THE AYURVEDIC PHARMACOPOEIA OF INDIA

THE AYURVEDIC PHARMACOPOEIA OF INDIA

PART –I
VOLUME –III
First Edition

GOVERNMENT OF INDIA
MINISTRY OF HEALTH AND FAMILY WELFARE
DEPARTMENT OF ISM & H.

CONTENTS

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 provision 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.III, is the book of standards for single drugs included therein and the standards prescribed in the Ayurvedic Pharmacopoeia of India, Part-I, Vol. III would be official. If considered necessary these standards can be amended and the Chairman of the Ayurvedic Pharmacopoeia Committee authorized to issue such amendments. Whenever such amendments are issued the Ayurvedic Pharmacopoeia of India, Part-I, Vol. III, 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 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 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 number 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 gramme of distilled water at 15°C.

Metric measures are required by the Pharmacopoeia to be graduated at 20°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.

Standards - For statutory purpose, statements appearing in the API, Part-I, Vol. III, 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 ^oC.

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.

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

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 I had the privilege to be 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 microstopic 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 and Vol-II comprise of 80 and 78 monographs of Ayurvedic single drugs of plant origin, which go into one or more formulations enlisted in the Ayurvedic Formulary of India Part I. 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. II comprising of 78 single drugs of vegetables origin, as per the format and procedure laid down, the different research units under Deptt. of ISM & H 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 78 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, 1998, Part-I, Vol II 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 Vol. I is already included in the First Schedule of Drugs & Cosmetics Act 1940.

26. 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 to Dr. S.K. Sharma, Adviser (Ayurveda), and Member Secretary of A.P.C., Ms. Savita Satakopan and Prof. S.S. Handa, Senior Member of A.P.C., Dr. M.L. Sharma and Dr. A.M.Joshi, Dy. Advisers (Ayurveda) and Dr. J.Pandey, Asstt. Advisor (Ay.) for their constant efforts to bring out this volume.

Dr. R.U. Ahmad, Director, PLIM, Ghaziabad and his colleagues viz. Dr. P.C. Srivastava, Sr. Scientific Officer (Chem.), Dr. Rajeev Kumar Sharma, Senior Scientific Officer (Pharmacognosy), Shri N.S.

Mahara, R.O. (Phg.) Dr. Jai Prakash, R.O. (Chem.), Shri B.B. Prasad, R. A. (Botany), Shri C.Arunachalam, R.A. (Botany) deserve my special thanks for this endeavor. The technical staff of Ayurvedic Pharmacopoeia Committee for preparing the Ayurvedic portion of the Pharmacopoeia viz; Dr. Chhote Lal, Dr. A.K. S. Bhadoria, Dr. M.N. Rangne, Mr. Padam Kumar, Mr. Ashok Kumar and Mr. O.P.Kohli Section Officer (APC) and also other officers who have done a wonderful job in convening the meetings of the committee and completion of this work also deserve my sincere thanks. Lastly I remember the efforts of late Prof. A.N.Namjoshi former chairman of A.P.C. who initiated this work a decade before but could be completed by the present pharmacopoeia committee in the year 2000.

Dr. I. Sanjeeva Rao
Chairman
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, Erandavane, 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.

6. 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.

7. The Government of India reconstituted the Ayurvedic Pharmacopoeia Committee with Prof. A.N. Namjoshi as Chairman in 1972 with the following members :

1. Prof.A.N. Namjoshi,M.Sc. MLA,Minister of Education and Sports, Maharashtra State, Sachivalaya, Bombay-32-Br. — Chairman

2. Vaidya Vasudev M. Dwivedi, "Maruti", 1, Master Society, Vice-Rajkot-2. — Chairman

3. The Drugs Controller (India), Government of India, Ministry of Health, Nirman Bhawan, New Delhi. — *Member Ex-Officio*

4. Kaviraj Purushotam Dev. Deputy Director (Ayurveda), Indian Medicine Pharmacy Buildings, Charminar, Hyderabad-2. — *Member*

5. Shri S. Bhattacharya, Principal, Government Ayurvedic College, Gauhati. — *Member*

6. Vaidya, R.R. Pathak, C/o Shri Baidyanath Ayurved Bhavan, (Private) Limited, Baidyanath Bhavan Road, Patna-1. — *Member*

7. Kumari Savita Satakopan, Drugs Laboratory, National Highway No.8, Baroda-2. — *Member*

8. Dr. M.N.Kesavan Pillai, Hony, Director, Central Research Institute for Ayurveda, Cheruthuruthy, VIA Shoranur. Kerala — *Member*

9. Dr. R.D. Jaiswal, Joint Director of Ayurveda, Government of Madhya Pradesh, Bhopal. — *Member*

10. Dr. B.M. Sharma, Principal Government College of Indian Medicine and Hospital, Bangalore-2. — *Member*

11. Dr. V.T. Kasturi, Managing Editor, National Integrated Medical Association, 307, Erangere, Ashok Road, Mysore-1. — *Member*

12. Pt. Keerti Sharma, Project Officer, Cental Research Institute for Ayurveda, Patiala. — *Member*

13. Dr. G.K. Bhatt, Officer-in-Charge, Regional Research Institute for Ayurveda, Madhovilas Palace, Amer Road, Jaipur. — *Member*

14. Kaviraj K.P. Areya, Principal's Staff Quarter, Ayurvedic Unani Tibbia College, Karol Bagh, New Delhi. *Member*

15. Kaviraj Ashutosh Majumdar, 90/8-Cannaught Circus, New Delhi-I. *Member*

16. Vaidya P.V. Sharma, Professor of Dravyaguna, Post Graduate Institute of Indian Medicine, Institute of Medical Sciences,Banaras Hindu University, Varanasi. *Member*

17. Dr. V.N. Sharma, Professor of Pharmacology, S.M.S. Medical College, Jaipur (Rajasthan). *Member*

18. Shri Prajapati Joshi, Office-in-Charge,Amalgamated Unit (CCRIM & H), Government Pharmaceutical Laboratory, Ranikhet. *Member*

19. Dr. (Mrs.) Assema Chatterji, Professor of Chemistry, Calcutta University, Calcutta. *Member*

20. Dr. P.N.V. Kurup, Adviser, Indigenous Systems of Medicine, Department of Health, Nirman Bhawan, New Delhi-II. *Member Secretary*

The reconstituted Committee initiated the work of identification and authentication of single drugs of plant, animal and mineral sources as important ingredients of the compound preparations of the formulary, in the light of various scientific parameters and other expertise on the subject available in the country and also on the basis of genuine and authentic drug samples approved by the physicians and experts from the manufacturing side. After the completion of this responsible job of authentication and identification, the list of single drugs was approved by the Ayurvedic Pharmacopoeia Committee and was included in the Ayurvedic Formulary of India, Part-I. The Committee after thorough scrutiny of the compound formulations and the single drugs published the First Part of the Ayurvedic Formulary of India in 1978.

8. A considerable initial period of the Committee had to be devoted to the completion of Ayurvedic Formulary of India, which was the essential pre-requisite for compilation of the Ayurvedic Pharmacopoeia. But for feeding each monograph of a single drug, a considerable laboratory data under the approved format was necessary. A study of published literature on the subject revealed that such comprehensive and authenticated data was not available. As a result the Committee had to turn to its own expertise available at the Pharmacopoeial Laboratory for Indian Medicine (P.L.I.M.), Ghaziabad which was established in 1970 and the several Survey and Drug Standardisation Units of the Central Council for Research in Ayurveda and Siddha (CCRAS), New Delhi, for working out standards and norms for the single drugs in the first instance and the compound medicines and formulations later. Knowing the fact that the technical data required for compilation of monographs was not universally available in respect of the Indian drug species, unlike the Pharmacopoeia of modern drugs, the compilation had to be based on an extensive experimental data to be produced in our own laboratories. Recommendations were therefore made to Goverment to strengthen the research staff at the different venues wehere such work was assigned.

9. Realising the need for a planned continued work and the pioneering effort that was made in the country the Government of India once again reconstituted the Ayurvedic Pharmacopoeia Committee and its 2 sub-committees, vide their notification No. X. 19011/7/81-APC dated 5th December, 1981 with the following members and assigned functions as under :-

Ayurvedic Pharmacopoeia Committee

1. Prof. A.N. Namjoshi, A-19, Navyug Mansion, N. Bharucha Road, Bombay-400007, (Maharashtra). *Chairman*

2. Vd. Vasudev M. Dwivedi, "Maruti", 1, Master Society, Rajkot, (Gujarat). *Member*

3. Vd. P.V. Sharma, 39, Gurdham Colony, Varansi-1. *Member*

4. Shri Prajapati Joshi, Officer-in-Charge, Amalgamated Units of CCRAS, Govt. Pharmaceutical Laboratory, Tarikhet (Ranikhet)-263663. *Member*

5. Kvj. A.T. Sharma, Siromani Press, Beshaja Mandir, Berhampur-2 (Gujarat), Orissa. *Member*

6. Prof. P.N. Mehra, Bungalow No. 1055, Sector 27-B, Chandigarh. *Member*

7. Dr. K.K. Purushotaman, Assistant Director, Captain Srinivasa Murti, Drug Research Institute for Ayurveda (CCRAS), A.A. Govt. Hospital Campus, Arumbakam, Madras-600029. (Tamil Nadu). *Member*

8. Vd. Hari Dutt Shastri, Director, Mool Chand Khairatiram Ayurveda Hospital, Lajpat Nagar, III, New Delhi. *Member*

9. Vd. K.S. Warrier, Chief Pysician, The Arya-Vaidya Pharmacy (cbe) Ltd. 366, Trichy Road, Combatore-641018 (Tamil Nadu). *Member*

10. Dr. S.P. Gupta, Director of Ayurvedic and Unani Services, Govt. of Uttar Pradesh, Lucknow. *Member*

11. Dr. S.S. Ghotoskar D.C. (I), D.G.H.S. New Delhi. *Member*

12. Vd. S.K. Mishra Advisor (Ay. & Siddha), Ministry of Health & F.W. New Delhi. *Member*

The following seven members were further nominated and added to this committee:

1. Km. Savita Satakopan, Senior Scientific Officer, Food & Drugs Laboratory, Near Polytechnic, Vadodara-390002 (Gujarat). *Member*

2. Dr. S.A. Vasavada, (Ashirvad), Opp. Pratap Vilas, Jamnagar 361001 (Gujarat). *Member*

3. Dr. Lalitha Michael, Cheif Superintendent, Govt. Central Pharmacy, Ashoka Pillar Circle, I Block, Jayanagar, Bangalore-560011. *Member*

4. Dr. Nagesh Dwivedi, Director of Indigenous Systems of Medicine, Govt. of Bihar, Patna (Bihar). *Member*

5. Dr. Chennabasappa, Director of Indian Systems of Medicine and Homoeopathy, Directorate of Indian Systems of Medicine & Homoeopathy, Government of Karnataka, Anandar Circle, Bangalore-9 (Karnataka). *Member*

6. Prof. C.P. Shukla, "Anil" 3, Patel Colony, Jamnagar -361008 (Gujarat). *Member*

7. Shri Nanak Chand Sharma, Ayurvedacharaya and Ayurved Brahaspati, Kayamaya Ayurvedic Pharmaceutical Works (Pvt.) Ltd., 8/3552, Regar Pura, Karol Bagh, New Delhi-110005. *Member*

Functions :-

(a) To prepare remaining parts of the official formulary of compound preparation which are currently used in Ayurvedic practices in the country including standardised compositions, methods of preparation, dosage, toxicity and administration with various anupanas or vehicles.

(b) To prepare a Pharmacopoeia of Ayurvedic single drugs which have been included in the official formulary.

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

(d) 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 within five years.

(e) The entire Pharmacopoeia should be released in convenient instalments within five years.

The Sub-Committee were reconstituted with the following members :

(1) Formulary Sub-Committee –

1. Prof. A. N. Namjoshi, Bombay	Chairman
2. Kj. A. T. Sharma, Behrampur	Member
3. Vd. Vasudev Dwivedi, Rajkot	Do.
4. Vd. Hari Dutt Shastri, New Delhi.	Do.
5. Vd. K.S. Warrier, Coimbatore	Do.
6. Vd. S.K. Mishra	Member-Secretary

Functions :

1. To suggest priority formulations to be included in next part of the Formulary.

2. To work out the details of formulations as per approved format to be included in remaining parts of the Ayurvedic Formulary.

(2) Drug Standardisation Sub-Committee.

1. Prof. A. N. Namjoshi, Bombay	Chairman
2. Vaidya Priyavrat Sharma, Varanasi	Member
3. Shri Prajapati Joshi,Rajkot	Do.
4. Prof. P.N. Mehra, Chandigarh	Do.
5. Vaidya S.K. Mishra, New Delhi	Member-Secretary

Functions :-

(a) To prepare monographs on Single Drugs (About 800 in five years period) providing information on identity, vernacular names, descriptions etc. The monographs may, if considered feasible, be limited to certain physical, chemical, physico-chemical and pharmacognostical standards.

