyl orange in 80 ml of water and dilute to 100 ml with alcohol.

Test for sensitivity –A mixture of 0.1 ml of the methyl orange solution and 100 ml freshly boiled and cooled water is yellow. Not more than 0.1 ml of 0.1 N hydrochloric acid is required to change the colour to red.

Colour change – pH 3.0 (red) to pH 4.4 (yellow).

Methyl Red –p-Dimethylaminoazobenzene-o-carboxylic acid, $C_{15}H_{15}O_2N_3$.

A dark red powder or violet crystals, sparingly soluble in *water*; soluble in alcohol.

Methyl red solution –Dissolve 100 mg in 1.86 ml of 0.1 *N sodium hydroxide* and 50 ml of *alcohol* and dilute to 100 ml with water.

Test for sensitivity –A mixture of 0.1 ml of the *methyl red solution* and 100 ml of freshly boiled and cooled *water* to which 0.05 ml of 0.02 *N hydrochloric acid* has been added is red. Not more than 0.01 ml of 0.02 *N sodium hydroxide* is required to change the colour to yellow.

Colour change – pH 4.4 (red) to pH 6.0 (yellow).

Molish's Reagent –Prepare two solutions in separate bottles, with ground glass stoppers :

(a) Dissolve 2 g of α–naphthol in 95 per cent alcohol and make upto 10 ml with alcohol (α–naphthol can be replaced by thymol or resorcinol). Store in a place protected from light. The solution can be used for only a short period.

(b) Concentrated sulphuric acid.

Mordant Black II –See Eriochrome black T.

Mordant Black II Mixture –*Mordant black mixture.*

A mixture of 0.2 part of Mordant Black II with 100 parts of sodium chloride. Mordant Black II Mixture should be recently prepared.

α–Naphthol – 1-Naphthol; $C_{10}H_7OH$=144.17.

Description – Colourless or white crystals or a white, crystalline powder; odour, characteristic.

Solubility –Freely soluble in alcohol yielding not more than slightly opalescent, colourless or almost colourless solution, with no pink tint.

Melting range –93° to 96°.

Sulphated ash –Not more than 0.05 per cent, Appendix 2.3.6.

α–Naphthol Solution – 1-Naphthol solution.

Dissolve 1 g of *α–naphthol* in a solution of 6 g of *sodium hydroxide* and 16 g of *anhydrous sodium carbonate* in 100 ml of water.

α–naphthol solution must be prepared immediately before use.

1-Naphthylamine –$C_{10}H_9N$ = 143.2 – Analytical reagent grade.

Almost colourless crystals, or a white crystalline powder; melting point, about 50°.

Naphthylamine-Sulphanilic Acid Reagent –Immediately before use mix equal volumes of solutions A and B prepared as follows :

Solution A –Dissolve 0.5 g of sulphuric acid in 30 ml of 6 M *acetic acid* and dilute to 150 ml with water.

Solution B –Dissolve 0.15 g of 1 naphthylamine in 30 ml of 6 M *acetic acid* and dilute to 150 ml with water.

Ninhydrin Reagent – 30 mg ninhydrin is dissolved in 10 ml n-butanol, followed by 0.3 ml of 98 % acetic acid.

Nitric Acid –Contains 70.0 per cent w/w of HNO3 (limits, 69.0 to 71:0). About 16 N in strength.

Description –Clear, colourless, fuming liquid.

Wt. per ml. – At 20°, 1.41 to 1.42 g.

Copper and Zinc –Dilute 1 ml with 20 ml of water, and add a slight excess of dilute ammonia solution; the mixture does not become blue. Pass hydrogen sulphide; a precipitate is not produced.

Iron –0.5 ml of complies with the limit test for iron, Appendix 2.3.4.

Lead –Not more than 2 parts per million, Appendix 2.3.5.

Chloride –5 ml neutralised with dilute ammonia solution, complies with the limit test for chlorides, Appendix 2.3.2.

Sulphates –To 2.5 ml add 10 mg of sodium bicarbonate and evaporate to dryness on a water-bath, the residue dissolved in water, complies with the limit test for sulphates, Appendix 2.3.7.

Sulphated ash –Not more than 0.01 per cent w/w, Appendix 2.3.6.

Assay –Weigh accurately about 4 g into a stoppered flask containing 40 ml of water, and titrate with N Sodium hydroxide, using methyl orange solution as indicator. Each ml of N sodium hydroxide is equivalent to 0.06301 g of HNO_3.

Nitric Acid, XN –Solutions of any normality XN may be prepared by diluting 63x ml of nitric acid to 1000 ml with water.

Nitric Acid, Dilute –Contains approximately 10 per cent w/w of HNO_3. Dilute 106 ml of nitric acid to 1000 ml with water.

2-Nitrobenzaldehyde –0-Nitrobenzaldehyde $NO_2C_6H_4CHO$ =151.12.

Description –Yellow needles, odour, resembling that of benzaldehyde.

Solubility –Soluble in alcohol.

Melting range –40° to 45°.

Sulphated ash – Not more than 0.1 per cent, Appendix 2.3.6.

Oxalic Acid –$(CO_2H)_2$, $2H_2O$ =126.07.

Contains not less than 99.0 per cent of $C_2H_2O_4$, $2H_2O$, as determined by the methods A and B under the Assay.

Description –Colourless crystals.

Solubility – Soluble in water and in alcohol.

Chloride – To 1 g dissolved in 20 ml of water add 5 ml. of dilute *nitric acid* and 1 drop of silver nitrate solution; no turbidity is produced.

Sulphated ash –Not more than 0.05 per cent, Appendix 2.3.6.

Assay –

(A) Weigh accurately about 3 g and dissolve in 50 ml of carbon dioxide free water and titrate with N sodium hydroxide, using phenolphtahalein solution as indicator. Each ml of N sodium hydroxide is equivalent to 0.06304 of $C_2H_2O_4$, $2H_2O$.

(B) Weigh accurately about 3 g, dissolve in water, and add sufficient water to produce 250 ml. To 25 ml of this solution add 5ml of sulphuric acid previously diluted with a little water, and titrate at a temperature of about 70° with 0.1N potassium permanganate. Each ml of 0.1 *N potassium permanganate* is equivalent to 0.006303 g of $C_2H_2O_4$, $2H_2O$.

Oxalic Acid, 0.1 N – $C_2H_2O_4$, $2H_2O$ = 126.07, 6.303 g in 1000 ml.

Dissolve 6.45 g of oxalic acid in sufficient water to produce 1000 ml and standardise the solution as follows:

Pipette 30 ml of the solution into a beaker, add 150 ml of water, 7 ml of *sulphuric acid* and heat to about 70°. Add slowly from a burette freshly standardised 0.1 *N potassium permanganate* with constant stirring, until a pale-pink colour, which persists for fifteen seconds, is produced. The temperature at the conclusion of the titration should not be less than 60°. Each ml of 0.1 *N potassium permanganate* is equivalent to 0.006303 g of $H_2C_2O_4$, $2H_2O$.

Petroleum Light – Petroleum Spirit

Description –Colourless, very volatile, highly flammable liquid obtained from petroleum, consisting of a mixture of the lower members of the paraffin series of hydrocarbons and complying with one or other of the following definitions :

Light Petroleum –(Boiling range, 30° to 40°).

Wt. per ml. –At 20°, 0.620 to 0.630 g.

Light Petroleum –(Boiling range, 40° to 60°).

Wt. per ml –At 20°, 0.630 to 0.650 g.

Light Petroleum –(Boiling range, 60° to 80°).

Wt. per ml. –At 20°, 0.670 to 0.690.

Light Petroleum –(Boiling range, 80° to 100°).

Wt. per ml. –At 20°, 0.700 to 0.720

Light Petroleum –(Boiling range, 100° to 120°).

Wt. per ml –At 20°, 0.720 to 0.740 g.

Light Petroleum –(Boiling range, 120° to 160°).

Wt. per ml –At 20°, about 0.75 g.

Non-volatile matter –When evaporated on a water-bath and dried at 105°, leaves not more than 0.002 per cent w/v of residue.

Phenacetin – $C_{10}H_{13}O_2N$ = 179.2

Analytical reagent grade.

White, glistening, crystalline scales, or a fine, white, crystalline powder; odourless; taste, slightly bitter.

Melting range –134° to 136°.

Phenol – C_6H_5OH = 94.11

Analytical reagent grade.

Caustic, deliquescent crystals with a characteristic odour; freezing point, about 41°.

Phenol Liquified –General reagent grade.

A solution in water containing about 80 per cent w/w C_6H_6O.

Phenol Red –$C_{19}H_{14}O_5S$. Phenolsulphonphthalein.

A light to dark red crystalline powder, very slightly soluble in water, slightly soluble in alcohol, soluble in dilute alkaline solutions.

Phenol Red Solution –Dissolve 0.10 g of *phenol red* in 2.82 ml of 0.1 *N sodium hydroxide*, and add 20 ml of *alcohol* and dilute to 100 ml with water.

Test for sensitivity –A mixture of 0.1 ml of the *phenol red solution* in 100 ml of freshly boiled and cooled water is yellow. Not more than 0.1 of 0.02 *N* sodium hydroxide is required to change the colour to red-violet.

Colour change - pH 6.8 (yellow) to pH 8.4 (red-violet).

Phenolphthalein –$C_{20}H_{14}O_4$.

A white to yellowish-white powder, practically insoluble in water, soluble in alcohol.

Phenolphthalein Solution –Dissolve 0.10 g in 80 ml of *alcohol* and dilute to 100 ml with water.

Test for sensitivity –To 0.1 ml of the *phenolphthalein solution* add 100 ml of freshly boiled and cooled water, the solution is colourless. Not more than 0.2 ml of 0.02 *N sodium hydroxide* is required to change the colour to pink.

Colour change –pH 8.2 (colourless) to pH 10.0 (red)

Phloroglucinol – 1 : 3 : 5 – Trihydroxybenzene , $C_6H_3(OH)_3$, $2H_2O$.

Description – White or yellowish crystals or a crystalline powder.

Solubility –Slightly soluble in water; soluble in *alcohol*, and in *solvent ether*.

Melting range –After drying at 110° for one hour, 215° to 219°.

Sulphated ash – Not more than 0.1 per cent, Appendix 2.3.6.

Phloroglucinol should be kept protected from light.

Phloroglucinol Solution –A 1.0 per cent w/v solution of phloroglucinol in alcohol (90 per cent).

Phosphoric Acid – H_3PO_4 = 98.00.

(Orthophosphoric Acid; Concentrated Phosphoric Acid).

Description –Clear and colourless syrupy liquid, corrosive.

Solubility –Miscible with water and with alcohol.

Hypophoshorous and phosphorous acid – To 0.5 ml add 10 ml of water and 2 ml of *silver nitrate solution* and heat on a waterbath for five minutes; the solution shows no change in appearance.

Alkali phosphates - To 1 ml in a graduated cylinder add 6 ml of *solvent ether* and 2 ml of *alcohol*; no turbidity is produced.

Chloride –1 ml complies with the limit test for chlorides, Appendix 2.3.2.

Sulphate –0.5 ml complies with the limit test for sulphate, Appendix 2.3.7.

Arsenic – Not more than 2 parts per million, Appendix 2.3.1.

Heavy metals –Not more than 10 parts per million, determined by Method A on a solution prepared by diluting 1.2 ml with 10 ml of *water*, neutralising with dilute *ammonia solution*, adding sufficient dilute *acetic acid* to render the solution acidic and finally diluting to 25 ml with *water*, Appendix 2.3.3.

Iron –0.1 ml complies with the limit test for iron, Appendix 2.3.4.

Aluminium and calcium –To 1 ml add 10 ml of water and 8 ml of dilute *ammonia solution* the solution remains clear.

Assay –Weigh accurately about 1 g. and mix with a solution of 10 g of *sodium chloride* in 30 ml of water. Titrate with *N sodium hydroxide*, using *phenolphthalein solution* as indicator. Each ml of *N sodium hydroxide* is equivalent to 0.049 g of H_3O_4

Storage –Store in a well-closed glass containers.

Phosphoric Acid, xN –

Solutions of any normality, x N may be prepared by diluting 49 x g of *phosphoric acid* with water to 1000 ml.

Phosphoric Acid, Dilute –

Contains approximately 10 per cent w/v of H_3O_4.

Dilute 69 ml of *phosphoric acid* to 1000 ml with water.

Piperazine Hydrate –$C_4H_{10}N_2$, $6H_2O$ = 194.2.

General reagent grade of commerce.

Colourless, glossy, deliquescent crystals, melting point, about 44°.

Potassium Antimonate –$KSbO_3$, $3H_2O$ =262.90.

Contains not less than 40.0 per cent of Sb.

Description – White, crystalline powder.

Solubility –Sparingly soluble in water, very slowly soluble in cold, but rapidly soluble on boiling.

Assay –Weigh accurately about 0.3 g, and dissolve in 100 ml of water, add 2 ml of dilute *hydrochloric acid*, and pass in *hydrogen sulphide* until the *antimony* is completely precipitated. Add 2 ml of *hydrochloric acid* and again pass in *hydrogen sulphide.* Boil, filter, wash the precipitate with hot *water* saturated with *hydrogen sulphide,* and dissolve the precipitate in 25 ml of *hydrochloric acid.* Boil to remove *hydrogen sulphide*, and dilute to 50 ml with *water.* Add 2 g of *sodium potassium tartrate,* neutralise carefully with *sodium carbonate,* add 2 g *sodium bicarbonate,* and titrate with 0.1 *N iodine, using starch solution* as indicator. Each ml of 0.1 *N iodine* is equivalent to 0.006088 g of Sb.

Potassium Antimonate Solution –Boil 2 g of *potassium antimonate* with 95 ml of *water* until dissolved. Cool rapidly and add 50 ml of *potassium hydroxide solution* and 5 ml of *N sodium hydroxide.* Allow to stand twenty-four hours, filter and and sufficient water to produce 150 ml.

Sensitivity to sodium –To 10 ml add 7 ml of 0.1 M *sodium chloride,* a white crystalline precipitate is formed within fifteen minutes.

Potassium Antimonate Solution should be freshly prepared.

Potassium Bisulphate – Potassium Hydrogen Sulphate; $KHSO_4$ = 136.16.

Contains not less than 98.0 per cent and not more than the equivalent of 102.0 per cent of $KHSO_4$.

Description – Fused, white lumps; hygroscopic.

Solubility –Very soluble in water, giving an acid solution.

Iron–2 g complies with the limit test for iron, Appendix 2.3.4.

Assay– Weigh accurately about 4.5 g, dissolve in 50 ml of *water* and titrate with *N sodium hydroxide* using *methyl red solution as* indicator. Each ml of *N sodium hydroxide* is equivalent to 0.1362 g of $KHSO_4$.

Potassium Bromate – $KBrO_3$ = 167.00

Contains not less than 99.8 per cent of $KBrO_3$ calculated with reference to the substance dried to constant weight at 105°.

Description –White, crystalline powder.

Solubility – Soluble in *water,* freely soluble in boiling water, almost insoluble in *alcohol.*

Acidity or Alkalinity – A 5 per cent w/v solution in *water* is clear and colourless and neutral to *litmus solution.*

Sodium –A warm 10 per cent w/v solution in *water,* tested on platinum wire, imparts no distinct yellow colour to a colourless flame.

Bromide –To 20 ml of a 5 per cent w/v solution in *water* , add 1 ml of 0.1 *N sulphuric acid;* no yellow colour develops within one minute, comparison being made with a control solution to which no acid has been added.

Sulphate –1 g complies with the limit test for *sulphates,* Appendix 2.3.7.

Assay –Weigh accurately about 1 g, dissolve in water and dilute to 250 ml. To 25 ml of this solution add 3 g of *potassium iodide* and 10 ml of *hydrochloric acid,* dilute with 100 ml of water and titrate with 0.1 *N sodium thiosulphate,* using *starch solution* as indicator. Each ml of 0.1 *N sodium thiosulphate* is equivalent 0.002783 g of $KBrO_3$.

Potassium Bromide –KBr = 119.0

Analytical reagent grade.

Potassium Bromide, 0.001 N –

Dissolve 0.1190 g of *potassium bromide* in sufficient *water* to produce 1000 ml.

Potassium Carbonate –$K2CO_3$ = 138.21

Contains not less than 98.0 per cent of $K2CO_3$.

Description –White, granular powder, hygroscopic.

Solubility –Very soluble in *water,* forming a clear solution.

Iron – 1 g, with the addition of 1.5 ml of *hydrochloric acid,* complies with the limit test for *iron,* Appendix 2.3.4.

Chloride –1g, with the addition of 5 ml of *nitric acid,* complies with the limit test for *chlorides,* Appendix 2.3.2.

Sulphate –1 g, with the addition of 5 ml of *hydrochloric acid,* complies with the limit test for *sulphates,* Appendix 2.3.7.

Chromium –To 25 ml of a 2 per cent w/v solution in *water,* add about 0.2 g of *sodium peroxide and* boil gently for five minutes, cool, acidify with *dilute sulphuric acid* and add 2 drops of *diphenylcarbazide solution;* no violet colour is produced.

Assay –Weigh accurately about 3 g, dissolve in 50 ml of *water,* and titrate with *N hydrochloric acid,* using *bromophenol blue solution* as indicator. At the first colour change, boil the solution, cool, and complete the titration. Each ml of *N hydrochloric acid* is equivalent to 0.06911 g of $K2CO_3$.

Potassium Carbonate, Anhydrous. –Potassium carbonate dried at 135° for two hours spread in a thin layer and then cooled in a desiccator.

Potassium Chlorate – $KClO_3$ =122.55

Contains not less than 99.0 per cent of $KClO_3$.

Description –White powder or colourless crystals. In admixture with organic or readily oxidisable substances, it is liable to explode if heated or subjected to percussion or trituration.

Solubility –Soluble in *water,* and in *glycerin*; practically insoluble in *alcohol.*

Lead –Not more than 10 parts per million, Appendix 2.3.5.

Chloride –0.5 g complies with the limit test for *chlorides,* Appendix 2.3.2.

Sulphate –0.5 g complies with the limit test for *sulphates,* Appendix 2.3.7.

Assay –Weigh accurately about 0.3 g and dissolve in 10 ml of *water* in a stoppered-flask, add 1 g of *sodium nitrate,* dissolved in 10 ml of *water,* and then 20 ml of *nitric acid;* stopper the flask and allow to stand for ten minutes; and 100 ml of water and sufficient *potassium permangnate solution* to produce a permanent pink colour; decolorise by the addition of a trace of *ferrous sulphate* and add 0.1 g of *urea.* Add 30 ml of 0.1 *N silver nitrate,* filter, wash with *water,* and titrate the filtrate and washings with 0.1 *N ammonium thiocyanate,* using *ferric ammonium sulphate solution* as indicator. Each ml of 0.1 *N silver nitrate* is equivalent to 0.01226 g of $KClO_3$

Potassium Chloride –KCl = 74.55

Analytical reagent grade

Potassium Chromate – K_2CrO_4 = 194.2

Analytical reagent grade

Potassium Chromate Solution –A 5.0 per cent w/v solution of potassium chromate.

Gives a red precipitate with *silver nitrate* in neutral solutions.

Potassium Cupri-Tartrate Solution –Cupric Tatrate Alkaline Solution : Fehling's Solution.

(1) **Copper Solution** –Dissolve 34.66 g of carefully selected small crystals of *copper sulphate,* showing no trace of efflorescence or of adhering moisture, in sufficient water to make 500 ml. Keep this solution in small, well-stoppered bottles

(2) **Alkaline Tartrate Solution** – Dissolve 176 g of sodium *potassium tartrate* and 77 g of *sodium hydroxide* in sufficient *water* to produce 500 ml.

Mix equal volumes of the solutions No. 1 and No. 2 at the time of using.

Potassium Cyanide –KCN =65.12

Contains not less than 95.0 per cent of KCN.

Description –White, crystalline powder, gradually decomposing on exposure to air.

Solubility –Readily soluble in *water,* forming a clear, colourless solution.

Heavy metals – To 20 ml of a 5 per cent w/v solution in *water,* add 10 ml of *hydrogen sulphide solution;* no darkening is produced immediately or on the addition of 5 ml of *dilute hydrochloric acid.*

Assay – Weigh accurately about 0.5 g and dissolve in 50 ml of *water,* add 5 ml of dilute *ammonia solution* and 1 drop of *potassium iodide solution*; titrate with 0.1 *N silver nitrate until a faint* permanent turbidity appears. Each ml of 0.1 *N silver nitrate* is equivalent to 0.01302 g of KCN.

Potassium Cyanide Solution –A 10.0 per cent w/v solution of *potassium cyanide* in *water.*

Potassium Cyanide Solution, Lead –free –Weigh accurately about 10 g of *potassium cyanide* and dissolve in 90 ml of *water,* add 2 ml of *hydrogen peroxide solution,* allow to stand for twenty-four hours, and make up to 100 ml with *water.* It complies with the following tests.

Mix 2 ml with 5 ml of *lead-free ammonia solution* and 40 ml of water, and add 5 ml of *standard lead solution;* no darkening is produced.

Potassium Dichromate – $K_2Cr_2O_7$ =294.18.

Contains not less than 99.8 per cent of $K_2Cr_2O_7$

Description – Orange-red crystals or a crystalline powder.

Solubility – Soluble in *water*

Chloride. –To 20 ml of a 5 per cent w/v solution in *water* and 10 ml *nitric acid,* warm to about 50° and add a few drops of *silver nitrate solution*; not more than a faint opalescence is produced.

Assay –Carry out the Assay described under Potassium Chromate, using 2 g. Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.004904 g of $K_2Cr_2O_7$.

Potassium Dichromate Solution – A 7.0 per cent w/v solution of *potassium dichromate* in *water.*

Potassium Dichromate, Solution 0.1N – $K_2Cr_2O_7$ = 294.18, 4.903 g in 1000 ml.

Weigh accurately 4.903 g of *potassium dichromate* and dissolve in sufficient *water* to produce 1000 ml.

Potassium Dihydrogen Phosphate - $KH_2PO_4 = 136.1$

Analytical reagent grade of commerce.

Potassium Ferricyanide – $K_3Fe(CN)_6 = 329.25$

Contains not less than 99.0 per cent of $K_3Fe(CN)_6$

Description –Ruby-red crystals.

Solubility –Very soluble in *water.*

Ferrocyanide –Rapidly wash 1 g with water, then dissolve in 100 ml of *water,* and add 1 drop of *ferric ammonium sulphate solution;* no blue colour is produced.

Assay –Weigh accurately about 1 g and dissolve in 50 ml of *water,* add 5 g of *potassium iodide* and 3 g of *zinc sulphate,* and titrate the liberated *iodine* with 0.1 *N sodium thiosulphate, using starch solution,* added towards the end of the titration, as indicator.Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.03293 g of $K_3Fe(CN)_6$.

Potassium Ferricyanide Solution –Wash about 1 g of *potassium ferricyanide* crystals with a little *water,* and dissolve the washed crystals in 100 ml of *water.*

Potassium Ferricyanide solution must be freshly prepared.

Potassium Ferrocyanide – $K_4Fe(CN)_6, 3H_2O = 422.39$

Contains not less than 99.0 per cent of $K_4Fe(CN)_6, 3H_2O$.

Description –Yellow, crystalline powder.

Solubility –Soluble in water.

Acidity or Alkalinity –A 10 per cent w/v solution in water is neutral to litmus paper.

Assay –Weigh accurately about 1g and dissolve in 200 ml of *water,* add 10 ml of *sulphuric acid* and titrate with 0.1 *N potassium permanganate.* Each ml of 0.1 *N potassium permanganate* is equivalent to 0.04224 g of $K_4Fe(CN)_6, 3H_2O$.

Potassium Ferrocyanide Solution –A 5.0 per cent w/v solution of *potassium ferrocyanide in water.*

Potassium Hydrogen Phthalate –$CO_2H.C_6H_4.CO_2K = 204.22$.

Contains not less than 99.9 per cent and not more than the equivalent of 100.1 per cent of $C_8H_5O_4K$ calculated with reference to the substance dried at 110° for one hour.

Description –White, crystalline powder.

Solubility –Slowly soluble in *water,* forming clear, colourless solution.

Acidity –A 2.0 per cent w/v solution in carbon dioxide free water gives with *bromophenol blue solution* the grey colour indicative of pH 4.0.

Assay –Weigh accurately about 9 g, dissolve in 100 ml of *water* and titrate with *N sodium hydroxide* using *phenolphthalein solution* as indicator. Each ml of *N Sodium hydroxide* is equivalent to 0.2042 g of $C_8H_5O_4K$.

Potassium Hydrogen Phthalate, 0.02 M –

Dissolve 4.084 g of *Potassium hydrogen phthalate* in sufficient *water* to produce 1000 ml.

Potassium Hydrogen Phthalate, 0.2 M –

Dissolve 40.84 g of *potassium hydrogen phthalate* in sufficient *water* to produce 1000 ml.

Potassium Hydroxide –Caustic Potash : KOH = 56.11

Contains not less than 85.0 per cent of total alkali, calculated as KOH and not more than 4.0 per cent of K_2CO_3.

Description –Dry white sticks, pellets or fused mass; hard, brittle and showing a crystalline fracture; very deliquescent; strongly alkaline and corrosive.

Solubility –Freely soluble in *water*, in *alcohol* and in *glycerin;* very soluble in boiling ethyl alcohol.

Aluminium, iron and matter insoluble in hydrochloric acid –Boil 5 g with 40 ml of *dilute hydrochloric acid,* cool, make alkaline with *dilute ammonia solution,* boil, filter and wash the residue with a 2.5 per cent w/v solution of *ammonium nitrate*; the insoluble residue, after ignition to constant weight, weighs not more than 5 mg.

Chloride –0.5 g dissolved in water with the additon of 1.6 ml of *nitric acid*, complies with the limit test for *chlorides*, Appendix 2.3.2.

Heavy metals –Dissolve 1 g in a mixture of 5 ml of *water* and 7 ml of *dilute hydrochloric acid.* Heat to boiling, add 1 drop of *phenolphthalein solution* and *dilute ammonia solution* dropwise to produce a faint pink colour. Add 2 ml of *acetic acid* and *water* to make 25 ml; the limit of heavy metals is 30 parts per million, Appendix 2.3.3.

Sulphate –Dissolve 1 g in water with the addition of 4.5 ml of *hydrochloric acid;* the solution complies with the limit test for *sulphates,* Appendix 2.3.7.

Sodium –To 3 ml of a 10 per cent w/v solution add 1 ml of *water*, 1.5 ml of *alcohol,* and 3 ml of *potassium antimonate solution* and allow to stand; no white crystalline precipitate or sediment is visible to the naked eye within fifteen minutes.

Assay –Weigh accurately about 2 g, and dissolve in 25 ml of *water,* add 5 ml of *barium chloride solution,* and titrate with *N hydrochloric acid, u*sing *phenolphthalein solution* as indicator. To the solution in the flask add *bromophenol blue solution,* and continue the titration with *N hydrochloric* acid. Each ml of *N hydrochloric acid,* used in the second titration in equivalent to 0.06911 g of K_2CO_3 . Each ml of *N hydrochloric acid,* used in the combined titration is equivalent to 0.05611 g of total alkali, calculated as KOH.

Storage –Potassium Hydroxide should be kept in a well-closed container.

Potassium Hydroxide, xN –

Solution of any normality, x N, may be prepared by dissolving 56.11x g of *potassium hydroxide* in *water* and diluting to 1000 ml.

Potassium Hydroxide Solution –Solution of Potash.

An aqueous solution of *potassium hydroxide* containing 5.0 per cent w/v of total alkali, calculated as KOH (limits, 4.75 to 5.25).

Assay –Titrate 20 ml with *N sulphuric acid,* using *solution of methyl orange* as indicator. Each ml of *N sulphuric acid* is equivalent to 0.05611 g of total alkali, calculated as KOH.

Storage –*Potassium hydroxide* solution should be kept in a well-closed container of lead-free glass or of a suitable plastic.

Potassium Iodate – KIO_3 = 214.0

Analytical reagent grade.

Potassium Iodate Solution – A 1.0 per cent w/v solution of potassium iodate in water.

Potassium Iodate, 0.05 M – KIO_3 – 214.0; 10.70 g in 1000 ml

Weigh accurately 10.700 g of *potassium iodate, previously* dried at 110° to constant weight, in sufficeint water to produce 1000 ml.

Potassium Iodide –KI = 166.00

Description –Colourless crystals or white powder; odourless, taste, saline and slightly bitter.

Solubility –Very soluble in *water* and in *glycerin;* soluble in *alcohol.*

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Heavy metals -Not more than 10 parts per million, determined on 2.0 g by Method A, Appendix 2.3.3.

Barium –Dissolve 0.5 g in 10 ml of *water* and add 1 ml of *dilute sulphuric acid;* no turbidity develops within one minute.

Cyanides –Dissolve 0.5 g in 5 ml of warm *water,* add one drop of *ferrous sulphate solution* and 0.5 ml of *sodium hydroxide solution* and acidify with *hydrochloric acid;* no blue colour is produced.

Iodates –Dissolve 0.5 g in 10 ml of freshly boiled and cooled *water,* and add 2 drops of *dilute sulphuric acid* and a drop of starch solution; no blue colour is produced within two minutes.

Assay –Weigh accurately about 0.5 g, dissolve in about 10 ml of *water* and add 35 ml of *hydrochloric acid* and 5 ml of *chloroform.* Titrate with 0.05 M *potassium iodate* until the purple colour of iodine disappears from the chloroform. Add the last portion of the iodate solution drop-wise and agitate vigorously and continuously. Allow to stand for five minutes. If any colour develops in the chloroform layer continue the titration. Each ml of 0.05 M *potassium iodate* is equivalent to 0.0166 mg of KI.

Storage –Store in well-closed containers.

Potassium Iodide, M –Dissolve 166.00 g of *potassium iodide* in sufficient *water* to produce 1000 ml.

Potassium Iodide and Starch Solution –Dissolve 10 g of *potassium iodide* in sufficeint water to produce 95 ml and add 5 ml of *starch solution.*

Potassium Iodide and Starch solution must be recently prepared.

Potassium Iodide Solution –A 10 per cent w/v solution of *potassium iodide* in *water.*

Potassium Iodobismuthate Solution –Dissolve 100 g of *tartaric acid* in 400 ml of *water* and 8.5 g of *bismuth oxynitrate.* Shake during one hour, add 200 ml of a 40 per cent w/v solution of potassium iodide, and shake well. Allow to stand for twenty four hours and filter.

Potassium Iodobismuthate Solution, Dilute –Dissolve 100 g of *tartaric acid* in 500 ml of *water* and add 50 ml of *potassium iodobismuthate solution.*

Potassium Mercuric-Iodide Solution –Mayer's Reagent.

Add 1.36 g of *mercuric chloride* dissolved in 60 ml of *water* to a solution of 5 g of *potassium iodide* in 20 ml of *water,* mix and add sufficient water to produce 100 ml.

Potassium Mercuri-Iodide Solution, Alkaline (Nessler's Reagent)

To 3.5 g of *potassium iodide* add 1.25 g of *mercuric chloride* dissolved in 80 ml of *water,* add a cold saturated solution of *mercuric chloride* in *water,* with constant stirring until a slight red precipitate remains. Dissolve 12 g of *sodium hydroxide* in the solution, add a little more of the cold saturated solution of *mercuric chloride* and sufficient *water* to produce 100 ml. Allow to stand and decant the clear liquid.

Potassium Nitrate - KNO_3 = 101.1

Analytical reagent grade.

Potassium Permanganate – $KMnO_4$ = 158.03

Description –Dark purple, slender, prismatic crystals, having a metallic lustre, odourless; taste, sweet and astringent.