(b) To lay down standards for compound formulations.

(c) To stipulate the packaging and storage conditions.

(d) To recommend permissible colour and preservatives that may be added to individual or groups of formulations.

The reconstituted Ayurvedic Pharmacopoeia Committee has finalised the Ayurvedic Formulary of India Part-II and the revised Hindi Version of Part-I of Ayurvedic Formulary of India which has been printed.

In order to carry out functions smoothly a Working Group consisting of the following members was constituted by the A.P.C. at its meeting held on 30th & 31st of August 1982.

1. Prof. A. N. Namjoshi	Chairman
2. Shri Prajapati Joshi	Member
3. Dr. M.S. Ansari	Do.
4. Vaidya S.K. Mishra	Member-Secretary

Constitution of Working Group:- 18 meetings of Working Group of A.P.C. were held during 1982 -85 in order to authenticate technical data received from P.L.I.M., Ghaziabad, Food and Drugs Laboratory. Vadodara, Standardisation Units of the Central Council of Research in Ayurveda and Siddha, all State Director of ISM including individual Vaidyas/Scientists in different regions of the country and also the information available from Universities and Ayurvedic Colleges and on the basis of the published data on the subject, before incorporating the data in the monographs. In each and every monographs Popular names, Synonyms in Indian languages, Description (Macroscopic and Microscopic), Identity, Purity and Strength, Constituents, Properties and Actions (Rasna, Guna, Virya, Vipaka, Karma and Prabhava), Important formulations, Therapeutic uses and Doses have been described in brief and in technical terms.

At its meeting held on 25th and 26th March, 1985, the Ayurvedic Pharmacopoeia Committee constituted 2 small committees. One committee was meant to approve the Sanskrit references to be added as Annexure to the monographs of single drugs. This committee constituted of the following members :

1. Prof. P.V. Sharma.

2. Vaidya Nanak Chand Sharma.

3. Dr. K. Raghunathan.

4. Dr. Satyapal Gupta.

The second Committee was meant to edit the monographs including the Introduction, General Notices, Legal Notices etc. and consisted of the following members :

1. Prof. A. N. Namjoshi.

2. Prof. P.V. Sharma.

3. Km. Savita Satakopan.

4. Shri Prajapati Joshi.

The aforesaid committees finalised the 80 monographs on Single Drugs entering into the formulations mentioned in Ist Part of the Ayurvedic Formulary of India and published the same as Ayurvedic Pharmacopoeia of India Part I, Vol. I, in the year 1986. The working format of laying down the standard on single drugs of plant origin was prepared more or less on the pattern of different Pharmacopoeia of Modern System viz. Indian Pharmacopoeia (I.P.), British Pharmacopoeia (B.P.), United States Pharmacopoeia (U.S.P.) and the State Pharmacopoeia of the Union of Soviet Socialist Republic with certain innovation. Every attempt has been made on priority basis to select for description the important drugs which are included in the Ayurvedic Formulary of India, Part-I. The present edition includes to the extent possible the scientific data/information received from authentic sources.

Realising the importance of laying down of the Pharmacopoeial Standards of the single drugs and compound formulation as a long term and continuous nature of scientific work, the Government. of India, Ministry of Health & Family Welfare has again reconstituted the Ayurvedic Pharmacopoeial Committee in the year 1988 vide their notification No. X-19011/9/88-APC, dated August 1988 with the following members and the functions assigned as under :-

1. Prof. A.N. Namjoshi, A-19, Navyug Mansion, N. Bharucha Road, Bombay-400007, (Maharashtra).	*Chairman*
2. Prof. P.V. Sharma, 39, Gurudham Colony, Varansi-221010.	*Member*
3. Miss. S. Satakopan, 8, Kalpana, Stadium North Road, Vadodara-390005.	*Member*
4. Vaidya Sri Ram Sharma, Agarwal Nagar, Dr. Ambedkar Road, Matunga, Bombay-400019.	*Member*
5. Vaidya Veni Madhav Ashvani Kumar Shastry, Prof. of Kaya Chikitsa & Head of the Deptt., Govt. Ayurved College, Gwalior.	*Member*
6. Vaidya Indra Mohan Jha, P.O. Ranti, Madhubani, Bihar-847211.	*Member*
7. Vaidya Amar Nath Shastry, 1550, Sector-7 C, Chandigarh-160019.	*Member*
8.Vaidya B. Vaidyanathan, Secretary, Indian Medical Practitionors Cooperative Pharmacy & Stores, 34/37 Latice Bridge Road, Thiruvanmiyur, Madras-600041.	*Member*
9. Dr. N.Hanumanta Rao, Director, Academy of Ayurveda, Vijyawada-520003.	*Member*
10. Dr. Surinder Kumar Sharma, Associate Prof. & Head, Deptt. of Shalya Shalakya, Govt. Ayurvedic College, Paprola, Distt., Kangra, Himachal Pradesh-176115.	*Member*
11. Vaidya D. Triguna, 143, Sarai Kale Khan, Nizam-ud-din, New Delhi-110013.	*Member*
12. Vaidya P.K. Warrier, Arya Vaidya Shala, Kottakal. (Kerala)-676503.	*Member*
13. Dr. Rajendra Gupta, Project Coordinator (M & AP), National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi-110012.	*Member*
14. Prof. S.S. Handa, Deptt. of Pharmaceutical Sciences, Punjab University, Chandigarh-160014.	Member
15. Managing Director, Indian Medicine Pharmaceutical Corporation, Via Ram Nagar, Mohan (U.P.).	*Member* (Ex-Officio)
16. Director, Central Council for Research in Ayurveda & Siddha, S-10, Dharma Bhavan, Green Park, New Delhi.	Member (Ex-Officio)
17. Drugs Controller (India), Directorate General of Health Services, New Delhi.	Member (Ex-Officio)
18. Adviser (Ay & S), Ministry of Health & Family Welfare., Nirman Bhawan, New Delhi.	Member Secretary

Functions :-

(a) To prepare remaining parts of the official formulary of compound preparations which are currently used in Ayurvedic practice in the country including standardised compositions, methods of preparations, dosage, toxicity and administration with various anupanas or vehicles.

(b) To prepare a Pharmacopoeia of Ayurveda of single drugs which have been included in the official formulary.

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

(d) 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.

The Ayurveda Pharmacopoeia Committee was further re-constituted in the year 1994 by the Government of India, vide their notification No. X-19011/6/94-APC, dated 2.9.94 with the following members and the assigned functions :

1. Prof. A.N. Namjoshi, A-19, Navyug Mansion, N. Bharucha Road, Bombay-400007.	*Chairman*
2. Prof. P.V. Sharma, 39, Gurudham Colony, Varansi-221010.	*Member*
3. Miss. S. Satakopan, 40-A, Ist Main Road, Nanganallur, Madras-600061.	*Member*
4. Dr. S.K. Mishra, 503, Appartment, Swasthya Vihar, Delhi-110092.	*Member*
5. Vd. S.T. Gujar, 16/6 Erandavan, Plot. No. 3, Erandavan Cooperative Housing Soceity, Behind Patavardhan Bagh, Pune –411004.	*Member*
6. Prof. Jharkhand Ojha, Deptt. of Dravyaguna, Institute of Medical Science, Banaras Hindu University, Varansi (U.P.) –221005.	*Member*
7. Vd. Sreerama Murthy, Director, Venkateswara Ayurveda Nilayam Pvt. Ltd., Chintaluru, East Godavari Distt., Andhra Pradesh –533232.	*Member*
8.Vd. B. Vaidyanathan, No.1, Ganapathy Ist Street, Avvai Nagar, Tiruvanmayur, Madras-600041.	*Member*
9. Dr. N. Hanumanta Rao, Director, Academy of Ayurveda, Vijyawada –520003.	*Member*
10. Vd. Nanak Chand Sharma, Kaya Maya Pharmacy, A-1, Tughlaqabad, M.B. Road, New Delhi –110044.	*Member*
11. Vd. Brihaspati Dev Triguna, 143, Sarai Kale Khan, Nizam-ud-din, New Delhi-110013.	*Member*
12. Vaidya P.K. Warrier, Arya Vaidya Shala, Kottakal (Kerala) –676503.	*Member*
13. Prof. C.Shantamma, Prof. & Principal Investigator, UGC Sponsored Project (Med. Plants), Deptt. of Studies in Botany, Manasa Gangotri, Mysore-750006.	*Member*

14. Prof. S.S. Handa, Director, Regional Research Laboratory (CSIR), Canal Road, Tawi, Jammu-180001.	*Member*
15. Managing Director, Indian Medicine Pharmaceutical Corporation Ltd., (Via Ram Nagar), Mohan (U.P.).	*Member* (Ex. Officio)
16. Dr. R.U. Ahmad, Director, Pharmacopoeial Laboratory for Indian Medicine, C.G.O. Complex, Kamla Nehru Nagar, Ghaziabad (U.P.).	*Member* (Ex-Officio)
17. Director, Central Council for Research in Ayurveda and Siddha, Adjacent to Tihar Jail, Near Lajwanti Garden, Janakpuri, New Delhi-11.	*Member* (Ex-Officio)
18. Drug Controller (India), Directorate General of Health Services, Nirman Bhawan, New Delhi –110011.	*Member* (Ex-Officio)
19. Dr. S.K. Sharma, Adviser Incharge (Ay. & S), Ministry of Health & Family Welfare, Nirman Bhawan, New Delhi-110011.	*Member* Secretary

Functions :-

(a) To prepare remaining parts of the official formulary of compound preparations which are currently used in Ayurvedic practice in the country including standardised compositions, methods of preparations, dosage, toxicity and administration with various anupanas or vehicles.

(b) To prepare a Pharmacopoeia of Ayurveda of single drugs which have been included in the official formulary.

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

(d) 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.

The Committee, while appreciating the efforts made by the Government of India to initiate the work on standardisation is aware of the fact that steps taken so far have been inadequate and need to be further accelerated. Therefore, the Committee very strongly recommends that Government will expedite the establishment of Laboratories for standardisation work and setting up of Drug Farms where genuine and authentic drugs may be cultivated for this purpose. As Government is aware that the vast majority of the population in the country depends and have faith on indigenous drugs, it is therefore, necessary that standardisation of drugs should be taken up on priority basis. The Committee also hopes that the Government will take suitable steps to strengthen P.L.I.M. Ghaziabad as well as different Research and Standardisation Units of C.C.R.A.S. on modern scientific lines, so that the main task of bringing out the Ayurvedic Pharmacopoeia in convenient installments, on single drugs and compound formulations could be effectively carried.

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 has 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-500002.	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, — Member
No. 1, Ganapathy,
Ist Street, Hawai Nagar,
Thiruvanmiyar,
Madras-600041.

10. Dr. D.B. Ananatha Narayana, — Member
262, -Pocket L, Sarita Vihar,
New Delhi-44, Fax-8770913.

11. Dr. D.S. Lucas, — Member
Principal & Head of Deptt. Dravyaguna,
Govt. Ayurvedic Medical College,
Dhanwantri Road, Banglore-560009.

12. Prof. V.V. Prasad, — Member
Head of Dept. Dravyaguna,
Ayurvedic College, Tirupati (AP).

13. Dr. C.K. Katiyar, — Member
Dabur Research Foundation,
22-Site IV, Sahibabad-201010.

14. Dr. M.A. Iyengar, — Member
Prof. of Pharmacognosy,
College of Pharmaceutical Sciences,
Kasturba Medical College,
Manipal-576119.

15. Dr. M.K. Raina, — Member
203, Rainbow Apartments,
Raheja Vihar, Powai, Bombay-400012.

16. Dr. Balaji Tambe, — Member
Chairman, ATM Santulan,
Vill. (P.O.) Kurla, Pune,
Maharashtra.

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

18. Dr. S.K. Sharma, — Member-Secretary
Adviser (Ayurveda),
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 formularies of India

ABBREVIATIONS FOR PARTS OF PLANTS

Cotldn.	Cotyledon
Fl.	Flower
Fr. Frt.	Fresh Fruit
Fr. Lf.	Fresh Leaf
Fr. Rz.	Fresh Rhizome
Frt. Pulp.	Fruit Pulp
Frt.	Fruit
Infl.	Inflorescence
Lf.	Leaf
Rt. Bk.	Root Bark
Rt.	Root
Rt. Stock	Root Stock
Rz.	Rhizome
Sd.	Seed
St.	Stem
St. Bk.	Stem Bark
Stmn.	Stamen
Tub. Rt.	Tuberous Root
W.P.	Whole Plant

ĀḌHAKĪ (Root)

Āḍhakī consists of dried root of *Cajanus cajan* (Linn.) Millsp. (Fam. Fabaceae); an annual or perennial, erect shrub, 1.2-3.1 m high, cultivated almost throughout as a pulse crop upto an altitude of 1830 m in the Himalayas. It is mainly grown in Uttar Pradesh, Madhya Pradesh, Bihar, Maharashtra and Tamil Nadu.

SYNONYMS -

Sansk. : Tuvarī
Assam.: Ruharmah
Beng. : Adar, Aaharee, Arhar
Eng. : Pigeon Pea, Red Gram
Guj. : Tuvar, Tuvera, Tur, Tuver
Hindi. : Arahad, Arahar
Kan. : Togari, Tovaree, Togari, Kari Uddu, Togaribele
Mal. : Thuvara, Tuvara
Mar. : Toor, Toori, Tura
Ori. : Harada, Kandulagachha
Punj. : Arhar
Tam. : Tovarai, Thovary, Adagi Tuvari, Thuvarai, Tuvarai, Thovarai
Tel. : Kandulu, Kadulu
Urdu. : Arhar

DESCRIPTION –

a) Macroscopic :

Root stout, branched, cylindrical, tapering having a number of secondary roots and rootlets, surface rough due to transversely running light brown lenticels, cream to light yellow externally, dirty white internally; fracture, hard and fibrous; odour, characteristic; taste, acrid.

b) Microscopic :

Mature root shows 3-7 layers of cork of rectangular, tangentially elongated, thin-walled cells, interrupted at certain places by lenticels; secondary cortex consists of outer 3-7 layers of thin-walled, somewhat tangentially elongated parenchymatous cell, followed by a row of oval to elongated stone cells, thick-walled, elliptical, with wide lumen; some adjoining parenchymatous cells contain prismatic crystals of calcium oxalate; in the inner region strands of isolated or groups of 2-12 lignified fibres present; secondary phloem consists of sieve elements, fibres and phloem parenchyma, traversed by phloem rays; phloem fibres lignified, variable in size with pointed tips and wide lumen scattered throughout phloem region in single or in groups; some stone cells, mostly in groups and possessing yellowish contents, also found scattered in inner phloem; phloem rays numer-

ous, uni to triseriate and straight; ray cells rectangular to rounded in inner phloem region, rounded to tangentially elongated in outer phloem; cambium consisting of 4-6 rows of thin-walled, narrow, tangentially elongated colourless cells; xylem occupies bulk of root and composed of vessels, tracheids, xylem parenchyma and fibres; vessels of varying sizes having pitted walls occur in small groups of 2-3 and also as occasionally isolated units in larger groups of 4-7; fibres short with wide lumen and pointed tips; parenchyma thin walled and rectangular; xylem rays numerous, uni to triseriate, biseriate being more common, straight, 3-25 cells high, radially elongated.

Powder – Cream coloured; shows numerous pieces of pitted vessels, fibres, cork cells, sclereids and a few prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 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 0.7 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 4 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' plate using Ethylacetate : Methanol (90 : 10) v/v shows under U.V. (366 nm) six fluorescent zones at Rf. 0.06, 0.20, 0.69, 0.80, 0.90 (all blue) and 0.92 (yellow). On spraying with 5% Methanolic Sulphuric acid six spots appear on heating the plate at 105°C for about ten minutes at Rf. 0.06, 0.22, 0.30, 0.80, 0.88 and 0.92 (all grey).

CONSTITUENTS – Saponins and Reducing Sugars.

PROPERTIES AND ACTION -

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

IMPORTANT FORMULATIONS - Mahāpañcagavya Ghṛta, Kaṅkāyana Guṭikā

THERAPEUTIC USES – Raktavikāra

DOSE – 2-6 g. of the drug in powder form.

AGNIMANTHA (Root)

Agnimantha consists of dried mature roots of *Clerodendrum phlomidis* Linn. (Fam. Verbenaceae); a large shrub or small tree reaching upto 9 m in height, with more or less pubescent branches, found in dry parts throughout the country.

SYNONYMS –

Sansk. : Gaṇikārikā; Jayā, Jayantī
Assam. : --
Beng. : Ganiyari, Arani, Goniari
Eng. : --
Guj. : Arani, Aranimula, Arni
Hindi. : Urni
Kan. : Taggi, Taggi Beru
Kash. : --
Mal. : Munja
Mar. : Takalimula
Ori. : Ganiary
Punj. : --
Tam. : Tazhutazhai
Tel. : Taluki
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Drug pieces 7-15 cm long, 0.2 –3.0 cm thick, occasionally branched, cylindrical, tough, yellowish-brown externally, bark thin, occasionally easily peeled, outer surface rough due to exfoliation, wood light yellow, fracture hard; taste, slightly astringent.

b) Microscopic :

Root shows exfoliating cork, consisting of 10-15, occasionally more, rows of tangentially elongated, thin-walled cells; secondary cortex consists of round to oval parenchymatous cells, a few containing rhomboidal crystals of calcium oxalate; secondary phloem consists of isodiametric, thin-walled, parenchymatous cells, a few of them containing rhomboidal crystals of calcium oxalate; phloem rays distinct, consisting of radially elongated cells; secondary xylem shows a wide zone, consisting of usual elements, all being lignified; vessels found in single as well as in groups of 2-3, scattered throughout xylem region; xylem parenchyma simple pitted, squarish wide lumen; xylem rays 1-5 seriate, consisting of radially elongated cells; rhomboidal crystal of calcium oxalate packed in xylem parenchyma and xylem rays; abundant simple, round starch grains measuring 6-17 μ in dia., found scattered throughout.

Powder – Dull yellow; shows fragments of cork cells, small, pointed, aseptate, lignified fibres, simple, pitted vessels, lignified cells packed with rhomboidal crystals of calcium oxalate and numerous simple, round to oval starch grains having narrow hilum, measuring 6-11 μ in diameter.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 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 2 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 Silica gel 'G' plate using Chloroform : Methanol (85 : 15) shows under U.V. (366 nm) four fluorescent zones at Rf. 0.10 (light yellow), 0.38, 0.59 and 0.90 (all blue). On exposure to Iodine vapour six spots appear at Rf. 0.10, 0.38, 0.59, 0.78, 0.87 and 0.98 (all yellow). On spraying with 5% Methanolic-Phosphomolybdic acid reagent and heating the plate for about ten minutes at 105°C six spots appear at Rf. 0.10, 0.38, 0.59, 0.78, 0.87 and 0.98 (all grey).

CONSTITUENTS – Sterols.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Kaṣāya
Guṇa : Laghu, Rūkṣha
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Kaphahara, Śvayathuhara

IMPORTANT FORMULATIONS - Daśamūlāriṣṭa, Daśamūla Kvātha Cūrṇa, Indukānta Ghṛta, Dhanvantara Ghṛta, Gorocanādi Vaṭī, Nārāyana Taila

THERAPEUTIC USES - Śotha, Pāṇḍu, Arśa, Vātavikāra, Vibandha, Agnimāndya, Ādhmāna, Gulma, Mūtrakṛcchra, Mūtrāghāta

DOSE – 12-24 g. of the drug in powder form for decoction.

AMBAṢṬHAKĪ (Root)

Ambaṣṭhakī consists of dried roots of *Hibiscus sabdariffa* Linn. (Fam. Malvaceae); an annual, erect, shrub, generally cultivated in the hotter parts of India.

SYNONYMS -

Sansk. : --
Assam. : --
Beng. : Masts Pal, Mesta
Eng. : Jamaican Sorrel
Guj. : Ambodi
Hindi. : Patsan, Patna
Kan. : Pudisoppu, Kempu Pundrike Pullichekir
Mal. : Pariccakam, Pulicheera
Mar. : Lalambari
Ori. : Khataa, Kaunria, Tak Bhend
Punj. : Kolada
Tam. : Pulichikire
Tel. : Pundikura, Gongura
Urdu. : Patsan

DESCRIPTION –

a) Macroscopic :

Tap root greyish-brown in colour, stout, cylindrical with many lateral branches gradually tapering towards lower end, moderately rough due to minute longitudinal wrinkles, 1-2 cm thick; fracture, fibrous in bark region and short in wood region; no characteristic odour and taste.

b) Microscopic :

Mature root shows 3-5 layers of cork consisting of tangentially elongated rectangular cells; secondary cortex almost absent, when present 2-3 layered, oval to polygonal, thin-walled, parenchymatous cells; secondary phloem composed of usual elements; secondary xylem consists of vessels, tracheids, fibres and parenchyma traversed by xylem rays; vessels solitary or 2-4 in groups with pitted thickening; fibres and tracheids short to moderately long with pitted walls; medullary rays 1-3 cells wide and multicelled in height; starch grains both simple and compound and the later having 2-3 components, measuring 5.5-14 μ in dia. present in phloem parenchyma, xylem parenchyma and ray cells.

Powder – Greyish-brown; shows pitted vessels, fragments of cork cells, fibres and tracheids, both simple and compound starch grains measuring 5.5-14 μ in dia. having 2-3 components.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 11 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 3 per cent, Appendix 2.2.4.
Alcohol-soluble extractives	-	Not less than 2 per cent, Appendix 2.2.6.
Water-soluble extractives	-	Not less than 5 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under U.V. (366 nm) four fluorescent zones at Rf. 0.36, 0.61, 0.92 (all blue) and 0.95 (pink). On exposure to Iodine vapour twelve spots appear at Rf. 0.06, 0.12, 0.17, 0.22, 0.29, 0.36, 0.44, 0.59, 0.61, 0.72, 0.82 and 0.92 (all yellow). On spraying with 5% Ethanolic Sulphuric acid reagent and heating the plate at 105°C for ten minutes seven spots appear at Rf. 0.29 (grey), 0.36 (violet), 0.44, 0.61, 0.73, 0.82 and 0.92 (all grey).

CONSTITUENTS – Sterols and Polysaccharides.

PROPERTIES AND ACTION -

Rasa : Madhura, Amla, Tikta, Kaṣāya
Guṇa : Laghu
Vīrya : --
Vipāka : Amla
Karma : Pittahara, Kaphahara, Asthisaṅdhānaka, Vraṇaropaṇa, Rucikara, Dīpana, Kaṇṭhaśodhana

IMPORTANT FORMULATIONS – Puṣyānuga Cūrṇa

THERAPEUTIC USES – Pakvātisāra, Kapharoga, Galaroga, Vātaroga, Asthibhagna, Vraṇa

DOSE – 5 -10 g.

ĀMRA (Seed)

Āmra consists of dried seed of *Mangifera indica* Linn. (Fam. Anacardiaceae), a tree found wild or cultivated throughout the country.

SYNONYMS -

Sansk. : Āmrabījamajjā
Assam. : --
Beng. : Am
Eng. : Mango
Guj. : Aambaro, Ambanoo, Aambo, Keri
Hindi. : Aam
Kan. : Amavina
Mal. : Manga
Mar. : Aamba
Ori. : Amkoili, Ambakoiti
Punj. : Amb
Tam. : Mangottai Paruppu, Maangottai
Tel. : Mamidi-Jeedi
Urdu. : Aam

DESCRIPTION –

a) Macroscopic :

Seed 3-4.5 cm long, 1.5-2.5 cm wide, ovoid, oblong covered with wrinkled integument, both outer and inner integument closely united, outer integument buff coloured, inner integument reddish-brown; taste, bitter and astringent.

b) Microscopic :

Seed shows outer integument consisting of tangentially elongated, irregular, thin-walled, parenchymatous cells, with poorly developed conducting tissues of vessels showing spiral thickenings towards inner integument, inner integument consisting of slightly rectangular, wavy and large thin-walled parenchymatous cells; cotyledons 2, composed of isodiametric, parenchymatous cells fully packed with simple and compound starch grains; compound starch grains consisting of 2-6 components, each starch grain round to oval, measuring 2-28 μ in dia., a few conducting tissues with spiral vessels also found scattered in parenchymatous cells of cotyledons.

Powder – Greyish-buff; shows reddish-orange coloured cells of integument, thin-walled, parenchymatous cells, simple and compound starch grains, consisting of 2-6 components, measuring 2-28 μ in diameter.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 3 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 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 10 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silical gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.62 (yellowish) and 0.92 (blue). On exposure to Iodine vapour five spots appear at Rf. 0.07, 0.29, 0.62, 0.77 and 0.93 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C five spots appear at Rf. 0.07 (grey), 0.29 (grey), 0.62 (grey), 0.77 (brown) and 0.93 (brown).

CONSTITUENTS – Tannins – Pyrogallotannins.

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Madhura
Guṇa : Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Saṁgrāhī, Vātakara, Kṛmighna

IMPORTANT FORMULATIONS – Puṣyānuga Cūrṇa, Bṛhat Gangādhara Cūrṇa, Aśokāriṣṭa

THERAPEUTIC USES – Atīsāra, Pravāhikā, Chardi, Dāha, Tvagroga

DOSE – 1-2 g. of the drug in powder form.

ĀMRA (Stem Bark)

Āmra consists of dried stem bark of *Mangifera indica* Linn. (Fam. Anacardiaceae), a tree found wild or cultivated throughout the country.