Solubility –Soluble in *water*; freely soluble in *boiling water.*

Chloride and Sulphate –Dissolve 1 g in 50 ml of boiling *water,* heat on a water-bath, and add gradually 4 ml or a sufficient quantity of *alcohol* until the meniscus is colour-less; filter. A 20 ml portion of the filtrate complies with the limit test for *chloride,* Appendix 2.3.2., and another 20 ml portion of the filtrate complies with the limit test for *sulphates,* Appendix 2.3.7.

Assay –Weigh accurately about 0.8 g, dissolve in water and dilute to 250 ml. Titrate with this solution 25.0 ml of 0.1 *N oxalic acid* mixed with 25 ml of *water* and 5 ml of *sulphuric acid.* Keep the temperature at about 70° throughout the entire titration. Each ml of 0.1 *N oxalic acid* is equivalent to 0.00316 g of $KMnO_4$.

Storage –Store in well-closed containers.

Caution –Great care should be observed in handling *potassium permanganate,* as dangerous explosions are liable to occur if it is brought into contact with organic or other readily oxidisable substance, either in solution or in the dry condition.

Potassium Permanganate Solution – A 1.0 per cent w/v solution of *potassium permanganate* in water.

Potassium Permanganate, 0.1 N Solution –158.03. 3.161 g in 1000 ml

Dissolve about 3.3. g of *potassium permanganate* in 1000 ml of *water*, heat on a water-bath for one hour and allow to stand for two days. Filter through glass wool and standardise the solution as follows :

To an accurately measured volume of about 25 ml of the solution in a glass stoppered flask add 2 g of *potassium iodide* followed by 10 ml of *N sulphuric acid.* Titrate the liberated *iodine* with standardised 0.1 *N sodium thiosulphate,* adding 3 ml of *starch solution* as the end point is approached. Correct for a blank run on the same quantities of the same reagents. Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.003161 g of $KMnO_4$

Potassium Tetraoxalate - $KH_3(C_2O_4)_2, 2H_2O = 254.2$.

Analytical reagent grade of commerce.

Potassium Thiocyanate –KCNS =97.18.

Analytical reagent grade.

Purified Water –$H_2O = 18.02$.

Description –Clear, colourless liquid, odourless, tasteless.

Purified water is prepareed from potable water by distillation, ion-exchange treatment, reverse osmosis or any other suitable process. It contains no added substances.

***p*H** – Between 4.5 and 7.0 determined in a solution prepared by adding 0.3 ml of a saturated solution of *potassium chloride* to 100 ml of the liquid being examined.

Carbon dioxide –To 25 ml add 25 ml of *calcium hydroxide solution*, no turbidity is produced.

Chloride –To 10 ml add 1 ml of *dilute nitric acid* and 0.2 ml of *silver nitrate solution;* no opalescence is produced.

Sulphate –To 10 ml add 0.1 ml of *dilute hydrochloric acid* and 0.1 ml of *barium chloride solution :* the solution remains clear for an hour.

Nitrates and Nitrites –To 50 ml add 18 ml of *acetic acid* and 2 ml of *naphthylamine-sulphanilic acid* reagent. Add 0.12 g of *zinc reducing mixture* and shake several times. No pink colour develops within fifteen minutes.

Ammonium – To 20 ml add 1 ml of *alkaline potassium mercuric-iodide solution* and after five minutes view in a Nessler cylinder placed on a white tile; the colour is not more intense than that given on adding 1 ml of *alkaline potassium mercuric-iodide solution* to a solution containing 2.5 ml of *dilute ammonium chloride solution (Nessler's)* 7.5 ml of the liquid being examined.

Calcium –To 10 ml add 0.2 ml of *dilute ammonia solution* and 0.2 ml of *ammonium oxalate solution;* the solution remains clear for an hour.

Heavy metals –Adjust the pH of 40 ml to between 3.0 and 4.0 with *dilute acetic acid,* add 10 ml of freshly prepared *hydrogen sulphide solution* and allow to stand for ten minutes; the colour of the solution is not more than that of a mixture of 50 ml of the liquid being examined and the same amount of *dilute acetic acid* added to the sample.

Oxidisable matter –To 100 ml add 10 ml of *dilute sulphuric acid* and 0.1 ml of 0.1 *N potassium permanganate* and boil for five minutes. The solution remains faintly pink.

Total Solids –Not more than 0.001 per cent w/v determined on 100 ml by evaporating on a water bath and drying in an oven at 105° for one hour.

Storage –Store in tightly closed containers.

Resorcinol –Benzene –1,3 diol; $C_6H_4(OH)_2 = 110.1$

Analytical reagent grade.

Colourless crystals or crystalline powder, melting point about 111°.

Resorcinol Solution –

Shake 0.2 g of *resorcinol* with 100 ml of toluene until saturated and decant.

Safranine – Basic red 2

Microscopical staining grade.

A reddish-brown powder.

Safranine Solution –

Saturated solution of *safranine* in *ethanol* (70 per cent.)

Sesame Oil –

Description – A pale yellow oil, odour, slight; taste, bland.

Solubility –Slightly soluble in alcohol; miscible with *chloroform,* with *solvent ether,* with *light petroleum* (b.p. 40° to 60°) and with *carbon disulphide.*

Refaractive index – At 40°, 1.4650 to 1.4665.

Wt. Per ml – At 25°, 0.916 to 0.921 g.

Storage –Preserve sesame oil in well-closed container protected from light, and avoid exposure to excessive heat.

Silver Carbonate – Ag2 CO3 = 214

Prepared from *silver nitrate* and soluble *carbonate solution.* Light yellow powder when freshly precipitated, but becomes darker on drying and on exposure to light.

Silica Gel –

Partially dehydrated, polymerised, colloidal silicic acid containing cobalt chloride as an indicator.

Description –Blue granules, becoming pink when the moisture absorption capacity is exhausted. Silica Gel absorbs about 30 per cent of its weight of water at 20°. Its absorptive capacity may be regenerated by heating at 150° for two hours.

Silver Nitrate –$AgNO_3 = 169.87$

Description –Colourless crystals or white crystalline powder; odourless; taste, bitter and metallic.

Solubility –Very soluble in *water*, sparingly soluble in *alcohol;* slightly soluble in *solvent ether.*

Clarity and colour of solution –A solution of 2 g in 20 ml of water is clear and colourless.

Bismuth, Copper and Lead –To a solution of 1 g in 5 ml of *water, add a slight excess* of dilute *ammonia solution;* the mixute remains clear and colourless.

Foreign substances –To 30 ml of 4. 0 per cent w/v solution add 7.5 ml of 2 *N hydrochloric acid,* shake vigorously, filter and evaporate 10 ml of the filtrate to dryness on a water-bath; the residue weighs not more than 1 mg.

Assay – Weigh accurately about 0.5 g and dissolve in 50 ml of *water,* add 2 ml of *nitric acid,* and titrate with 0.1 *N ammonium thiocyanate,* using *ferric ammonium sulphate solution* as indicator. Each ml of 0.1 *N ammonium thiocyanate* is equivalent to 0.01699 g of $Ag NO_3$.

Storage –Store in tightly-closed, light resistant containers.

Silver Nitrate Solution –

A freshly prepared 5.0 per cent w/v solution of silver nitrate in water.

Silver Nitrate, 0.1 N– $Ag NO_3$ = 169. 87; 16.99 g in 1000 ml. Dissolve about 17 g in sufficient *water* to produce 1000 ml and standardise the solution as follows:

Weigh accurately about 0.1 g of *sodium chloride* previously dried at 110° for two hours and dissolve in 5 ml of *water.* Add 5 ml of *acetic acid,* 50 ml of *methyl alcohol* and three drops of *eosin solution is* equivalent to 1 ml of 0.1 *N silver nitrate.*

Sodium Bicarbonate – $NaHCO_3$ =84.01

Description –White, crystalline powder or small, opaque, monoclinic crystals; odourless; taste, saline.

Solubility –Freely soluble in *water*; practically insoluble in *alcohol.*

Carbonate –pH of a freshly prepared 5.0 per cent w/v solution in *carbon dioxide-free water,* not more than 8.6.

Aluminium, calcium and insoluble matter –Boil 10 g with 50 ml of *water* and 20 ml of *dilute ammonia solution,* filter, and wash the residue with water; the residue, after ignition to constant weight, not more than 1 mg.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Iron –Dissolve 2.5 g in 20 ml of *water* and 4 ml of *iron-free hydrochloric acid,* and *dilute* to 40 ml with *water*; the solution complies with the *limit test for iron,* Appendix 2.3.4.

Heavy metals –Not more than 5 parts per million, determined by Method A on a solution prepared in the following manner :

Mix 4.0 g with 5 ml of *water* and 10 ml of *dilute hydrochloric acid,* heat to boiling, and maintain the temperature for one minute. Add one drop of *phenolphthalein solution* and sufficient *ammonia solution* drop wise to give the solution a faint pink colour. Cool and dilute to 25 ml with *water, Appendix 2.3.3.*

Chlorides —Dissolve 1.0 g in *water* with the addition of 2 ml of *nitric acid;* the solution complies with the *limit test for chlorides,* Appendix 2.3.2.

Sulphates —Dissolve 2 g in *water* with the addition of 2 ml of *hydrochloric acid;* the solution complies with the limit test for *sulphates,* Appendix 2.3.7.

Ammonium compounds —1 g warmed with 10 ml of *sodium hydroxide solution* does not evolve ammonia.

Assay —Weigh accurately about 1 g, dissolve in 20 ml of *water,* and titrate with 0.5 *N sulphuric acid* using *methyl orange solution* as indicator. Each ml of 0.5 *N sulphuric acid* is equivalent to 0.042 g of $NaHCO_3$.

Storage —Store in well-closed containers.

Sodium Bicarbonate Solution —A 5 per cnet w/v solution of *sodium bicarbonate* in *water.*

Sodium Bisulphite —Consists of sodium bisulphite ($NaHSO_3$) and sodium metabisulphite ($Na2S2O_3$) in varying proportions. It yields not less than 58.5 per cent and not more than 67.4 per cent of SO_2.

Description —White or yellowish-white crystals or granular powder; odour of sulphur dioxide. It is unstable in air.

Solubility —Freely soluble in *water,* slightly soluble in *alcohol.*

Assay —Weigh accurately about 0.2 g and transfer to a glass-stoppered flask, add 50 ml of 0.1 *N iodine* and insert the stopper of the flask. Allow to stand for five minutes, add 1 ml of *hydrochloric acid,* and titrate the excess of iodine with 0.1 *N sodium thiosulphate,* using *starch solution* as indicator added towards the end of the titration. Each ml of 0.1 *N iodine* is equivalent to 0.003203 g of SO_2.

Storage —Preserve Sodium Bisulphite in tightly-closed containers in a cool place.

Sodium Bisulphite Solution —Dissolve 10 g of *sodium bisulphite* in sufficient *water* to make 30 ml.

Sodium Bisulphite Solution must be freshly prepared.

Sodium Carbonate – $Na_2CO_3.\ 10H_2O$ =286.2.

Analytical reagent grade.

Sodium Chloride – NaCl = 58.44

Analytical reagent grade.

Sodium Cobaltinitrite –$Na_3CO(NO_2)_6$ = 403.94

Description —An orange-yellow powder.

Solubility —Readily soluble in *water,* forming a clear orange-red solution.

Potassium — Dissolve 3 g in 10 ml of *water* , add the solution to a mixture of 5 ml of *water* and 2 ml of *dilute acetic acid,* and allow to stand for one hour; no precipitate is produced.

Sodium Cobaltinitrite Solution – A 30 per cent w/v solution of *sodium cobaltinitrite* in *water.*

Sodium Diethyldithiocarbamate –$(C_2H_5)_2$, N. CS.SNa, $3H_2O$ = 225.30.

Description –White or colourless crystals.

Solubility –Readily soluble in *water*, yielding a colourless solution.

Sensitivity –Add 10 ml of a 0.1 per cent w/v solution to 50 ml of *water* containing 0.002 mg of copper previously made alkaline with *dilute ammonia solution.* A yellowish-brown colour should be apparent in the solution when compared with a blank test containing no copper.

Sodium Diethyldithiocarbamate Solution – A 0.1 per cent w/v solution of *sodium diethyldithiocarbamate* in *water.*

Sodium Hydroxide –NaOH = 40.00

Description –White sticks, pellets, fused masses, or scales; dry, hard brittle, and showing a crystalline fracture, very deliquescent; strongly alkaline and corrosive.

Solubility –Freely soluble in *water* and in *alcohol.*

Aluminium, iron and matter insoluble in hydrochloric acid –Boil 5 g with 50 ml of dilute hydrochloric acid, cool, make alkaline with *dilute ammonia solution,* boil, filter, and wash with a 2.5 per cent w/v solution of *ammonium nitrate;* the insoluble residue after ignition to constant weight weighs not more than 5 mg.

Arsenic –Not more than 4 parts per million, Appendix 2.3.1.

Heavy metals –Not more than 30 parts per million, determined by Method A, Appendix 2.3.3. on a solution prepared by dissolving 0.67 g in 5 ml of water and 7 ml of 3 *N hydrochloric acid.* Heat to boiling, cool and dilute to 25 ml with water.

Potassium –Acidify 5 ml of a 5 per cent w/v solution with *acetic acid* and add 3 drops of *sodium cobaltnitrite solution;* no preciptitate is formed.

Chloride –0.5 g dissolved in *water* with the addition of 1.8 ml of *nitric acid,* complies with the limit test for *chlorides,* Appendix 2.3.2.

Sulphates –1 g dissolved in *water* with the addition of 3.5 ml of *hydrochloric acid* complies with the limit test for *sulphates,* Appendix 2.3.7.

Assay –Weigh accurately about 1.5 g and dissolve in about 40 ml of *carbon dioxide-free water.* Cool and titrate with *N sulphuric acid* using *phenolphthalein solution* as indicator. When the pink colour of the solution is discharged, record the volume of acid solution required, add *methyl orange solution* and continue the titration until a persistent pink colour is produced. Each ml of *N sulphuric acid* is equivalent to 0.040 g of total alkali calculated as NaOH and each ml of acid consumed in the titration with *methyl orange* is equivalent to 0.106 g of Na_2CO_3.

Storage –Store in tightly closed containers.

Sodium Hydroxide, xN – Solutions of any normality, xN may be prepared by dissolving 40 x g of *sodium hydroxide* in *water* and diluting to 1000 ml.

Sodium Hydroxide Solution – A 20.0 per cent w/v solution of *sodium hydroxide* in *water.*

Sodium Hydroxide Solution, Dilute –

A 5.0 per cent w/v solution of *sodium hydroxide* in water.

Sodium Nitrite –$NaNO_2$ = 69.00, Analytical reagent grade.

Sodium Nitroprusside –(Sodium penta cyano nitrosyl ferrate (iii) dihydrate; $Na_2[Fe(CN)_5 (NO)], 2H_2O$ = 298.0

Analytical reagent grade of commerce.

Sodium Peroxide – Na_2O_2 =77.98.

Analytical grade reagent.

Sodium Potassium Tartrate –Rochelle Salt COONa.CH(OH). CH(OH), COOK, $4H_2O$ = 282.17

Contains not less than 99.0 per cent and not more than the equivalent of 104.0 per cent of $C_4H_4O_6KNa$, $4H_2O$.

Description –Colourless crystals or a white, crystalline powder; odourless; taste saline and cooling. It effloresces slightly in warm, dry air, the crystals are often coated with a white powder.

Solubility –Soluble in *water;* practically insoluble in alcohol.

Acidity or Alkalinity –Dissolve 1 g in 10 ml of recently boiled and cooled *water,* the solution requires for neutralisation not more than 0.1 ml of 0.1 *N sodium hydroxide* or of 0.1 *N hydrochloric acid,* using *phenolphthalein solution as indicator.*

Iron –0.5 g complies with the *limit test for iron,* Appendix 2.3.4.

Chloride –0.5 g complies with the *limit test for chlorides,* Appendix 2.3.2.

Sulphate –0.5 g complies with the *limit test for sulphate* , Appendix 2.3.7.

Assay –Weigh accurately about 2 g and heat until carbonised, cool, and boil the residue with 50 ml of *water* and 50 ml of 0.5 *N sulphuric acid;* filter, and wash the filter with *water;* titrate the excess of acid in the filtrate and washings with 0.5 *N sodium hydroxide,* using *methyl orange solution* as indicator. Each ml of 0.5 *N sulphuric acid* is equivalent to 0.07056 g of $C_4H_4O_6KNa$, $4H_2O$.

Sodium Sulphide –Na_2S + aq.

Analytical reagent grade. Deliquescent, crystalline masses turning yellow on storage.

Sodium Sulphide Solution –Dissolve with heating, 12 g of *sodium sulphide* in a mixture of 10 ml of *water* and 25 ml of *glycerol,* cool and dilute to 100 ml with the same mixture.

Sodium Sulphite, Anhydrous –Na_2SO_3 =126.06

Description –Small crystals or powder.

Solubility –Freely soluble in *water,* soluble in *glycerin;* almost insoluble in *alcohol.*

Sodium Thiosulphate – $Na_2S_2O_3$, $5H_2O$ =248.17.

Description –Large colourless crystals or coarse, crystalline powder; odourless; taste, saline, deliquescent in moist air and effloresces in dry air at temperature above 33°.

Solubility –Very soluble in *water;* insoluble in *alcohol.*

pH –Between 6.0 and 8.4, determined in a 10 per cent w/v solution.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Heavy metals –Not more than 20 parts per million, determined by Method A, Appendix 2.3.3. on a solution prepared in the following manner : Dissolve 1 g in 10 ml of *water,* slowly add 5 ml of *dilute hydrochloric acid* and evaporate the mixture to dryness on a water-bath. Gently boil the residue with 15 ml of *water* for two minutes, and filter. Heat the filtrate to boiling, and add *sufficient bromine solution* to the hot filtrate to produce a clear solution and add a slight excess of *bromine solution.* Boil the solution to expel the *bromine* completely, cool to room temperature, then add a drop of *phenolphthalein solution* and *sodium hydroxide solution* until a slight pink colour is produced. Add 2 ml of *dilute acetic acid* and dilute with *water* to 25 ml.

Calcium –Dissolve 1 g in 20 ml of *water,* and add a few ml of *ammonium oxalate solution;* no turbidity is produced.

Chloride –Dissolve 0.25 g in 15 ml of *2N nitric acid* and boil gently for three to four minutes, cool and filter; the filtrate complies with the *limit test for chlorides,* Appendix 2.3.2.

Sulphate and Sulphite –Dissolve 0.25 g in 10 ml of *water,* to 3 ml of this solution add 2 ml of *iodine solution,* and gradually add more *iodine solution,* dropwise until a very faint-persistant yellow colour is procduced; the resulting solution complies with the limit test for sulphates, Appendix 2.3.7.

Sulphide –Dissolve 1 g in 10 ml of *water* and 10.00 ml of a freshly prepared 5 per cent w/v solution of *sodium nitroprusside;* the solution does not become violet.

Assay –Weigh accurately about 0.8 g and dissolve in 30 ml of *water.* Titrate with 0.1 *N iodine,* using 3 ml of *starch solution* as indicator as the end-point is approached. Each ml of 0.1 iodine is equivalent to 0.02482 g of $Na_2S_2O_3, 5H_2O$.

Storage –Store in tightly-closed containers.

Sodium Thiosulphate 0.1 N – $Na_2S_2O_3, 5H_2O$. = 248.17, 24.82 g in 1000 ml.

Dissolve about 26 g of *sodium thiosulphate* and 0.2 g of *sodium carbonate* in *carbon dioxide-free water* and dilute to 1000 ml with the same solvent. Standardise the solution as follows :

Dissolve 0.300 g of *potassium bromate* in sufficient *water* to produce 250 ml. To 50 ml of this solution, add 2 g of *potassium iodide* and 3 ml of 2 *N hydrochloric acid* and titrate with the *sodium-thiosulphate solution* using *starch solution,* added towards the end of the titration, as indicator until the blue colour is discharged. Each 0.002784 g of *potassium bromate* is equivalent to 1 ml of 0.1*N sodium thiosulphate.* Note: –Re-standardise 0.1 *N sodium thiosulphate* frequently.

Stannous Chloride – $SnCl_2, 2H_2O$ =225.63.

Contains not less than 97.0 per cent of $SnCl_2, 2H_2O$.

Description –Colourless crystals.

Solubility –Soluble in *dilute hydrochloric acid.*

Arsenic- Dissolve 5.0 g in 10 ml of *hydrochloric acid,* heat to boiling and allow to stand for one hour; the solution shows no darkening when compared with a freshly prepared solution of 5.0 g in 10 ml of *hydrochloric acid.*

Sulphate –5.0 g with the addition of 2 ml of *dilute hydrochloric acid,* complies with the *limit test for sulphates,* Appendix 2.3.7.

Assay –Weigh accurately about 1.0 g and dissolve in 30 ml of *hydrochloric acid* in a stoppered flask. Add 20 ml of *water* and 5 ml of *chloroform* and titrate rapidly with 0.05 *M potassium iodate until* the *chloroform* layer is colourless. Each ml of 0.05 M potassium iodate is equivalent to 0.02256 g of $SnCl_2$, $2H_2O$.

Stannous Chloride Solution – May be prepared by either of the two methods given below :

1. Dissolve 330 g of *stannous chloride* in 100 ml of *hydrochloric acid* and add sufficient *water* to produce 1000 ml.

2. Dilute 60 ml of *hydrochloric acid* with 20 ml of *water,* add 20 g of tin and heat gently until gas ceases to be evolved; add sufficient *water* to produce 100 ml, allowing the undissolved tin to remain in the solution.

Starch Soluble – Starch which has been treated with *hydrochloric acid* until after being washed, it forms an almost clear liquid solution in hot water.

Description –Fine, white powder.

Solubility –Soluble in hot *water,* usually forming a slightly turbid *solution.*

Acidity or Alkalinity –Shake 2 g with 20 ml of *water* for three minutes and filter; the filtrate is not alkaline or more than fainthy acid to litmus paper.

Sensitivity –Mix 1 g with a little cold *water* and add 200 ml *boiling water.* Add 5 ml of this solution to 100 ml of *water* and add 0.05 ml of 0.1 *N iodine.* The deep blue colour is discharged by 0.05 ml of 0.1 *N sodium thiosulphate.*

Ash – Not more than 0.3 per cent, Appendix 2.2.3.

Starch Solution –Triturate 0.5 g of *soluble starch,* with 5 ml of *water,* and add this, with constant stirring, to sufficient water to produce about 100 ml. Boil for a few minutes, cool, and filter.

Solution of *starch must be recently prepared.*

Sudan Red G –Sudan III; Solvent Red 23; 1-(4-Phenyl-azophenylazo)-2-naphthol; $C_{22}H_{16}N_4O$ = 352.40.

Description –Reddish-brown powder.

Solubility –Insoluble in *water*; soluble in *chloroform,* in *glacial acetic acid;* moderately soluble in *alcohol,* in solvent *ether* and in *acetone.*

Sulphamic Acid –NH_2SO_3H =97.09.

Contains not less than 98.0 per cent of H_3NO_3S .

Description -White crystals or a white crystalline powder.

Solubility –Readily soluble in water.

Melting Range –203° to 205°, with decomposition.

Sulphuric Acid – H2SO4 = 98.08.

When no molarity is indicated use analytical reagent grade of commerce containing about 98 per cent w/w of *sulphuric acid.* An oily, corrosive liquid weighing about 1.84 g per ml and about 18 M in strength.

When solutions of molarity xM are required, they should be prepared by carefully adding 54 x ml of sulphuric acid to an equal volume of water and diluting with water to 1000 ml.

Solutions of sulphuric acid contain about 10 per cent w/v of H_2SO_4 per g mol.

Sulphuric Acid, Dilute –Contains approximately 10 per cent w/w of H_2SO_4.

Dilute 57 ml of sulphuric acid to 1000 ml with water.

Sulphuric Acid, Chlorine-free –Sulphuric acid which complies with the following additional test:

Chloride –Mix 2 ml with 50 ml of water and add 1 ml of solution of *silver nitrate,* no opalescence is produced.

Sulphuric Acid, Nitrogen-free-Sulphuric acid which contains not less than 98.0 per cent w/w of H_2SO_4 and complies with the following additional test :

Nitrate –Mix 45 ml with 5 ml of *water,* cool and add 8 mg of *diphenyl benezidine;* the solution is colourless or not more than very pale blue.

Tartaric Acid –$(CHOH.\ COOH)_2$ =150.1

Analytical reagent grade.

Thioglycollic Acid – Mercapto acetic acid, – HS. CH_2COOH =92.11.

Contains not less than 89.0 per cent w/w of $C_2H_4O_2S$, as determined by both parts of the Assay described below :

Description –Colourless or nearly colourless liquid; odour strong and upleasant.

Iron –Mix 0.1 ml with 50 ml of water and render alkaline with *strong ammonia solution;* no pink colour is produced.

Assay –

(1) Weigh accurately about 0.4 g and dissolve in 20 ml of *water* and titrate with 0.1 *N sodium hydroxide* using *cresol red solution* as indicator. Each ml of 0.1 *N sodium hydroxide is equivalent to* 0.009212 g of $C_2H_4O_2S$.

(2) To the above neutralised solution and 2 g of *sodium bicarbonate* and titrate with 0.1 *N iodine* Each ml of 0.1 *N iodine is equivalent to 0.009212 g of* $C_2H_4O_2S$.

Thymol – 2-Isopropyl-5-methylphenol; $C_{10}H_{14}O$ = 150.2

General reagent grade.

Colourless crystals with an aromatic odour; freezing point not below 49°.

Thymol Blue –6, 6' –(3H-2, 1 Benzoxathil –3 –ylidene) dithymol SS =dioxide; $C_{27}H_{30}O_5S$ = 466.6

Gives a red colour in strongly acid solutions, a yellow colour in weakly acid and weakly alkaline solutions, and a blue colour in more strongly alkaline solutions (pH range, 1.2 to 2.8 and 2.0 to 9.6).

Thymol Blue Solution –Warm 0.1 g of *thymol blue* with 4.3 ml of 0.05 M sodium hydroxide and 5 ml of *ethanol (90 per cent);* after solution is effected add sufficient *ethanol (20 per cent)*to produce 250 ml.

Complies with the following test –

Sensitivity –A mixture of 0.1 ml and 100 ml of carbon dioxide-free water to which 0.2 ml of 0.02 *N sodium hydroxide* has been added is blue. Not more than 0.1 ml of 0.2 *N hydrochloric* acid is required to change the colour to yellow.

Titanous Chloride Solution –General reagent grade of commerce containing about 15 per cent w/v to TiCl3.

Weight per ml, about 1.2 g.

Dull purplish liquid with a strongly acid reaction.

Titanous Chloride 0.1 N – $TiCl_3$=154.26; 15.43 g in 1000 ml.

Add 103 ml of *titanous chloride solution* to 100 ml of *hydrochloric acid,* dilute to 1000 ml with recently boiled and cooled water, and mix, standardise, immediately before use, as follows :

Place an accurately measured volume of about 30 ml of standardised 0.1 *N ferric ammonium sulphate* in a flask and pass in a rapid stream of *carbon dioxide* until all the air has been removed. Add the *titanous chloride solution* from a burette and in an atmosphere of carbon dioxide until near the calculated end point then add 5 ml of *ammonium thiocyanate solution,* and continue the titration until the solution is colourless. Each ml of 0.1 *N ferric ammonium sulphate* is equivalent to 0.01543 g of $TiCl_3$.

Vanillin-Sulphuric Acid Reagent – 5 % Ethanolic sulphuric acid (Solution I)
1 % Ethanolic vanillin (Solution II)

The plate is sprayed vigorously with 10 ml Solution I, followed immediately by 5-10 ml of Solution II.

Water –See purified water.

Water, Ammonia-free –Water which has been boiled vigorously for a few minutes and protected from the atomosphere during cooling and storage.

Xylenol Orange – [3H-2,1-Benzoxathiol–3-ylidene bis – (6-hydroxy-5-methyl-m-phenylene) methylenenitrilo] tetra acetic acid SS-dioxide or its tetra sodium salt.

Gives a reddish-purple colour with mercury, lead, zinc and contain other metal ions in acid solution. When metal ions are absent, for example, in the presence of an excess of *disodium ethylenediamine tetraacetate*, this solution is yellow.

Xylenol Orange Solution –Shake 0.1 g of *xylenol orange* with 100 ml of *water* and filter, if necessary.

Zinc, Granulated –Zn=65.38.

Analytical reagent grade of commerce.

Zinc Powder –Zn =65.38.

Analytical reagent grade of commerce.

Zinc Sulphate –$ZnSO_4$, $7H_2O$ = 287.6.

Analytical reagent grade of commerce.

APPENDIX –5

5.1 WEIGHT AND MEASURES

METRIC SYSTEM

Measure of Mass (Weights)

1 Kilogram (Kg) – is the mass of the International Prototype Kilogram.
1 Gramme (g) – the 1000^{th} part of 1 Kilogram.
1Milligram (mg) – the 1000^{th} part of 1 gramme.
1 Microgram (µg) – the 1000^{th} part of 1 milligram.

Measures of capacity (Volumes)

1 Litre (1) is the volume occupied at its temperature of maximum density by a quantity of water having a mass of 1 Kilogram.
1 Millilitre (ml) the 1000^{th} part of 1 litre.

The accepted relation between the litre and the cubic centimetre is 1 litre –1000.027 cubic centimeters.

Relation of capacity of Weight (Metric)

One litre of water at 20° weighs 997.18 grammes when weighed in air of density 0.0012 gramme per millilitre against brass weights of density 84 grammes per millilitre.

Measures of Length

1 Metre (m) is the length of the International Prototype Metre at 0.
1 Centimetre (cm) – the 100^{th} part of 1 metre.
1 Millimetre (mm) – the 1000^{th} part of 1 metre.
1 Micron (µ) – the 1000^{th} part of 1 millimetre
1 Milliimicron (mµ) – the 1000^{th} part of micron.

5.2 APPROXIMATE EQUIVALENTS OF DOSES IN INDIAN SYSTEM AND METRIC SYSTEM :

1	Ratti or Gunja		=125 mg
8	Rattis or Gunjas	=1 Masa	=1 g
12	Masa	=1 Karsa (Tola)	=12 g
2	Karsas (Tolas)	=1 Sukti	=24 g
2	Suktis (4 Karsas or Tolas)	=1 Pal	=48 g
2	Palas	=1 Prasrti	=96 g
2	Prasrtis	=1 Kudava	=192 g
2	Kudavas	=1 Manika	=384 g
2	Manikas	=1 Prastha	=768 g
4	Prasthas	=1 Adhaka	=3 Kg 73 g
4	Adhakas	=1Drona	= 12 Kg 288 g
2	Dronas	=1Surpa	= 24 Kg 576 g
2	Surpas	=1 Droni (Vahi)	= 49 Kg 152 g
4	Dronis	=1 Khari	=196 Kg 608 g
100	Palas	=1 Tula	= 4 Kg 800 g
20	Tulas	=1 Bhara	= 96 Kg

APPENDIX-6

6.1 CLASSICAL AYURVEDIC REFERENCE

आम्रहरिद्रा (प्रकन्दः)

आम्रगन्धा हरिद्रा तु शीतला वातला तथा।
पित्तहृत् स्वादु तिक्ता च वृष्या स्यात्सन्निपातजित्।।1118।।
[कै. नि., ओषधि वर्ग]

आम्रगन्धिर्हरिद्रा या सा शीता वातला मता।
पित्तहृत् मधुरा तिक्ता सर्वकण्डूविनाशिनी।।199।।
[भा. प्र. नि., हरितक्यादि वर्ग]

अम्ला रुचिप्रदा लघ्वी दीपनी च वरा सरा।
कफं चोग्रव्रणं कासं श्वासं हिक्कां ज्वरं जयेत्।
अभिघातभवं शोफं लेपात् शीघ्रं विनाशयेत्।।
[शा. नि.]