SYNONYMS -

Sansk. : Āmra
Assam.: Aam
Beng. : Ama, Am
Eng. : Mango
Guj. : Aambo
Hindi. : Ama
Kan. : Mavu
Mal. : Mavu
Mar. : Amba
Ori. : Am, Amba
Punj. : Amb
Tam. : Mamaram
Tel. : Amaramu
Urdu. : Aam

DESCRIPTION –

a) Macroscopic :

Drug occurs in pieces of variable size and thickness, surface rough due to longitudinal cracks, fissures and scattered, raised lenticels, greyish to dark brown externally and yellowish-white to reddish internally; odour, pleasant; taste, astringent.

b) Microscopic :

Mature bark, shows a wide cork consisting of tangentially elongated cells, a few outer layers brown and inner lighter in colour, at a few places lenticels appear; secondary cortex almost absent; secondary phloem wide, consisting of sieve elements, parenchyma and phloem fibres, traversed by medullary rays, resin canals and yellow coloured elongated, tannin sacs adundantly scattered throughout phloem region; stone cells thick walled, lignified, rectangular with wide lumen also present in single or in groups; starch grains and prismatic crystals of calcium oxalate present in number of phloem cells; phloem fibres in groups composed of 2-15 or more cells, long and thick walled, phloem rays 1-3 seriate, 3 seriate rays more common, somewhat wavy, thin-walled, radially elongated and filled with crystals of calcium oxalate and simple, round starch grains, measuring 12-16 μ in diameter.

Powder – Brown; shows fragments of cork cells, stone cells, single or in groups; phloem fibres, prismatic crystals of calcium oxalate; simple, spherical to elliptical, starch grains measuring 12 – 16 μ in diameter.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 9 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 20 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 14 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4 : 1 : 5) shows under U.V. (366 nm) three violet spots at Rf. 0.12, 0.73 and 0.87. On exposure to Iodine vapour four yellow coloured spots appear at Rf. 0.33, 0.51, 0.74 and 0.88. On spraying with 5% Methanolic-Sulphuric acid reagent and after heating the plate at 105°C for ten minutes, three grey coloured spots appear at Rf. 0.49, 0.69 and 0.88.

CONSTITUENTS – Tannins - Protocatechuic Acid, Catechin, Mangiferin, Alanine, Glycine, α –Aminobutyric acid, Kinic and Shikimic Acids.

PROPERTIES AND ACTION -

Rasa : Kaṣāya
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Grāhī, Kaphapittaśāmaka, Vraṇaropaṇa, Rucya

IMPORTANT FORMULATIONS - Nyagrodhādi Cūrṇa, Nyagrodhādi Kwātha Curṇa, Candanāsava, Grahaṇīmihira Taila, Mūtra sangrahaṇīya Kaṣāya Cūrṇa

THERAPEUTIC USES – Atisāra, Vraṇa, Agnimāndya, Grahaṇī, Prameha, Yoni Roga

DOSE – 3-6 g. of powder.
25-50 g. for decoction.

ĀMRĀTA (Stem)

Āmrata consists of dried stem of *Spondias pinnata* (Linn. f.) Kurz Syn. *S. mangifera* Willd., *S. acuminata* Roxb. non Gamble (Fam. Anacardiaceae); a small, aromatic, deciduous tree, upto 27 m high and 2-5 m in girth, found wild or cultivated almost throughout the country, ascending upto an altitude of 1500 m in the Himalayas, and also distributed in Andamans.

SYNONYMS –

Sansk. : Āmrātaka, Markaṭamrah, Kapītana,
Assam.: Amda
Beng. : Amda
Eng. : Indian Hog Plum, Hog Plum
Guj. : Jangali Ambo, Ambeda
Hindi. : Ambada
Kan. : Ambate, Amatemara
Mal. : Ambazham
Mar. : Ambada
Ori. : Aabada
Punj. : --
Tam. : Mampulecci, Mampulicci
Tel. : Ambalamu
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Stem occurs in cut pieces, about 3.5 –10.0 cm long, 1.0-3.0 cm in dia., cylindrical, more or less rough due to longitudinal wrinkles; occasionally a few round, prominent leaf scars also present, reddish-grey externally having lenticel, white or cream coloured internally with prominent dark brown centre, light in weight; fracture very hard; odour and taste not characteristic.

b) Microscopic :

Mature stem shows a wide zone of cork ranging from 15-25 rows, comprising of tangentially elongated, radially arranged, thin-walled cells containing reddish-brown contents, a few outer cells exfoliating; secondary cortex consisting of 15-17 layers, oval to polygonal, tangentially elongated, thin-walled cells, followed by 2-3 tangential bands comprising of groups of stone cells; secondary phloem consisting of usual elements; phloem fibres arranged in tangential bands, thick-walled, lignified; prominent lysigenous cavities surrounded by a number of tannin sacs present in between the patches of phloem fibres; phloem parenchyma consisting of thin-walled cells having a few prismatic crystals

of calcium oxalate; secondary xylem consists of usual elements, lignified; vessels single or in groups of 2-4 having simple pits, occasionally reticulate thickening, fibres fusiform with blunt tips; tracheids thick-walled; xylem rays 1-2 cells wide and 3-11 cells high; starch grains simple, round to oval having concentric striations and hilum, measuring 3-14 μ in dia., present in secondary cortex, phloem parenchyma, xylem parenchyma and xylem rays.

Powder – Grey; shows fragments of cork cells, phloem fibres, stone cells mostly in groups, occasionally single; a few prismatic crystals of calcium oxalate, simple and reticulate vessels; starch grains simple, round to oval having concentric striations and hilum in centre, measuring 3-14 μ in diameter.

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 0.5	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 5	per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform: Ethylacetate : Formic acid (5 : 4 : 1) shows in visible light three spots at Rf. 0.08, 0.74 and 0.83 (all grey). Under UV (366 nm) five fluorescent zones are visible at Rf. 0.04, 0.79, 0.83, 0.87 (all blue) and 0.93 (sky blue). On exposure to Iodine vapour six spots appear at Rf. 0.13, 0.48, 0.74, 0.83,0.87 and 0.93 (all yellow). On spraying with 10% Ferric chloride solution (aqueous) reagent two spots appear at Rf. 0.04 and 0.93 (both blue).

CONSTITUENTS – Tannins.

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Amla
Guṇa : Guru
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātaghna, Sāraka

IMPORTANT FORMULATIONS – Dādhika Ghṛta

THERAPEUTIC USES – Dāha, Kṣaya, Rakta Vikāra, Atisāra

DOSE – 1-3 g. of powder.

APĀMĀRGA (Root)

Apāmārga consists of dried root of *Achyranthes aspera* Linn. (Fam. Amaranthaceae); a stiff erect, 0.1-0.9 m high, herb found commonly as a weed throughout the country up to 900 m.

SYNONYMS -

Sansk. : Adhaḥśalya, Śikhari, Mayūraka
Assam. : Chirchita
Beng. : Apang
Eng. : Prickly Chaff Flower
Guj. : Aghedo
Hindi. : Chirchira, Latjira
Kan. : Uttarane, Uttaren
Mal. : Kadaledee
Mar. : Anghada
Ori. : --
Punj. : Puthakanda, Lattajeera
Tam. : Nayuruvi
Tel. : Uttareni
Urdu. : Chirchita

DESCRIPTION –

a) Macroscopic :

Tap root cylindrical slightly ribbed, upto 1.0 cm in thickness, gradually tapering, rough due to presence of some root scars; secondary and tertiary roots present; yellowish-brown; odour, not distinct; taste not characteristic.

b) Microscopic :

Mature root shows 6-10 layered, rectangular, tangentially elongated, thin-walled cork cells; secondary cortex consisting of 6-9 layers, oval to rectangular, thin-walled parenchymatous cells having scattered, thick-walled, irregular lignified stone cells, followed by 5-6 discontinuous rings of anomalous secondary thickening, composed of vascular tissues; small patches of sieve tubes are distinct in the phloem parenchyma demarcating the xylem rings; secondary xylem composed of tracheids, fibres and parenchyma; vessels with both simple and bordered pits and with scalariform thickening, measuring 135-348 μ in length and 32-64 μ in width; fibres pointed at both ends with walls moderately thickened, measuring 260-740 μ in length and 12-24 μ in width; tracheids have tapering ends, measuring 165-535 μ in length and 17-34 μ in width.

In *A. bidentata* BL. vessels show bordered pits and reticulate thickening; medullary rays not distinct; stone cells and prismatic crystals absent in cortex.

Powder – Yellowish-brown; shows fragments of rectangular cork cells, stone cells, vessels showing bordered pits and scalariform thickening, fibres and a few prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 9 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 10 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (95:5) shows under UV (366 nm) five fluorescent zones at Rf. 0.05, 0.19, 0.43, 0.50 and 0.97 (all light blue). On exposure to Iodine vapour six spots appear at Rf. 0.05, 0.12, 0.43, 0.50, 0.92 and 0.97 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent two spots appear at Rf. 0.12 and 0.97 (both light orange).

CONSTITUENTS – Saponins.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṭu
Guṇa : Laghu, Rūkṣa, Tīkṣṇa, Sara
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Dīpana, Pācana, Rucya, Vātahara, Kaphanāśaka, Medohara, Mūtrala, Vantihara

IMPORTANT FORMULATIONS - Agastya Harītakī Rasāyana, Mahā Pañcagavya Ghṛta, Vastyāmayāntaka Ghṛta, Mahā Viṣagarbha Taila, Apāmārga Kṣāra, Kṣāra Taila, Panaviralādi Kṣāra

THERAPEUTIC USES - Chardi, Ādhmana, Kaṇḍu, Śūla Apacī, Granthi, Bhagandara, Hṛda roga, Jwara, Świtra, Vādhirya, Udara roga, Yakṛt roga, Danta roga, Rakta Vikāra

DOSE – 5-10 g.

ARALU (Stem Bark)

Aralu consists of dried stem bark of *Ailanthus excelsa* Roxb. (Fam. Simarubaceae); a large deciduous tree occurring in Bihar, Chhota Nagpur, Madhya Pradesh, forests of Ganjam, Vishakhapatnam and Deccan.

SYNONYMS -

Sansk. : Kaṭvaṅga, Dīrghavṛnta
Assam.: Aralu
Beng. : --
Eng. : --
Guj. : Aralavo
Hindi. : Arlu, Maruk, Ghoda Karanj
Kan. : Hiremara Hebbever
Kash. : Merumaram, Mattipongilyam
Mal. : Merumaram, Mattipongilyam
Mar. : Ghoda Karanj
Ori. : Dakshinakabala, Mahala
Punj. : Aruo
Tam. : Peruvagai
Tel. : Peddmanu
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Bark thick, external surface light grey, granular and rough due to presence of longitudinal ridges, internal surface yellowish-white and fibrous; fracture, fibrous; odour, disagreeable when fresh; taste, bitter.

b) Microscopic :

Stem Bark cork multilayered, compactly arranged, tangentially elongated, thin-walled cells obliterated at certain points due to rhytidoma; secondary cortex narrow, composed of tangentially elongated cells, a few cells contain rosette and prismatic crystals of calcium oxalate; phloem, wide, consisting of sieve elements, parenchyma, fibres and stone cells; a few layers of outer phloem collapsed forming ceratenchyma; stone cells, in groups and in singles, present towards outer region of phloem; lignified fibres present in groups in radial rows in inner phloem region; calcium oxalate crystals similar to those found in secondary cortex also found in phloem region; medullary rays not distinct.

Powder – Brownish-yellow, fragments of cork cells; groups or single, oval to polygonal, thick-walled, lignified, stone cells, having wide lumen with distinct striations, lignified phloem fibres, a few rosette and prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 8.5 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 1.5 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 5.5 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (95 : 5) shows under U.V. (366 nm) twelve fluorescent zones at Rf. 0.07 (sky blue), 0.10 (sky blue) 0.21, 0.38, 0.47 (all yellow), 0.57 (sky blue), 0.71 (light sky blue), 0.76, 0.81 (both yellow), 0.84 (sky blue), 0.93 (whitish blue) and 0.97 (sky blue). On exposure to Iodine vapour twelve spots appear at Rf. 0.07, 0.10, 0.21, 0.38, 0.47, 0.57, 0.71, 0.76, 0.81, 0.84, 0.93 and 0.97 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for fifteen minutes thirteen spots appear at Rf. 0.07, 0.10(both grey), 0.21 (light brown), 0.24 (blue), 0.38, 0.47 (both light brown), 0.52 (pink), 0.59 (blue), 0.71, 0.76 (both light brown), 0.84 (blue), 0.93 and 0.97 (both dark grey).

CONSTITUENTS – β –Sitosterol, Quassinoids, Ailantic Acid, 2-6 Dimethoxy-Benzoquinone and Melanthin.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya
Guṇa : Rūkṣa
Vīrya : Kaṭu
Vipāka : Śīta
Karma : Kaphapitta, Śāmaka, Dīpana, Pācana, Grāhī, Vraṇaśodhana

IMPORTANT FORMULATIONS - Puṣyānuga Cūrṇa, Bṛhat Gangādhara Cūrṇa, Aralu Puṭapāka

THERAPEUTIC USES - Atisāra, Kṛmi, Arśa, Sannipāta Jwara, Bhrama, Tvakaroga, Chardi, Kuṣṭha, Pravāhikā, Grahaṇī, Prameha, Śwāsa, Gulma, Mūṣaka Viṣaja Roga

DOSE - 1-3 g.