अङ्कोलः (पत्रम्)

शङ्खिन्यङ्कोठसुमनः करवीरसुवर्चलाः।
शोधनानि कषायाणि वर्गश्चारग्वधादिकः।।12।।
(सु.सू. 37)

मत्स्यविषे-

अंकोलवृक्षदलधूपविधानयोगान्
नाशं प्रयाति विषामाशु नरस्य मात्स्यम्।
धूपः पुनः कटुकतेलनृकेश सक्तुक्लृप्तोस्य
दंशपदके सुतरां प्रशस्तः।।
(शो. नि.)

अँङ्कोलः स्निग्धतीक्ष्णोष्णः कटुको वातनाशनः।
कुक्कुराखुविषं हन्ति ग्रहजन्तुविषापहः 11251।।
भूतहद् विषहृच्चैव कण्ठयः सूतस्य शोधनः।
(ध.नि.,गुडूच्यादि वर्ग.)

अङ्कोलस्तिक्तकः स्निग्धः तीक्ष्णोष्णस्तुवरः कटुः ।
वामनो रेचनो हन्ति शूलशोफग्रहकृमीन् ।। 927 ।।
विसर्पकफपित्तास्रकुक्कुराखुविषं विषम् ।
(कै.नि., ओषधि वर्ग)

अङ्कोलः कटुकः स्निग्धो विषलूतादिदोषनुत् ।
कफानिलहरः सूतशुद्धिकृत् रेचनीयकः ।।
(रा.नि., प्रभद्रादिवर्ग.)

अङ्कोटकः कटुस्तीक्ष्णः स्निग्धोष्णस्तुवरो लघुः ।
रेचनः कृमिशूलामशोफग्रहविषापहः ।
विसर्पकफपित्तास्रमूषकाहिविषापहः ।। 140 ।।
(भा.प्र.नि., गुडूच्यादि वर्ग)

आरग्वध (शाखा त्वक्)

चतुरङ्गुल मृदु विरेचनानाम्।।39।।
(च. सू. 25)

आरग्वधस्य मूलेन शतकृत्वः श्रृतं घृतम्।
पिबेत् कुष्ठं जयत्याशु भजन् सरवदिरं जलम्।।13।।
(अ.ह.चि. 19)

उपदंशे - - - - शम्याकानां पृथक् पृथक्।
मूलेन परिपिष्टेन वारिणा - - - - - - ।।
असाध्यापि व्रजत्यस्तं लिंगोटया रुक् प्रलेपनात्।।21।।
(ग. नि. 4/8)

आरग्वधो रसे तिक्तो गुरूष्णः कृमिशूलनुत्।
कफोदरप्रमेहघ्नः कृच्छ्रगुल्मत्रिदोषजित्।।216।।
(ध.नि., गुडूच्यादि वर्ग)

आरग्वधो हिमस्तिक्तो मधुरोमृदुरेचनः।
गुरूर्दोषत्रयहरो ज्वरगुल्मोदरापहः।।944।।
शूलोदावर्तहृद्रोगव्रणकृच्छ्रप्रमेहनुत्।
(कै. नि., ओषधि वर्ग)

आरग्वधोऽतिमधुरः शीतः शूलापहारकः।
ज्वरकण्डूकुष्ठमेहकफविष्टम्भनाशनः।।47।
(रा. नि., प्रभद्रादि वर्ग)

आरग्वधोगुरूः स्वादुः शीतलः स्त्रंसनोत्तमः।
ज्वरहृद्रोगपित्तास्रवातोदावर्त्तशूलनुत्।।149।।
(भा.प्र.नि., हरीतक्यादि वर्ग)

आस्फोटा (- ता) (मूलम्)

भल्लातकास्फोतकण्डीर---------- चोष्णवीर्याणां---- 11263।।
(च.चि. 3)

पित्तजग्रहण्यां-
षड्ग्रन्थाशारिवास्फोता--------- घृतात्पचेत्।।126।।
(च.चि.15)

द्वेबले शारिवास्फोता----- सर्वविषाणां स्याद्घृतोत्तमम्।।245।।
(च.चि.23)

क्षारनिर्माणे-
अथानेनैव विधानेन कुटजपलाश----- तिल्वकार्कः
इन्द्रवृक्षास्फोता------ समूलफलपत्रशाखां दहेत्।।99।।
(सु. सू. 11)

अर्शःसु तक्रकल्पः ।।13।।
(सु. चि. 6)

कुष्ठघ्न तैले-
स्नुहीशिरीषयोर्मूलं चित्रकास्फोतयोरपि।।54।।
(सु. चि. 9)

मूषिकविषे-
आस्फोतमूलसिद्धं वा----- घृतं पिबेत् ।।40।।
(सु. क. 7)

बस्तान्त्री (मूलम्)

श्यामा---- छगलान्त्रीसुधाःसुवर्णक्षीरी चेति।
उक्तः श्यामादिरित्येष गणो गुल्मविषापहः।।
आनाहोदरविड्भेदी तथोदावर्तनाशनः ।।30।।
(सु. सू. 38)

त्रिवृत्------ छगलान्त्री----- तिल्वक----- चेत्यधोभागहराणि।
तत्र तिल्वक्दूर्वाणां मूलानि,-----।।4।।
(सु. सू. 39)

चुच्चू---- छगलान्त्री----- कोविदारप्रभृs तीनि ।।249।।
कषायस्वादुतिक्तानि रक्तपित्तहराणिच (शाकानि)।।
कफघ्नान्यनिलं कुर्युः संग्राहीणि लघूनि च।।250।।
(सु. सू. 39)

श्यामा-दन्ती-द्रवन्ती-क्रमुक-कुटरणा-शङ्खिनी-
चर्मसाह्वा-स्वर्णक्षीरी-गवाक्षी-शिखरि-रजनक-च्छिन्नरोहा-
करञ्जाः -बस्तान्त्री-व्याधिघातो बहलबहुरसस्तीक्ष्ण
वृक्षात् फलानि श्यामाद्यो हन्ति गुल्मं विषमरुचिकफौ
हृद्रुजंमूत्रकृच्छ्रम् ।। 45।।
(अ.हृ.सू.15)

श्लीपदे-
काञ्जिकेन पिबेच्चूर्णं वृद्धदारुकसंभवम्।।14।।
(वृ. मा. 42)

पुत्रकामाय-
वृद्धदारकमूलेन घृतं पक्वं पयोन्वितम्।
एतद् वृष्यतयं र.पिः पिबेन्नरः।।174।।
(वंगसेन)

वृद्धदारु : कटुस्तिक्तस्तथोष्णः कफवातजित्।
श्वयथुकृमिमेहास्रवातोदरहरः परः ।।108।।
(ध.नि., करवीरादि वर्ग)

वृद्धदारोः ग्रहोन्मादपायालक्ष्मीविनाशनः।
अपस्मारामवातघ्नः शोफशूलापहोऽग्निकृत्।।
बल्यः कण्ठयोऽस्थिसंधानकारी वातरुजापहः।
विषूचीप्रतितून्यादिव्याधिघाती रसायनम्।।
(सोढल नि.)

वृद्धदारु : कटुस्तिक्तः कषायोष्णो रसायनः।
शुक्रायुर्बलमेधाग्निस्वरकान्तिकरः सरः ।।1578।।
शोफामवातास्रवातमेहकफापहः।।
(कै. नि., ओषधि वर्ग)

वृद्धदारुः कषायोष्णः कटुस्तिक्त रसायनम्।
वृश्यो वातामवातार्शःशोथमेहकफप्रणुत्।।
शुक्रायुर्बलमेधाऽग्निस्वरकान्तिकरः सरः ।।299।।
(भा.प्र.नि., गुडूच्यादि वर्ग)

भूर्जः (शा.त्वक्)

गर्भसंगे अपरापातने च-
भूर्जपत्रधूमं शिंशपासारधूमं वा।।38।।
(च.शा.8)

भूर्जपत्रकाचमणिसर्पनिर्मोकैश्चास्या योनिं धूपयेत् ।।41।।
(च.शा.8)

भूर्जलांगलिकीतुम्बीसर्पत्वक्कुष्ठसर्षपैः ।।86।।
(अ.ह.,1)

पृथग् द्वाभ्यां समस्तैर्वा योनिलेपनधूपनम् ।। (अ.ह.शा.1.86)

भूर्जः कषायो जयति बलासं पित्तशोणितम्।।818।।
मेदो भूतग्रहं रक्षःकर्णरोगविषप्रणुत्।।
(कै. नि., ओषधि वर्ग)

भूर्जः कटुकषायोष्णो भूतरक्षाकरः परः।।
त्रिदोषशमनः पथ्यो दुष्टकौटिल्यनाशनः।।23।।
(रा. नि., प्रभद्रादि वर्ग)

भूर्जो भूतग्रहश्लेष्मकर्णरुक्पित्तरक्तजित्।।47।
कषायो राक्षसघ्नश्च मेदोविषहरः परः।।48।।
(भा. प्र.नि., वटादिवर्ग)

चण्डा(मूलम्)

चण्डानतंत्वक्सुरदारुरास्ना . . . . . शीतं निहन्यादचिरात् प्रदेहो ।। 26।।
(च.सू. 3)

कफज शोथे

चण्डागुरूभ्यामनुलेपनंच ।। 70।।
(च.चि.12)

शटीपुष्करमूलाम्लवेतसैला . . . . . जीवन्तीचण्डा इति
दशेमानि श्वासहराणि भवन्ति ।।37।।
(च. सू. 4)

एलातगर . . . . चण्डा चोचचोरकवालुक. . . . . पुन्नागकेशरं चेति ।।24।।
एलादिको वातकफौ निहन्याद्विषमेव च ।
वर्णप्रसादनः कण्डूपिडकाकोठनाशनः ।।25।।
(सु.सू. 38)

चोरक (मूलम्)

हिंगु..... चोरक ..... इति दशोमानि संज्ञास्थापनानि भवन्ति।।48।।
(च.सू.4)

शिरःशूले-
शिरोरुजायां सघृतः प्रदेहो लोहैरकापद्मकचोरकैश्च ।।24।।
(च.सू. 3)

धूपनार्थम्-
धूपनानि पुनर्नवासिसो शयनास्तरणप्रावरणानांच
यवसर्षपातसीहिंगुगुग्गुलुवचाचोरकवयःस्थागोलोमी
जटिलापलंकषाशोकरोहिणीसर्पनिर्मोकाणि घृतयुक्तानि स्युः ।।62।।
(च.शा. 8)

उन्मादे-
सिद्धं सर्पिर्हितं तद्वद् वयःस्था हिंगुचोरकैः ।।57।।
(च.चि.9)

अपस्मारे-
वचाशम्याककैटर्यवयः स्थाहिंगुचोरकैः
सिद्धं पलंकषायुक्तैर्वातश्लेष्मात्मके घृतम् ।।27।।
अपेतराक्षसीकुष्ठपूतनाकेशिचोरकैः ।
उत्सादनं मूत्रपिष्टैर्मूत्रैरेवावसेचनम् ।।39।।
(च.चि. 10)

हिक्काश्वासयोः -
दशमूलरसे सर्पिर्दधिमण्डे च साधयेत् ।
कृष्णासौवर्चलक्षारवयःस्थाहिंगु चोरकैः ।।
कायस्थयाच तत्पानाद्धिक्काश्वासौ प्रणाशयेत् ।।140-141।।
(च.चि.17)

प्रतिश्याये-
घ्रेयाश्च रोहिषाजाजीवचातर्कारिचोरकाः ।
त्वक्पत्रमरिचैलानां चूर्णा वा सोपकुञ्चिकाः ।।138।।
(च.चि.26)

मनोविकारे-
जात्याः सौमनसायिन्या रजन्याश्चोरकस्य वा-----
घृतं मनोविकारेषु पिबेद्वमनमुत्तमम्।।14।।
(च. क. 4)

विषे-
एकसरगणे विषापहे ।।84-86।।
(सु.क.5)

एलायुग्म- - - - चोरकचोच- - - नागाह्वयम्।।43।।
एलादिको वातकफौ विषं च विनियच्छति ।
वर्णप्रसादनः कण्डूपिटिकाकोठनाशनः ।। 44।।
(अ.ह.सू. 15)

शीतज्वरे-
तगरादि तैले ।।135-139।।
(अ.ह.चि. 1)

बालरोगे-
वचावयःस्थातगरकायस्थाचोरकैःश्रृतम् ।
बस्तमूत्रसुराभ्यांच तैलमभ्यंजने हितम् ।।53।।
(अ.ह.उ.2)

चोरकोऽशिशिरो (पाठा. चोरकः शिशिरोऽत्यन्तं) विषरक्तान्तकारकः।
कुष्ठकण्डूव्रणान्हन्ति क्षणाद्दोषान्प्रयोगतः।।72।।
चोरकश्चोग्रगन्धश्च तिक्तः कृमिसमीरजित्।
(ध. नि., चन्दनादि वर्ग)

चोरको मधुरस्तिक्तः कटु पाकः कटुर्लघुः ।। 112।।
तीक्ष्णो हृद्यो हिमो हन्ति कुष्ठ कण्डू कफानिलान्।
रूक्षोऽश्री स्वेदमेदोऽस्र ज्वर गन्ध विष व्रणान्।(113)
(भा.प्र.नि., कर्पूरादि वर्ग)
चोरकस्तीव्रगन्धोष्णस्तिक्तो वातकफापहः।
नासामुखरुजाजीर्णकृमिदोषविनाशनः।।129।।
(रा. नि., चन्दनादि वर्ग)

दर्भः (मूलम्)

वीरण . . . . . दर्भकुश . . . . दशेमानि स्तन्यजननानि भवन्ति ।।17।।
(च.सू.4)

वृक्षादनी . . . . दर्भकुश . . . . दशेमानि मूत्रविरेचनीयानि भवन्ति ।।35।।
(च.सू. 4)

यानि तु खलु वमनादिषु.....दर्भपोटगल.....कल्पसंग्रहो वमन द्रव्याणाम् ।।143।।
(च.वि.8)

मधुरस्कन्धः -
जीवकर्षभक्तौ. . . . दर्भकुश. . . . . चेति ।।146।।
(च. वि. 8)

पंचानां पंचमूलानां . . . . . शरेक्षुदर्भकाशानां शालीनां मूलमेव च।
इतिब्राह्मरसायनम् ।।42-55।।
(च.चि. 1-1)

वरूणार्तगल . . . . दर्भा बृहतीद्वयं चेति ।
वरूणादिगणो ह्येष कफमेदोनिवारणः ।
विनिहन्ति शिरःशूलगुल्माभ्यन्तरविद्रधीन् ।।8।।
(सु.सू.38)

वीरतरू . . . . दर्भ . . . श्वदंष्ट्रा चेति ।
वीरतर्वादिरित्येष गणो वाताविकारनुत् ।।
अश्मरीशर्करामूत्रकृच्छ्राघातरूजापहः ।। 10-11।।
(सु.सू.38)

कुशकाशनलदर्भकाण्डेक्षुका इति तृणसंज्ञकः ।
मूत्रदोषविकारं च रक्तपितं तथैव च ।। 75-76 ।।
(सु.सू. 38)

दर्भयुग्मं पवित्रं स्यान्मूत्रकृच्छ्रघ्नशीतलम् ।
रक्तपित्तप्रशमनं केवलं पित्तनाशनम् ।। 119।।
(ध.नि. करवीरादि वर्ग)

दर्भः स्निग्धो हिमः स्वादु कषायः कफपित्तहा ।
विसर्पदाहकृच्छ्राश्मतृष्णाबस्तिविकारनुत ।। 1241।।
(कै.नि., ओषधि वर्ग)

दभौ द्वौ च गुणे तुल्यौ तथाऽ पि च सितोऽ धिकः ।
यदि श्वेतकुशाभावस्त्वपरं योजयेत् भिषक् ।।94।।
(रा.नि., शाल्मल्यादि वर्ग)

दर्भद्वयं त्रिदोषघ्नं मधुरं तुवरं हिमम् ।
मूत्रकृच्छ्राश्मरी तृष्णाबस्तिरूक् प्रदरास्रजित् ।।
(भा.प्र.नि. गुडूच्यादि वर्ग)

धन्वयासः (सं. व.)

कुटजबिल्व-------- धन्वयासक---------- चव्यानीति
दशेमानि अर्शोघ्नानि भवन्ति ।।12।।
(च. सू. 4)

नागरधन्वयवासक---------- तृष्णानिग्रहणानि भवन्ति।।29।1
(च. सू. 4)

दुरालम्भा स्वादुशीता तिक्ता दाहविनाशिनी।
विषमज्वरतृच्छर्दिमेहमोहविनाशिनी ।।20।।
[ध. नि., गुडूच्यादि वर्ग]

धन्वयासो हिमस्तिक्तः कषायो मधुरो लघुः ।।985।।
सर निहंति पित्तास्रकफमेदोमदभ्रमान्।
विसर्पकुष्ठवातास्रतृष्णाकासवमिज्वरान्।।986।।
[कै. नि., ओषधि वर्ग]

यासः स्वादुः सरस्तिक्तस्तुवरः शीतलो लघुः।
कफमेदोमदभ्रान्तिपित्तासृक्कुष्ठ कासजित्।
तृष्णाविसर्पवातास्रवमिज्वरहरः स्मृतः।।213।।
[भा.प्र.नि., गुडूच्यादि वर्ग]

द्रवन्ती (बीज)

दन्तीद्रवन्ती फलजं तैलं दूष्योदरे हितम् ।। 154 ।।
शूलानाहविबन्धेषु मस्तुयूषरसादिभिः ।
(च.चि. 13)

नागदन्तीत्रिबृद्दन्तीद्रवन्तीस्नुक्पयः फलैः ।
सधितं माहिषं सर्पिः सगोमूत्राढकं हितम् ।। 241 ।।
सर्पकीटविषार्तानां गरार्तानां च शान्तये ।
(च.चि. 23)

मूलैर्वाऽप्यश्वगन्धाया मूलैरर्कस्य वा भिषक्।
पिचुमर्दस्य वा मूलैरथवा देवरारूणः ।। 50 ।।
क्षौद्रसर्षपवल्मीकमृत्तिकासंयुतैर्भिषक्।
गाढमुत्सादनं कुर्यदूरूस्तम्भे प्रलेपनम्।। 51 ।।
दन्तीद्रवन्तीसुरसासर्षपैश्चापि बुद्धिमान ।
(च.चि. 27)

श्यामामहाश्यामात्रिबृद्दन्ती ------पुत्रश्रेणी सुवर्णक्षीरो चेति ।। 29 ।।
उक्तः श्यामादिरित्येष गणो गुल्मविषापहः ।
आनाहोदरविड्भेदी तथोदावर्तनाशनः ।। 30 ।।
(सु.सू. 38)

दन्तीद्रवन्त्योर्मूलानि विशेषान्मृत्कुशान्तरे ।
पिप्पलीक्षौद्रयुक्तानि----------शोषयेत् ।।46 ।।
ततस्त्रिवृद्धिधानेन योजयेच्छूलेष्मपित्तयोः ।
(सु.सू. 44)

दन्तीद्रवन्ती ----------यवासकैः ।। 49 ।।
विश्वभेषजमृद्वीका -------मूत्रभावितम् ।
सप्ताहं सर्पिषा चूर्णं योज्यमेतद्विरेचनम्।। 50 ।।
(सु .सू. 44)

तुम्बीकोशाम्रदन्तीद्रवन्तीश्यामा -------स्नेहास्तिक्तकटुकषाया ।
अधोभागदोषहराः कृमिकफकुष्ठानिलहरा दुष्टव्रणशोधनाश्च ।। 124 ।।
(सु.सू. 45)

जीमूतकैः कोशवतीफलैश्च
दन्तीद्रवन्तीत्रिवृतासु चैव ।। 20 ।।

सर्पिः कृतं हन्त्यपची प्रवृद्धां
द्विधा प्रवृत्तं तदुदारवीर्यम्
(सु.चि. 18)

तत्र तिल्वकैरण्डकोशाग्रदन्तीद्रवन्ती -----स्नेहा विरेचयन्ति ।। 5 ।।
(सु.चि. 5)

द्रवन्ती ग्रहणीतृष्णात्रिदोषशमनी हिता ।
अभिच्छिन्नतनौ ग्रन्थां प्रमेहे जठरे गरे ।। 226 ।।
कफपित्तामये पाण्डौ कृमिकोष्ठ भगंदरे ।
द्रवन्ती हृद्रोगहरा कफकृमिविनाशिनी ।। 227 ।।
(ध.नि. गुडूच्यादि वर्ग)

द्रवन्ती मधुरा शीता रसबन्धकरी परा।
ज्वरघ्नी क्रिमिहा शूल-शमनी च रसायनी ।। 136 ।।
(रा.नि., पर्पटादि वर्ग)

दुग्धिका (सं. व.)

क्षीरिणी राजक्षवक------- ऋष्यगन्धा इति
दशेमानि बृंहणीयानि भवन्ति।।2।।
(च. सू. 4)

नागार्जुन्यतिसारघ्नी ।।585।।
(सो. नि. II)

गोरक्षदुग्धी मधुरा वृष्या सा ग्राहिणी हिमा।
सर्ववश्यकरी चैव रसे सिद्धिगुणप्रदा।।54।।
(रा. नि., पर्पटादि वर्ग.)

दुग्धिकोष्णा गुरू रूक्षा वातला गर्भकारिणी।।275।।
स्वादुक्षीरा कटुस्तिक्ता सृष्टमूत्रा मलापहा।
स्वादुविष्टम्भिनी वृष्या कफकुष्ठकृमिप्रणुत्।।276।।
[भा.प्र.नि., गुडूच्यादि वर्ग]

नागार्जुनी तु मधुरा वृष्या रूक्षा च ग्राहिणी।
तिक्ता च वातला गर्भस्थापनी कटुका पटुः।
धातुवृद्धिकरी हृद्या चोष्णा पारदबन्धिनी।
मलस्तम्भकरी मेहकफकुष्ठकृमीन् हरेत्।
[नि. र.]

एलवालुकम् (बीजम्)

कुष्ठैलवालुक कटफल.....वसुकोशीराणीति दशेमानि शुक्रशोधनानि भवन्ति।।20।।
शालकट्फल- - - - - - शिरीषवञ्जुलैलवालुकाशोका
इति दशेमानि वेदनास्थापनानि भवन्ति।।47।।
(च. सू. 4)

लोध्रसावरलोध्र. . . . कटफलैलवालुकशल्लकी . . . . कदली चेति।।14।।
एष रोध्रादिरित्युक्तो मेदः कफहरो गणः।
योनिदोषहरः स्तम्भी वर्ण्यो विषविनाशनः।।15।।
(सु. सू. 38)
रोध्रशाबरक. . . . सैलवालुपरिषेलवमोचाः।।26।।
एषरोध्रादिको नाम मेदः कफहरो गणः।
योनिदोषहरः स्तम्भी वर्ण्यो विषविनाशनः।।27।।
(अ.हृ.सू. 15)

एलवालुः सुगन्धिः स्याच्छीतोऽत्यन्तं प्रकीर्तितः।
विषविध्वंसनोऽ त्युग्रकण्डूकुष्ठव्रणान्तुकृत्।।76।।
(ध. नि., चन्दनादि वर्ग)

एल्वालु शीतलं हन्ति कण्डूकुष्ठकफक्रिमीन्।
तृट्छर्दिकफपित्तास्रहन्मूत्रगदजिल्लघु।।17।
(म.पा.नि., कर्पूरादि वर्ग, पृ.क्र. 79)

एलवालु कटुकं पाके कषायं शीतलं लघु।।1324।।
हन्ति कण्डूव्रणच्छर्दितृट्कासारूचि हृद्रुजः।
बलासविषपित्तास्रकुष्ठमूत्रविषकृमीन्।।1325।
(कै. नि., ओषधिवर्ग)

एलवालुकमत्युग्रं कषायं कफवातनुत।
मूर्च्छार्तिज्वर दाहांश्च नाशयेद्रोचनं परम्।।126।।
(रा. नि., शताह्वादि वर्ग)

एलालु कटुकं पाके कषायं शीतलं लघु।
हन्तिकण्डूव्रणच्छर्दितृट्कासारूचिहृद्रुजः।।
बलास विषपित्तास्रकुष्ठमूत्रगदक्रिमीन्।।121।।
(भा.प्र.नि., कर्पूरादि वर्ग)

गण्डीरः (मूलम्)

वायु वत्सादनी हन्यात् कफं गण्डीर चित्रकौ।।106।।
[च. सू. 27]

गण्डीरो जलपिप्पल्यस्तुम्बरू श्रृङ्गबेरिका।
तीक्ष्णोष्णकटुरूक्षाणि कफवातहराणिच ।।171।।
[च. सू. 27]

सरलदेवदारुशिंशपागुरुगण्डीर सारस्नेहास्तिक्तकटुकषायाः।
दुष्टव्रणशोधनः कृमिकफकुष्ठानिलहराभ्य।।123।।
[सु. सू 45]

विदाही बद्धविण्मूत्रं रूक्षं तीक्ष्णोष्णमेवच।
त्रिदोषं सार्षपं शाकं गाण्डीरं वेगनामच।।238।।
[सु. सू 46]

गण्डीर- - - - - - कृमिविनाशनम्।।49।।
(सोढल, नि.I)

काण्डीरः (गण्डीरः?) कटुतिक्तोष्णः सरो दुष्टव्रणार्तिजित्।
लूतागुल्मोदरप्लीहशूलमन्दाग्निनाशनः।।63।।
(ध. नि., करवीरादि वर्ग)

गवेधुक (मूलम)

सकोरदूषः श्यामाकः कषायमधुरो लघुः ।
वातलः कफपित्तघ्नः शीत संग्राहिशोषणः ।।16।।
हस्तिश्यामाक. . . .गवेधुका . . . श्यामाकसदृशा गुणैः ।।18।।
(च.सू. 27)

गवेघुका कटुः काश्र्यकरी स्वाद्वी कफापहा ।।107।।
(कै.नि.धान्यवर्ग)

गवेघुः कटुका स्वाद्वी काश्र्यकृत्कफनाशिनी ।।85।।
(भा. प्र.नि. धान्यवर्ग)

घोण्टा (फलम्)

आरग्वधमदनगोपघोण्टा--------- सुषवी चेति।।6।।
आरग्वधादिरित्येष गण श्लेष्मविषापहः।।
मेहकुष्ठज्वरवमीकण्डूघ्नो व्रणशोधनः।।7।।
(सु. सू. 38)

आरग्वधेन्द्रयव-------- बाणघोण्टाः।।17।।
आरग्वधादिर्जयति छर्दिकुष्ठविषज्वरान्।
कफंकण्डूं प्रमेहं च दुष्टव्रणविशोधनः।।18।।
(अ.ह.सू.15)

घोटिका कटुकोष्णा च मधुरा वातनाशनी।
व्रणकण्डूतिकुष्ठासृग्दोषश्वयथुहारिणी।।61।।
[रा. नि., शागुन्द्रः (- न्द्रा) (मूलम्)

वीरणशालि---------- गुन्द्रेत्कटतृणमूलानीति
दशेमानि स्तन्यजननानि भवन्ति।।17।।
[च. सू. 4]

वृक्षादनी श्वदंष्ट्रावसुक------- गुन्द्रेत्कटमूलानीति
दशेमानि मूत्रविरेचनीयानि भवन्ति।।35।।
[च. सू. 4]

वीरतरु ------ वृक्षादनीगुन्द्रानल----- श्वंदष्ट्रा चेति।।12।।
वीरतर्वादिरित्येष गणो वातविकारनुत्।।
अश्मरीशर्करामूत्रकृच्छ्राघातरु जापहः।।13।।
(सु. सू. 38)

चन्दन----- शतावरीगुन्द्रा---- समासेन पित्तसंशमनो वर्गः ।।8।।
(सु. सू. 39)

कषायानुरसः स्वादुः शीतलो मूत्रकृच्छ्रहा।
रक्तपित्तहरो गुण्ठो रजःशुक्रविशोधनः ।।82।।
[ध.नि., गुडूच्यादि वर्ग]

गुन्थः कषायो शिशिरो मधुरो रक्तपित्तजित्।
स्तन्यशुक्ररजोमूत्रशोधनी मूत्र कृच्छ्रहृत्।।857।।
[कै. नि. ओषधि वर्ग]

गुन्द्रः कषायो मधुरः शिशिरः पित्तरक्तजित्।
स्तन्यशुक्ररजोमूत्रशोधनी मूत्रकृच्छ्रहृत्।।163।।
[भा.प्र.नि., गुडूच्यादि वर्ग]

गुन्द्रः (- न्द्रा) (मूलम्)

वीरणशालि---------- गुन्द्रेत्कटतृणमूलानीति
दशेमानि स्तन्यजननानि भवन्ति।।17।।
[च. सू. 4]

वृक्षादनी श्वदंष्ट्रावसुक------- गुन्द्रेत्कटमूलानीति
दश मानि मूत्रविरेचनीयानि भवन्ति।।35।।
[च. सू. 4]

वीरतरु ------ वृक्षादनीगुन्द्रानल----- श्वंदष्ट्रा चेति।।12।।
वीरतर्वादिरित्येष गणो वातविकारनुत्।।
अश्मरीशर्करामूत्रकृच्छ्राघातरु जापहः।।13।।
(सु. सू. 38)

चन्दन---------- शतावरीगुन्द्रा---------- समासेन पित्तसंशमनो वर्गः ।।8।।
(सु. सू. 39)

कषायानुरसः स्वादुः शीतलो मूत्रकृच्छ्रहा।
रक्तपित्तहरो गुण्ठो रजःशुक्रविशोधनः ।।82।।
[ध.नि., गुडूच्यादि वर्ग]

गुन्थः कषायो शिशिरो मधुरो रक्तपित्तजित्।
स्तन्यशुक्ररजोमूत्रशोधनी मूत्र कृच्छ्र हृत्।।857।।
[कै. नि. ओषधि वर्ग]

गुन्द्रः कषायो मधुरः शिशिरः पित्तरक्तजित्।
स्तन्यशुक्ररजोमूत्रशोधनी मूत्रकृच्छ्रहृत्।।163।।
[भा.प्र.नि., गुडूच्यादि वर्ग]

हिंस्रा (मूलम्)

वातिकयोनिव्यापदि-
हिंस्राकल्कं तु वातार्हा कोष्णमभ्यज्य धारयेत्।।62।।
(च.चि. 30)

अहिंस्रा चैव रास्ना च प्रलेपो वातशोफजित् ।।3।।
(वृ. मा. 44)

कन्थारी कटुका सोष्णा श्वासकासत्रिदोषहा।।830।।
(कै. नि., ओषधि वर्ग)

कन्थारी कटुतिक्तोष्णा कफवातनिकृन्तनी।
शोफघ्नी दीपनी रुच्या रक्तग्रन्थिरुजापहः।।21।।
[रा. नि. , शाल्मल्यादिवर्ग]

हिंगुपत्री (पत्रम्)

बाष्पिका कटुतिक्तोष्णा हृद्या वातकफापहा ।
कृमिप्लीहविवन्धशोगुल्महृब्दस्तिशूलनुत् ।।39।।
(ध.नि., शतपुष्पादि वर्ग)

हिंगुपत्री कटुस्तीक्ष्णा तिक्तोष्णा कफवातनुत्।
आमकृमिहरा रुच्या पथ्या दीपनपाचनी।।40।।
(रा. नि., पिप्पल्यादि वर्ग)

हिंगुपत्री भवेद्रुच्या तीक्ष्णोष्णा पाचनी कटुः ।
हृब्दस्तिरुग्विबन्धार्शःश्लेष्मगुल्मानिलापहा ।। 264।।
(भा.प्र.नि.,गुडूच्यादि वर्ग)

इत्कट (मूलम्)

वीरणशालि------ गुन्द्रेत्कट कतृणमूलानाति
दशेमानि स्तन्यजननानि भवन्ति ।।117।।
(च.सू. 4)

वृक्षादनी ------- गुन्द्रेत्कटमूलानीति दशेमानि
मूत्रविरेचनीयानि भवन्ति ।।35।।
(च.सू. 4)

इत्कटांकुरजस्तद्वत् स्वरसो नेत्रणम् ।।
(वृन्द, नेत्ररोगाधिकार)

इत्कट (काण्ड)

वीरणशालि ----------गुन्द्रेत्कटकतृणमूलानीति
दशेमानि स्तन्यजननानि भवन्ति ।। 17 ।।
(च.सू. 4)

वृक्षादनी ---------- गुन्द्रेत्कटमूलानीति दशेमाणि
मूत्रविरेचनीयानि भवन्ति ।। 35 ।।
(च.सू. 4)

चन्दनाद्यै तैले ---चन्दन ---दूर्वेत्कट कषायकारयेत् ।। 258 ।।
(च.चि. 3)

क्षीरजननानि --------इत्कटमूलकषायाणांच पानमिति ।
(च.शा. 8/57)

मधुरस्कन्धे पठितः ।। 146 ।।
(च.वि. 35)

दिवास्वप्न ----इत्कटमाष -----श्लंष्मा प्रकोपमायद्यते ।। 23 ।।
इत्कटांकुरजस्तद्वत् स्वरसो नेत्रपूरणम् ।।
(वृन्द, नेत्ररोगाधिकार)

जलपिप्पली (सं. व.)