ARKA (Stem Bark)

Arka consists of dried stem bark of *Calotropis procera* (Ait.) R. Br. (Fam. Asclepiadaceae); an erect shrub exuding milky white latex from cut parts, found wild more or less throughout India.

SYNONYMS -

Sansk. : Sūrya
Assam.: Akand, Akan
Beng. : Akanda, Akone
Eng. : Maddar
Guj. : Aakado
Hindi. : Aak, Madar, Akavana
Kan. : Ekka, Ekkagida
Kash. : --
Mal. : Errikku
Mar. : Rui
Ori. : Arakka
Punj. : Akk
Tam. : Vellerukku, Erukku
Tel. : Jilledu
Urdu. : Madar, Aak

DESCRIPTION –

a) Macroscopic :

Drug occurs in channelled, quilled and fibrous pieces, upto 0.1 – 0.5 cm thick, external surface yellowish brown having longitudinal cracks, internal surface greenish, smooth, with an occasional wood tissue attached; fracture, fibrous; odour and taste not distinct.

b) Microscopic :

Stem bark shows exfoliated cork, consisting of 6-8 layers of tangentially elongated, thick-walled cells; where cork has not developed, epidermis present consisting of a single layered rectangular cells covered externally with striated cuticle; secondary cortex composed of tangentially elongated, oval, rounded or rectangular thin-walled, parenchymatous cells having intercellular spaces, some cells contain rosette crystals of calcium oxalate, a number of rounded, oval to elongated, single or groups of stone cells and latex cells also found scattered in this region; pericyclic fibres numerous, lignified; secondary phloem composed of sieve elements, phloem parenchyma, phloem fibres and phloem rays; phloem parenchyma rectangular to polygonal in shape having rosette crystals of calcium oxalate, latex cells and stone cells similar to those found in secondary

cortex; phloem fibres aseptate with bordered pits; phloem rays mostly uniseriate and run straight.

Powder – Light yellowish-green; shows fibres, stone cells, rosette crystals of calcium oxalate and latex cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 12 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1.5 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 15 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (1:1) shows under UV (366 nm) four fluorescent zones at Rf. 0.63, 0.71, 0.81 and 0.87 (all blue). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent one spot appears at Rf. 0.08 (orange).

CONSTITUENTS – α – and β – Calotropeols, β-Amyrin, Giganteol, a Colourless wax, small amount of Tetracyclic Terpenes and Traces of Sterols.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta
Guṇa : Laghu, Rūkṣa, Tīkṣṇa, Sara
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Śodhana, Virecan, Vātahara, Dīpana, Lekhan, Ropaṇa

IMPORTANT FORMULATIONS - Abhayā Lavaṇa, Arka Lavaṇa

THERAPEUTIC USES – Udararoga, Kuṣṭha, Kaṇḍu, Vraṇa, Plīhāroga, Gulma, Arśa, Kṛmiroga

DOSE – 0.5 -1 g. in powder form.

ASANA (Stem Bark)

Asana consists of dried stem bark of *Pterocarpus marsupium* Roxb. (Fam. Fabaceae); a moderate to large sized, deciduous tree, upto 30 m high and 2.5 m in girth, with straight clear bole, found throughout deciduous forests in peninsular India.

SYNONYMS -

Sansk. : Bījaka, Pītasara, Asanaka, Bījasāra
Assam.: Aajar
Beng. : Piyasala, Pitasala
Eng. : Indian Kino Tree
Guj. : Biyo
Hindi. : Vijayasara, Bija
Kan. : Bijasara, Asana
Kash. : Lal Chandeur
Mal. : Venga
Mar. : Bibala
Ori. : Piashala
Punj. : Chandan Lal. Channanlal
Tam. : Vengai
Tel. : Yegi, Vegisa
Urdu. : Bijasar

DESCRIPTION –

a) Macroscopic :

Drug consists of pieces of stem bark, 1-1.5 cm thick, channelled, usually yellowish-grey with brownish spots due to exudates, outer surface rough and uneven due to protuberances and exfoliations, longitudinal and horizontal cracks present, inner surface fairly smooth; fracture fibrous, breaks with much difficulty; taste, astringent.

b) Microscopic :

Stem bark shows the presence of rhytidoma; idioblasts consisting of lysigenous cavities, present in a row just below cork; secondary cortex not distinct; secondary phloem occupies almost two third of the thickness of bark consisting of sieve elements, phloem parenchyma, phloem fibres, crystal fibres and traversed by a number of phloem rays; sieve elements and parenchyma found collapsed towards the middle and outer regions of phloem, forming ceratenchyma; phloem parenchyma thin-walled, circular to oval; phloem fibres single usually numerous in groups forming alternating bands throu-ghout phloem region, thick-walled and lignified with a small lumen; rhomboidal crystals of calcium oxalate found scattered throughout the

region; lysigenous cavities and tanniniferous ducts filled with red colour masses distributed throughout phloem region; phloem rays very close to each other, mostly uniseriate but biseriate rays also occasionally found.

Powder – Yellowish-brown; shows plenty of lignified fibres, crystal fibres, reddish-brown contents and free rhomboidal crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 18 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 7.5 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 11.5 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic Acid : Water (4:1:5) shows six spots at Rf 0.09, 0.22, 0.41 0.52, 0.63 and 0.78 (all brown). On exposure to Iodine vapour six spots appear at Rf. 0.09, 0.22, 0.41, 0.63, 0.78 (all brown) and 0.92 (yellow). On spraying with 5% Methanolic Phosphomolybdic acid reagent six spots appear on heating the plate at 105°C for about ten minutes at Rf. 0.09, 0.22 (both blue), 0.41 (faint blue), 0.63, 0.78 and 0.92 (all blue).

CONSTITUENTS – Tannins and Gum Kino (which contains Kino-Tannic Acid, 1-Epicatechin and a reddish brown colouring matter).

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Kaṭu, Tikta
Guṇa : laghu, Rūkṣa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Ṣāraka, Vātārtidoṣanut, Galadoṣaghna, Keśya, Tvacya, Raktamaṇḍalnāśinī, Śleṣmahara, Pittahara

IMPORTANT FORMULATIONS - Nārasiṅgha Ghṛta Rasāyana

THERAPEUTIC USES – Pāṇḍu, Prameha, Medodoṣa, Kuṣṭha, Kṛmiroga, Świtra, Madhumeha, Sthoulya

DOSE – 32-50 g. of the drug for decoction.

ASTHISAMHṚTA (Stem)

Asthisamhṛta consists of dried stem of *Cissus quadrangularis* Linn. (Fam. Vitaceae); a perennial fleshy cactus-like climber with tendrils and a quadrangular stem, found throughout the hotter parts of India alongside hedges.

SYNONYMS -

Sansk. : Vajravallī, Chaturdhārā
Assam. : Harjara
Beng. : Hadajora
Eng. : --
Guj. : Hadasankala
Hindi. : Hadjod
Kan. : Mangaraballi
Mal. : Changalam Parande
Mar. : Kandvel
Ori.. : Hadbhanga
Punj. : Haddjor
Tam. : Perandai
Tel. : Nalleru
Urdu. : Hathjod

DESCRIPTION –

a) Macroscopic :

Drug occurs as pieces of stem of varying lengths; stem quadrangular, 4-winged, internodes constricted at nodes; a tendril occasionally present at nodes; internodes 4-15 cm long and 1-2 cm thick; surface smooth, glabrous, buff coloured with greenish tinge, angular portion reddish-brown; no taste and odour.

b) Microscopic :

Mature stem shows squarish outline with prominent projection at each anular point; epidermis single layered, covered externally with thick cuticle; epidermal cells thin-walled, rectangular and tangentially elongated, followed by 2-3 layers of cork and single layered cork cambium; cortex composed of 8-16 layers of thin-walled, circular to oval parenchymatous cells; four patches of collenchymatous cells present in all the four angular points embedded in cortical region like an umbrella arching over large vascular bundles; in the projected portion of angular region cortical cells filled with brown-red contents present; endodermis not distinct; stele consists of a large number of vascular bundles varying in size arranged in the form of a ring separated by rays of parenchyma; 3-4 vascular bundles larger in size, in each angular region, below collenchymatous patch, while rest of bundles smaller in size; vascular

bundles collateral and open type, capped by sclerenchymatous sheath which is well developed in larger bundles; cambium and interfascicular cambium quite distinct; central region occupied by a wide pith composed of thin-walled, circular to oval parenchymatous cells; idioblasts containing raphides and isolated acicular crystals of calcium oxalate present in the outer region of cortex and also in a number of cells throughout the region; rosette crystals of calcium oxalate also found in most of the cells in cortical region; starch grains present throughout the cortical and the pith regions.

Powder – Brown; shows fragments of vessels, fibres, parenchymatous cells and a few rosette crystals of calcium oxalate, starch grains and idioblast containing raphides and isolated acicular crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 22 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1.5 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 20 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.59 and 0.91 (both blue). On exposure to Iodine vapour four spots appear at Rf. 0.46, 0.56, 0.66 and 0.91 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C five spots appear at Rf. 0.06, 0.46 (both violet), 0.59 (light violet), 0.66 and 0.91 (both violet).

CONSTITUENTS – Calcium Oxalate, Carotene and Ascorbic Acid.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Madhura
Guṇa : Laghu, Rūkṣa, Sara
Vīrya : Uṣṇa
Vipāka: Madhura
Karma: Dīpana, Vātaśleṣmahara, Asthisandhānakara, Cakṣuṣya, Vṛṣya

IMPORTANT FORMULATIONS – Lakṣādi Guggulu

THERAPEUTIC USES – Kṛmi, Arśa, Asthibhagna, Sandhi Cyuta

DOSE – 10-20 ml. (Svarasa).
3-6 g. (Powder).

ĀTMAGUPTĀ (Seed)

Ātmaguptā consists of dried mature seed of *Mucuna prurita* Hook., Syn. *M. pruriens* Baker. (Fam. Fabaceae); a slender extensive climbing plant found almost all over the country.

SYNONYMS -

Sansk. : Kapikacchu, Markaṭī, Kaṇḍura
Assam. : Banar Kakua
Beng. : --
Eng. : Cowhage
Guj. : Kavach, Kaucha
Hindi. : Kewanch, Kaunch
Kan. : Nasugunne, Nasugunnee
Mal. : Naikuruna
Mar. : Khajkuhilee, Kavach
Ori. : Baikhujnee
Punj. : Tatgajuli, Kawach
Tam. : Poonaikkali
Tel. : Doolagondi, Duradagondi
Urdu. : Kanwach, Konch

DESCRIPTION –

a) Macroscopic :

Seed ovoid, slightly laterally compressed, with a persistent oblong, funicular hilum, dark brown with spots; usually 1.2-1.8 cm long, 0.8-1.2 cm wide, hard, smooth to touch, not easily breakable; odour, not distinct; taste, sweetish-bitter.

b) Microscopic :

Mature seed shows a thin seed-coat and two hard cotyledons; outer testa consists of single layered palisade-like cells; inner testa composed of 2 or 3 layers, outer layer of tangentially elongated, ovoid, thin-walled cells, inner 1 or 2 layers of dumb-bell or beaker-shaped, thick-walled cells; tegmen composed of a wide zone of oval to elliptical, somewhat compressed, thin-walled, parenchymatous cells; some cells contain starch grains; cotyledons composed of polygonal, angular, thin-walled, compactly arranged, parenchymatous cells, containing aleurone and starch grains; starch grains small, simple, rounded to oval measuring 6-41 μ in dia., but not over 45 μ in dia.; a few vascular bundles with vessels showing reticulate thickening or pitted present,

Powder – Pale cream coloured; shows fragments of testa with palisade-like cells thin-walled parenchyma, reticulate and pitted vessels, aleurone and starch grains small, simple, rounded to oval measuring 6-41 μ in dia., but not over 45 μ in dia.

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 23 per cent, Appendix 2.2.7.
Fixed oil	-	Not less than 3 per cent, Appendix 2.2.8

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' plate, using n-Butanol : Acetic acid : Water (4:1:5), shows in visible light four spots at Rf. 0.51, 0.59, 0.69 (all grey) and 0.92 (light yellow). Under UV (366 nm) six fluorescent zones are visible at Rf. 0.45 (blue), 0.51, 0.59, 0.69 (all grey), 0.79 (light blue) and 0.92 (blue). On spraying with Ninhydrin reagent and heating the plate for ten minutes at 110°C seven spots appear at Rf. 0.17, 0.28, 0.34 (all pink) 0.51 (orange), 0.59 (pink), 0.69 (grey) and 0.92 (pink).

CONSTITUENTS – Fixed Oil, Alkaloid and 3,4-Dihydroxyphenylalanine.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta
Guṇa : Guru, Snigdha
Vīrya : Śīta
Vipāka : Madhura
Karma : Vātaśamana, Vṛṣya, Kaphanāśaka, Pittanāśaka, Raktadoṣanāśaka, Bṛhaṇa, Balya

IMPORTANT FORMULATIONS - Brhat Masa Taila

THERAPEUTIC USES – Vātavyādhi, Kampavāta, Klaivya, Raktapitta, Duṣṭavraṇa, Daurbalya

DOSE – 3-6 g.

BHĀRAṄGĪ (Root)

Bharaṅgi consists of dried roots of *Clerodendrum serratum* (Linn.) Moon (Fam. Verbenaceae); a shrub distributed throughout the country.

SYNONYMS -

Sansk. : Aṅgāravallī, Brāhmaṇayaṣṭikā
Assam. : --
Beng. : Bamun Hatee, Baman hatee, Bhuijam
Eng. : --
Guj. : Bharangee
Hindi. : Bharangee
Kan. : Gantubarangee
Mal. : Cheruteku
Mar. : Bharangee, Bharang
Ori. : Chinds
Punj. : Bhadangee
Tam. : Cheruteku
Tel. : Ganttubrarangee
Urdu. : Bharangi, Baharangi

DESCRIPTION –

a) Macroscopic :

Mature root hard, woody, cylindrical, upto 5 cm thick, external surface light brown having elongated lenticels; bark, thin and easily separated from a broad wood which shows marked medullary rays and concentric growth rings in a transversely cut surface; fracture, short; taste, acrid.

b) Microscopic :

Mature root shows stratified cork composed of 14-20 layers of thin-walled, tangentially elongated cells; each stratification consists of 3-5 layers of cells; secondary cortex wide, outer 2 or 3 layers radially arranged and tangentially elongated, inner cells polyhedral or circular to ellipsoidal with intercellular spaces; a few cells modified into stone cells with greatly thickened wall having concentric striations and radiating canals with narrow lumen; some cells contain acicular crystals of calcium oxalate and a few contain brown colouring matter; secondary phloem consists of sieve elements and parenchyma mostly collapsed in outer region, forming ceratenchyma; some phloem parenchymatous cells modified into stone cells similar to those in secondary cortex but somewhat smaller and with greater thickening of walls; secondary xylem diffused porous consisting of vessels, tracheids, fibres and xylem parenchyma traversed by xylem rays; macerated preparation show wider vessels cylindrical, drum-shaped, some being elongated at one end having bordered pits, rarely reticulate or pitted, while narrower ones elongated with spiral to reticulate thicken-

tracheids long, cylindrical with tapering ends and bordered pits; xylem fibres moderately thick-walled with mostly tapering, pointed ends and oblique bordered pits; xylem parenchyma square to rectangular with simple pits on their walls; medullary rays 1-4 cells wide and 2-50 cells high, 2 or 3 cell wide rays more common, having simple pits on their walls; acicular crystals and abundant simple and compound starch grains measuring up to 20 μ in dia. present in a number of cells throughout the region.

Powder – Light-brown; shows vessels reticulate, spiral and with bordered pits, starch grains simple and compound, round to oval, measuring upto 20 μ in dia. and acicular crystals; stone cells as describes under microscopy present.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	- Not more than	2	per cent, Appendix 2.2.2.
Total ash	- Not more than	11	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	12	per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows in visible light two spots at Rf. 0.62 and 0.74 (both dirty yellow). Under UV light (366 nm) three fluorescent zones are visible at Rf. 0.62 (yellowish green), 0.68 (blue) and 0.74 (yellowish green). On spraying with 5% Methanolic Sulphuric acid and heating the plate for ten minutes at 110°C two spots appear at Rf. 0.62 and 0.74 (both grey).

CONSTITUENTS – Saponins.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Kaṣāya
Guṇa : Laghu, Rūkṣa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Kaphahara, Dīpana, Pācana, Śwāsahara, Rucya

IMPORTANT FORMULATIONS - Ayaskṛti, Kanakāsawa, Daśamūlāriṣṭa, Rāsnādi Kwātha Cūrna, Dhanwantara Ghṛta, Mahā Vātagajāṅkuśa Rasa

THERAPEUTIC USES - Gulma, Jwara, Śwāsa, Kāsa, Yakṣmā, Pīnasa, Śotha, Hikkā, Raktadoṣa

DOSE – 3-6 g. of powder.
10-20 g. of kwatha curna.

BĪJAPŪRA (Fresh Fruit)

Bījapūra consists of fresh fruit of *Citrus medica* Linn. (Fam. Rutaceae); an evergreen shrub or small tree, about 3.6 m high with short, thick and thorny branches, cultivated sparsely throughout the warm-moist regions of the country.

SYNONYMS -

Sansk. : Mātuluṅga
Assam.: Jaradeda
Beng. : Bijapura, Mutulanga
Eng. : Wild Lemon, Citron
Guj. : Bijora
Hindi. : Bijoura
Kan. : Madavala, Madalahannu, Madala
Mal. : Matala Narakam, Gonapatinarakam, Bongi, Mathulanarakam, Mathulunga
Mar. : Mahalunga, Bijora
Ori. : Jambhira
Punj. : Galgal
Tam. : Turunji Pazham, Kadarangai
Tel. : Madi Phalam
Urdu. : Turanj

DESCRIPTION –

Macroscopic :

Fruit-hesperidium, 5-10 cm long, ovoid, oblong or globose, nipple-shaped at the end with thick, rough or irregular or warted rind; dark green when unripe and yellow when ripe; pulp, pale yellow; taste, acidic and sweetish.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	– Nil –
Total ash	-	Not more than 5 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.2 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 20 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 45 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under U.V. (3661 nm) seven fluorescent zones at Rf. 0.03 (light sky blue), 0.08 (yellowish green), 0.11 (light sky blue), 0.19 (light sky blue), 0.39 (light sky blue), 0.56 (dark sky blue) and 0.66 (light sky blue). On exposure to Iodine vapour ten spots appear at Rf. 0.03, 0.04, 0.08, 0.11, 0.16, 0.38, 0.43, 0.53, 0.72 and 0.93 (all yellow).

CONSTITUENTS – Volatile Oil.

PROPERTIES AND ACTION -

Rasa : Amla, Madhura
Guṇa : Laghu, Snigdha
Vīrya : Uṣṇa
Vipāka : Amla
Karma : Vātahara, Pittahara, Kaphahara, Dīpana, Hṛdya, Kaṇṭha śodhaka, Jihvāśodhaka, Varṇanāśaka, Medhya, Chardigrahaṇa

IMPORTANT FORMULATIONS - Kṣāra Taila, Hiṅguwādi Cūrṇa, Kaṅkāyana Gutikā, Taruṇārka Rasa, Śaṅkha Drāvaka, Mādiphala Rasāyana

THERAPEUTIC USES - Rakatapitta, Swāsa, Kāsa, Aruci, Tṛṣṇā, Udara roga, Vibandha, Madātyaya, Hikkā, Agnimāndya

DOSE – 10-20 ml. of juice.

BILVA (Root)

Bilva consists of dried root of *Aegle marmelos* Corr. (Fam. Rutaceae); an armed, medium sized tree, occurring in the plains and upto 1000 m in the hills, as well as cultivated throughout the country, particularly in sacred groves.

SYNONYMS -

Sansk. : Śriphala
Assam.: Bael, Vael
Beng. : Bela, Bilva
Eng. : Bael Root, Bengal Quince
Guj. : Bilivaphal, Bill, Bilum
Hindi. : Bel, Bela, Sriphal
Kan. : Bilva
Kash. : --
Mal. : Koovalam
Mar. : Baela, Bel
Ori. : Bela
Punj. : Bil
Tam. : Vilvam
Tel. : Maredu
Urdu. : Bel

DESCRIPTION –

a) Macroscopic :

Root cream yellow or pale yellowish-brown, thin, irregularly and shallowly ridged due to formation of longitudinal and transverse lenticels, surface ruptured, peeling off in layers, internal surface cream to light yellow; fracture, short; taste, sweet.

b) Microscopic :

Root shows lignified and stratified cork consisting of 3 or 4 alternating bands of 4-14 layers of smaller cells and a few layers of larger cells having golden yellow contents; secondary cortex, a wide zone, consisting of large, polyhedral, parenchymatous cells and stone cells of varying shapes and sizes, thick-walled, lignified, scattered throughout region; secondary phloem consists of sieve elements, fibres, parenchyma and crystals fibres traversed by phloem rays; some sieve elements compressed, forming tangential bands of ceratenchyma alternating with bands of lignified phloem fibres in outer phloem region, but intact in inner phloem region; phloem parenchyma radially and transversely elongated; phloem fibre groups arranged in concentric rings, fibre groups in inner phloem region extend tangentially from one

meduallary ray to another, each group consisting of 2-35 or more cells; fibres long, generally with tapering ends but occasionally forked, lignified, some others have wavy walls; crystal fibres numerous, long, about 9-30 chambered, each containing a prismatic crystal of calcium oxalate; medullary rays uni to triseriate in inner region while bi to pentaseriate in outer region of phloem; cambium consists of 3-7 rows of tangentially elongated to squarish cells; secondary xylem consists of vessels tracheids, fibres and xylem parenchyma; vessels scattered throughout xylem region, in groups of 2-5, single vessels also found, varying in shape and size, mostly drum-shaped, with bordered pits some having a pointed, tail-like process at one end; fibres thick-walled with blunt or pointed tips; xylem parenchyma rectangular in shape; medullary rays uni to triseriate, bi and triseriate rays more common, triseriate rays 12-40 cells high, uniseriate rays 4-10 cells high; prismatic crystals of calcium oxalate present; starch grains simple, 5-19 μ in dia., mostly round to oval with centric hilum; compound starch grains having 2-3 components present in inner few layers of cork cells, secondary cortex, phloem and xylem rays.

Powder – Grey to greyish-brown; shows thick-walled, angular cells of cork, numerous prismatic crystal of calcium oxalate, crystal fibres, starch grains simple, 5-19 μ in dia., mostly round to oval with centric hilum; compound starch grains having 2-3 components, fragments of xylem vessels with bordered pits and thick-walled xylem fibres.

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 7 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 7 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under UV (366 nm) three fluorescent zones at Rf. 0.54 (bright sky blue). 0.84 (light sky blue) and 0.93 (bright sky blue). On exposure to Iodine vapour seven spots appear at Rf. 0.15, 0.27 0.54, 0.67, 0.78 and 0.93 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for ten minutes eight spots appear at Rf. 0.15, 0.27, 0.32, 0.38 (all grey), 0.54 (yellow) 0.67, 0.84 (light grey) and 0.93 (brown).

CONSTITUENTS – Auraptene, Coumarins, Glycosides.

PROPERTIES AND ACTION -

Rasa : Madhura
Guna : Laghu
Virya : Śīta

Vipāka : Madhura
Karma : Mūtrala, Tridoṣaghna

IMPORTANT FORMULATIONS - Mānasa Mitra Vaṭaka, Amṛtāriṣṭa, Dantyādyariṣṭa, Agastya Haritakī Rasāyana, Daśamūlariṣṭa, Daśamūla Kwātha Cūrṇa, Bilvādi Leha

THERAPEUTIC USES - Vātavyādhi, Śotha, Śūla, Agnimāndya, Chardi, Mūtrakṛcchra, Āmavāta

DOSE – 2-6 g. of the drug in powder form.

BIMBĪ (Whole Plant)

Bimbī consists of dried whole plant of *Coccinia indica* W. & A. = *C. cordifolia* Cogn. Syn. *Cephalandra indica* Naud. (Fam. Cucurbitaceae); a climbing or prostrate, much branched, perennial herb, growing wild throughout the country.

SYNONYMS -

Sansk. : Tuṇḍikā, Tuṇḍikerī
Assam. : Kawabhaturi
Beng. : Bimbu, Telakucha
Eng. : Ivy-Gourd
Guj. : Kadavighilodi, Ghilodi
Hindi. : Kundaruki-Bel
Kan. : Tonde-Balli
Mal. : Kova, Nallakova
Mar. : Tondale
Ori. : Pitakundii, Kainchikakudi
Punj. : Kanduri
Tam. : Kovai
Tel. : Donda Tiga
Urdu. : Kunduru

DESCRIPTION –

a) Macroscopic :

Root –Root available in cut pieces with a few lateral roots, surface rough due to longitudinal striations and lenticels, cylindrical, 0.5 –2.5 cm in dia., greyish-brown.

Stem –Slender, soft, 0.3-1.5 cm in dia., branched, longitudinally grooved, glabrous, nodes swollen, whitish dots over external surface, a few tendrils attached with nodes, greyish coloured externally and cream to light yellow internally, fracture, fibrous; no odour and taste.

Leaf –Petiolate, petiole cylindrical, simple 2-3.2 cm long, 3.8-9 cm or rarely 10 cm long, palmately lobed, with 3 to 5 lobes or angles, lobes broad, obtuse or acute, more or less sinuate, occasionally constricted at the base, often with circular patches of glands between nerves; lamina bright green above, paler beneath, surface studded and sometimes rough with papillae.