गण्डीरो जलपिप्पल्यस्तुम्बुरूः श्रृङ्गवेरिका।
तीक्ष्णोष्णकटुरूक्षाणि कफवात हराणि च।।166।।
(च. सू. 27)

जलपिप्पलिका तिक्ता कषाया कफपित्तजित्
(पाठा कफवातजित)।
श्वासास्त्रविषदाहार्ति भ्रममूर्च्छातृषापहा।।65।।
(ध. नि., करवीरादि वर्ग)

जलपिप्पलिका हृद्या चक्षुष्या शुक्रला लघु।
संग्राहिणी हिमा रूक्षा रक्तदाह व्रणापहा।।
(म.पा.नि.)

जलपिप्पलिका हृद्या चक्षुष्या शुक्रला लघुः।।295।।
संग्राहिणी हिमा रूक्षा रक्तदाह व्रणापहा।
कटुपाकरसा रूच्या कषाया वह्निवर्द्धनी ।।296।।
(भा. प्र. नि., गुडूच्यादि वर्ग)

जलपिप्पलिका हृद्या चक्षुष्या शीतला मता।
रसकाले च कटुका ग्राहिणी शुक्रला लघुः।।
रूक्षा तीक्ष्णा च तुवरा मुखशुद्धिकरी मता।
रूच्याग्निदीपनी वातकारिणी रक्तदोषहा।।
रसदोषं कृमीं दाहं व्रणं श्वासं कफं तथा।
वातं विषं भ्रमं मूर्च्छा तृषां पित्तज्वरं हरेत्।।
[शा. नि. अन्यच्य गुडूच्यादि वर्ग]

जलपिप्पलिका रूक्षा कषायाऽक्षिहिता हिमा।
कटुपाकरसा रूच्या पित्तातीसार नाशिनी।।
श्वासतृङ्विषदाहार्त्तिभ्रममूर्च्छाज्वरापहा।
रसदोषहरी चैवं मुखशुद्धिकरी मता।
हृद्याग्निदीपनी वातकारिणी रक्तदोषहा।
[नि.र.]

जीवकः (कन्दः)

जीवकर्षभक ---------- वृद्धरुहाजटिलाकुलिंगा इति
दशेमानि शुक्रजननानि भवन्ति।।19।।
[च. सू. 4]

मृद्वीकामधुक---------- जीवकजीवन्तीशालपर्ण्य इति
दशेमानि स्नेहोपगानि भवन्ति।।21।।
[च. सू. 4]

विदारीगन्धा विदारी------- जीवकर्षभकौ--------- वृश्चिकाल्यृषभी चेति।।4।।
विदारिगन्धादिरयं गणः पित्तानिलापहः।
शोषगुल्मांगमर्दोर्ध्वश्वासकासविनाशनः।।5।।
[सु. सू. 38]

लोणिकाजातुक-------- जीवकसुवर्चला---------- कुरण्टिकाप्रभृतयः।।274।।
स्वादुपाकरसाः शीताः कफघ्ना नातिपित्तलाः।
लवणानुरसाः रुक्षाः सक्षाराः वातला सराः ।।275।।
[सु. सू. 46]

जीवको मधुरः शीतो रक्तपित्तानिलान् जयेत्।
दाहज्वरक्षयान् हन्ति कफशुक्रविवर्धनः ।।120।।
[ध. नि., गुडूच्यादि वर्ग]

जीवकर्षभकौ शीतौ बृंहणौ कफशुक्रलौ।।92।।
मधुरौ वातपित्तास्रदाहक्षयनिबर्हणौ।
[कै. नि., ओषधि वर्ग]

जीवको मधुरः शीतो रक्तपित्तानिलार्त्तिजित्
क्षयदाहज्वरान् हन्ति शुक्रश्लेष्मविवर्धनः।।13।।
[रा. नि., पर्पटादि वर्ग]

जीवकर्षभकौ बल्यौ शीतौ शुक्रकफप्रदौ। मधुरौ पित्तदाहस्रकार्श्यवातक्षयापहौ।।125।।
(भा.प्र.नि., हरीतक्यादि वर्ग)

जीवको मधुरः शीतः शुक्रलः कफकृन्मतः।
रक्तपित्तहरो बल्यो वातपित्तज्वरापहः।।
कृशताक्षयदाहानां रक्तदोषस्य नाशकः।
(नि. र.)

कदरः (का. म.)

तिन्दुक. . . . खदिरकदर. .. .अरिमेदा इति
दशेमान्युदर्दप्रशमनानि भवन्ति।।43।।
(च. सू. 4)

शाल. . . . . खदिरकदर. . . .मधुकैः सारासवा विंशतिः।।48।।
(च. सू. 25)

सालसाराजकर्ण खदिर कदर . . . कालीयकं चेति।।8।।
सालसारादिरित्येष गणः कुष्ठविनाशनः।
मेहपाण्ड्वागमयहरः कफमेदोविशोषणः।।9।।
(सु. सू. 38)

मधुमेहे - कदरक्रमुकषायम्।।9।।
(सु. चि.11)

मधुमेहे कदरखदिरपुरकषायम्।।8।।
(अ.सं.चि. 14)

कदरखदिरपूगक्वाथं क्षौद्राह्वये पिबेत्।।13।।
(वृ. मा.)

श्वेतस्तु खदिरस्तिक्तः शीतः पित्तकफापहः।
रक्तदोषहरश्चैव कण्डूकुष्ठविनाशनः।।28।।
(ध. नि., गुडूच्यादि वर्ग)

कदरो विशदो वर्ण्यो मुखरोगकफास्रजित्।।
(कै.नि.ओषधि वर्ग 825, भा.प्र.नि., वटादि वर्ग 33)

प्रमेहमेदोदोषघ्नः कफपित्तव्रणापहः।
पाण्डुकुष्ठप्रशमनः कदरः श्वित्रनाशनः।।
(म. नि.)

काकजङ्घा (बीजम्)

सुरसा. . . . . प्राचीबल. . . . . विषमुष्टिकश्चेति।।18।।
सुरसादिर्गणो ह्येष कफहृत् कृमिसूदनः।
प्रतिश्यायारुचिश्वासकासघ्नो व्रणशोधनः।।19।।
(सु. सू. 38)

काकजङ्घा च तिक्तोष्णा रक्तपित्त ज्वरापहा।
कृमिदोषहरा वर्ण्या विषदोषहरा मता।।21।।
(ध. नि., करवीरादि वर्ग)

काकज्ङ्घा हिमा हन्ति रक्तपित्तकफज्वरान्।
(म. नि.)

काकजङ्घा हिमा तिक्ता कषाया कफपित्तजित्।
निहन्ति ज्वरपित्तास्रव्रण कण्डूविष कृमीन्।
(कै. नि. ओषधि वर्ग, 713;
भा.प्र.नि., गुडूच्यादि वर्ग, 251)

काकनज (फलम्)

पर्पोटयां रक्तहन्त्री च फलाम्ला ज्वरकारिणी।।664।।
(सो. नि. I)

पर्पोटी पानलेपाभ्यां रक्तविद्राविणी परम्।।571।।
(सो. नि. II)

चीरपोटा हिमा रुक्षा भेदनी श्वासकासजित्।
(म. नि.)

टंकारी वातजित् तिक्ता श्लेष्मघ्नी दीपनी लघुः।
शोथोदरव्यथाहन्त्री हिता पीठविसर्पिणाम्।।134।।
(भा.प्र.नि., गुडूच्यादि वर्ग)

चिरपोटा हिमा रूक्षा भेदिनी श्वासकासजित्।
पर्पोटि पानलेपाभ्यांरक्ताविद्राविणीध्रुवम्।
तस्याः पक्वफलंपित्तश्लेष्मलं ज्वरकारिच।।
(शा. नि. परिशिष्ट- पृ. 916-917)

सस्वादुतिक्ता कुञ्ची स्यात् शूलनाशिनी।
व्रण वीसर्प कण्डूघ्नी शोफदाहहरो स्मृता।।स्व.।।
(इ.मे.प्लॉ., कोट्टाक्कल)

कालीयक (मूलम्)

शैवालपद्मनोत्पलवेत्रतुङ्गप्रपौण्डीकाव्यमृणाललोध्रम।
प्रियङ्गुकालेयकचन्दनानि निर्वापणः स्यात्सघृतः प्रदेहः।।26।।
(च. सू. 3)

सालसाराजकणखदिर---------- कालीयकं चेति।।8।।
सालसारादिरित्येष गणः कुष्ठविनाशनः।
मेहपाण्ड्वामयहरः कफमेदोविशोषणः ।।9।।
(सु. सू. 38)

कालीयकं पवित्राढयं शीतलं रक्तपित्तजित्।।9।।
(ध. नि., चन्दनादि वर्ग)

कालीयकं रक्तगुणं विशेषाद् व्यङ्गनाशनम्।।15।।
(भा.प्र.नि., कर्पूरादि वर्ग)

शैवालपद्मनोत्पलवेत्रतुङ्गप्रपौण्डीकाव्यमृणाललोध्रम।
प्रियङ्गुकालेयकचन्दनानि निर्वापणः स्यात्सघृतः प्रदेहः।।26।।
(च. सू. 3)

सालसाराजकणखदिर---------- कालीयकं चेति।।8।।
सालसारादिरित्येष गणः कुष्ठविनाशनः।
मेहपाण्ड्वामयहरः कफमेदोविशोषणः ।।9।।
(सु. सू. 38)

कालेयकागुरू--------- सुरसादिरारग्वधादिरिति
समासेन श्लेष्मसंशमनो वर्गः ।।9।।
(सु. सू. 39)

कालीयकं पवित्राढयं शीतलं रक्तपित्तजित्।।9।।
(ध. नि., चन्दनादि वर्ग)

कालीयकं रक्तगुणं विशेषाद् व्यङ्गनाशनम्।।15।।
(भा.प्र.नि., कर्पूरादि वर्ग)

कपीतनः (का. त्वक्)

जम्ब्वाम्र.....कपीतनोदुम्बर इतिदशेमानी मूत्रसंग्रहणीयानि भवन्ति।।33।।
(च.सू.4)

प्रियग्ङ्वनन्ता-------- वटकपीतन- - - - - इति कषायस्कन्धः।।20/6।।
(च. वि. 8)

न्यग्रोधोदुम्बराश्वत्थ. . . . . कपीतन. . . नन्दीवृक्षश्चेति।।48।।
न्यग्रोधादिर्गणो व्रण्यः संग्राही भग्नसाधकः।
रक्तपित्तहरो दाहमेदोघ्नो योनिदोषहृत्।
(सु. सू. 38)

न्यग्रोधापिप्पल . . . . . कपीतन सोमवल्काः।
प्लक्षाम्र. . . . . मधूकं।।41।।
न्यग्रोधादिर्गणो व्रण्यः संग्राही भग्नसाधंनः।
मेदः पित्तास्र तृड्दाहयोनिरोगनिबर्हणः।।42।।
(अ.हृ.सू. 15)

पारिशोऽ श्वत्थको वृष्यः स्निग्धः श्लेष्मकृमिप्रदः।।
(म.पा.नि.)

फलीशो दुर्ज्जरः स्निग्ध कृमिशुक्रफप्रदः ।।434।।
फलोऽ म्लो मधुरो मूले कषाय स्वादुमज्जकः।
(कै. नि. ओषधि वर्ग)

पारीषो दुर्जरः स्निग्धः कृमिशुक्रकफप्रदः।
फलोऽम्लो मधुरो मूले कषाय स्वादुमज्जकः।।5।।
(भा.प्र.नि., वटादि वर्ग.)

याऽबला पिबति पार्श्वपिप्पलं जीरकेण सहितं हिताशिनी।
श्वेतया विशिखपुंखया युतं सा सुतं जनयतीह नान्यथा।।29।।
(भा. प्र. चि. 70)

कपीतनो लघू रूक्षः कषायः शिशिरो हरेत्।
कफपित्तप्रमेहास्रकुष्ठयोनिगदव्रणान्।।स्व।।
(द्र.गु.वि., प्रो. प्रि. व्र. शर्मा)

कर्कश (मूलम्)

कौलकं कार्कशं नैम्बं ताकं पार्पटकं च यत् ।
कफपित्तहरं तिक्तं शीतं कटु विपच्यते ।। 96।।
(च.सू. 27)

कर्कोटकीयुगं तिक्तं हन्ति श्लेष्मविषद्वयम् ।
मधुना च शिरोरोगे कन्दस्तस्याः प्रशस्यते ।। 185।।
(ध. नि., गुडूच्यादि वर्ग)

वन्ध्या तिक्ता कटुस्तीक्ष्णा लघुर्व्रणविषास्त्रनुत् ।। 597।।
बलाससर्पदर्पघ्नी विसर्पविषहारिणी ।
(कै.नि. ओषधि वर्ग)
कर्कोटिकी कटूष्णा च तिक्ता विषविनाशनी ।
वातघ्नी पित्तहच्चैव दीपनी रूचिकारिणी ।।277।।
(रा.नि.मूलकादि वर्ग)
वन्ध्याकर्कोटिकी लघ्वी कफनुद् व्रणशोधिनी ।
सर्पदर्पहरी तीक्ष्णा विसर्पविषहारिणी ।। 288।।
(भा.प्र.नि. गुडुच्चयादि वर्ग)
वन्ध्याकर्कोटिकीकंदो हन्ति श्लेष्मविषद्वयम् ।।
(शोढल)

कर्णस्फोटा (बीजम्)

कर्णस्फोटा कटुस्तिक्ता हिमा सर्वविषापहा।
ग्रहभूतादिदोषघ्नी सर्वव्याधिविनाशनी।।42।।
(रा.नि., गुडूच्यादि वर्ग)

इन्द्रवल्ली ज्वरहरा वातघ्नी वृद्धिनाशिनी।
(ह. प्रि.)

इन्द्रवल्ली ज्वरहरा शोफपाण्डुहरा स्मृता।
वातघ्नी मूत्रला केश्या वृद्धिशूलापहारिणी।।स्वः।।
(इंडियन मेडिसिनल प्लांट्स, कोट्टाकल)

कर्णस्फोटा (मूलम्)

इन्द्रवल्ली ज्वरहरा वातघ्नी वृद्धिनाशिनी।
(ह्र. प्रि.)

इन्द्रवल्ली ज्वरहरा शोफपाण्डुहरा स्मृता।
वातघ्नी मूत्रला केश्या वृद्धिशूलापहारिणी।।स्वः।।
(इंडियन मेडिसिनल प्लांट्स, कोट्टाकल)

कर्णस्फोटा कटुस्तिक्ता हिमा सर्वविषापहा।
ग्रहभूतादिदोषघ्नी सर्वव्याधिविनाशनी।।42।।
(रा.नि., गुडूच्यादि वर्ग)

कतृण (सं. व.)

वीरण. . . . कतृणमूलनीति दशेमानि स्तन्यजननानि भवन्ति।।17।।
(च. सू. 4)

तगरागुरु.... भूतीकवचा.....पिप्पल्य इति दशेमानि शीतप्रशमनानि भवन्ति।।42।।
(च. सू. 4)

उदरे-
भूतीका नागरं धान्यं जले पक्त्वावसेचयेत्।।108।।
(च. चि. 13)

भूतृणो लघुरूष्णश्च रूक्षः श्लेष्मयापहः।
अस्य प्रयोगः सहसा हन्ति जन्तून् समुद्धतान्।।48।।
(ध. नि., करवीरादि वर्ग)

उदर्द्दशमनो श्लेष्मकृमिघ्नः कुष्ठ नाशनः।
सुगन्धो वातशमनो भूस्तृणोऽ रोचकापहः।।
(म. नि.)

भूस्तृणः कटुकस्तिक्तः तीक्ष्णोष्णो रोचनो लघुः।
विदाही दीपनो रूक्षो चक्षुष्यो वक्त्रशोधनः।।1249।।
अवृष्यो बहुविट्कः स्याद्रक्तपित्तप्रदूषणः।
कृमिकास वमिश्लेष्मश्वासदद्रु विनाशनः।।1250।।
(कै. नि., ओषधि वर्ग)

भूतृणं कटुतिक्तञ्च वातसन्तापनाशनम्।
हन्ति भूतग्रहावेशात् विषदोषांश्च दारूणात्।।74।।,
(रा. नि. शाल्मल्यादि वर्ग)

भूतृणं कटुकं तिक्तं तीक्षणोष्णं रेचनं लघुः।
विदाही दीपनं रूक्षमनेत्र्यं मुखशोधनम्।।70।।
अवृष्यं बहुविट्कञ्च पित्तरक्तप्रदूषणम्।।71।।
(भा. नि., गुडूच्यादि वर्ग)

केबुक (प्रकन्द)

अक्षीवमरिचगण्डीर केबुक . .इति
दशेमानि क्रिमिघ्नानि भवन्ति ।।15।।
(च. सू. 4)

वृषपुष्पाणि शाङ्र्गेष्टा केम्बुकं . .कफपित्तहरं
तिक्तं शीतं कटु विपच्यते ।।96।।
(च.सू. 27)

मण्डुकपर्णी . . . . केबु (म्बु). . . . प्रभुतीनि ।।262।।
रक्तपित्त हराण्याहुर्हघानि सुलघुनि च ।
कुष्ठमेह ज्वर श्वास कासारूचि हराणि च ।।263।।
(सु.सू. 46)

केमुकं कटुकं पाके तिक्तं ग्राहि हिमं लघु ।
दीपनं रोचनं हृद्यं कफपित्त ज्वरापहम् ।।1608।।
कुष्ठकासप्रमेहासृक हरते कुरूतेऽ निलम् ।
कटु स्वादु रसं वृष्यं हितं पित्तभ्रमे सदा ।।1609।।
(कै.नि., ओषिध वर्ग)

केमुकं कटुकं पाके तिक्तं ग्राहि हिमं लघु ।।110।।
दीपनं पाचनं हृद्यं कफपित्तज्वरापहम् ।।
कुष्ठकासप्रमेहास्रनाशनं वातलं कटु।।111।।
(भा.प्र.नि. शाक वर्ग)

खसखसः (बीजम्)

वृष्यो बल्यश्च खस्तिलः श्लेष्मघ्नो (श्लेष्मलो-शुद्धपाठ) वातजिद्वरूः।।120।।
(ध.नि., सुवर्णादि वर्ग)

दुग्धेन खाखसं बीजं प्रलेपाद दारूणं जयेत्।।11, 19।।
(शा. सं. 3)

वृष्यो बल्यः खसतिलः श्लेष्मलो वातजिद्वरूः।।44।।
(म.पा.नि., अभयादि वर्ग 1)

खस्खसो मधुरः पाके कान्ति वीर्य बलप्रदः।।190।।
(रा.नि., शताह्वादि वर्ग)

खसबीजानि बल्यानि वृष्याणि सुगुरूणि च।
जनयन्ति कफं तानि शमयन्ति समीरणम्।।232।।
(भा. प्र. नि., हरीतक्यादि वर्ग)

खत्मी (मूलम्)

खत्मी तु मधुरा स्निग्धा पिच्छिला शीतला गुरु :।
वातपित्तहरा श्लेष्मसारणी मूत्रला सरा।
प्रतिश्याये तथा कासे मूत्रकृच्छ्रे च शस्यते।। स्व।।
[प्रो. प्रि.व्र. शर्मा, द्र. गु. वि. II, 274]

खत्मी (बीजम्)

खत्मी तु मधुरा स्निग्धा पिच्छिला शीतला गुरुः।
वातपित्तहरा श्लेष्मसारणी मूत्रला सरा।
प्रतिश्याये तथा कासे मूत्रकृच्छ्रे च शस्यते।। स्व।।
[प्रो. प्रि. व्र. शर्मा, द्र. गु. वि.II, 274]

खूबकलाँ (बीजम्)

खाकसी सर्षपाभासा कटूष्णा पिच्छिला सरा।
वातश्लेष्महरा बल्या स्वेदनी ज्वरकासनुत्।।[स्व.]
[द्र. गु. वि., प्रो. पी.वी.शर्मा]

कोद्रवः (फलम्)

प्रशातिका प्रियङ्गुश्च-------- कोद्रवामुद्गाः कुलत्थाश्चक्रमुद्वकाः।।25।।
आढकीनां-------- पानं चानु मधूदकम्।।26।।
अरिष्टांश्चानुपानोर्थे-------- मेदोमांसकफापहान्।
अतिस्थौल्यविनाशाय संविभाज्यप्रयोजयेत्।।27।।
(च.सू. 21)

सकोरदूषः श्यामाकः कषायमधुरो लघुः।
वातलः कफपित्तघ्नः शीतंसग्राहिशोषणः।।15।।
(च. सू. 27)

कषायमधुरस्तेषां शीतः पित्तापहः स्मृतः।
कोद्रवश्च सनीवारः श्यामकश्च सशान्तनुः।।23।।
(सु.सू. 46)

कोरदूषः परं ग्राही स्पर्शे शीतो विषापहः।।13।।
(अ.हृ.सू. 6)

कोद्रवः शीतलो ग्राही विषपित्तकफाञ्जयेत्।।75।।
(ध.नि., सुवर्णादि वर्ग)

कोद्रवो विषपित्तजित् हिमः ।।102।।
(कै. नि., धान्यवर्ग)

कोद्रवो मधुरस्तिक्तो व्रणानां पथ्यकारकः।
कफपित्तहरो रूक्षो मोहकृद् वातलो गुरूः।।124।।
(रा. नि., शाल्यादि वर्ग)

कोद्रवो वातलोग्राही हिमः पित्तकफापहः।।80।।
(भा.प्र.नि., धान्यवर्ग)

क्षीरकाकोली (प्र. मू.)

जीवनीय, बृंहणीय, शुक्रजनन तथा
स्नेहोपग महाकषाये पठितः।।1,2,19,21।।
(च. सू. 4)

काकोली क्षीर काकोली- - - - मधुकं चेति।।35।।
काकोल्यादिरयं पित्तशोणितानिलनाशनः।
जीवनो बृंहणो वृष्यः स्तन्यश्लेष्मकरस्तथा।।36।।
(सु. सू. 38)

रुचिष्या कफपित्तास्रंहद्रोगशमनी मता।
श्वासकासक्षयहरा वृष्या बस्ति विशोधनी।।135।।
(ध. नि., गुडूच्यादि वर्ग)

काकोली मधुरा स्निग्धा क्षयपित्तानिलार्त्तिनुत्।
रक्तदाहज्वरघ्नी च कफशुक्रल विवर्द्धनी।।168।।
क्षीर काकोली- रसवीर्य विपाकेषु काकोल्या सदृश च सा।।169।।
(रा. नि., गडूच्यादि वर्ग)

काकोलीयुगलं शीतं शुक्रलं मधुरं गुरू।
बृंहणं वातदाहास्र पित्तशोष ज्वरापहम्।।137।।
(भा. प्र. नि., हरीतक्यादि वर्ग)

काकोली शीतला वृष्या मधुरा शुक्रकारिणी।
तिक्ता कफकरी गुर्वी क्षयपित्ततृषाहरा।।
रक्तदोषं रक्तपित्तं दाहं शोषं ज्वरं विषम्।।
वातापित्तरूजं चैव नाशयेदिति कीर्त्तिता।।
(नि. र.)

क्षीरविदारी (मूलम्)

मधुर स्कन्धे पठितः।।139।।
(च. वि. 8)

महावातव्याधौ-पानादिषु तैले पठितः
वातरक्ते पानार्थ तैलेयोगे पठितः।।7।।
(सु. चि. 5)

क्षीरविदारिका बल्या वातापित्तहराच सा।
मधुरा बृंहणी वृष्या शीतस्पर्शाऽ तिमूत्रला।।146।।
स्तन्यदोषस्यहरणी पित्तशूलनिषूदनी (पाठा. मूढावृष्यविषूदनी :)।
(ध. नि., गुडूच्यादि वर्ग)

विदारी बृंहणी वृष्याः सुस्निग्धा शीतला गुरूः।।1583।।
मधुरा मूत्रला स्वर्या स्तन्यवर्णबलप्रदा।
पित्तानिलास्रदाहघ्नी जीवनीया रसायनी।।1584।।
(कै. नि., ओषधि वर्ग)

ज्ञेया क्षीरविदारी च मधुराम्ला कषायका।
तिक्ता च पित्तशूलघ्नी मूत्रमेहामयापहा।।104।।
(रा.नि., मूलकादि वर्ग)

कुलञ्जनम् (प्रकन्दः)

कुलंजो गन्धमूलश्च तीक्ष्णमूलः कुलंजनः।
कुलंजः कटुतिक्तोष्णो दीपनो मुखदोषनुत्।।55।।
[रा. नि., पिप्पल्यादि वर्ग]

सुगन्धाऽप्युग्रगन्धा च विशेषात्कफकासनुत्।
सुस्वरत्वकरी रुच्या हृत्कण्ठमुखशोधिनी।।105।।
स्थूलग्रन्थि सुगन्धा स्यात् ततो हीनगुणा स्मृता।।106।।
[भा.प्र.नि., हरीतक्यादि वर्ग]

कुलिंजनं कटुस्तिक्तमुष्णं चाग्निप्रदीपनम्।
रुच्यं स्वर्यं च हृद्यं च मुखकण्ठविशुद्धिकृत्।।
मुखदोषं कफश्वासं कासं वातं ध्रुवं जयेत्।
बृहत्कुष्ठगुणैर्ज्ञेयं न्यूनमस्मादिति स्मृतम्।।
[नि. र.]

कुम्भी (कः) (बीजम्)

प्रियङ्गुसमङ्गा. . . . . कुम्भीक. . . . दीर्घमूला चेति।।45।।
गणौ प्रियङ्ग्वम्बष्ठादि पक्वातीसारनाशनौ।।
सन्धानीयौ हितौ पित्ते व्रणानां चापि रोपणौ।।47।।
(सु. सू. 38)

कुम्भीकः श्लक्ष्णत्वक्को रोमशः कुम्भीनामा वृक्षो
यस्य त्वग्वस्त्राकारा भवति इतिऽलहणः।।17।।
(सु. सू. 38)

कुम्भी स्थलकुम्भी यस्यास्त्वग्वक्राभवति इतिऽल्हणः।।17।।
(सु. उ. 59)

कुम्भी कटुः कषायोष्णो ग्राही वातकफापहः ।।105।।
[रा. नि., प्रभद्रादि वर्ग]

लताकरञ्ज (बीजम्)

तत्र भद्रदारु ----------कुबेराक्षी ----------पञ्चमूल्यौ,
समासेन वातसंशमनो वर्गः ।। 7 ।।
(सु.सू. 39)

कपित्थबिल्वत ----------गन्धर्वहस्तकाः ।
कुबेराक्षी च ----------स्युर्बालानां परिषचने ।। 3 ।।
(सु. उ. 35)

शूले-
एक एव कुबेराक्षः सर्वशूलापहारकः ।
किं पुनः स त्रिभिर्युक्तः पथ्यारूचकरामहै ।। 58 ।।
(हा.सं. 37)

कुबेराक्षी यकृत्प्लीहवातघ्नीं व्रणरोपणी ।। 523 ।।
(सो.नि. II)

प्रवाहिकाथाम्-
यक्षलोचनमज्जानं काञ्जिकेन पिबेत् प्रगे ।
सश्लेष्मरक्तातीसारं कोष्ठशूलं जयेद् द्रुतम् ।। 6 ।।
(वै.म. 6)

तिरिगिच्छिर्वलापार्शः कृमिकुष्ठप्रमेहहृत् ।
(म.प.नि.)

लताकरञ्जपत्रं तु कटूष्णं कफवातनुत् ।
तद्बीजं दीपनं पथ्यंशूलगुल्मव्यथापहम् ।। 25 ।।
(रा.नि., शाल्मल्यादि वर्गः)

तत्फलं कफवातघ्नं मेहार्शः कृमिकुष्ठाजित् ।। 122 ।।
(भा.प्र.नि., गुडूच्यादि वर्ग)

करञ्जमज्जो द्वितयं त्रयं वा विभर्ज्यसाकं पटुना निगीर्णम्।
शूलं समूलं हरति प्रसह्य कूलं यथा निर्झरिणीप्रवाहः ।। 510 ।।
(सि. भे. 4)

कण्टयुक्तः करञ्जस्तु पाके च तुवरः कटुः ।
ग्राहकश्चोष्णवीर्यः स्यात्तिक्तः प्रोक्तश्च मेहहा ।।
कुष्ठार्शोव्रणवातानां कृमीनां नाशनः परः ।
(शा.नि.)