Flower –Ebracteate, pedicellate, incomplete, unisexual, actinomorphic, pentamerous. *Male Flower* pedicel 2-3.8 cm long, subfiliform, calyx tube glabrous, broadly campanulate, 4.5 mm long linear; corolla 2.5 cm long, white, veined, pubescent inside, glabrous outside, segments 4.5 –7.5 mm long, triangular, acute, staminal column glabrous, capitu-

lum of anthers subglobose; *Female Flower* pedicel 1.3 –2.5 cm long, calyx and corolla as in male flowers; staminodes 3, subulate, 3 mm long, ovary fusiform, glabrous, slightly ribbed, stigma 3, bifid.

Fruit –A pepo, ovoid, glabrous, 3.5 – 4.5 cm long and 1.5-2 cm thick, greenish-brown to yellowish-brown with white linings; no odour and taste.

Seed – Somewhat obovoid, 0.7 cm long and 0.2-0.3 cm wide rounded at apex, much compressed, yellowish-grey.

b) Microscopic :

Root – Shows 7 or more rows of thin-walled cork cells having lenticels at places; secondary cortex 4-7 layered, oval to elliptical, tangentially elongated, thin-walled, parenchymatous cells having groups of oval to rectangular, elongated stone cells in lower region; secondary phloem composed of usual elements; phloem fibres absent; secondary xylem consists of usual elements; vessels mostly solitary with simple pits; tracheids simple pitted; fibres simple pitted with pointed tips and arranged around the vessels; medullary rays 6-10 or more cells wide; starch grains abundant, simple, round to oval, measuring 3-11 μ in dia., and compound having 2-4 components present in secondary cortex, phloem and xylem parenchyma and ray cells.

Stem –Mature stem with ridges and furrows, shows a single layered epidermis composed of tabular cells externally covered with cuticle, or the epidermis interrupted at certain places due to formation of cork cells; collenchyma 2-4 layered consisting of isodiametric cells; secondary cortex narrow, consisting of thin-walled, parenchymatous cells; pericycle present in the form of discontinuous ring of pericyclic fibres; vascular bundles 10 in number, bicollateral, widely separated by broad strips of ground tissue arranged in a single ring, inner part of which almost meeting at centre of stem; secondary phloem consists of sieve-tubes, companion cells and phloem parenchyma; inner phloem semi-lunar in shape; secondary xylem in the centre of each bundle, consists of vessels, tracheids, fibres and xylem parenchyma; vessels numerous uniformly scattered throughout xylem, lignified, pitted and with spiral thickening; tracheids pitted; pith small, composed of thin-walled parenchymatous cells.

Leaf –

Petiole – Shows single layered epidermis, consisting of flattened, tangentially elongated cells, covered externally with striated cuticle; cortex differentiated into 2-5 layered collenchyma and 2-6 layered circular, thin-walled, parenchymatous cells with conspicuous intercellular spaces; vascular bundles bicollateral, arranged in a single ring, usually nine, seven larger and two smaller, traversed by wide parenchymatous cells of medullary rays; some bundles capped by one or two layered, thick-walled, lignified, polygonal pericyclic sclerenchyma; centre occupied by very wide pith composed of large isodiametric parenchymatous cells.

Midrib –Single layered epidermis, on either side, externally covered with striated cuticle, followed by 1-3 layers of well developed collenchyma on the dorsal side and 3-5 layers on the ventral side; vascular bundles, bicollateral, three, ventral larger and two dorsal smaller; layers of collenchymatous cells gradually reduce to 2 or 3 towards dorsal side, 1 or 2 on ventral side and ultimately towards apex of leaf, collenchyma reduces to 1 layer on ventral side and 2 layers on dorsal side; parenchyma 2-3 layered on both sides; vascular bundles single, semicircular; vessels arranged in radial rows.

Lamina –Dorsiventral structure with single layered upper and lower epidermis, externally covered with striated cuticles; epidermal cells show almost straight walls and anomocytic stomata in surface view; below upper epidermis palisade single layered; spongy parenchyma represented by 3-6 layers of loosely arranged cells, a number of veins surrounded by parenchyma, present in mesophyll.

Fruit –Epicarp single layered; mesocarp composed of a wide zone of thin-walled parenchymatous cells differentiated into two regions, outer 5-6 layers rectangular to polygonal, smaller in size, while inner region composed of oval to polygonal cells of larger size; a few fibro-vascular bundles present in this region.

Seed –Testa show ridges and furrows at a few places, more prominent at lateral sides, and consisting of oval to polygonal, thin-walled parenchymatous cells, upper most layer forms radially elongated thin-walled colourless cells; tegmen consists of single layered radially elongated, thin walled, lignified cells, followed by a layer of thin-walled, collapsed parenchymatous cells; a few starch grains 3-6 μ in dia. scattered in this region; embryo consists of hexagonal to polygonal, thin-walled cells having a few oil globules.

Powder – Greyish-brown; shows groups of round to polygonal parenchymatous cells, reticulate, spiral and pitted vessels, aseptate fibres, palisade cells, stone cells, simple and compound, round to oval, starch grains, measuring 3-11 μ in diameter, fragments of epidermis with straight walled cells and anomocytic stomata.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 21 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 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 14 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol : Ammonia (90:18:2) shows under UV (366 nm) three fluorescent zones at Rf. 0.23 (blue), 0.47 (red) and 0.61 (blue). On spraying with Dragendorff reagent one spot appears at Rf. 0.38 (orange).

CONSTITUENTS - Saponins and Fixed Oil in seeds.

PROPERTIES AND ACTION -

Rasa : Tikta, Madhura
Guṇa : Guru, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Vātakara, Pittahara, Atirucya, Lekhhana, Stambhana, Vibandhādhmānakara, Chardikara

IMPORTANT FORMULATIONS – Vastyāmayāntaka Ghṛta

THERAPEUTIC USES – Kāsa, Śwāsa, Jwara, Raktavikāra, Dāha, Śopha, Pāṇḍu

DOSE – 3-6 g. of the drug in powder form.
5-10 ml. (Svarasa).

CĀṄGERĪ (Whole Plant)

Cāṅgerī consists of dried whole plant of *Oxalis corniculata* Linn. (Fam. Oxalidaceae); a small annual or perennial, more or less erect herb with creeping or subterranean stem, 6-25 cm high, found throughout warmer parts of the country and also in all tropical and temperate climate, growing upto an elevation of 3000 m in North-West Himalayas.

SYNONYMS -

Sansk. : Cāṅgerī, Amlapatrikā
Assam. : Chengeritenga
Beng. : Amrul
Eng. : Indian Sorrel
Guj. : Ambolee, Changeri, Teen Panaki, Rukhadi
Hindi. : Tinpatiya, Changeri, Ambilosa
Kan. : Pullamouradi, Sivargee, Purachi Soppu
Mal. : Pulliparel
Mar. : Ambutee, Ambatee, Ambti, Bhui Sarpati
Ori. : --
Punj. : Khatkal, Khattibootee, Khatmittha
Tam. : Puliyarai
Tel. : Pulichinta
Urdu. : Changeri, Teen Patiya

DESCRIPTION –

a) Macroscopic :

Root –Dark brownish, thin, about 1-2 mm thick, branched, rough, soft; no odour and taste.

Stem –Creeping, brownish-red, soft, very thin, easily breakable; no odour and taste .

Leaf –Palmately compound, trifoliate; petiole-green, thin, about 3-9 cm long, cylindrical, pubescent; leaflet-green, 1-2 cm long, obcordate, glabrous, sessile or sub sessile, base cuneate; taste, somewhat sour.

Flower –Yellow, axillary, sub-umbellate.

Fruit –Capsules cylindrical, tomentose.

Seed –Tiny, dark brown, numerous, broadly ovoid transversely striate.

b) Microscopic :

Root – Shows 3-4 layers of cork, composed of thin-walled rectangular cells, brownish in appearance; cortex, a wide zone, consisting of rectangular and oval, thin-walled parenchymatous cells filled with simple starch grains, yellowish pigment and tannin; inner cortical cells rectangular and polygonal, smaller in size than outer ones; cortex followed by thin strips of phloem consisting of sieve tubes, companion cells and phloem parenchyma, cambium not distinct; xylem consists of vessels, tracheids, fibres and xylem parenchyma; vessels cylindrical, pitted some with tail-like projection at one end; tracheids pitted with pointed ends; a few starch grains simple, round to oval measuring 3-11 μ in dia., present scattered throughout the region.

Stem – Shows single layered epidermis, composed of rectangular to oval cells, some of which are elongated to become unicellular covering trichomes; cortex consists of 4-5 layers of thin-walled, circular and polyhedral parenchymatous cells; endodermis single layered of thin-walled rectangular cells; pericycle composed of two or three layers of squarish and polygonal sclerenchymatous cells; vascular bundles 6-7 in number, arranged in a ring, composed of a few elements of phloem towards outer side and xylem towards inner side; xylem composed of pitted vessels, tracheids, fibres and xylem parenchyma; central region occupied by pith composed of thin-walled, parenchymatous cells, a few simple, round to oval starch grains measuring 3-11 μ in dia, scattered throughout the region.

Leaf –

Petiole – Shows rounded or plano-convex outline consisting of single layered epidermis of rectangular or circular, thin-walled cells; cortex 3-4 layers of thin-walled, circular, oval or polygonal parenchymatous cells, generally filled with green pigment; endodermis single layered followed by 2-3 layers of sclerenchymatous pericycle, less developed towards upper side of petiole; vascular bundles 5 in number, arranged in a ring, consisting of phloem towards outer side and xylem towards inner side; centre occupied by a small pith; a few simple, round to oval starch grains, measuring 3-11 μ in dia., scattered throughout.

Lamina – Shows single layered epidermis on upper and lower surfaces, composed of rectangular cells; covering trichomes unicellular; palisade single layered composed of thin-walled, columnar cells, filled with green pigment; below palisade 2-3 layers of thin-walled, spongy parenchyma consisting of circular to oval cells filled with green pigment; stomata paracytic.

Powder– Greenish-brown; shows fragments of trichomes, parenchymatous, sclerenchymatous cells, fibres, epidermis showing irregular cell walls in surface view; a few simple, rounded to oval starch grains, measuring 3-11 μ in diameter.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 20 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 10 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 13 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene :Ethylacetate (8 :2) shows under UV (366 nm) one fluorescent zone at Rf. 0.65 (blue). On exposure to Iodine vapour three spots appear at Rf. 0.27, 0.53 and 0.65 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 110°C three spots appear at Rf. 0.27, 0.53 and 0.65 (all grey).

CONSTITUENTS –Vitamin C, Carotene, Tartaric Acid , Citric Acid and Malic Acid.

PROPERTIES AND ACTION -

Rasa : Amla, Kaṣāya
Guṇa : Laghu, Rūkṣa
Vīrya : Uṣṇa
Vipāka : Amla
Karma : Grāhī, Pittakara, Dīpana, Agnivardhaka, Rucikara, Vātahara, Kaphahara

IMPORTANT FORMULATIONS - Cāngerī Ghṛta

THERAPEUTIC USES - Grahaṇī, Arśa, Kuṣṭha, Atisāra

DOSE – 5-10 ml. (Svarasa).
It is also used externally.

CIRABILVA (Fruit)

Cirabilva consists of dried fruit of *Holoptelea integrifolia* Planch. (Fam. Ulmaceae); a large, spreading, glabrous, deciduous tree, 15-18 m high, distributed throughout the greater part of India upto an altitude of 600 m and sometimes grown on the road side.

SYNONYMS -

Sansk. : Putigandha
Assam. : --
Beng. : --
Eng. : --
Guj. : Kanjo, Chirbil, Chirmil
Hindi. : Chirabil, Chiramil, Papri
Kan. : Tapasimara, Chirabilwa
Kash. : --
Mal. : Avil, Aval
Mar. : Baval, Vavala
Ori. : Duranja, Karanj, Putikaranj
Punj. : Papri, Chirbid
Tam. : Avil Pattai
Tel. : Nemalinara, Tapazi
Urdu. : Papri

DESCRIPTION –

a) Macroscopic :

Fruit a one seeded samara; light brown, obliquely elliptic or orbicular, 1.5 – 2.5 cm wide, 2.5-3.5 cm long, winged and stalked, indehiscent, pubescent, wings reticulately veined.

b) Microscopic :

Fruit shows single layered epicarp having numerous, pointed, unicellular hairs; mesocarp composed of 3-5 layered, oval to polygonal, elongated parenchymatous cells; a few vascular bundles and tannin cells found scattered in this region; endocarp consisting of 2-3 layered, round to oval, sclerenchymatous cells with striations and narrow lumen; perisperm in seed composed of single layered, parenchymatous cells filled with reddish-brown content; endosperm and embryo composed of colourless cells containing oil globules.