लवली फलम्

कषायविशदत्वाच्च सौगन्ध्याच्च रुचिप्रदम् ।
अवदंशक्षमं हृद्यं वातलं लवलीफलम् ।।144।।
(च.सू. 27)

कषायं कफपित्तघ्नं किंचित्तिक्तं रुचिप्रदम् ।
हृद्यं सुगन्धि विशदं लवलीफलमुच्यते ।।189।।
(सु. सू. 46)

ज्योत्स्ना मुक्ताफलं प्रोक्तं श्यामलं लवलीफलम्।
विशदं रोचनं रूक्षं हृद्यं तिक्तं कषायकम् ।।510।।
वातलं कफपित्तघ्नं सुगन्धि लवलीफलम्।
(कै. नि., ओषधि वर्ग)

सुगन्धमूला लवली पाण्डुः कोंमलवल्कला ।।79।।
लवलीफलमश्मार्शःकफपित्तहरं गुरु ।
विशदं रोचनं रूक्षं स्वाद्वम्लं तुवरं रसे ।।80।।
(भा. प्र. नि.,आम्रादिफलवर्ग)

मधूलिका (मूलम्)

नान्दीमुखी मधूली च मधुरस्निग्धशीतले ।।21।।
(च. सू. 27)

मधूली मधुरा शीता स्निग्धा
नन्दीमुखी तथा ।।21, 25।।
(सु. सू. 46)

नृत्यकुण्डलबीजानां चूर्णं माक्षिकसंयुतम्।
अविक्षीरेण सप्ताहं पीतमश्मरीपातनम्।।30।।
[अ. हृ. चि. 11]

नर्तकः पित्तहा शीतः---------- ।।103।।
[कै. नि., धान्य वर्ग]

रागी तु लाञ्छनः स्याब्दहुदलकणिशश्च गुच्छकणिशश्च।।136।।
तिक्तो मधुरकषायः शीतः पित्तास्रनाशनो बलदः ।।137।।
[रा. नि., शाल्यादि वर्ग]

नर्त्तकस्तुतुवरस्तिक्तो मधुरस्तर्पणो लघुः।
बल्यः शीतः पित्तहरस्त्रिदोषशमनो मतः।।
रक्तदोषहरश्चैव मुनिभिः पूर्वमीरितः।
[नि. रत्नाकर]

महामेदा (मूलम्/प्रकन्दः)

जीवकर्षभकौ मेदा महामेदा . . . . . जीवन्ती मधुकमिति दशेमानि
जीवनीयानि भवन्ति ।। 1।।
(च. सू. 4)

काकोलीक्षीरकाकोलीजीवकर्षभकमुद्गपर्णीमाषपर्णी मेदामहामेदा. . . . .
. . . . . जीवन्त्यो मधुकं चेति ।।35।।
काकोल्यादिरयं पित्तशोणितानिलनाशनः
जीवनो बृंहणो वृष्यः स्तन्यश्लेष्मकरस्तथा ।।36।।
(सु. सू. 38)

महामेदा हिमास्वादुः कफशुक्रविवर्धनी ।
हन्ति दाहास्रपित्तानि क्षयवातज्वरैः सह ।।125।।
(ध.नि., गुडूच्यादि वर्ग)

मेदायुग्मं परं स्निग्धं शुक्लमेदः प्रवर्द्धनम् ।
मधुरं रसपाकाभ्यां जीवनं वातपितहत् ।।
(सो.नि.)

मेदाद्वयं हिमं स्वादु स्तन्यशुक्रलवलासकृत्। ।
बृंहणं वातपितास्त्रक्षतक्षयहरं गुरू ।।88।।
(कै.नि., ओषधि वर्ग, 88)

महामेदा हिमारुच्या कफशुक्रप्रवृद्धिकृत् ।
हन्ति दाहास्रपित्तानि क्षयं वातं ज्वरं च सा ।। 27।।
(रा.नि., पर्पटादि वर्ग)

मेदायुगं गुरु स्वादु वृष्यं स्तन्यकफावहम् ।
बृंहणं शीतलं पित्तरक्तवातज्वर प्रणुत् ।।131।।
(भा.प्र.नि, हरीतक्यादि वर्ग)

मधुस्नुही (मूलम्)

द्वीपान्तर वचा किञ्चितिक्तोष्णा वह्निदीप्तिकृत्।
विबन्धाध्मानशूलघ्नी शकृन्मूत्रविशोधिनी।
वातव्याधीनपस्मारमुन्मादं तनुवेदनाम्।
व्यपोहति विशेषण फिरङ्गामयनाशिनी।।108।।
(भा.प्र.नि., हरीतक्यादिवर्ग)

चोबाचीनी भवं चूर्णं शाणमानं समाक्षिकम्।
फिरग्ङ व्याधिनाशाय भक्षयेल्लवणं त्यजेत्।।87।।
(भै. र., फिरङ्ग रोग)

द्वीपान्तर वचातिक्ता चोष्णा चाग्निप्रदीपनी।
धातुावृद्धिकरी बल्या मलमूत्रविशोधिनी।।
तारूण्यदा पौष्टिकी च वृष्या चैव रसायनी।
गर्भप्रदा बद्धाविट्काऽध्मानोन्माद विनाशिनी।।
वातं शूलमपस्मारं धातुक्षयविनाशिनी।
अंगग्रहं फिरंगोपदशं मान्द्यं कटीग्रहम्।
पक्षाघातमुरूस्तम्भं राजायक्ष्मव्रणांस्तथा।
गण्डमालां नेत्ररोगं शुक्रशोणितदोषकम्।।
सर्वांगकम्पवातं च कुब्जवातं च नाशयेत्।
(निः रः)

मेदासकः (काष्ठम्)

मेदासको लघुः स्निग्धः कटुस्तिक्तः कषायकः।
उष्णो वातकफौहन्ति शोथशूलविनाशनः।।
दीपनः स्तम्भनश्चैव सर्ववातविकारनुत्।
अग्निमांद्येऽतिसारे च रक्तस्रावे च युज्यते।।स्व.।।
[द्र. गु. वि.II , प्रो. प्रि. ब्र. शर्मा]

मेषशृङ्गी (पत्रम्)

सालसार. . . . मेषशृङ्ग. . . . . कालीयकं चेति।।8।।
सालसारादिरित्येष गणः कुष्ठविनाशनः।
मेहपाण्ड्वामयहरः कफमेदोविशोषणः।।9।।
(सु. सू. 38)

असनादिर्विजयते श्वित्रकुष्ठकफक्रिमीन्।
पाण्डुरोगं प्रमेहं च मेदोदोषनिबर्हणः।।20।।
(अ.ह.सू. 15)

अजशृङ्गी हिमा स्वादुः शोफतृष्णावमीर्जयेत्।।
चक्षुष्या श्वासहृद्रोगविषकासार्तिकुष्ठनुत्।।86।।
(ध.नि., गुडूच्यादि वर्ग)

श्रृङ्गिका तुवरा तिकता दाहपित्तकफास्रहा।
निहंति तिमिरश्वासकासव्रण विषकृमीन्।।738।।
(कै. नि., ओषधि वर्ग)

अजशृङ्गी कटुस्तिक्ता कफार्शःशूलशोफजित्।
चक्षुष्या श्वासहृद्रोगविषकासातिकुष्ठजित्।।
(रा. नि., प्रभद्रादि वर्ग)

मेषशृङ्गी रसे तिक्ता वातला श्वासकासहृत्।
रूक्षा पाके कटुः पित्तव्रणश्लेष्माक्षिशूलनुत्।।254।।
(भा.प्र.नि., गुडूच्यादि वर्ग)

अजशृङ्गी तु कासघ्नी वातनुत विषनाशनी।
रेचनी चाक्षिभैषज्यमर्शोदन्तकृमीन् जयेत्।
(नि. र.)

मेषश्रृङ्गी (मूलम्)

सालसार. . . . मेषशृङ्ग. . . . . कालीयकं चेति।।8।।
सालसारादिरित्येष गणः कुष्ठविनाशनः।
मेहपाण्ड्वामयहरः कफमेदोविशोषणः।।9।।
(सु. सू. 38)

असनादिर्विजयते श्वित्रकुष्ठकफक्रिमीन्।
पाण्डुरोगं प्रमेहं च मेदोदोषनिबर्हणः।।20।।
(अ.ह.सू. 15)

अजश्रृङ्गी हिमा स्वादुः शोफतृष्णावमीर्जयेत्।।
चक्षुष्या श्वासहद्रोगविषकासार्तिकुष्ठनुत्।।86।।
(ध.नि., गुडूच्यादि वर्ग)

श्रृङ्गिका तुवरा तिकता दाहपित्तकफास्रहा।
निहंति तिमिरश्वासकासव्रण विषकृमीन्।।738।।
(कै. नि., ओषधि वर्ग)

अजशृङ्गी कटुस्तिक्ता कफार्शःशूलशोफजित्।
चक्षुष्या श्वासहद्रोगविषकासातिकुष्ठजित्।।
(रा. नि., प्रभद्रादि वर्ग)

मेषश्रृङ्गी रसे तिक्ता वातला श्वासकासहृत्।
रूक्षा पाके कटुः पित्तव्रणश्लेष्माक्षिशूलनुत्।।254।।
(भा.प्र.नि., गुडूच्यादि वर्ग)

अजशृङ्गी तु कासघ्नी वातनुत विषनाशनी।
रेचनी चाक्षिभैषज्यमर्शोदन्तकृमीन् जयेत्।
(नि. र.)

नन्दी (प्रकन्द)

न्यग्रोधोदुम्बराश्वत्थ----------
पलाशा नन्दीवृक्षश्चेति ।। 48 ।।
न्यग्रोधादिर्गणो व्रण्यः संग्राही भग्नसाधकः ।
रक्तपित्तहरो दाहमेदोघ्नो योनिदोषहृत् ।। 49 ।।
(सु.सू. 38)

नन्दीवृक्षो लघुः स्वादुः कषायोष्णः सतिक्तकः ।। 446 ।।
कटुपाकरसो ग्राही विषपित्तकफास्रजित्
(कै. नि., औषधि वग)

नन्दीवृक्षो लघुः स्वरदुस्तिवतस्तुवर उष्णकः ।
कटुपाकरसो ग्राही विषपित्तकफास्रजित् ।। 7 ।।
(भा. प्र. नि., वटादि वर्ग)

नन्दी (का. त्वक्)

अम्बष्ठा धातकी - पलाश नन्दी वृक्षा - - - - - चेति।।46।।
गणौ प्रियङ्गवम्बाष्ठादी- पक्वातीसारनाशनौ।
सन्धानीयौ हितौ पित्ते व्रणानां चापि रोपणौ।।47।।
(सु. सू. 38)

न्यग्रोधोदुम्बराश्वत्थ- - - - - नन्दीवृक्षश्चेति।।48।।
न्यग्रोधार्दिणो व्रण्यः संग्राही भग्नासाधकः।
रक्तपित्तहरो दाहमेदोघ्नो योनिदोषहृत्।।49।।
(सु. सू. 38)

युच्चूयूथिका--नदी(न्दी)भल्लातक---कोविदारप्रभृतीनि।।249।।
कषायस्वादुतिक्तानि रक्तपित्तहराणि च
कफ धान्यनिल कुर्युः संग्राहीणि लघूनि च।।250।।
(सु. सू. 46)

न्यग्रोधपिप्पल- - - - - - नन्दी कोलीकदम्ब विरलामधुकं मधूकम्।।41।।
न्यग्रोधार्दिर्गणो व्रण्यः संग्राही भग्नसाधनः।
मेदः पित्तास्रतृङ्दाहयोनिरोगनिर्वहणः।।42।।
(अ. ह. सू. 15)

नन्दीवृक्षो लघुः स्वादुः कषोयोष्णः सतिक्तकः।।446।।
कटुपाकरसो ग्राही विषपित्तकफास्रजित्।
(कै.नि., ओषधि वर्ग)

नन्दीवृक्षोलघुः स्वादु स्तिक्तस्तुवर उष्णकः।
कटुपाकरसो ग्राही विषपित्तकफास्त्रजित्।।7।।
(भा.प्र.नि., वटादि वर्ग)

नीलझिण्टी (मूलम्)

मूषकविषे-

अथवा सैर्यकान् मूलं सक्षौद्रं तण्डुलाम्बुना।।30।।
(अ.ह.उ. 38)

सिराग्रन्थौ नवे पेयं तैलं साहचरं तथा।
उपनाहोऽ निलहरैः बस्तिकर्म सिराव्यधः।।
(शो.)

यदि सहचरमूलं वारिणा संप्रघृष्टं।
पिबति यदि च गोधामांसमश्नाति योषित्।
प्रतिदिनमभिवृद्धिं याति गर्भस्तदानीं
क्रमवशपरिपुष्टैः धातुभिः पूर्यमाणैः।।
[शो.]

नीलपुष्पस्त्वार्त्तगलो राजसैरेयकः स्मृतः।।1049।।
बाणस्त्वोदनपाकी स्यात् शाणकः केशरंजनः।।
सैरेयो मधुरः स्निग्धस्तिक्तोष्णः केशरंजनः।।1050।।
केश्यो बलासवातास्रकुष्ठकण्डूविषं जयेत्।
[कै. नि., ओषधि वर्ग]

झिण्टिकाः कटुकास्तिक्ता दन्तामयशान्तिदाश्च शूलघ्न्यः।
वातकफशोफकासत्वग्दोषविनाशकारिण्यः।।421।।
(रा.नि.गुडूच्यादि वर्ग)

नीले बाणा द्वयोरुक्तो दासी चार्त्तगलश्च सः ।।52।।
सैरेयः कुष्ठवातास्रकफकण्डूविषापहः।
तिक्तोष्णो मधुरोऽ नम्लः (पाठा. मधुरो दन्त्यः) सुस्निग्धः केशरंजनः।।56।।
[भा.प्र.नि., पुष्प वर्ग]

निम्बः (मूल त्वक्)

मदनं मधुकं निम्बं जीमूतं कृतवेधनम्।
पिप्पली कुटजेक्ष्वाकून्येलां धामार्ग वाणि च।।7।।
उपस्थिते श्लेष्मपित्ते व्याधावामाशयाश्रये।
वमनार्थ प्रयुञ्जीत भिषग्देहमदूषयन्।।8।।
(च. सू. 2)

चन्दननलदकृतमाल. . . .निम्बकुटज- मुस्तानीति
दशेमानि कण्डूघ्नानिभवन्ति।।14।।
(च. सू. 4)

आरग्वधमदन. . . . . निम्ब. . . . सुषवी चेति।।6।।
आरग्वधादिरित्येष गणः श्लेष्मविषापहः।
मेहकुष्ठज्वरवमीकण्डूघ्नो व्रणशोधनः।।7।।
(सु. सू. 38)

गुडुचीनिम्बकुस्तुम्बुरू चन्दनानि पद्मकं चेति।।50।।
एष सर्वज्वरान् हन्ति गुडुच्यादिस्तु दीपनः।
हल्लासारोचकवमीपिपासादाहनाशनः।।51।।
(सु. सू. 38)

लाक्षारेवतकुटजा. . . .निम्ब. . . .त्रायमाणा चेति।।64।।
कषायतिक्तमधुरः कफपित्तातिनाशनः
कुष्ठकृमिहरश्चैव दुष्टव्रण विशोधनः।।65।।
(सु. सू. 38)

तिक्तस्कन्धमाह-
तिक्तः पटोली. . .. भूनिम्बनिम्बकटुका. .. . वत्सकम्।।28।।
(अ.ह.सू.10)
क्वाथश्च निम्बमूलस्य दन्तरोगनिवारणः।।14।।
(हा. सं 3/46)

निम्बस्तिक्तरसः शीतो लघुः श्लेष्मास्रपित्तनुत्।
कुष्ठकण्डूव्रणान्हन्ति लेपाहारादिशीलितः।।29।।
अपक्वं पाचयेच्छोफं व्रणं पक्वं विशोधयेत्।
(ध. नि., गुडूच्यादि वर्ग)

निम्बः शीतो लघुर्ग्राही कटुपाकोऽ ग्निवातकृत्।।38।।
व्रणपित्त कफच्छर्दि कुष्ठहल्लासमेहनुत्।
(म.पा.नि. पृ. क्र. 25)

निम्बस्तिक्तः कटुः पाके लघुः शीतोऽग्निवातकृत्।।879।।
ग्राह्यहृद्यो जयेत् पित्तकफमेहज्वरकृमीन्।
कुष्ठकासारूचिश्वास हल्लासश्वयथु व्रणान्।।880।।
(कै. नि. ओषधि वर्ग)

प्रभद्रकः प्रभवति शीततिक्तकः कफव्रणकृमिवमिशोफशान्तये।
बलासभिदहुविषपित्तदोषाजित् विशेषतो हृदयविदाहशान्तिकृत्।।10।।
(रा. नि. प्रभद्रादि वर्ग)

निम्बः शीतो लघुर्ग्राही कटुपाकोऽ ग्निवातनुत्।
अहृद्यः श्रमतृट्कासज्वरारुचिकृमिप्रणुत्।
व्रणपित्तकफच्छर्दि कुष्ठहल्लासमेहनुत्।।94।।
(भा. प्र. नि., गुडूच्यादि वर्ग)

निम्बः (पुष्पम्)

चन्दननलदकृतमाल. . . . . निम्बकुटज. . . . .
मुस्तानीति दशेमानि कण्डूघ्नानि भवन्ति।।14।।
(च. सू. 4)

आटरूषक वेत्राग्रगुडूची निम्ब पर्पटाः।।
किराततिक्तसहितास्तिक्ताः पित्तकफापहाः।।270।।
(सु. सू. 46)

रक्तवृक्षस्य निम्बस्य मुष्ककर्कासनस्य च।
कफपित्तहरं पुष्पं कुष्ठघ्नं कुटजस्य च।।284।।
(सु. सू. 46)

निम्बस्तिक्तरसः शीतो लघुः श्लेष्मास्रपित्तनुत्।
कुष्ठकण्डूव्रणान्हन्ति लेपाहारादिशीलितः।।29।।
अपक्वं पाचयेच्छोफं व्रणं पक्वं विशोधयेत्।
(ध. नि., गुडूच्यादि वर्ग)

निम्बवृक्षस्य पुष्पाणि पित्तघ्नानि विशेषतः ।
तिक्तानि च कृमिघ्नानि तथा कफहराणिच।।
(शा. नि., पृ. 239)

निम्बः शीतो लघुर्ग्राही कटुपाकोऽ ग्निवातकृत्।
व्रणपित्तकफच्छर्दिकुष्ठ हृल्लासमेहनुत।
(म. नि., पृ. क्र. 25)

चक्षुष्यं निम्बपुष्पञ्च कृमिपित्तविषप्रणुत्।।883।।
वातलं कटुपाकंस्यात् सर्वारोचक नाशनम्।।
(कै. नि., ओषधि वर्ग)

प्रभद्रकः प्रभवति शीततिक्तकः कफव्रणकृमिवमिशोफशान्तये।

बलासभिदहुविषपित्तदोषाजिदिशेषतोहृदयवि दाहशान्तिकृत्।।10।।
(रा. नि., प्रभद्रादिवर्ग)

निम्बः शीतो लघुर्ग्राही कटुपाकोऽग्निवातनुत्।
अहृद्यः श्रमतृट्कासज्वरारूचिकृमिप्रणुत्।
व्रणपित्तकफच्छर्दि कुष्ठहृल्लासमेहनुत्।।94।।
(भा. प्र. नि., गुडूच्यादि वर्ग)

निम्बम् (फलम्)

मदनं मधुकं निम्बं जीमूतं कृतवेधनम्।
पिप्पली कुटजेक्ष्वाकून्येलां धामार्ग वाणि च।।7।।
उपस्थिते श्लेष्मपित्ते व्याधावामाशयाश्रये।
वमनार्थं प्रयुञ्जीत भिषग्देहमदूषयन्।।8।।
(च. सू. 2)

गुडुचिनिम्बकुस्तुम्बुरू. . . . . पद्मकं चेति।।50।।
एष सर्वज्वरान् हन्ति गुडुच्यादिस्तु दीपनः।
हल्लासारोचकवमीपिपासादाहनाशनः।।51।।
(सु. सू. 38)

निम्बातसी . . . . . शिग्रुसषर्प सुवर्चलाविडङ्ग
ज्योतिष्मतीफलतैलानि तीक्ष्णानि लघून्युष्णावीर्याणि
कटूनि कटूविपाकानि सराण्यनिल कफकृमिकुष्ठप्रमेह
शिरोरोगापहराणि चेति।।115।।
(सु. सू. 45)

नात्युष्णं निम्बजं (तैलं) तिक्तं कृमिकुष्ठकफप्रणुत्।।60।।
(अ. ह्र. सू. 5)

निम्बस्तिक्तरसः शीतो लघुः श्लेष्मास्रपित्तनुत्।
कुष्ठकण्डूव्रणान्हन्ति लेपाहारादिशीलितः।।29।।
अपक्वं पाचयेच्छोफं व्रणं पक्वं विशोधयेत्।
(ध. नि., गुडूच्यादि वर्ग)

नात्युष्णं निम्बजं तैलं कृमिपित्तकफापहम्।
वातपित्तप्रशमनं मदारश्मीरुजापहम्।।136।।
(ध. नि., सुवर्णादि वर्ग.)

तत्फलम् भेदनं स्निग्धमुष्णमं कुष्ठहरं लघु।
अपक्वं पाचयेन्निम्बः पक्वं च परिशोषयेत्।
(म.पा.नि. पृ. क्र. 25)

फलं तिक्त रसे पाके कटुकं भेदनं लघु ।।884।।
अरूक्षमुष्णं कुष्ठघ्नं गुल्मार्शः कृमिमेहनुत्।
निम्बस्य पक्वं मधुरं सतिक्तं स्निग्धं फलं शोणित पित्तरोगे।
कफे प्रशस्तं नयनामयघ्नं क्षतक्षयघ्नं गुरू पिच्छिलञ्च।।885।।
निम्ब बीजस्य मज्जा च कृमि कुष्ठ विशोधनः।

(कै. नि., ओषधि वर्ग)

प्रभद्रकः प्रभवति शीततिक्तकः कफव्रणकृमिवमिशोफशान्तये।
बलासभिद्धहुविषपित्तदोषाजिद्विशेषतोहृदयविदाहशान्तिकृत्।।10।।

(रा. नि., प्रभद्रादिवर्ग)

निम्बफलं रसे तिक्तं पाके तु कटुभेदनम्।
स्निग्धं लघूष्णं कुष्ठघ्नं गुल्मार्शः कृमिमेहनुत्।

(भा. प्र. नि., गुडूच्यादि वर्ग)

आमं फलं रसे तिक्तं पाके तु कटुकं मतम्।
स्निग्धं लघूष्णं कुष्ठघ्नं गुल्मार्शः कृमिमेहनुत।।
निम्बस्य पक्वं मधुरं सुतिक्तं स्निग्धं फल शोणित पित्तरोगे।
कफे प्रशस्तं नयानामयघ्नं, क्षतक्षयघ्नं गुरू पिच्छिलं च।।

(शा.नि.,गुडुच्यादि वर्ग, पृ.240)

पलाशः(बीजम्)

---------- पलाशतैलानि मधुरकषायाणि कफपित्तप्रशमनानि।।121।।
(सु. सू. 45)

बीजं तु कटुकं स्निग्धमुष्णं कृमिबलासजित्।।150।।
[ध. नि., आम्रादि वर्ग]

तद्बीजं कृमिविध्वंसि काण्डो रसायने हितः।
[सो. नि.]

तृड्दाहकफपित्तास्रकुष्ठहृत् फलमस्य च।।834।।
[कै. नि., ओषधि वर्ग]

तद्बीजं पामकण्डूतिदद्रूत्वग्दोषनाशकृत्।।37।।
[रा. नि., करवीरादि वर्ग]

फलं लघूष्णं मेहार्शकृमिवातकफापहम्।।
विपाके कटुकं रूक्षं कुष्ठं गुल्मोदरप्रणुत् ।।53।।
(भा.प्र.नि., वटादि वर्ग)

पलाशः (पुष्पम्)

किंशुकं पुष्पं कफपित्तघ्नम्।।288।।
(सु. सू. 46)

प्लीहगुल्मग्रहण्यर्शोवातश्लेष्मविनाशनः।
किंशुकस्यापि कुसुमं सुगन्धि मधुरं च यत्।।150।।
[ध. नि. आम्रादि वर्ग]

तत् पुष्पं स्वादु तिक्तकम्।
तृड्दाहकफपित्तास्रकुष्ठहृत्।।834।।
[कै. नि., ओषधि वर्ग]

तस्यपुष्पंच सोष्णश्च कण्डूकुष्ठार्त्तिनाशनम्।।38।।
रक्तःपीतःसितो नीलः कुसुमैस्तु विभज्यते।।39।।
[रा. नि., करवीरादि वर्ग]

तत्पुष्पं स्वादु पाके तु कटु तिक्तं कषायकम्।।51।।
वातलं कफपित्तास्रकृच्छ्रजिद् ग्राहि शीतलम्।
तृड्दाहशमकं वातरक्तकुष्ठहरं परम्।।52।।
[भा.प्र.नि., वटादि वर्ग]

पारसीक यवानी (बीजम्)

पारसीकयवानिका पीता पर्युणितवास्णा प्रातः।
गुडपूर्वा कृमिजालं कोष्ठगतं वातयत्याशु।।
(वृन्दमाधव-I)

यवानी यावनी रूक्षा ग्राहिणी मादिनी कटुः।।91।।
(ध. नि., शतपुष्पादि वर्ग)

पारसीकयवानी तु यवानीसदृशी गुणैः।
विशेषात् पाचनी रूच्या ग्राहिणी मादिनी गुरूः।।80।।
(भा.प्र.नि., हरीतक्यादि वर्ग)

खुरेसानी यवानी तु कटुरूक्षा च पाचका।
ग्राहकोष्णा मादका च गुर्वीवातकरा (शु. पाठ. वातहरा) मता।।
(नि. र.)

पट्टूर (सं.व.)

गोरक्षगञ्जा तुवरा सतिक्ता लघ्वी च तीक्ष्णा परमोष्ण वीर्या ।
कफार्तिहृत् मूत्रविरेचनीया प्रभावतोऽ प्यश्मारिनाशनी स्यात् ।।स्व.।।
(प्रो.प्रि.व्रत् शर्मा, द्र.गु.वि.II, अपामार्गकुल)

पीलु (फलम्)

पीलु----------दोषघ्नं गरहारि।
(च. सू.27)

तिक्तं पित्तकरं तेषां सरं कटुविपाकिच ।
तीक्ष्णोष्ण कटुकं पीलु सस्नेहं कफवातजित्
(सु. सू.46)

गुल्मे पीलूनि पिष्टानि पिबेत् सलवणानि तु ।।64।।
(सु. उ.42)

रक्तपित्तहरः पीलुः फलं कटुविपाकि च ।
अर्शोघ्नं बस्तिशमनं सस्नेहं कफवातजित् ।।45।।
पीलुजं रसे स्वादु गुल्मार्शोघ्नं तु तीक्ष्णकम् ।
(ध.नि., आम्रादि वर्ग)

पीलूष्णमूषणं पाक रसयेर्भिदि दीपनम् ।
तीक्ष्णं विदाहि पित्तास्रजननं सन्नियच्छति।।453।।
गुल्मार्शः कफवातास्रप्लीहानाहगरोदरम्।
तत् स्वादु तिक्तं दोषघ्नं सोष्णं रूक्षं रसायनम् ।।454।।
(कै.नि., ओषधि वर्ग)

पीलुः श्लेष्मसमीरघ्नं पित्तलं भेदि गुल्मनुत्।
स्वादुतिक्तं च यत्पीलु तन्नात्युष्णं त्रिदोषहृत्।।28।।
(भा. प्र. नि; आम्रादिफल वर्ग)

पीलुः (पत्र, मूलत्वक्)

पीलु. . . . . दोषघ्नंगरहारिच ।।42।।
(च.सू.27)

द्राक्षाकाश्मर्य. . . . . पीलूनीति दशेमानि
विरेचनोपगानि भवन्ति ।।24।।
(च.सू. 4)

सारिवाशर्करापाठा . . . . पीलुपरूषका . . .ज्वरहराणि भवन्ति ।।39।।
(च.सू.4)

पिप्पलीविडङ्गापामार्ग . . . पीलु जातीशालतालमधुक . . .
शिरोविरेचनानि ।।6।।
(सु.सू.39)

गुल्मे-एवं पीलूनि भृष्टानि पिबेत् सलवणानि तु ।।64।।
(सु.उ.42)

रक्तपित्तहरः पीलुःफलं कटु विपाकि च ।
अर्शोघ्नं बस्तिशमनं सस्नेहं कफवातजित् ।।45।।
पीलुजं च रसं स्वादु गुल्मार्शोघ्नं तु तीक्ष्णकम् ।
(ध.नि. आम्रादि वर्ग)

पीलूष्णमूषणं पाकरसयोर्भदि दीपनम् ।
तीक्ष्णं विदाहि पित्तास्रजननं सन्नियच्छति ।।453।।
गुल्मार्शःकफवातास्रप्लीहानाहगरोदरम् ।
तत् स्वादु तिक्तं दोषघ्नं सोष्णं रूक्षं रसायनम् ।।454।।
(कै.नि., ओषधि वर्ग)

पीलुः श्लेष्मसमीरघ्नं पित्तलं भेदि गुल्मनुत् ।
स्वादु तिक्तं च यत्पीलु तन्नात्युष्णं त्रिदोषहृत् ।।128।।
(भा.प्र.नि., आम्रादिफल वर्ग)

पोटगल (मूलम.)

हिमा शुक्रवृद्धिकरी चक्षुष्या वातकोपना ।
मूत्रकृच्छ्राश्मरीदाहपित्तशोणितघ्नी च ।।
(रा.नि.)

एरका शिशिरा वृष्या चक्षुष्या वातकोपिनी ।
मूत्रकृच्छ्राश्मरीदाहपित्तशोणितनाशिनी ।।164।।
(भा.प्र.नि., गुडूच्यादि वर्ग)

पुदिनः (सं. व.)

रोचनी वन्हिजननो वक्त्रजाडयनिषूदनी।
कफवातहरी बल्या छर्द्यरोचक वारिणी।।
(आयुर्वेद विज्ञान)

अरोचवैरस्ययकृद्वमिक्रिमिप्रभञ्जनश्लेष्मगद्प्रभञ्जनः।
रूक्षस्तथोष्णः सुरभि रजःप्रदः पोदनिकः कल्कविधौ प्रशस्यते।।
(सि. भे.म.)

पूतिहा कटुरूष्णश्च रोचनो दीपनो लघुः।
हन्ति वातकफाध्मानशूलच्छर्दिकृमीस्तथा।।स्व.।।
[द्र.गु.वि., प्रो. पी.वी.शर्मा]

पुल्लानि (सं. व. मूल,पत्र, काण्ड)

कृमिपित्तहरा तिक्ता भेदिनी कफनाशिनी ।
पाण्डुकुष्ठविकारघ्नी कारवल्ली ज्वरापहा ।।
(म.पा.नि)

जलजं कारवेल्लं स्यात् तिक्तं भेदकरं मतम् ।
कफं कुष्ठं पाण्डुरोगं कृमीन् पित्तं च नाशयेत्।।
(नि.र.)

कारवेल्लं तु जलजं कृमिपित्तकफे हितम् ।।594।।
(कै.नि., ओषधि वर्ग)

पूतिकरञ्जः (का. त्वक्)

शोफघ्नं उष्णवीर्य च पत्रं पूतीकरञ्जम्।।278।।
(सु. सू. 46)

पूतीकरञ्जपत्राणां रसं वाऽपि यथाबलम्।।159।।
(सु. चि. 19)

करञ्जो नक्तमालश्च् करजश्चिरबिल्वकः।
घृतपूर्णकरञ्जोऽन्यः प्रकीर्यः पूतिकोऽपि च ।।119।।
स चोक्तः पूतिकरञ्जः सोमवल्कश्चस स्मृतः।
करञ्जः कटुकस्तीक्ष्णों वीर्योष्णो योनि दोषहृत्।
कुष्ठोदावर्तगुल्मार्शोव्रणक्रिमिकफापहः।।120।।
(भा.प्र.निघण्टु, गुडूच्यादि वर्ग 119-120)

रेणुका (बीजम्)

रेणुका शिशिराऽ त्यन्ता तृष्णां कण्डूं च नाशयेत्।
विषघ्नी दाहदौर्बल्यमुन्मूलयति योजिता।।50।।
[ध. नि., चन्दनादि वर्ग]

रेणुका कटुका पाके तिक्ताऽनुष्णा कटुर्लघुः।
पित्तला दीपनी मेध्या पाचनी गर्भपातनी।।1351।।
[कै. नि., ओषधि वर्ग]

रेणुका पित्तला मेध्या वृद्धिकृत्गर्भपातिनी।।40।।
[म.पा.नि. 3]

रेणुका तु कटुः शीता खर्जूकण्डूतिहारिणी।
तृष्णादाहविषघ्नी च मुखवैमल्यकारिणी।।113।।
[रा. नि., पिप्पल्यादि वर्ग]

रेणुका कटुका पाके तिक्ताऽ नुष्णा कटुर्लघुः।
पित्तला दीपनी मेध्या पाचनी गर्भपातिनी।
बलासवातकृच्चैव तृट्कण्डूविषदाहनुत्।।106।।
[भा.प्र.नि., कर्पूरादि वर्ग]

रेणुका कटुका शीता मुखवैमल्यकारका।
तिक्ता च पित्तला लघ्वी चाग्निमेधाकरी मता।।
पाचनी गर्भपातस्य कारिणी दद्रुकण्डुहा।
तृष्णादाहविषक्लैब्यकफवातविनाशिनी।।
दौर्बल्यगुल्मयोः हन्त्री बीजं चापि गुणा इमे।
[नि. र.]

ऋद्धि (मूलकन्द)

ऋद्धिमधुरशीता स्यात् क्षयपित्तानिलाञ्जयेत्।
रक्तदोषं ज्वरं हन्ति वर्धनी कफशुक्रयोः ।।142।।
(ध.नि., गुडूच्यादि वर्ग)

ऋद्धिस्त्रिदोषशमनी प्राणैश्वर्यकरा गुरूः ।
शुक्रला मधुरा वृष्या मूर्च्छापित्तास्र नाशिनी ।।96।।
(कै.नि., ओषधि वर्ग)

रोहिषं (सं. व.)

रोहिषङ्कटुकम्पाके तिक्तोष्णन्तुवरञ्जयेत्।
कुष्ठहृद्रोगपित्तास्रशूलकास कफज्वरान्।।168।।
(म. पा. नि.)

रोहिषं तुवरं तिक्तं कटुपाकं व्यपोहति।
हृत्कण्ठ व्याधिपित्तास्रशूलकासकफज्वरान्।।168।।
(भा. प्र. नि., गुडूच्यादि वर्ग.)

रूमी मस्तगी (रालः)

रूमजो मस्तकीगुन्द्रो दशनस्थिरताकरः।
(सि. भे. म.)

मधुरो मस्तकीगुन्द्रो लघुरुष्णः सुगन्धयुत्।
कफघ्नो मूत्रलो वृष्यः संग्राही दीपनो मतः।।स्व.।।
(प्रो. प्रि. व्र. शर्मा, द्र. गु. वि. II,260)

सरलस्त्रावः

जम्बु-------- श्रीवेष्टकभृष्टमृत्------- तिलकणा इति
दशेमानि पुरीषविरजनीयानि भवन्ति।।32।।
(च. सू. 4)

एलातगर . . . . श्रीवेष्टक . . . . . पुन्नागकेशरं चेति ।।24।।
एलादिको वातकफौ निहन्याद्विषमेवच ।
वर्णप्रसादनः कण्डूपिडकाकोठनाशनः ।।25।।
(सु.सू. 38)

सरल . . . . . सारस्नेहास्तिक्तकटुकषायाः दुष्टव्रणशोधनाः
कृमि कफकुष्ठानिलहराश्च ।।123।।
(सु.सू. 45)

एलायुग्म . . . . . श्रीवासकः कुंकुमं . . . . पुन्नागनागाह्वयम् ।।43।।
एलादिको वातकफौ विषं च विनियच्छति ।
वर्णप्रसादनः कण्डूपिटिकाकोठनाशनः ।।44।।
(अ.हृ.सू.15)

श्रीवेष्टः स्वादुतिक्तस्तु कषायो व्रणरोपणः ।
कफपित्तास्रजान् हन्ति ग्रहघ्नःशीर्षरोगनुत् ।।12।।
(ध.नि., चन्दनादि वर्ग)

श्रीवासो मधुरस्तिक्तः स्निग्धोष्णस्तुवरः सरः।
पित्तलो वातमूर्द्धाक्षिस्वररुक्कफपीनसान् ।।1316।।
रक्षोघ्नः स्वेददौर्गन्ध्ययूकाकण्डूव्रणान् जयेत् ।
(कै.नि., ओषधि वर्ग)

श्रीवेष्टः कटुतिक्तश्च कषायः श्लेष्मपित्तजित्।
योनिदोषरुजाजीर्णव्रणध्मानदोषजित् ।।151।।
(रा.नि., चन्दनादि वर्ग)

श्रीवासो मधुरस्तिक्तः स्निग्धोष्णस्तुवरः सरः ।।
पित्तलो वातमूर्द्धाक्षिस्वररोगकफापहः ।
रक्षोघ्नः स्वेददौर्गन्ध्ययूकाकण्डूव्रणप्रणुत् ।।47।।
(भा.प्र.नि., कर्पूरादि वर्ग)

सर्पगन्धा (मूलम्)

विषे---- एकसर गणे ।।84।।
(सु. क. 5)

मूषिकविषे---- ।।29।।
(सु. क. 7)

मानसरोगे--- अपराजितगणे।।47।।
(सु. उ. 60)

सर्पगन्धाऽतितिक्तोष्णा रूक्षा कटुविपाकिनी।
पित्तवृद्धिकरी रुच्या शूलप्रशमनी सरा।।
कफवातहरा निदाप्रदा हृदवसादिनी।
कामावसादिनी चैव हन्ति शूलज्वरकृमीन।।
अनिद्रां भूतमुन्मादमपस्मारं भ्रमं तथा।
अग्निमांद्यं विषं रक्तवाताधिक्यं व्यपोहति।।
(द्र.गु.वि.II, प्रो. प्रि. व्र. शर्मा)

विषघ्नी कटुतिक्तोष्णा मूत्रला मदनाशिनी।
कफवातव्रणहरी तन्त्रवेगप्रवर्त्तनी।।
योनिशूलज्वरहरी मलपाचनदीपनी। (स्व.)
(इंडि. मेडि. प्लॉट्स कोट्टाकल)

श्वेतपुनर्नवा (मूल)

पुनर्नवा (श्वेत-डल्हण) वरुणतर्कार्युरूबूकवत्सादनीबिल्वशाकप्रभृतीनि।
उष्णानि स्वादुतिक्तानि वातप्रशमनानिच।।254।।
[सु. सू. 46]

क्षौद्रेणाऽ खुविषे लिह्यात् श्वेतान्चापि पुनर्नवाम्।।24।।

अलर्क विषे-
श्वेतां पुनर्नवान्चास्य दद्याद्धत्तूरकायुताम्।।52।।
(सु. क. 7)

धवलपुनर्नवाजटया तण्डुलजलपीतया च पुष्यर्क्षे।
अपहरति विषधरविषोपद्रवं मासं संवत्सरं पुंसाम्।(चक्रदत्त)

यः पिबति पुष्यदिवसे जलपिष्टं सितपुनर्नवा मूलम्।
तत्सन्निधौ न वर्षं वृश्चिकभुजगाः प्रसर्पन्ति।।9।।
(राज मा. 29)

मूलं समं तण्डुलधावनेन प्रपेषितं श्वेतपुनर्नवायाः
पीतं भवेत् प्लीहविनाशहेतु पाठाजटा छिन्नरुहाजटा वा।।5।।
(राज मा.7)

सितपुनर्नवामूलं पीतञ्च गोसलिलेन निहन्ति।
शोथं सर्वसमुत्थमुदराणि च दुस्तराण्यचिरात्।।74।।
(वंगसेन, शोथ)

पुनर्नवायाः श्वेतायाः तैलं मूलेन् साधितम्।
वातकण्टकमाहन्यात् पादाभ्यंगेन मर्दनात्।।140।।
(वंगसेन, वातव्याधि)

सितवर्षाभूमूलं पयसा पीतञ्च पैत्तिकं जयति।
चातुर्थिकं (ज्वर) सुचिरजं ताम्बूलेनैव भक्षणादथवा।।580।।
(वंगसेन, ज्वर)

पुनर्नवा भवेदुष्णा तिक्ता रूक्षा कफापहा।
सशोफपाण्डुहृद्रोगकासोरःक्षतशूलनुत्।।265।।
[ध. नि., गुडूच्यादि वर्ग]

श्वेता पुननर्वा सोष्णा तिक्ता कफविषापहा।
कासहृद्रोगशूलास्रपाण्डुशोफानिलात्तिनुत्।।116।।
(रा.नि., पर्पटादि वर्ग)

पुनर्नवा श्वेतमूला शोथघ्नी दीर्घपत्रिका।
कटुकषायानुरसा पाण्डुघ्नी दीपनी परा।
शोफानिलगरश्लेष्महरी ब्रध्नोदरप्रणुत्।।231।।
[भा. प्र. नि., गुडूच्यादि वर्ग]

तैलपर्णः (पत्रम्)

हरिद्रुमो ज्वरहरः कीटमर्दश्च तिक्तकः।।
कफपित्तहरस्तिक्तः सुगन्धः पूतिनाशकः।

बलप्रदो रुचिकरी क्षताक्षेपविनाशजः।
जीर्णुर्बाष्पविषमज्वरहत् कामशूलनुत्।।
तैलं दुर्गन्धहरणं पत्रं सर्वरूजापहम्।
सम्पकदिस्य नश्यन्ति सर्वेरोगा न संशय।।
[आ. वि.]

तैलपर्णः लघुः स्निग्धः कटुतिक्तकषायकः।
वीर्योष्णः कफवातघ्नः पूतिजन्तुहरः स्मृतः।।
जीर्णकासे प्रतिश्याये स्वरभेदे च शस्यते।
[द्र.गु.वि., प्रो. पी. वी. शर्मा]

तैलपर्णः कटुस्तिक्तः कषायोष्णो लघुः स्मृतः।
दीपनः पाचनो हृद्यो मूत्रलो ज्वरनाशकः।।
जीर्णकासशिरः शूलकफदौर्गन्ध्यनाशनः।
पूयमेहक्षयश्वासतन्तुकृमिविकारनुत्।।
अग्निमान्द्य प्रतिश्यायवस्तिरोग प्रवाहिकाः।
स्वरभेदयकृत्प्लीहृद्गदांश्च विनाशयेत्।।स्व.।।
[इंडियन मेडीसीनल प्लांट्स, कोट्टाकल]

तिनिशः (का. म.)

सालसाराजकर्ण- तिनिशचन्दन कालीयकं चेति ।।8।।
सालसारादिरित्येष गणः कुष्ठविनाशनः
मेहपाण्ड्वामयहरः कफमेदोविशोषणः।।9।।
(सु. सू. 38)

श्वित्रकुष्ठकफच्छेदी व्रणघ्नः कृमिनाशनः।
पाण्डुरोगप्रेमहघ्नो तिनिशो मेदुरो हिमः।।
(म.नि.)

तिनिशस्तुवरो हन्ति श्वित्रकुष्ठव्रणकुमीन्।
प्रमेहपाण्डुतादाहाबलासं पित्तमेदसी।।815।।
(कै. नि. ओषधि वर्ग)

तिनिशस्तु कषायोष्णः कफरक्तातिसारजित्।
ग्राहको दाहजननो वातामयहरः परः।।25।।
(रा.नि., प्रभद्रादिवर्ग)

तिनिशः श्लेष्मपित्तास्रमेदः कुष्ठप्रमेहजित्।
तुवरः श्वित्रदाहघ्नो व्रणपाण्डुकृमिप्रणुत।।76।।
(भा.प्र.नि., वटादि वर्ग)

तिनिशस्तुवरश्चोष्णो ग्राहकः कफवातहा।
रक्तातिसारं कुष्ठं च मेहमेदं व्रणं तथा।।
रक्तदोषं च पित्तं च श्वित्रकुष्ठं कृमींस्तथा।
दाहं च पाण्डुरोगं च नाशयेदिति कीर्त्तितः।।
(नि.र.)

तिन्तिडीकम् (फलम्)

वातापहं तिन्तिडीकमामं पित्तबलासकृत्।
ग्राह्युष्णं दीपनं रुच्यं संपक्वं कफवातनुत्।।159।।
[सु. सू. 46]

तिन्तिडीकं समीरघ्नमाममुष्णं परं गुरु।
तत्पक्वं लघु संग्राही ग्रहणीकफवातजित्।।88।।
[म. नि. वर्ग 6]

तिन्तिडीकः (सं. व.)

वातापहं तिन्तिडीकमांमं पित्तबलासकृत्।
ग्राह्युष्णं दीपनं रुच्यं संपक्वं कफवातनुत्।।159।।
[सु. सू. 46]

तिन्तिडीकं समीरघ्नमाममुष्णं परं गुरु।
तत्पक्वं लघु संग्राही ग्रहणीकफवातजित्।।88।।
[म. नि. वर्ग 6]

त्रपुषम्(बीजम)

त्रपुसैर्वारूकं स्वादु गुरू विष्टम्भि शीतलम्।।110।।
मुखप्रियं च रूक्षं च मूत्रलं त्रपुसं त्वति।
(च. सू. 27)

किराततिक्तकातिमुक्तक- - - - त्रपुसैर्वारूक- - - - तैलानि मधुराणि मधुरविपाकानि वातपित्तप्रशमनानि शीतवीर्याण्यभिष्यन्दीनि सृष्टमूत्राण्यंग्निसादनानि चेति ।।120।।
(सु. सू. 45)

त्रपुसैर्वारूकं - - - - - - - - - - - - प्रभृतीनि।।216।।
स्वादु तिक्तरसान्याहुः कफवातकरणि च।।
सृष्टमूत्रपुरीषाणि रक्तपित्तहराणि च ।।217।।
(सु. सू. 46)

त्रपुसं कटुकं तिक्तं - - - - - - - - - - - - - - - ।।172।।
- - - त्रपुसं छर्दिहृत् प्रोक्तं मूत्रबस्तिविशोधनम्।
(ध. नि., गुडूच्यादि वर्ग)

त्रपुसं मूत्रलं शीतं रूक्षं पित्ताश्मकृच्छ्रनुत्।
तत्पक्वमुष्णमम्लं स्यात्पित्तलं कफवातजित्।।13।।
(म.पा.नि., शाकवर्ग)

तिक्तं स्वादु हिमं रूक्षं मूत्रकृच्छ्रास्रपित्तजित्।
तत् पाण्डु कफकृज्जीर्णमम्लं वातकफापहम्।।549।।
(कै. नि., ओषधि वर्ग)

स्यात् त्रपुसीफलं रूच्यं मधुरं शिशिरं गुरू।
भ्रमपित्तविदाहार्त्तिवान्तिहृद्बहुमूत्रदम्।।206।।
(रा.नि., मूलकादि वर्ग)

तद्बीजं मूत्रलं शीतं रूक्षं पित्तास्त्रकृच्छ्रजित्।।48।।
(भा.प्र.नि., आम्रादि फलवर्ग)

कषायो - - - - - अशेषमूत्रकृच्छ्रजित्।
पीतञ्च त्रपुसबीजं सतिलाजयपयोन्वितम्।।40।।
(भा.प्र.चि.)

त्रपुसबीजं पयसा पीतं वा नारिकेरजं कुसुमम्।
विण्मूत्रशर्करायां भवति सुखी कतिपयैर्दिवसैः।।50।।
(भा.प्र.चि.)

तूनी (काण्डत्वक्)

अम्बष्ठाधातकी . . . . . नन्दीवृक्षाः पद्मनकेशराणि चेति।।46।।
गणौ प्रियंग्वम्बष्ठादी पक्वातीसारनाशनौ ।
सन्धानीयौ हितौपित्ते व्रणानां चापिरोपणौ ।।47।।
(सु.सू. 38)

करीरं कुलकं नन्दी . . . . . शकुलादनी ।।77।।
कटिल्लं . . . . . कर्कशम् ।
तिक्तं पाके कटु ग्राहि वातलं कफपित्तजित् ।। 78।।
(अ.ह.सू. 6)

न्यग्रोध्र . . . . नन्दी कोलीकदम्ब . . . . मधूकम् ।।41।।
न्यग्रोधादिर्गणोव्रण्यः संग्राही भग्नसाधनः ।
मेदः पित्तास्रतृड्.दाहयोनिरोगनिबर्हणः ।।42।।
(अ.ह.सू. 15)

वन्दा(-क :) (सं. व. , फलम्, पुष्पम्, मूलम्, पत्रम् , काण्ड)

जीवक----- मेदा वृद्धरुहा (पाठा. वृक्षरुहा) जटिला------- इति दशेमानि शुक्रजननानि भवन्ति।।19।।

(च. सू. 4)

शटी----- बृहतीवृक्षरुहाभया------- इति दशेमानि हिक्कानिग्रहणानि भवन्ति।।30।।

(च. सू. 4)

वृक्षादनी------ इत्कटमूलानीति दशेमानि मूत्रविरेचनीयानि भवन्ति।।35।।

(च. सू. 4)

संहर्षा शतावरी------- मधुरस्कन्धः।।146।।

(च. वि. 8)

वीरतरु ----- दर्भवृक्षादनीगुन्द्रा------ श्वंदष्ट्रा चेति।।12।।
वीरतर्वादिरित्येष गणो वातविकारनुत्।
अश्मरीशर्करामूत्रकृच्छ्राघातरुजापहः।।13।।

(सु. सू. 38)

वृक्षादनी वातहरा---- 11252।।

(सु. सू. 46)

अर्शे- कुटजबन्दाकमूलकल्कं वा तक्रेण।।13।।

(सु. चि. 6)

पिण्डारकतरु संभवबन्दाकशिफा जयति सर्पिषा पीता।
श्लीपदमुग्रं नियतं बद्धा सूत्रेण जंघायाम् ।।4।।

(वृन्दमाधव, 42)

वन्दाकः शीतलः पाके ग्राही स्याद्व्रणरोपणः।।86।।

[ध. नि., करवीरादि वर्ग]

वृक्षादनी हिमा तिक्ता कषाया मधुरा रसे।
मांगल्या कफवातस्त्रव्रणरक्षोग्रहापहा।।855।।

[कै. नि., ओषधि वर्ग]

वन्दाकः तिक्तशिशिरः कफापित्तश्रमापहः।
वश्यादि सिद्धिदो वृष्यः कषायश्च रसायनः।।70।।
[रा. नि., पर्पटादि वर्ग]

वन्दाकः स्याद्धिमस्तिक्तः कषायो मधुरो रसे।
मंगल्यः कफपित्तास्रक्षोव्रणविषापहा।।261।।
[भा.प्र.नि., गुडूच्यादि वर्ग]

बन्दाकमौदुम्बरमादरेण वन्ध्यांगना पुष्पविशुद्धिवारे।
पूर्वं विरिक्ता लभते कुमारं छागस्य दुग्धेन सह प्रपीय।।
(वैद्य मनोरमा)

वन्दाको बिल्वभवस्तक्रेण घृतेन वा प्रगे पीतः।
विषमज्वरस्य विकृतिं जयेन्निःशेषमतिविषमाम्।।19।।
(वैद्य मनोरमा, 1)

वन्यजीरकः (फलम्)

सोमराज्यां तु सुरसा विषभूतगरापहा ।।659।।
कटुका जंतुहंत्री च बालानां च हितावहा ।
(सो.नि. I)

आरण्यजीरकं चोष्णं तुवरं कटुकं मतम् ।
स्तंभं वातकफं चैव व्रणं चैव विनाशयेत् ।।
(नि.र.)

सोमराजी कटुस्तिक्ता कृमिकुष्ठकफापहा।
तीक्ष्णोष्णा विषकण्डूतिज्वरप्रशमनी च सा ।। स्व.।।
(प्रो.प्रि.व्र.शर्मा, द्र.गु.वि. II)

आरण्यजीरकं तिक्तं तीक्ष्णोष्णं कटुकं लघु ।
कषायं श्वासकासघ्नं हिक्काज्वरविनाशनम् ।।
कुष्ठकण्डूश्वित्रशोफवातश्लेष्मापहं परम् ।
मूत्रलं दीपनं नेत्र्यं गुल्मशूलकृमिप्रणुत् ।। स्व.।।
(इं. मे. प्लॅ, कोट्टाक्कल, V, पृ.क्र. 355)

विदारीकन्द (कन्द)

मधुरो बृंहणो वृष्यः शीतः स्वयेऽि तिमूत्रलः ।
विदारी कन्दो बल्यस्तु वातपित्तहरश्च सः ।।300।।
(सु.स.,सू. 46)

विदारी शिशिरा स्वादुर्गुरूः स्निग्धा समीरजित् ।
पित्तास्रजित्तथा बल्या वृष्याचैव प्रकीर्तिता ।।144।।
(ध.नि., गुडूच्यादि वर्ग)

विदारी मधुरा शीता गुरूः स्निग्धाऽ स्रपित्तजित्।
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(रा.नि, मूलकादि वर्ग)

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(भा.प्र.नि., गुडूच्यादि वर्ग)

विरला (काण्ड त्वक्)

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(च. सू. 4)

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(च. सू. 25)

तिन्दुक (फलं) कफपित्तघ्नं कषायमधुरं लघु ।।143।।
(च. सू. 27)

अतिदग्धे-
तिन्दुकी त्वक्कपालैर्वा घृतमिश्रैः प्रलेपयेत्।।26।।
(सु. सू. 12)

न्यग्रोधोदुम्बराश्वत्थ--------- कदम्बबदरीतिन्दुकी
---------- नन्दीवृक्षश्चेति ।।48।।
न्यग्रोधादिर्गणो व्रण्यः संग्राही भग्नसाधकः।
रक्तपित्तहरो दाहमेदोघ्नो योनिदोषहृत्।।49।।
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विपाके गुरु संपक्वं मधुरं कफपित्तजित्।।68।।
(सु. सू. 46)

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हारीत सं. 3/3

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(अ.ह.सू. 10)

मदन- - - - - विशाला - -- - छर्दनानि।।1।।
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(ध.नि., गुडूच्यादि वर्ग)

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(भा.प्र.नि., गुडूच्यादि वर्ग)

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English equivalents of Ayurvedic clinical conditions and diseases

Sub Class A01D – Characterised by Rogas (Disease)

Group 1/00- Diseases of Eye

SubGroup

1/01-	Abhisyanda	Conjunctivitis(HR)
1/02-	Adhimantha	Glaucoma(MN)
1/03-	Ajkajata	Iris-prolapse or Anterior staphyloma
1/04-	Aklinnavartma	Ankyloblepharon or conjunctivitis
1/05-	Aksipakatyaya	Serpiginous ulcer(Cornea), Hypopyon ulcer, Panopthalmitis
1/06-	Alaji	Internal hordeolum/stye/lacrimal abscess/ Phylctenular keratitis
1/07-	Anjananamika	Stye, Style(HR) / External hordeolum/stye
1/08-	Arbuda(Vartmagata)	Lid tumour
1/09-	Arjuna	Subconjunctival Haemorrhage
1/10-	Arma	Pterygium(HR)
1/11-	Arsovartma	A form of Trachoma
1/12-	Asopha aksi paka	Uveitis or endopthalamitis
1/13-	Avrana sukla	Adherent leucoma(HR)/Corneal opacity
1/14-	Bahala vartma	Multiple chalazion
1/15-	Bisavartma	Porous condition of sebacious gland / xanthelasma
1/16-	Dhumadarsi	Smoky vision
1/17-	Divandhya	Day blindness(HR)
1/18-	Dristi daurbalya	Weak eye-sight(HR)
1/19-	Hatadhimantha	Atrophic bulbi/Phthisis bulbi due to acute congestive glaucoma
1/20-	Hrasvajadya	Retinitis pigmentosa/Choroiditis
1/21-	Kaphaja Abhisyanda	Acute Mucopurulent conjunctivitis or Allergic conjunctivitis
1/22-	Kaphaja Adhimantha	Chronic glaucoma
1/23-	Klinna vartma	A stage of Bleppharitis/conjunctivitis
1/24-	Klistavartma	Allergic conjunctivitis
1/25-	Krcchrunmilana	Blepharospasm or difficulty in opening the eyes
1/26-	Krimi granthi(Netra)	Blepharitis
1/27-	Kukunaka	Ophthalmia neonatorum or Acute conjunctivitis of infants
1/28-	Kukunaka	Conjunctivitis(HR)
1/29-	Kumbhikapadika	Cyst of Zeus gland
1/30-	Kuncana	Blepharospasm
1/31-	Lagana	Chalazion, Meibumiah cyst
1/32-	Linganasa	Cataract
1/33-	Naktandhya	Night blindness(HR)
1/34-	Netranadi	Chronic dacrocystitis or epiphora

1/35-	Netraroga	Diseases of the eye(HR)
1/36-	Netrasrava	Chronic dacrocystitis or epiphora
1/37-	Nimesa	Blinking of the eye lid
1/38-	Paittika Adhimantha	Acute congestive glaucoma
1/39-	Paittika Abhisyanda	Acute catarrhal conjunctivitis
1/40-	Paksmakopa	Trichiasis, Entropion
1/41-	Paksmasata	Falling of eye lashes(HR)/Madarosis
1/42-	Parvani	Phlyctenular conjunctivitis
1/43-	Pilla	Ankyloblepharon/symplepharon/ Blepharophimosis
1/44-	Pistaka	Pinguecula
1/45-	Pittavidagadhadrsti	Day blindness, central cataract
1/46-	Pothaki	Trachoma(HR)
1/47-	Puyalasa	Acute dacrocystitis and lacrimal abscess
1/48-	Raktaja Adhimantha	Congestive glaucoma, secondary glaucoma/ Iridocyclitis
1/49-	Raktaja Abhisyanda	Acute mucopurulent conjunctivitis
1/50-	Sasopha Aksipaka	Uveitis or Panophthalmitis
1/51-	Savrana sukla	Corneal ulcer/Ulcerative Keratitis/Adherent leucoma
1/52-	Sirajala	Scleritis, Haemangioma
1/53-	Sirapidika	Episcleritis
1/54-	Sirotpata	Allergic conjunctivitis, Angioneurotic odema, Episcleritis
1/55-	Sirotpraharsa	Allergic hyperaemia of the eye ball/Acute orbital cellulitis
1/56-	Slesmavidagdhadrsti	Night blindness, retinitis pigmentosa
1/57-	Suktika	Xerophthalmia
1/58-	Suskaksipaka	Xerophthalmia/Trachoma/Uveitis/ Ophthalmoplegia
1/59-	Suskarsa	Polyp of the palpebral conjunctiva
1/60-	Syavavartma	Inflammatory condition of the eye lid
1/61-	Timira	Cataract(HR)
1/62-	Upnaha	Lacrimal cyst or mucocele
1/63-	Utklistavartma	Allergic conjunctivitis
1/64-	Utsangini	Chalazion or Meibomian cyst in lower lid
1/65-	Vartamarsa	A form of Trachoma
1/66-	Vartmakardama	Secondary infection after allergic conjunctivitis
1/67-	Vartmasarkara	Lithiasis conjunctivae (A form of trachoma)
1/68-	Vartmavabandha	Imperfect closure of the lid following inflammatory swelling / Angio-neurotic oedma.
1/69-	Vata paryaya	Ocular pain due to chronic glaucoma or Trigeminal Neuralgia
1/70-	Vatahata vartma	Lagophthalmos/Opthalmoplegia
1/71-	Vataja Abhisyanda	Sub-acute catarrhal conjunctivitis
1/72-	Vatika Adhimantha	Acute congestive glaucoma

2/00- Diseases of Ear

2/01-	Kaphaja karna sula	Chronic suppurative otitis media/chronic otitis externa
2/02-	Karna roga	Ear diseases(HR)
2/03-	Karna srava	Otorrohea/ chronic suppurative otitis media/ otitis externa

2/04-	Karna samsrava	Otorrohea/ chronic suppurative otitis media/ otitis externa
2/05-	Karna paka	Otitis externa or furuncle in the external ear/Sepsis in the ear
2/06-	Karna gutha	Cerumen or wax in the ear
2/07-	Karna sula	Ear-ache/Otalgia(HR)
2/08-	Karna puya	Otitis media
2/09-	Karna nada	Tinnitus(MN)Tinnitus Aurium
2/10-	Karna ksveda	Tinnitus(HR)Tinnitus Aurium
2/11-	Karna vidradhi	Acute suppurative otitis media or acute serous otitis media
2/12-	Karna pratinah	Perforation of tympanic membrane/catarrh of eustachian tube / Acute obstruction of the eustachian tube
2/13-	Karna kandu	Itching sensation in the ear/ pruritis
2/14-	Krmi karna	Maggots in the ear
2/15-	Kucikarnaka	Congenital defermity of the lobule of pinna
2/16-	Palisosa	Atrophy of the pinna
2/17-	Pattika karna sula	Otitis externa/acute serous otitis media
2/18-	Putikarna	Chronic suppurative otitis media/attic suppuration
2/19-	Raktaja karna sula	Acute traumatic otitis
2/20-	Sannipataja karnasula	Acute or chronic suppurative otitis media
2/21-	Vadhirya	Deafness(HR)
2/22-	Vatika karna sula	Otitis externa/acute serous otitis media
2/23-	Vidarika	Dermatitis or eczema of the external ear

3/00- Diseases of Nose

3/01-	Bhransathu	Hypertrophic or chronic rhinitis/frontal sinusitis
3/02-	Dipta	Acute catarrhal condition of nasal mucus membrane
3/03-	Kaphaja Pratisyaya	Rhinitis with Kapha predominence
3/04-	Ksvathu	Allergic rhinitis/vasomotor rhinorrhoea
3/05-	Nasa sosa	Rhinitis sicca/atrophic rhinitis
3/06-	Nasanaha	Deviation of the septum/nasal obstruction
3/07-	Nasagata Arbuda	Nasal Tumour
3/08-	Nasapaka	Nasal furunculosis, fissure in nares / Herpes or dermatitis of the vestibule,
3/09-	Nasaparisosa	Rhinitis sicca/atrophic rhinitis
3/10-	Nasaparisrava	Acute or chronic rhinorrhoea
3/11-	Nasapratinaha	Deviation of the septum/nasal obstruction
3/12-	Nasarsa	Nasal polyps
3/13-	Nasasrava	Acute or chronic rhinorrhoea
3/14-	Pratisyaya	Rhinitis
3/15-	Putakaroga	Chronic rhinitis
3/16-	Putinasa	Artophic Rhinitis/Ozena
3/17-	Putinasya	Artophic Rhinitis/Ozena
3/18-	Puyarakta	Hypertrophic or chronic rhinitis/frontal sinusitis
3/19-	Nasagataroga	Naso pharyngeal diseases
3/20-	Pinasa	Ozaena, sinusitis(HR)

3/21-	Suryavarta	Chronic sinusitis(HR)
3/22-	Svayathu	Vasomotor rhinorrhoea
3/23-	Raktaja Pratisyaya	Acute influenza
3/24-	Paittika Pratisyaya	Acute Rhinitis
3/25-	Tridosaja Pratisyaya	Allergic rhinitis/vasomotor rhinorrhoea
3/26-	Slesmic Siroroga	Catarrhal / sinusitis
3/27-	Nasagata raktapitta	Epistaxis
3/28-	Kaphaja Pratisyaya	Hypertrophic rhinitis/chronic rhinitis
3/29-	Nasagata Arbuda	Nasal tumour
3/30-	Vatika Pratisyaya	Sub-acute Rhinitis

4/00- Diseases of Throat

4/01-	Abhighataja Ostha prakopa	Hare lip
4/02-	Adhijihvika	Ranula or cystic swelling
4/03-	Adhrusa	Palatitris or tonsilitis
4/04-	Alasa	Sublingual infected dermal cyst / Sublingual abscess or cancer
4/05-	Ostha roga	Disease of lips
4/06-	Arbuda (Talugata)	Epithilioma
4/07-	Balasa granthi	Pinguecula
4/08-	Ekavrnda	A Tumour in the throat
4/09-	Galarbuda	Benign throat tumour
4/10-	Galaudha	Retropharyngeal abscess
4/11-	Galaugha	Tumour in the throat(HR)
4/12-	Galavidradhi	Retropharyngeal or peritonsilar abscess
4/13-	Galayu	Tonsillitis(HR)
4/14-	Galsundika	Elongated uvula or uvulitis
4/15-	Gilayu	Benign growth or cyst
4/16-	Jihva kantaka	Leukoplakia
4/17-	Jihvagataroga	Disease related to tounge
4/18-	Jihvaroga	Diseases of tongue
4/19-	Jihvastambha	Paralysis of tongue(MN)
4/20-	Jalarbuda	Cyst in the lips
4/21-	Kacchapa	Adenoma of palate
4/22-	Kanthagat roga	Diseases of pharynx and larynx
4/23-	Kantha-roga	Diseases of throat(HR)
4/24-	Kanthasaluka	Adenoid or nasopharyngeal tonsil
4/25-	Kanthasundi	Elongated uvula or uvulitis
4/26-	Kaphaja Osthaprakopa	Herpes labialis
4/27-	Kaphaja jhvakantaka	Chronic Leucoplakia/ Superficial Glossitis
4/28-	Kaphaja Mukhapaka	Subacute or chronic Stomatitis
4/29-	Khandaustha Osthaprakopa	Hare lip
4/30-	Ksataja Osthaprakopa	Hare lip
4/31-	Mahasausira	Gangrinous stomatitis/Cancrum oris

4/32-	Mamsa samghata	Adenoma or fibroma of palate
4/33-	Mamsadusta Osthaprkopa	Epithelioma of lips
4/34-	Mamsatana	Cellulitis or cancer of the throat
4/35-	Mansasamghata	Fibroma or Adenoma
4/36-	Medoja Osthaprakopa	Macrochelia or herpes labialis, hypertrophy of the lips
4/37-	Mukha roga	Diseases of the mouth(HR)
4/38-	Mukhapaka	Stomatitis(HR)
4/39-	Paittika Jihvakantaka	Acute superficial Glossitis/Red glazed tongue
4/40-	Paittika Osthaprakopa	Herpes labialis or simplex or aphthous ulcer
4/41-	Pandara	Cancrum oris/Gangrenous stomatitis
4/42-	Pasana gardaha	Mumps / parotitis
4/43-	Pittaja Mukhapaka	Acute Stomatitis
4/44-	Raktaja Osthaprakopa	Lip-granuloma
4/45-	Rohini(VPKRT)	Diphtheria
4/46-	Sannipatika Osthaprakopa	Aphthous ulcer or carcinoma
4/47-	Sarvasara Mukhapaka	Stomatitis
4/48-	Slesmic Jihvakantaka	Chronic Leucoplakia/ Superficial Glossitis
4/49-	Svarabheda	Hoarseness(HR)
4/50-	Svaraghna	Paralysis of the larynx/ a stage of Asthma / Tuberculosis or cancer of the Larynx
4/51-	Talugat roga	Diseases of palate
4/52-	Talupaka	Palatitis or ulceration of the palate
4/53-	Talupata	Descended palate
4/54-	Talupupputa	Epulis or fibroma or cystic swelling
4/55-	Talusosa	Constitutional disease of cleft palate
4/56-	Tundikeri	Enlarged tonsil/ peritonsilar abscess
4/57-	Tundikeri	Elongated tonsils/Uvulitis(T)
4/58-	Upjihvika	Ranula or cystic swelling
4/59-	Valaya	Benign or malignant tumour in the throat
4/60-	Vataja Mukhapaka	Stomatitis with vata predominence
4/61-	Vatik Jihvakantaka	Chronic Glossitis
4/62-	Vatika Austhaprakopa	Cracked lips/Cheilosis
4/63-	Vidari	Retropharyngeal abscess(after bursting) / Gangrenous stomatitis, Retropharyngeal abscess(after bursting)
4/64-	Vrnda	Tumour of the throat / Pharyngitis

5/00- Dental Diseases

5/01-	Adhidanta	Extra tooth
5/02-	Adhimansa	Impacted wisdom tooth
5/03-	Bhranjanaka	Cracked or fissured tooth
5/04-	Dalana	Toothache/Odontina/cracked tooth
5/05-	Danta chala	Loose tooth
5/06-	Danta vaidarbha	Allergic gums

5/07-	Danta vesta	Pyorrhoea alveolaris(HR)
5/08-	Dantagata roga	Diseases of teeth/ Dental diseases(T)
5/09-	Dantaharsa	Odonitis due to exposed nerve filament, carious tooth/attrition Sensitive tooth(T)/Odontitis(MN)
5/10-	Dantamulagataroga	Disease of gums and toothroots
5/11-	Dantanadi	Sinuses of gums / Aleolar abscess
5/12-	Dantapupputa	Gum boil(HR)
5/13-	Dantapupputaka	Gingivitis, Gumboil, alveolar or apical abscess
5/14-	Dantasarkara	Tartar(MN)
5/15-	Dantavesta	Pyorrhoea alveolaris(HR)
5/16-	Dantavidradhi	Alveolar abscess
5/17-	Dantasula	Toothache
5/18-	Kapalika	Enamel separation
5/19-	Karala	Ill formed tooth
5/20-	Khalivardhani	Wisdom tooth(HR)
5/21-	Krmi danta	Carious tooth/dental caries
5/22-	Mahasausira	Gangrenous stomatitis
5/23-	Sausira	Apical abscess or chronic gingivitis / Gingivitis(HR)
5/24-	Sitada	Spongy gums/bleeding gums
5/25-	Syavadanta	Black tooth
5/26-	Vardhana	Extra tooth

6/00 Skin diseases

6/01-	Alsaka (Kshudra roga)	Lohobiesotich (Skin disease)
6/02-	Arunsika	Seborrhea (MN), ptyriasis capitisis Frunculosis or boils in scalp (HR)
6/03-	Agneya visarpa	Erysipelas vesiculosum
6/04-	Agnidagdha	Burns(HR),Thermal burn
6/05-	Ahiputana	Erythema, napkin rash(MN)
6/06-	Carmakustha	Xerodermia pigmentosa
6/07-	Carmaroga	Diseases of skin (HR)
6/08-	Cippa & kunakha	Onychia(HR)
6/09-	Carmadala	Excoriation
6/10-	Dadru	Ring worm (HR)
6/11-	Dagdha	Thermal or chemical injury
6/12-	Dandaka jvara	Dengue fever(MN)
6/13-	Dandapatanaka	Plenosthotonus(MN)
6/14-	Dhumopahat	Asphyxiation(24)
6/15-	Ekakustha	Erythrodersias
6/16-	Granthi visarpa	Erysiplas Postulosum
6/17-	Granthika jvara	Plague(HR)
6/18-	Gandalaji	Cellulitis of the Cheek
6/19-	Gandroga	Cellulitis of the Cheek
6/20-	Indralupta	Baldness

6/21-	Jatumani	Congenital mole
6/22-	Kacchu	Scabies, Itch(8)
6/23-	Kadara	Corn(MN)
6/24-	Kala jvara	Kalazar(MN)
6/25-	Kandu	Itching(HR)
6/26-	Khalitya	Alopecia
6/27-	Kitibha	Psoriasis
6/28-	Kotha	A kind of skin disease with large round spots (ringworm / impetigo)/Erythema
6/29-	Ksata	Lacerated wound
6/30-	Kunaka	Onychogryphosis
6/31-	Kustha	Leprosy/Skin disease(HR)
6/32-	Masaka	Elevated mole
6/33-	Medoja Granthi	Sebaceous cyst(MN)
6/34-	Nilika	Chloasma/melasmo/melanedermia
6/35-	Nyaccha	Capillary angiomata, naevi(11)
6/36-	Padadari	Chaffed soles(MN)Rhagades(MN)
6/37-	Padminikantaka	Pipilloma of the skin
6/38-	Palita	Premature grey hair / Cavities
6/39-	Pama	Eczema
6/40-	Panatyaya	Acute alcoholism
6/41-	Panavibhrama	Chronic alcoholism
6/42-	Sarkara(ksudra-roga)	Sebaccous horn(MN)
6/43-	Sataru	Erythemas
6/44-	Sita-varsa-anil dagdha	Frost bite(24)
6/45-	Sitapitta	Urticaria
6/46-	Svitra	Leucoderma/Vitiligo(T)
6/47-	Tilkalaka	Non elivated mole
6/48-	Usna-vatatapa dagdha	Heat stroke/Thermic fever(24)
6/49-	Daha	Burning sensation(HR)
6/50-	Vaipadika	Rhagades
6/51-	Vak-graha	Aphonia
6/52-	Vicarcika	Dry & weeping eczema(HR)
6/53-	Vidradhi	Abcess
6/54-	Vipadika	Cracks of skin (HR)
6/55-	Visphotaka	Eruptions(HR)
6/56-	Visarpa	Erysipelas
6/57-	Visarpa (Granthi)	Erysiplas postulosum
6/58-	Visarpa (Kardama)	Erysiplas gangrinosum
6/59-	Vrsana kacchu	Eczema of scrotum(MN)
6/60-	Vyanga	Chloasma of face
6/61-	Yuvana pidika	Acne vulgaris

7/00 Gastrointestinal diseases

7/01-	Adhman	Tympanitis / Flatulance
7/02-	Antrapuchha Pradah (shotha)	Appendicitis
7/03-	Arochaka	Anorexia
7/04-	Agnimandya	Dyspepsia/Loss of appetite(HR)
7/05-	Ahara visa	Food poisoning(HR)
7/06-	Ajirna	Indigestion(HR)
7/07-	Alasaka	Cholera sicca(1),Lichen, Lohobiesoitch(MN)
7/08-	Amaja sula	Intestinal colic(HR)
7/09-	Amlapitta	Hyperacidity(HR)
7/10-	Amlathuysita	Chemosis(Allergic)
7/11-	Anaha	Constipation(HR)
7/12-	Annadravasula	Gastric ulcer/Acute gastritis(HR)
7/13-	Antrasothaja atisara	Diarrhoea due to colitis(HR)
7/14-	Atisara	Acute diarrhoea(HR)
7/15-	Balchardi	Infantile vomiting
7/16-	Balaudarasula	Infantile abdominal pain
7/17-	Balyakrita & pleha vrddhi	Enlargement of liver & spleen
7/18-	Bhasmaka	Polyphagia / excessive hunger
7/19-	Bala Atisara	Infantile diarrhoea(HR)
7/20-	Bala-Jvaratisara	Infantile Diarrhoea with fever(HR)
7/21-	Bala-Malavarodha	Infantile Constipation(HR)
7/22-	Bala-Pravahika	Infantile Dysentry(HR)
7/23-	Bala-Raktatisara	Infantile Dysentry(HR) with bleeding
7/24-	Bala-roga	Diseases of childern and infants(HR)
7/25-	Chardi	Vomiting / Emesis
7/26-	Grahani	Sprue / Malabsorption Syndrome
7/27-	Halimaka	Chronic obstructive jaundice/Chlorosis(MN)
7/28-	Hrllasa	Nausea
7/29-	Jalodara	Ascites(HR)
7/30-	Jvaratisara	Diarrhea with fever(HR)
7/31-	Kamala	Jaundice(HR)
7/32-	Kloma roga	Diseases of pancreas
7/33-	Krmi roga	Worm infestation(HR)
7/34-	Montharaka	a type of fever
7/35-	Paravahika	Dysentry/Gastro-entrocolitis(HR)
7/36-	Parikartika	Fissure-in-ano(MN)
7/37-	Parinamasula	Duodenal ulcer(MN)
7/38-	Pitasmarijanya sula	Biliary colic (HR)
7/39-	Plihodara	Enlargement of spleen(HR)
7/40-	Raktatisara	Blood dysentry(HR)
7/41-	Rasayana	Geriatrics (drugs of)
7/42-	Rohini(VPKRT)	Diphtheria
7/43-	Sanniruddha-guda	Stricture of the rectum
7/44-	Udara-roga	Diseases of the abdomen(HR)

7/45-	Udavarta	Abdominal diseases characterised by retention of afeces(7)
7/46-	Vamana	Vomiting/Emesius(HR)
7/47-	Vatodara	Enlargement of abdomen(due to vata)(4)
7/48-	Vibandha	Constipation
7/49-	Vida vighata	Rectovesical fistula
7/50-	Visucika	Gastro-enteritis/Cholera(MN)
7/51-	Vilambika	Food poisoning
7/52-	Yakrtdalyodara	Enlargement of liver(HR)

8/00 Neurological diseases(CNS)

8/01-	Acaita	Unconciousness
8/02-	Aksepaka	Convulsions(HR)
8/03-	Aksepaka jvara	Meningitis(MN)
8/04-	Anantavata Siroroga	Trigiminal neuralgia
8/05-	Apasmara	Epilepsy
8/06-	Ardhava bhedaka	Hemicrania / Migraine
8/07-	Ardita	Facial Paralysis
8/08-	Bahyayama	Opisthotonus
8/09-	Dandaptanaka	Plenosthotonus
8/10-	Gadagadsvarta	Dysarthria
8/11-	Grahabadha	Seizures
8/12-	Grdhrasi	Sciatica
8/13-	Hanustambha	Lock-jaw(HR)
8/14-	Kalayakhanja	Lytharism(MN)
8/15-	Kampavata	Paralysis agitans/Tremors(HR)/Paralysis agitans
8/16-	Kaphaja Siro-roga	Catarrhal Siro-roga/Sinusitis
8/17-	Katisula	Lumbago(HR)
8/18-	Khalli	Cramps of ankle,knee,hip,wrist,joints
8/19-	Khanja vata	Lameness/Monoplegia(HR)
8/20-	Krmija Siroroga	Headache due to hydatid cyst / Taenia solium Taenia Echinococcus
8/21-	Manyastambha	Torticolis(HR)
8/22-	Madatyaya	Alcoholism
8/23-	Minminata	Rhinophonia
8/24-	Mukata	Dysphonia
8/25-	Murccha	Syncope(HR)
8/26-	Panatyaya	Acute Alcoholism
8/27-	Panavibhrama	Chronic Alcoholism
8/28-	Paksaghata	Paralysis/Hemiplegia(HR)
8/29-	Pangu	Paraplegia(MN)
8/30-	Parsvasula	Pleurodyria and intercostal neuralgia
8/31-	Prstha sula	Lumbago
8/32-	Puyarakta	Hypertrophic or chronic rhinitis/frontal sinusitis
8/33-	Raktaj Siroroga	Headache due to hypertension / due to Alcohol

8/34-	Sanknak Siroroga	Lateral sinus thrombosis
8/35-	Saisaviva vata	Poliomyeletis(T)
8/36-	Sanyasa	Coma(HR)
8/37-	Sarvanga vata	Quadriplegia(MN)
8/38-	Sarvangata vata	Peripheral Polly neuritis(MN)
8/39-	Hanustambha	Tetanus(MN)
8/40-	Tandra	Drowsiness(T)
8/41-	Trika sula	Sacral pain
8/42-	Trsna	Polydipsia, excessive thirst(T)
8/43-	Tvakgata vata	Peripheral neuritis
8/44-	Unmada	Insanity(HR)/Psychosis(T)
8/45-	Urustambha	Stillness, loss of movement of leg
8/46-	Vata-Vyadhi	Diseases of nervous system(HR)
8/47-	Vatagraha	Aphonia
8/48-	Vatakantaka	Sprain of the ankle(HR)
8/49-	Vatika siroroga	Neuraligic headache
8/50-	Visvaci	Brachial neuralgia(HR)
8/51-	Yosa apasmara	Hysteria

9/00 Musculo - skeletal diseases

9/01-	Amavata	Rheumatism(HR)
9/02-	Asthi bhagna	Bone fracture
9/03-	Asthi Ksaya	Osteomyelitis
9/04-	Krostusirsa	Osteo-Arthritis of knee joint(HR)
9/05-	Phakka roga	Rickets
9/06-	Sandhibhagna	Dislocation of joint
9/07-	Vatarakta	Gout

10/00 Diseases of male genital organs

10/01-	Asthila	Enlarged prostate(HR)
10/02-	Avapatika	Paraphymosis
10/03-	Niruddhprakarsa	Phymosis
10/04-	Parivartika	Paraphymosis
10/05-	Sukadosa	Side effect of drugs applied externally on Penis for increasing its size
10/06-	Vrsana kacchu	Eczema of the scrotum
10/07-	Vrsana vrddhi	Inflammation and enlargement of scrotum(HR)

11/00 Respiratory diseases

11/01-	Ardra-kasa	Cough with expectoration(HR)
11/02-	Bala-kasa	Infantile cough(HR)

11/03-	Balasa	Benign or malignant tumour in the larynx or pharynx
11/04-	Bala Svasa	Infantile Asthama
11/05-	Chinna svasa	Chyne stroke respiration
11/06-	Dhumopahat	Asphyxiation
11/07-	Kasa	Cough/Bronchitis(HR)
11/08-	Jirna-kasa	Chronic cough(HR)
11/09-	Ksataja kasa	Cough due to internal chest injury
11/10-	Ksayaja kasa	Tubercular cough/cough due to weakness or emaciation
11/11-	Suska-kasa	Dry cough(HR)
11/12-	Kukkara kasa	Whooping cough(HR)
11/13-	Mahasvasa	Biot's breathing
11/14-	Rajayaksma	Tuberculosis, Pthysis(T)
11/15-	Rohini	Diptheria
11/16-	Svasa	Dyspnoea(HR)
11/17-	Svasnaka jvara	Pneumonia(HR)
11/18-	Tamaka svasa	Bronchial Asthma(T)
11/19-	Urah ksata	Pulmonary cavitation
11/20-	Urastoya	Pleurisy(HR)(Hydrothorax)(MN)
11/21-	Urdhva svasa	Stertorous breathing

12/00 Diseases related to Gynae and Obstt.

12/01-	Apatanaka	Post partum eclampsia
12/02-	Asrgdara	Metrorrhagia / Menorrhagia
12/03-	Bandhyathva	Infertility
12/04-	Bhaga-sotha	Vulvitis(HR)
12/05-	Garbhapata	Abortion / miscarriage
12/06-	Garbhasaya Bhransa	Pralapse of the Uterus
12/07-	Kastartava	Dysmenorrhoea
12/08-	Makkala Sula	After pains
12/09-	Mudagarbha	Foetal malpresentation
12/10-	Nastartava	Amenorrhoea
12/11-	Rajorodha	Amenorrhoea / oligomenorrhoea
12/12-	Rakta gulma	Uterine tumour
12/13-	Rakta pradara	Menorhagia / Metrorhagia
12/14-	Stanyadosa	Lactal disorder
12/15-	Stanya vidradhi	Abcess of the breast
12/16-	Striroga	Diseases of female genetal ograns
12/17-	Sutika jvara	Puerparial fever
12/18-	Sveta prada	Leucorrhoea
12/19-	Yoni daha	Vaginitis
12/20-	Yoni Kandu	Dryness and itching vagina

13/00 Diseases of Urinary system

13/01-	Haridrameha	Biluria
13/02-	Hastimeha	False incontinence of urine
13/03-	Iksumeha	Alimentary glycosuria(MN) / Glycosuria
13/04-	Kalameha	Melanuria
13/05-	Ksarameha	Alkaline urine
13/06-	Majjameha	Hemoglobinuria
13/07-	Hastimeha	Incontinence from overflow
13/08-	Raktameha	Haematuria
13/09-	Sukrameha	Spermaturia
13/10-	Udakameha	Polyuria, Diabetes inspidus
13/11-	Manjistha meha	Haemoglobinuriea
13/12-	Mutraghata	Retention of urine(HR)
13/13-	Mutraganthi	Enlarged prostate/tumour of the bladder
13/14-	Mutrajathara	Distended bladder/complete retention of urine
13/15-	Mutrakrcchra	Dysuria(HR)
13/16-	Mutraksaya	Anurea/suppression of urine
13/17-	Mutraroga	Diseases of the urinary system(HR)
13/18-	Mutrasada	Scanty urination
13/19-	Mutrasmari	Stone in Bladder/Urolythiasis/Calculus(HR)
13/20-	Mutrasukra	Spermaturia
13/21-	Mutratita	Incontinence of urine/partial retention of urine
13/22-	Mutrotsanga	Stricture of urethra
13/23-	Nilameha	Indican urea
13/24-	Pistameha	Chyluria
13/25-	Prameha / Meha	Urinary disorders(HR)/Poly urea(T)
13/26-	Pratyasthila	Recto vescular tumour
13/27-	Sandrameha	Phosphaturia(MN)
13/28-	Sikatameha	Lithuria
13/29-	Somaroga	Polyuria in female(Diabetes like disease)
13/30-	Surameha	Acetonuria(MN)
13/31-	Usnavata	Cystitis/urethritis
13/32-	Vasameha	Lipuria
13/33-	Vasti sula	Pain in urinary bladder
13/34-	Vastikundala	Atonic condition of bladder
13/35-	Vatabasti	Retention of urine
13/36-	Vatakundalika	Spasmodic stricture of urinay tract
13/37-	Vrkka roga	Diseases of the kidney (HR)
13/38-	Vrkka sula	Renal colic(HR)

14/00 Cardio vascular diseases

14/01-	Hrd-roga	Diseases of heart(HR)

14/02-	Hrdsula	Angina prectoris
14/03-	Krmija Hrdroga	Heart disease with infective pathology
14/04-	Paittika Hrdroga	Heart disease with Pitta predominence
14/05-	Pratamaka svasa	Cardiac Asthma(T)
14/06-	Vyanabala vaisamya	High blood pressure
14/07-	Siragranthi	Aneurysm(MN)
14/08-	Vatika Hrdroga	Heart disease with Vata predominence

15/00 Toxicological conditions

15/01-	Alarka visa	Rabies
15/02-	Dusivisa	Slow cumulative poisoning
15/03-	Jangama visa	Poisoning From animals and animal products(HR)
15/04-	Luta visa	Spider bite(HR)
15/05-	Maksika Dansa	Fly bite / Insect bite
15/06-	Madatyaya	Alcoholism(HR)
15/07-	Malla vikara	Arsenic poisoning(HR)
15/08-	Musaka visa	Rat bite poisoning(HR)
15/09-	Naga visa	Lead poisoning(HR)
15/10-	Panatyaya	Acute alcoholism
15/11-	Panavibhrama	Chronic alcoholism
15/12-	Parada vikara	Mercurial poisoning(HR)
15/13-	Parigarbhika	Pinning
15/14-	Sarpadansa	Snake bite(HR)
15/15-	Sthavara visa	Poisoning From vegetable products(HR)
15/16-	Visa	Poisoning(HR)
15/17-	Vrschika damsa visa	Scorpion sting poison(HR)

16/00 Endocrinal diseases

16/01-	Galaganda	Goitre
16/02-	Madhumeha	Diabetes mellitus(HR)
16/03-	Prameha pidika	Carbuncle(HR)
16/04-	Udakameha	Polyurea / Diabetes insipidus

17/00 Ano-Rectal diseases

17/01-	Arsa	Piles / Ano- rectal growths
17/02-	Bhagandara	Fistula-in-ano
17/03-	Guda Bhransa	Prolapse of rectum / prolapsus ani
17/04-	Guda roga	Disease of ano-rectum
17/05-	Parikartika	Fissure in ano
17/06-	Sanniruddha guda	Stricture of the rectum

18/00 Lymphatic diseases

18/01-	Apaci	Chronic lymphadenitis
18/02-	Gandamala	Scrofula
18/03-	Granthika jvara	Plague
18/04-	Slipada	Elephantiasis / Filariasis

19/00 Viral diseases

19/01-	Masurika	Small pox
19/02-	Romantika	Measles

20/00 Miscellaneous diseases

20/1 -	Abhinyasa Jvara	Meningitis
20/2 -	Antarayama	Opisthotonus
20/3 -	Antarika Vidradhi	Internal Abssess
20/4 -	Antra Vrddhi	Hernia
20/5 -	Antrika Jvara	Enteric Fever
20/6 -	Anyatovata	Referred pain in the eye / sphenoidal sinusitis
20/7 -	Arbuda	Tumour
20/8 -	Bala Jvara	Infantile Fever
20/9 -	Bhrama	Giddiness
20/10 -	Chinna Vrana	Excised Wound
20/11 -	Daha	Burning Sensation
20/12 -	Dandaka jvara	Dengue fever
20/13 -	Dhatuksaya	Neurasthenia, impairment of memory, impotency
20/14 -	Ghrsda Vrana	Abrasion
20/15 -	Granthi	Cyst
20/16 -	Gulma	Chronic Obstructive jaundice / Chlorosis
20/17 -	Hikka	Hiccough
20/18 -	Kala jvara	kalazar
20/19 -	Kaphaja javara	Fever with kapha predominance
20/20 -	Kaphodara	Enlargement of abdomen (due to kapha)
20/21 -	Krsata	Marasmus / Emaciation
20/22 -	Krmi roga	Worm infestatioon
20/23 -	Krmi janya sula	Pain due to worms
20/24 -	Ksayaja siroroga	Tuberculos headache
20/25 -	Medovrddhi	Obesity
20/26 -	Nava jvara	fever upto 7 days
20/27 -	Nadi	Sinus / Fistula / Pulse
20/28 -	Paittika Jvara	Fever with Pitta predominance
20/29 -	Pralepaka jvara	Hectic fever
20/30 -	Punaravartaka Jvara	Relapsing fever

20/31 -	Paittic Siro-roga	Bilious headache
20/32 -	Pandu	Anaemia
20/33 -	Raktapitta	Haemorrhagic diseases
20/34 -	Raktasrava	Bleeding
20/35 -	Sandhika Jvara	Rheumatic fever
20/36 -	Sannipatika jvara	Typhoid fever
20/37 -	Sirahsula	Headache
20/38 -	Snayuka roga	Dracontiasis, guinea worm
20/39 -	Sosa	Emaciation
20/40 -	Sotha	Oedema (HR)
20/41 -	Sula	Colic
20/42 -	Trsna	Polydipsia, Excessive thirst
20/43 -	Usna-vatatapadagdha	Heat stroke / thermic fever
20/44 -	Vata sleshmika jvara	Influenza
20/45 -	Vatika jvara	Fever with vata predominance
20/46 -	Visama jvara	Malaria / Inter mittent fever
20/47 -	Viddha vrana	Punctured wound
20/48 -	Vrana	Ulcer
20/49 -	Vrana Sotha	Inflammation
20/50-	Vataja Sula	Body ache
20/51-	Vata Vikar	Disease with Vata predominence
20/52	Kapha Vikar	Disease with Kapha predominence
20/53-	Pitta Vikar	Disease with Pitta predominence

A01E - Pharamaceutical Preparations Characterized by Action(Karm)

Groups

1/1 -	Adhamanakara	Causing flatulence
1/2 -	Adhobhagahara	Purgative
1/3 -	Agada	Anti-poison
1/4 -	Agnidaha	Cauterisation
1/5 -	Agnisadana	Depressing digestive fire
1/6 -	Agnivardhana	Promoting digestive fire
1/7 -	Aharya	Extractable
1/8 -	Amahara	Alleviating ama
1/9 -	Angamandaprasamana	Pacifying body ache
1/10 -	Anjana	Collyrium
1/11 -	Annadvesa	Aversion to food
1/12 -	Antah Parimarjana	Internal cleansing
1/13 -	Anulepa	After paste
1/14 -	Anupana	Intake of vehicle following drug
1/15 -	Anuvasana	Unduous enema

1/16 - Anuvasanopaga	Supporting unctuous enema
1/17 - Apakarsana	Extraction
1/18 - Apatarpana	Desaturation
1/19 - Arsoghna	Anti-haemorrhoid
1/20 - Asthapanopaga	Supporting non-unctuous enema
1/21 - Asukari	Immediately acting
1/22 - Asyotana	Application of drops
1/23 - Atapa	Sun
1/24 - Ausadha-Pana	Potion
1/25 - Avacuranana	Application as powder
1/26 - Avagaha	Dipping in water
1/27 - Avapidana	Hand Pressing
1/28 - Avarodhana	Confinement
1/29 - Avasadana	Depressing elevated wound
1/30 - Avrsya	Non-aphrodisiac
1/31 - Ayusya	Beneficial for life span
1/32 - Ayusyakara	Providing longevity
1/33 - Balya	Strength promoting
1/34 - Bhedaniya	Useful for breaking
1/35 - Brmhaniya	Beneficial for bulk promoting
1/36 - Cakshusya	Beneficial for eyes
1/37 - Chedana	Excision
1/38 - Chhardinigrahana	Anti-emetic
1/39 - Chhedaniya	Channel cleansing
1/40 - Cusana	Sucking
1/41 - Dahaprasamana	Pacifying bruning sensation
1/42 - Dantagharsana	Rubbing the teeth
1/43 - Dhavana	Running
1/44 - Dhupana	Fumigation
1/45 - Dipaniya	Useful for stimulating digestive fire
1/46 - Drstiprasadana	Clearing vision
1/47 - Gandanut	Alleviating enlarged gland
1/48 - Gandusa	Gargle
1/49 - Garbhapatana	Abortificient
1/50 - Gudalepa	Pasting on anus
1/51 - Gulmaghna	Destroying abdominal lump
1/52 - Harsana	Exhilaration
1/53 - Hikkanigrahana	Anti-hiccough
1/54 - Hrdya	Wholesome for heart
1/55 - Jivaniya	Vitaliser
1/56 - Jvarahara	Antipyretic
1/57 - Kamalahara	Alleviating Jaundice
1/58 - Kandughna	Anti-pruritic
1/59 - Kanthya	Beneficial for throat
1/60 - Karna Purana	Ear drop
1/61 - Karnasulaghna	Alleviating earache

1/62 -	Karnatarpana	Saturating the ears
1/63 -	Karsana	Emaciating
1/64 -	Karsana	Emaciating
1/65 -	Karsana	Reducing
1/66 -	Kasahara	Anti-tussive
1/67 -	Kavalagraha	Gargle
1/68 -	Kesya	Beneficial for hairs
1/69 -	Kilasaghna	Alleviating vitiligo
1/70 -	Kledana	Moistening
1/71 -	Klibata	Impotency
1/72 -	Kopana	Aggravating factor
1/73 -	Krimighna	Anthelmintic
1/74 -	Ksapana	Diminishing measure
1/75 -	Kusthaghna	Anti-dermal disease
1/76 -	Lekhaniya	Emaciating
1/77 -	Mutrasamgrahaniya	Anti-diuretic
1/78 -	Mutravirajaniya	Normalising colour of the urine
1/79 -	Mutravirecaniya	Diuretic
1/80 -	Nasya	Snuffing
1/81 -	Nirvapana	Extinguishing
1/82 -	Nispidana	Compression
1/83 -	Nivata	Wind-less
1/84 -	Ojovardhana	Energy providing
1/85 -	Osadhi-Dharana	Wearing herbs
1/86 -	Pacana	Ripening, Digestive Measures
1/87 -	Pana	Intake, potion
1/88 -	Pancakarma	Five (Evacuative) Measures
1/89 -	Pariseka	Sprinkling (Bath)
1/90 -	Patana	Incision
1/91 -	Pattabandhana	Cloth bandage
1/92 -	Picchabasti	Slimy enema
1/93 -	Picu	Swab, Tampon
1/94 -	Pindasveda	Bolus fomentation
1/95 -	Pracchadana	Covering
1/96 -	Pracchana	Scarifying
1/97 -	Pradeha	Unctuous paste
1/98 -	Praitmarsa	Nasal smearing
1/99 -	Prajasthapana	Foetus-Stabilising
1/100 -	Pralepa	Paste
1/101 -	Pratisarana	Local application
1/102 -	Purisasamgrahaniya	Anti-diarrhoeal
1/103 -	Purisavirajaniya	Normalising colour of the faces
1/104 -	Sadhaniya	Wholesome for union promoting
1/105 -	Samatarpana	Saturation
1/106 -	Samjnasthapana	Resuscitative
1/107 -	Samsodhana	Elimination

1/108 -	Santavana	Consoling
1/109 -	Saradaha	Cauterisation by (Iron) arrow
1/110 -	Satmya	Suitable
1/111 -	Secana	Sprinkling media
1/112 -	Seka	Sprinkling
1/113 -	Sirovasti	Head pouch
1/114 -	Sirovirecanopaga	Sub-errhine
1/115 -	Sirsavirecana	Head-evacuation
1/116 -	Sitaprasamana	Pacifying cold
1/117 -	Snana	Bath
1/118 -	Sneha Pana	Intake of uncting substance
1/119 -	Snehana	Unction
1/120 -	Snehopaga	Promoting unction
1/121 -	Sonitasthapana	Restoring normalcy of blood
1/122 -	Sosana	Absorption
1/123 -	Sothahara	Anti-inflammatory
1/124 -	Sramahara	Removing tiredness
1/125 -	Sramsana	Purgation
1/126 -	Sravana	Draining
1/127 -	Stambhana	Checking
1/128 -	Stanyajanana	Galactogogue
1/129 -	Stanyajsadhana	Galacto-depurant
1/130 -	Suci-todana	Pricking with needle
1/131 -	Sukrajanana	Semen-promoting
1/132 -	Sukrasodhana	Semen-depurant
1/133 -	Sulaprasamana	Relieving colics
1/134 -	Svasahara	Relieving dyspnoea
1/135 -	Sveda	Sudation
1/136 -	Svedana	Sudation (Fomentation)
1/137 -	Svedopaga	Co-diaphoretic
1/138 -	Tadana	Beating
1/139 -	Tadana	Pricking
1/140 -	Tarpana	Saturating
1/141 -	Tridosaghna	Pacifying three dosas
1/142 -	Trptighna	Alleviating feeling of satiety
1/143 -	Trsnanigrahana	Pacifying thirst
1/144 -	Tvacya	Beneficial for skin
1/145 -	Udardaprasamana	Pacifying allergic rashes
1/146 -	Udgharsana	Rubbing
1/147 -	Udvestana	Twisting
1/148 -	Unmadanasana	Alleviating insanity
1/149 -	Upacayakara	Increasing body weight
1/150 -	Upanaha	Poultice
1/151 -	Upavasa	Fasting
1/152 -	Upaya	Measure
1/153 -	Utkartana	Cutting

1/154 -	Utsadana	Elevating wound
1/155 -	Utsadana	Anointing
1/156 -	Vamanopaga	Sub-emetics
1/157 -	Varnya	Complexion promoting
1/158 -	Vayasthapana	Age-sustaining
1/159 -	Vedanasthapana	Analgesic
1/160 -	Vilayana	Compression
1/161 -	Vilekhana	Scraping
1/162 -	Vilepana	Posting
1/163 -	Virecana	Purgation
1/164 -	Virecanopaga	Sub-purgatives
1/165 -	Visaghna	Anti-poison
1/166 -	Vyayama	Exercise

Definitions

Rasa :

The term 'Rasa' refers to the direct and immediate actio of a drug when it comes in contact with the sense organ of taste i.e. tongue. The existence of different types of rasas (tastes) in different substances is attributed to their varying pancabhautika composition. The 'Rasa' of different substances have difinite relationship to the increase or decrease of Dosha and they have certain actions in the body. The drugs are selected keeping in view their(taste) and the predominate doshas in the body of the patient. There are six tupes of rasas (tastes) Katu(pungent) and kasaya(astringent) etc In other contexts the word rasa also applied to nutrition, to the end product of digestion of food, to the first dhatu(tissue)and to the principal metal drug Mercury etc.

1. Madura- Sweet	2. Amla- Sour	3. Lavana- salty
4. Katu(Pungent)	5. Tikta- Bitter	6. Kashaya- Astringent

Guna :

The term 'guna' refers to the physico-chemical and also the pharmacodynamic properties of drugs and dietary. Articles, which are responsible for the action of therespective drugs/diets in the body. A total of 41 gunas are discribed in Ayurveda but out of these twenty are more important.
These are

1. Guru- Heaviness	2. Laghu- Ligntness
3. Sheet- cold	4. Ushna-Hot
5. Snigdha- Unctuousness	6. Ruksha-Non-unctousness or dryness
7. Manda- Dullness	8. Teelshana- Sharpness
9. Sthira- Immobility	10. Chala- Mobility
11. Mrudu- Softness	12. Kathina- Hardness
13.Vishada- Clarity	14. Picchila- Sliminess
15. Shlakshana-Smoothness	16. Khara- Roughness
17. Shkshama- Fineness	18. Sthlla- Bulkiness
19. Sandra- Densness	20. Drava- fluidity

Vipaka :

Vipaka is the aciton of the drug after it has undergone digestive and assimilative transformations. The Vipaka of a drug overcomes the action of ' rasa' (taste) but is itself overcome by virya; vipaka refers to drug metabolism i.e. action of a drug through drug metabolism. The texts describe three kinds of drug metabolism viz. Katu (pungent) amla(sour) madhura(sweet) responsible in turn for increase in vata,pitta and kapha respectively.

Virya :

Virya refers to the potency of a drug/drug action such an action is not accounted for the rasa, guna or vipaka of a drug. According to the most commonly held view virya is of two kinds: usna(Literal meaning; hot) and sita (literal menaning: cold).

MONOGRAPHS PUBLISHED IN AYURVEDIC PHARMACOPOEIA OF INDIA PART-I, VOL.-I

1.	Ajagandha (Sd.)	*Cleome gynandra* Linn.
2.	Ajamoda (Frt.)	*Apium leptophyllum* (Pers.) F.V.M. ex Benth.
3.	Amalaki (Fr. Frt. Pulp)	*Emblica officinalis* Gaertn.
4.	Amalaki (Drd. Frt.)	*Emblica officinalis* Gaertn.
5.	Aragvadha (Frt. Pulp.)	*Cassia fistula* Linn.
6.	Arka (Rt.)	*Calotropis procera* (Ait.) R. Br.
7.	Arka (Lf.)	*Calotropis procera* (Ait.) R. Br.
8.	Asana (Ht.Wd.)	*Pterocarpus marsupium* Roxb.
9.	Ashoka (St. Bk.)	*Saraca asoca* (Rosc.) DC. Willd.
10.	Asvagandha (Rt.)	*Withania somnifera* Dunal.
11.	Asvattha (Bk.)	*Ficus religiosa* Linn.
12.	Atasi (Sd.)	*Linum usitatissimum* Linn.
13.	Atibala (Rt.)	*Abutilon indicum* (Linn.) Sw.
14.	Ativisa (Rt.)	*Aconitum heterophyllum* Wall. ex Royle
15.	Babbula (St.Bk.)	*Acacia nilotica* (Linn.) Willd. ex Del. sp. *indica* (Benth.) Brenan
16.	Bakuci (Frt.)	*Psoralea corylifolia* Linn.
17.	Bibhitaka (Frt.)	*Terminalia belerica* Roxb.
18.	Bilva (Frt. Pulp)	*Aegle marmelos* Corr.
19.	Candrasura (Sd.)	*Lepidium sativum* Linn.
20.	Citraka (Rt.)	*Plumbago zeylanica* Linn.
21.	Dhanyaka (Frt.)	*Coriandrum sativum* Linn.
22.	Dhataki (Fl.)	*Woodfordia fruticosa* (Linn.) Kurz.
23.	Eranda (Rt.)	*Ricinus communis* Linn.
24.	Gambhari (Rt. Bk.)	*Gmelina arborea* Roxb
25.	Goksura (Rt.)	*Tribulus terrestris* Linn.
26.	Goksura (Frt.)	*Tribulus terrestris* Linn.
27.	Guduci (St.)	*Tinospora cordifolia* (Willd.) Miers.
28.	Guggulu (Exudate)	*Commiphora wightii* (Arn.) Bhand.
29.	Gunja (Sd.)	*Abrus precatorius* Linn.
30.	Haridra (Rz.)	*Curcuma longa* Linn.
31.	Haritaki (Frt.)	*Terminalia chebula* Retz.
32.	Hingu (Oleo-Gum-Resin)	*Ferula foetida* Regel.
33.	Jatamansi (Rz.)	*Nardostachys jatamansi* DC.
34.	Jatiphala (Sd.)	*Myristica fragrans* Houtt.
35.	Kampilla (Frt.)	*Mallotus philippinensis* Muell.-Arg.
36.	Kancanara (St. Bk.)	*Bauhinia variegata* Blume
37.	Kankola (Frt.)	*Piper cubeba* Linn. f.
38.	Kantakari (W.P.)	*Solanum surattense* Burm. f.
39.	Kanyasara (Lf.)	*Aloe barbadensis* Mill.
40.	Karanja (Sd.)	*Pongamia pinnata* (Linn.) Merr.
41.	Karavira (Lf.)	*Nerium indicum* Mill.
42.	Karkatasrngi (Gall)	*Pistacia chinensis* Burgo

43.	Karpasa (Sd.)	*Gossypium herbaceum* Linn.
44.	Kaseru (Rz.)	*Scirpus kysoor* Roxb.
45.	Ketaki (Rt.)	*Pandanus tectorius* Soland. ex Parkinson
46.	Khadira (Ht.Wd.)	*Acacia catechu* (Linn. f.) Willd.
47.	Kiratatikta (W.P.)	*Swertia chirata* Buch.-Ham.
48.	Krsnajiraka (Frt.)	*Carum carvi* Linn.
49.	Kulattha (Sd.)	*Vigna unquiculata* (Linn.) Walp.
50.	Kustha (Rt.)	*Saussurea lappa* C.B. Clarke
51.	Kutaja (St. Bk.)	*Holarrhena antidysenterica* (Roth) A. DC.
52.	Lavanga (Fl. Bud)	*Syzygium aromaticum* (Linn.) Merr. & M.Perry
53.	Lodhra (St. Bk.)	*Symplocos racemosa* Roxb.
54.	Madana (Frt.)	*Xeromphis spinosa* (Thunb.) Keay
55.	Misreya (Frt.)	*Foeniculum vulgare* Mill.
56.	Nyagrodha (St. Bk.)	*Ficus bengalensis* Linn.
57.	Pasanabheda (Rz.)	*Bergenia ciliata* (Haw.) Sternb.
58.	Patha (Rt.)	*Cissampelos pareira* Linn.
59.	Puga (Sd.)	*Areca catechu* Linn.
60.	Punarnava (Rakta) (W.P.)	*Boerhaavia diffusa* Linn.
61.	Saptaparna (St. Bk.)	*Alstonia scholaris* (Linn.) R. Br.
62.	Sati (Rz.)	*Hedychium spicatum* Ham. ex Smith
63.	Snuhi (St.)	*Euphorbia neriifolia* Linn.
64.	Suksmaila (Frt.)	*Elettaria cardamomum* (Linn.) Maton
65.	Sunthi (Rz.)	*Zingiber officinale* Roxb.
66.	Svarnapatri (Lf.)	*Cassia angustifolia* Vahl.
67.	Svetajiraka (Frt.)	*Cuminum cyminum* Linn.
68.	Sveta Sariva (Rt.)	*Hemidesmus indicus* (Linn.) R. Br.
69.	Tagara (Rz.)	*Valeriana wallichii* DC.
70.	Tamalaki (Rt., St. & Lf.)	*Phyllanthus fraternus* Webst.
71.	Tvak (Bk.)	*Cinnamomum zeylanicum* Blume
72.	Tvakapatra (Lf.)	*Cinnamomum tamala* (Buch.-Ham.) Nees & Eberm.
73.	Udumbara (Bk.)	*Ficus racemosa* Linn.
74.	Upakuncika (Sd.)	*Nigella sativa* Linn.
75.	Varuna (St. Bk.)	*Crataeva nurvala* Buch.-Ham.
76.	Vasa (Lf.)	*Adhatoda vasica* Nees
77.	Vidanga (Frt.)	*Embelia ribes* Burm.f.
78.	Vijaya (Lf.)	*Cannabis sativa* Linn.
79.	Yasti (St. & Rt.)	*Glycyrrhiza glabra* Linn.
80.	Yavani (Frt.)	*Trachyspermum ammi* (Linn.) Sprague ex Turril

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1.	Akarakarabha (Rt.)	*Anacyclus pyrethrum* DC.
2.	Aksoda (Cotldn.)	*Juglans regia* Linn.
3.	Amrata (St. Bk.)	*Spondias pinnata* (Linn. f.) Kurz.
4.	Apamarga (W.P.)	*Achyranthes aspera* Linn.
5.	Aparajita (Rt.)	*Clitoria ternatea* Linn.
6.	Ardraka (Rz.)	*Zingiber officinale* Rosc.
7.	Arimeda (St.Bk.)	*Acacia leucophloea* Willd.
8.	Arjuna (St.Bk.)	*Terminalia arjuna* W.& A.
9.	Bhallataka (Frt.)	*Semecarpus anacardium* Linn.
10.	Bhrngaraja (W.P.)	*Eclipta alba* Hassk.
11.	Brahmi (W.P.)	*Bacopa monnieri* (Linn.) Wettst.
12.	Brhati (Rt.)	*Solanum indicum* Linn.
13.	Cavya (St.)	*Piper retrofractum* Vahl.
14.	Dadima (Sd.)	*Punica granatum* Linn.
15.	Daruharidra (St.)	*Berberis aristata* DC.
16.	Dronapuspi (W.P.)	*Leucas cephalotes* Spreng.
17.	Ervaru (Sd.)	*Cucumis melo* var. *utilissimus* Duthie & Fuller
18.	Gajapippali (Frt.)	*Scindapsus officinalis* Schoott.
19.	Gambhari (Frt.)	*Gmelina arborea* Roxb.
20.	Gangeru (St.Bk.)	*Grewia tenax* (Forsk.) Aschers & Schwf.
21.	Gunja (Rt.)	*Abrus precatorius* Linn.
22.	Iksu (St.)	*Saccharum officinarum* Linn.
23.	Indravaruni (Rt.)	*Citrullus colocynthis* Schrad.
24.	Indravaruni (Lf.)	*Citrullus colocynthis* Schrad.
25.	Jambu (Sd.)	*Syzygium cuminii* (Linn.) Skeels
26.	Jambu (St.Bk.)	*Syzygium cuminii* (Linn.) Skeels
27.	Jayapala (Sd.)	*Croton tiglium* Linn.
28.	Jayanti (Lf.)	*Sesbania sesban* (Linn.) Merr.
29.	Jyotismati (Sd.)	*Celastrus paniculatus* Willd.
30.	Kadamba (St.Bk.)	*Anthocephalus cadamba* Miq.
31.	Kakamaci (W.P.)	*Solanum nigrum* Linn.
32.	Kamala (Fl.)	*Nelumbo nucifera* Gaertn.
33.	Kapittha (Frt.Pulp)	*Feronia limonia* (Linn.) Swingle
34.	Karamarda (St.Bk.)	*Carissa carandas* Linn.
35.	Karanja (Rt.Bk.)	*Pongamia pinnata* (Linn.) Merr.
36.	Karanja (Rt.)	*Pongamia pinnata* (Linn.) Merr.
37.	Karanja (St.Bk.)	*Pongamia pinnata* (Linn.) Merr.
38.	Karanja (Lf.)	*Pongamia pinnata* (Linn.) Merr.
39.	Karavallaka (Fr. Frt.)	*Momordica charantia* Linn.
40.	Katuka (Rz.)	*Picrorhiza kurroa* Royle ex Benth.
41.	Kokilaksa (W.P.)	*Asteracantha longifolia* Nees
42.	Kokilaksa (Rt.),	*Asteracantha longifolia* Nees
43.	Kokilaksa (Sd.)	*Asteracantha longifolia* Nees
44.	Kozuppa (W.P.)	*Portulaca oleracea* Linn.
45.	Lajjalu (W.P.)	*Mimosa pudica* Linn.
46.	Madhuka (Fl.)	*Madhuca indica* J.F. Gmel.
47.	Matsyaksi (W.P.)	*Alternanthera sessilis* (Linn.) R. Br.

48.	Methi (Sd.)	*Trigonella foenum-graecum* Linn.
49.	Mulaka (W.P.)	*Raphanus sativus* Linn.
50.	Mulaka (Rt.)	*Raphanus sativus* Linn.
51.	Mura (Rt.)	*Selinium candollei* DC.
52.	Murva (Rt.)	*Marsdenia tenacissima* Wight. & Arn.
53.	Nagakesar (Stmn.)	*Mesua ferrea* Linn.
54.	Nili (Lf.)	*Indigofera tinctoria* Linn.
55.	Nili (Rt.)	*Indigofera tinctoria* Linn.
56.	Nimba (Lf.)	*Azadirachta indica* A. Juss.
57.	Nimba (St.Bk.)	*Azadirachta indica* A. Juss.
58.	Palasa (St.Bk.)	*Butea monosperma* (Lam.) Kuntze
59.	Paribhadra (St.Bk.)	*Erythrina indica* Lam.
60.	Pippalimula (St.)	*Piper longum* Linn.
61.	Plaksa (St.Bk.)	*Ficus lacor* Buch.-Ham.
62.	Prasarini (W.P.)	*Paederia foetida* Linn.
63.	Priyala (Sd.)	*Buchanania lanzan* Spreng.
64.	Priyangu (Infl.)	*Callicarpa macrophylla* Vahl.
65.	Sali (Rt.)	*Oryza sativa* Linn.
66.	Sankhapuspi (W.P.)	*Convolvulus pluricaulis* Choisy
67.	Saptala (W.P.)	*Euphorbia dracunculoides* Lam.
68.	Satahva (Frt.)	*Anethum sowa* Roxb. ex Flem.
69.	Sigru (Lf.)	*Moringa oleifera* Lam.
70.	Sthulaela (Sd.)	*Amomum subulatum* Roxb.
71.	Tejovati (St.Bk.)	*Zanthoxylum armatum* DC.
72.	Tulasi (W.P.)	*Ocimum sanctum* Linn.
73.	Tulasi (Lf.)	*Ocimum sanctum* Linn.
74.	Vaca (Rz.)	*Acorus calamus* Linn.
75.	Vatsanabha (Rt.)	*Aconitum chasmanthum* Stapf ex Holmes
76.	Vidari (Tub.Rt.)	*Pueraria tuberosa* DC.
77.	Yava (Frt.)	*Hordeum vulgare* Linn.
78.	Yavasaka (W.P)	*Alhagi pseudalhagi* (Bieb.) Desv.

PHARMACOPOEIAL MONOGRAPHS TO BE PUBLISHED IN AYURVEDIC PHARMACOPOEIA OF INDIA PART-I, VOL.-III

1.	Adhaki (Rt.)	*Cajanus cajan* (Linn.) Millsp.
2.	Agnimantha (Rt.)	*Clerodendrum phlomidis* Linn. f.
3.	Ambasthaki (Rt.)	*Hibiscus sabdariffa* Linn.
4.	Amra (Sd.)	*Mangifera indica* Linn.
5.	Amra (St. Bk.)	*Mangifera indica* Linn.
6.	Amrata (St.)	*Spondias pinnata* (Linn.f.) Kurz.
7.	Apamarga (Rt.)	*Achyranthes aspera* Linn.
8.	Araluka (St. Bk.)	*Ailanthus excelsa* Roxb.
9.	Arka (St. Bk.)	*Calotropis procera* (Ait.) R. Br.
10.	Asana (St. Bk.)	*Pterocarpus marsupium* Roxb.
11.	Asthisamhrta (St.)	*Cissus quadrangularis* Linn.
12.	Atmagupta (Sd.)	*Mucuna prurita* Hook.
13.	Bharangi (Rt.)	*Clerodendrum serratum* Linn.
14.	Bijapura (Frt.)	*Citrus medica* Linn.
15.	Bilva (Rt.)	*Aegle marmelos* Corr.
16.	Bimbi (W.P.)	*Coccinia indica* W. & A.
17.	Cangeri (W.P.)	*Oxalis corniculata* Linn.
18.	Cirabilva (Frt.)	*Holoptelea integrifolia* Planch
19.	Danti (Rt.)	*Baliospermum montanum* Muell-Arg.
20.	Dhattura (Sd.)	*Datura metel* Linn.
21.	Draksa (Frt.)	*Vitis vinifera* Linn.
22.	Durva (Rt.)	*Cynodon dactylon* (Linn.) Pers.
23.	Eranda (Lf.)	*Ricinus communis* Linn.
24.	Eranda (Sd.)	*Ricinus communis* Linn.
25.	Gambhari (St.)	*Gmelina arborea* Roxb.
26.	Gojihva (Aer. Pt.)	*Onosma bracteatum* Wall.
27.	Granthiparni (Rt.)	*Leonotis nepetaefolia* R. Br.
28.	Hamsapadi (W.P.)	*Adiantum lunulatum* Burm
29.	Hapusa (Frt.)	*Juniperus communis* Linn.
30.	Indravaruni (Frt.)	*Citrullus colocynthis* Schrad.
31.	Indrayava (Sd.)	*Holarrhena antidysenterica* Wall.
32.	Isvari (Rt.)	*Aristolochia indica* Linn.
33.	Jati (Lf.)	*Jasminum officinale* Linn.
34.	Kadali (Rz.)	*Musa paradisiaca* Linn.
35.	Kakajangha (Rt.)	*Peristrophe bicalyculata* Linn.
36.	Kakanasika (Sd.)	*Martynia annua* Linn.
37.	Kakoli (Tub. Rt.)	*Lilium polyphyllum* D. Don
38.	Kamala (Rz.)	*Nelumbo nucifera* Gaertn.
39.	Karavira (Rt.)	*Nerium indicum* Mill.
40.	Karinkara (Rt.)	*Carissa carandas* Linn.
41.	Kasa (Rt.)	*Saccharum spontaneum* Linn.
42.	Katphala (Frt.)	*Myrica esculenta* Buch.-Ham. ex D. Don
43.	Katphala (St. Bk.)	*Myrica esculenta* Buch.-Ham. ex D. Don
44.	Kola (Frt. Pulp)	*Zizypus jujuba* Lam.
45.	Kola (St. Bk.)	*Zizypus jujuba* Lam.
46.	Kosataki (W.P.)	*Luffa acutangula* (Linn.) Roxb.
47.	Kumuda (Fl.)	*Nymphaea alba* Linn.
48.	Kusa (Rt. St.)	*Desmostachya bipinnata* Stapf.
49.	Langali (Rz.)	*Gloriosa superba* Linn.

50.	Lasuna (Bulb)	*Allium sativum* Linn.
51.	Mahabala (Rt.)	*Sida rhombifolia* Linn.
52.	Manjistha (St.)	*Rubia cordifolia* Linn.
53.	Marica (Frt.)	*Piper nigrum* Linn.
54.	Masaparni (W.P.)	*Teramnus labialis* Spreng.
55.	Masura (Sd.)	*Lens culinaris* Medic.
56.	Mudga (Sd.)	*Phaseolus radiatus* Linn.
57.	Mulaka (Sd.)	*Raphanus sativus* Linn.
58.	Munditika (Lf.)	*Sphaeranthus indicus* Linn.
59.	Musta (Rz.)	*Cyperus rotundus* Linn.
60.	Nagavalli (Lf.)	*Piper betle* Linn.
61.	Narikela (Endo.)	*Cocos nucifera* Linn.
62.	Nicula (Frt.)	*Barringtonia acutangula* (Linn.) Gaertn.
63.	Nili (W.P.)	*Indigofera tinctoria* Linn.
64.	Nirgundi (Lf.)	*Vitex negundo* Linn.
65.	Padmaka (Ht. Wd.)	*Prunus cerasoides* D. Don
66.	Patalai (Rt.)	*Stereospermum suaveolens* DC.
67.	Phalgu (Frt.)	*Ficus hispida* Linn.
68.	Phalgu (Rt.)	*Ficus hispida* Linn.
69.	Prapunnada (Sd.)	*Cassia tora* Linn.
70.	Raktacandana (Ht.Wd.)	*Pterocarpus santalinus* Linn.
71.	Raktapunarnava (Rt.)	*Boerhaavia diffusa* Linn.
72.	Ramasitalika (W. P.)	*Amaranthus tricolor* Linn.
73.	Rasna (Lf.)	*Pluchea lanceolata* Oliver & Hiem.
74.	Sahacara (W.P.)	*Barleria prionitis* Linn.
75.	Sahadevi (W.P.)	*Vernonia cinerea* Lees.
76.	Saileya (Lichen-'Thallus')	*Parmelia perlata* (Huds.) Ach.
77.	Saka (Ht. Wd.)	*Tectona grandis* Linn.
78.	Sakhotaka (St. Bk.)	*Streblus asper* Lour.
79.	Salaparni (Rt.)	*Desmodium gangeticum* DC.
80.	Sali (Frt.)	*Oryza sativa* Linn.
81.	Salmali (St.Bk.)	*Bombax ceiba* Linn.
82.	Sana (Sd.)	*Crotolaria juncea* Linn.
83.	Sara (Rt.)	*Saccharum bengalense* Retz.
84.	Sarala (Ht. Wd.)	*Pinus roxburghii* Sargent
85.	Sarala (Rt.)	*Pinus roxburghii* Sargent
86.	Sarsapa (Sd.)	*Brassica campestris* Linn.
87.	Satapatrika (Fl.)	*Rosa centifolia* Linn.
88.	Simsapa (Ht. Wd.)	Dalbergia *sissoo* Roxb.
89.	Simsapa (St. Bk.)	*Dalbergia sissoo* Roxb.
90.	Sirisa (St. Bk.)	*Albizzia lebbeck* Benth.
91.	Sthauneya (Lf.)	*Taxus baccata* Linn.
92.	Surana (Corm.)	*Amorphophallus campanulatus* (Roxb.) Bl.
93.	Svetacandana (Ht.Wd.)	*Santalum album* Linn.
94.	Syonaka (Rt.)	*Oroxylum indicum* Vent.
95.	Tala (Infl.)	*Borassus flabellifer* Linn.
96.	Trivrta (Rt.)	*Operculina turpethum* (Linn.) Silva Manso
97.	Tumbini (Frt.)	*Lagenaria siceraria* (Mol.) Standl.
98.	Udambara (Frt.)	*Ficus glomerata* Roxb.
99.	Usira (Rt.)	*Vetiveria zizanioides* (Linn.) Nash
100.	Utpala (Fl.)	*Nymphaea stellata* Willd.

MONOGRAPHS PUBLISHED IN AYURVEDIC PHARMACOPOEIA OF INDIA PART-I, VOL. – IV

1. Adhaki (Sd.)	*Cajanus cajan* Linn.
2. Agaru (Ht. Wd.)	*Aquilaria agallocha* Roxb.
3. Aklari (Endm.)	*Lodoicea maldivica* Pers.
4. Aparajita (Lf.)	*Clitoria ternatea* Linn.
5. Atmagupta (Rt.)	*Mucuna prurita* Hook.
6. Bilva (St. Bk.)	*Aegle marmelos* Corr.
7. Champaka (Fl.)	*Michelia champaca* Linn.
8. Cinca (Ft. Pl.)	*Tamarindus indica* Linn.
9. Dadima (Fr. Fruit)	*Punica granatum* Linn.
10. Dadima (Ft. Rind)	*Punica granatum* Linn.
11. Dadima (Lf.)	*Punica granatum* Linn.
12. Devadaru (Ht. Wd.)	*Cedrus deodara* (Roxb.) Loud.
13. Dhattura (W.P.)	*Datura metel* Linn.
14. Durva (W.P.)	*Cynodon dactylon* (Linn.)
15. Gambhari (St. Bk.)	*Gmelina arborea* Linn.
16. Iksu (Rt. Stock)	*Saccharum officinarum* Linn.
17. Kadali (Fl.)	*Musa paradisiaca* Linn.
18. Karcura (Rz.)	*Curcuma zedoaria* Rosc.
19. Kasturilatika (Sd.)	*Hibiscus abelmoschus* Linn.
20. Kataka (Sd.)	*Strychnos potatorum* Linn. f.
21. Kharjura (Drd. Ft.)	*Phoenix dactylifera* Linn.
22. Kharjura (Fr. Ft.)	*Phoenix dactylifera* Linn.
23. Krsnasariva (Rt.)	*Cryptolepis buchanani* Roem. & Schult.
24. Kunduru (Exud.)	*Boswellia serrata* Roxb.
25. Kunkuma (Sty. & Stg.)	*Crocus sativus* Linn.
26. Kusmanda (Ft.)	*Benincasa hispida* (Thunb.) Cogn.
27. Madayanti (Lf.)	*Lawsonia inermis* Linn.
28. Mahanimba (St. Bk.)	*Melia azedarach* Linn.
29. Mandukaparni (W.P.)	*Centella asiatica* (Linn.) Urban
30. Mayakku (Gall)	*Quercus infectoria* Oliv.
31. Mudgaparni (W.P.)	*Vigna trilobata* (Linn.) Verdc.
32. Munditika (W.P.)	*Sphaeranthus indicus* Linn.
33. Nayagrodha Jata (Ar. Rt.)	*Ficus bengalensis* Linn.
34. Nimbu (Fr. Ft.)	*Citrus limon* (Linn.) Burm. f.
35. Nirgundi (Rt.)	*Vitex negundo* Linn.
36. Palasa (Fl.)	*Butea monosperma* (Lam.) Kuntze.
37. Palasa (Gum)	*Butea monosperma* (Lam.) Kuntze.
38. Palasa (Sd.)	*Butea monosperma* (Lam.) Kuntze.
39. Parpata (W.P.)	*Fumaria parviflora* Lam.
40. Patalai (St. Bk.)	*Stereospermum chelonoides* (L.F.)DC.
41. Pattanga (Ht. Wd.)	*Caesaplinia sappan* Linn.
42. Pippali (Ft.)	*Piper longum* Linn.
43. Plaksa (Ft.)	*Ficus lacor Buch.* – Ham.
44. Priyala (St. Bk.)	*Buchanania lanzan* Spreng.
45. Priyangu (Fruit)	*Callicarpa macrophylla* Vahl.

46. Prsniparni (W.P.)	*Uraria picta* Desv.
47. Puskara (Rt.)	*Inula racemosa* Hook. f.
48. Rudraksa (Sd.)	*Elaeocarpus sphaericus* Gaertn. K. Schum
49. Saraja (Exud.)	*Vateria indica* Linn.
50. Satavari (Rt.)	*Asparagus recemosus* Willd.
51. Sigru (Rt. Bk.)	*Moringa oleifera* Lam.
52. Sigru (Sd.)	*Moringa oleifera* Lam.
53. Sigru (St. Bk)	*Moringa oleifera* Lam.
54. Srngataka (Drd.Sd)	*Trapa natans* Linn.
55. Sruvavrksa (Lf.)	*Flacourtia indica* Merr.
56. Sruvavrksa (St. Bk)	*Flacourtia indica* Merr.
57. Talamuli (Rz.)	*Curculigo orchioides* Gaertn.
58. Talisa (Drd. Lf.)	*Abies webbiana* Lindl.
59. Tila (Sd.)	*Sesamum indicum* Linn.
60. Tulasi (Sd.)	*Ocimum sanctum* Linn.
61. Tumburu (Ft.)	*Zanthoxylum armatum* DC.
62. Utingana (Sd.)	*Blepharis persica* (Burm.f.) O. Kuntze.
63. Varahi (Rz.)	*Dioscorea bulbifera* Linn.
64. Varsabhu (Rt.)	*Trianthema portulacastrum* Linn.
65. Vasa (Rt.)	*Adhatoda zeylanica* Medic.
66. Visamusti (Sd.)	*Strychnos nux-vomica* Linn.
67. Vrscikalli (W.P.)	*Tragia involucrata* Linn.
68. Yava (W.P.)	*Hordeum vulgare* Linn.