Powder – Reddish-brown; shows fragments of thin walled, oval to polygonal parenchymatous cells of endosperm, taniniferous oil globules, unicellular hairs, thick-walled, polygonal, sclerenchymatous cells, polygonal cells of testa in surface view.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 9 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 10 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 13 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under UV (366 nm) a fluorescent zone at Rf. 0.85 (blue). On exposure to Iodine vapour five spots appear at Rf. 0.11, 0.38, 0.44, 0.50 and 0.85 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate at 105°C for ten minutes five spots appear at Rf. 0.11, 0.38, 0.44, 0.50 and 0.85 (all violet).

CONSTITUENTS – Fixed Oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya
Guṇa : Laghu, Rūkṣa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Pittahara, Stambhaka

IMPORTANT FORMULATIONS - Piyūṣavallī Rasa, Gandharvahastādi Kwātha Cūrṇa

THERAPEUTIC USES - Chardi, Arśa, Kṛmi, Kuṣṭha, Prameha

DOSE – 1-3 g.

DANTĪ (Root)

Dantī consists of dried root of *Baliospermum montanum* Muell.-Arg. (Fam. Euphorbiaceae); a leafy undershrub, distributed in outer range of Himalayas from Kashmir to Assam and in moist deciduous forests elsewhere in India.

SYNONYMS -

Sansk. : Dantī
Assam. : Danti
Beng. : Danti
Eng. : Wild Croton
Guj. : Danti
Hindi : Danti
Kan. : Kadu Haralu
Mal. : Neervalam, Dantti
Mar. : Danti
Ori. : Danti
Punj. : Danti
Tam. : Danti
Tel. : Konda Amudamu
Urdu. : Danti

DESCRIPTION -

a) Macroscopic :

Root pieces almost cylindrical, straight or ribbed with secondary and tertiary roots, 0.2-1 cm thick and upto 10 cm or more in length, tapering at one end, tough, externally brown; surface, rough due to longitudinal striations, transverse cracks and scars of rootlets; internally cream-coloured; transversely smoothened root shows thin, brown bark and yellowish-white central core; taste, bitter.

b) Microscopic :

Shows 5-18 layered cork, consisting of brown coloured, suberised or lignified brick-shaped cells, a few cells containing tannin and red colouring matter; secondary cortex consists of 2-7 layers of oval to elliptical, tangentially elongated cells, a few cortical fibres are also present in this region; secondary phloem consists of usual elements, traversed by uni to biseriate phloem rays; secondary xylem consists of usual elements; vessels and tracheids, bordered pits, a few having reticulate thickening; fibres slightly thick-walled, narrow lumen and blunt tips; xylem rays 1 or 2 cells wide; rosette crystals of calcium oxalate and starch grains, present only in secondary cortex and phloem; starch grains solitary and in groups, simple, round to oval measuring 6-17 μ in dia.

Powder - Brown; shows fragments of cork more or less rectangular, thick-walled in surface view; rosette crystals of calcium oxalate; numerous phloem fibres with narrow lumen and blunt tips, border pitted and reticulate vessels, tracheid and tannin cells, round to oval simple starch grains measuring 6-17μ in diameter, and in groups occasionally.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more then 2 per cent, Appendix 2.2.2.
Total ash	-	Not more then 10 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more then 3 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 1.5 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 alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 :1) shows under U.V. (366 nm) a fluorescent zone at Rf. 0.65 (blue). On exposure to Iodine vapour two spots appear at Rf. 0.51 and 0.65 (both yellow). On spraying with 50% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 110°C two spots appear at Rf. 0.51 and 0.65 (both grey).

CONSTITUENTS - β -Sitosterol and Triterpenoids, Resinous Glycosides, Phorbol Esters.

PROPERTIES AND ACTION -

Rasa : Kaṭu
Guṇa : Tīkṣṇa, Sara, Laghu
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphahara, Raktadoṣahara, Vidahara, Dīpana, Rocaka, Śodhaka, Vikāśi, Vrana

IMPORTANT FORMULATIONS – Dantyadyariṣṭa, Punarnavā Maṇḍura, Abhayariṣṭa, Kaṅkāyana Guṭikā, Dantīharītaki, Kalyaṇaka Kṣāra, Kaiśora Guggulu

THERAPEUTIC USES – Tvakadoṣa, Dāha, Śotha, Udararoga, Śūlaroga, Krimi, Arśa, Aśmarī, Kaṇḍu, Kuṣṭha, Vraṇa, Plīhā Vṛddhi, Gulma, Kāmalā

DOSE – 1-3 g. of the drug in powder form.

DHATTŪRA (Seed)

Dhattūra consists of dried seeds of *Datura metel* Linn.; Syn. *D. fastuosa* L., *D. alba* Ramph; *D. cornucopaea* Hort. (Fam. Solanaceae); occurring wild throughout the country.

SYNONYMS -

Sansk. : Kanaka, Ummatta, Dhustūra
Assam. : Dhatura
Beng. : Dhutura, Dhutra
Eng. : White Thorn Apple
Guj. : Dhaturo
Hindi : Dhatura
Kan. : Umbe
Mal. : Ummam
Mar. : Dhatra
Ori. : Dudura
Punj. : Dhatura
Tam. : Oomattai, Umattai
Tel. : Ummettha, Erriummetta
Urdu. : Dhatura

DESCRIPTION –

a) Macroscopic :

Seed reniform, compressed, flattened, surface finely pitted; 0.6 cm long, 0.4 cm wide; light brown to yellowish-brown in colour; thicker towards the curved edge, which is rugose; large, pale strophiole near micropyle; odourless; taste, bitter.

b) Microscopic :

Shows in outline more or less elongated, irregular or wavy structure having bulgings at either side; testa single layered consists of thick-walled, lignified, sclerenchymatous cells forming club-shaped structure, followed by 3-5 layered more or less tangentially elongated, thin-walled, parenchymatous cells; endosperm encloses more or less curved embryo composed of polygonal, thin-walled, parenchymatous cells, filled with aleurone grains and abundant oil globules.

Powder - Brown and oily; shows fragments of testa of groups of thick-walled, light brown sclerenchymatous cells; polygonal, thin-walled parenchymatous cells containing oil globules and aleurone grains.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more then 2 per cent, Appendix 2.2.2.
Total ash	-	Not more then 6 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more then 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 7 per cent, Appendix 2.2.7

T.L.C. -

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate : Diethylamine (7:2:1) shows under U.V. (366 nm) three fluorescent zones at Rf. 0.18, 0.33 (both light blue) and 0.93 (blue). On exposure to Iodine vapour three spots appear at Rf. 0.33, 0.47 and 0.93 (all yellow). On spraying with Dragendorff reagent two spots appear at Rf. 0.33 and 0.47 (both orange).

CONSTITUENTS – Alkaloids – Tropane Alkaloids – Hyoscyamine etc. and Fixed Oil.

PROPERTIES AND ACTION –

Rasa : Madhura, Kaṭu, Kaṣāya, Tikta
Guṇa : Tīkṣṇa, Rūkṣa, Guru
Vīrya : Uṣna
Vipāka : Kaṭu
Karma : Madakārī, Kaphahara, Viṣahara, Kṛmihara, Vraṇahara, Kaṇḍuhara, Bhramahara, Varṇya, Vāmaka

IMPORTANT FORMULATIONS – Kanakāsava, Sūta Śekhara Rasa, Jwarāṅkuśa Rasa, Lakṣmī Vilāsa Rasa (Naradiya), Kanakasundara Rasa, Dugdha Vaṭī, Piyūṣavallī Rasa

THERAPEUTIC USES – Kṛmi, yukā, Likṣā

DOSE – 30-60 mg.

DRĀKṢĀ (Fruit)

Drākṣā consists of dried mature fruits of *Vitis vinifera* Linn. (Fam. Vitaceae); a deciduous climber, mostly cultivated in north western India in Punjab, Himachal Pradesh and Kashmir for their use as dessert fruit. However, the dried fruits, known in trade as 'Raisins', are mostly imported into India, from the Middle East and Southern European countries.

SYNONYMS -

Sansk. : Mṛdvīkā, Gostanī
Assam. : Dakh, Munaqqa
Beng. : Maneka
Eng. : Dry Grapes, Raisins
Guj. : Drakh, Darakh
Hindi. : Munkka
Kan. : Draksha
Kash. : --
Mal. : Munthringya
Mar. : Draksha, Angur
Ori. : Drakya, Gostoni
Punj. : Munaca
Tam. : Drakshai, Kottai Drakshai
Tel. : Draksha Kottai, Drakshai
Urdu. : Munaqqa

DESCRIPTION –

a) Macroscopic :

Fruit a berry, sticky and pulpy, dark brown to black; oblong or oval, sometimes spherical; 1.5 –2.5 cm long and 0.5-1.5 cm wide; outer skin irregularly wrinkled forming ridges and furrows; usually contain 1-4 seeds, 4-7 mm long, ovoid rounded to triangular or simply ovoid, brown to black; odour, sweetish and pleasant; taste, sweet.

b) Microscopic :

A single layered epidermis cells filled with reddish-brown contents; mesocarp pulpy, made up of thin-walled, irregular cells containing prismatic crystals of calcium oxalate, measuring 13.75 –41 μ in dia.; some fibro-vascular bundles also present in this region; seeds composed of testa and endosperm; testa composed of thick-walled yellowish cells; endosperm composed of angular parenchymatous cells containing oil globules and cluster crystals of calcium oxalate, measuring 11-16 μ in diameter.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 3 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.2 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 25 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 70 per cent, Appendix 2.2.7.
Loss on drying	-	Not more than 15 per cent, Appendix 2.2.9.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under UV (366 nm) a fluorescent zone at Rf. 0.29 (blue). On exposure to Iodine vapur four spots appear at Rf. 0.08, 0.29, 0.69 and 0.85 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C three spots appear at Rf. 0.08 (black), 0.29 (black) and 0.98 (violet).

CONSTITUENTS – Malic, Tartaric & Oxalic Acids, Carbohydrates and Tannins.

PROPERTIES AND ACTION -

Rasa : Madhura, Kaṣāya
Guṇa : Guru, Sara, Snigdha
Vīrya : Śīta
Vipāka : Madhura
Karma : Bṛṁhaṇa, Cakṣuṣya, Vṛṣya, Vātapittahara, Swarya

IMPORTANT FORMULATIONS – Drākṣāsava, Drākṣāriṣṭa, Drākṣāvaleha, Drākṣādi Kwātha Cūrṇa, Drākṣādi Cūrṇa, Elādi Guṭikā

THERAPEUTIC USES – Tṛṣṇā, Jwara, Kāsa, Śwāsa, Dāha, Śoṣa, Kāmalā, Raktapitta, Kṣata Kṣīna, Vibandha, Arśa, Agnimāndya, Madātyaya, Pāṇḍu, Udāvarta, Aṣya Śoṣa, Vātarakta

DOSE – 5-10 g. of the drug.

DŪRVĀ (Root)

Dūrvā consists of dried fibrous roots of *Cynodon dactylon* (Linn.) Pers. (Fam. Poaceae); an elegant, hard, perennial, creeping grass growing throughout the country and ascending to 2440 m.

SYNONYMS -

Sansk. : Śatavīrya
Assam.: --
Beng. : Durva
Eng. : Creeping Cynodon, Conch Grass,
Guj. : Khadodhro, Lilidhro, Dhro
Hindi. : Doob
Kan. : Garike Hullu
Mal. : Koruka Pullu
Mar. : Doorva, Hariyalee, Harlee
Ori. : --
Punj. : Dubada
Tam. : Aruvam Pullu
Tel. : Garika, Pacchgaddi
Urdu. : Doob Ghas, Doob

DESCRIPTION –

a) Macroscopic :

Roots fibrous, cylindrical, upto 4 mm thick, minute hair-like roots arise from the main roots; cream coloured.

b) Microscopic :

Mature root shows epiblema or piliferous layer composed of single layered, thin-walled, radially elongated to cubical cells; hypodermis composed of 1-2 layered, thin-walled, tangentially elongated to irregular shaped cells; cortex differentiated into two zones, 1 or 2 layers of smaller, thin-walled, polygonal, lignified sclerenchymatous and 4-6 layers of thin-walled, elongated parenchymatous cells being larger; endodermis quite distinct being single layered, thick-walled, tangentially elongated cells; pericycle 1-2 layers composed of thin-walled sclerenchymatous cells; vascular bundles consisting of xylem and phloem, arranged in a ring on different radials; xylem exarch, having usual elements; centre occupied by wide pith, composed of oval to rounded thick-walled parenchymatous cells containing numerous simple, round to oval or angular starch grains measuring 4-16 μ in dia., and compound starch grains having 2-4 components.

Powder – Cream coloured; fragments of xylem vessels with pitted walls, thick-walled lignified sclerenchymatous cells and numerous simple round to oval or angular starch grains measuring 4-16 μ in dia., and compound starch grains having 2-4 components.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2	per cent, Appendix 2.2.2.
Total ash	-	Not more than 7	per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 3	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 5	per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under UV (366 nm) three fluorescent zones at Rf. 0.70, 0.89 (both blue) and 0.92 (pink). On exposure to Iodine vapour six spots appear at Rf. 0.22, 0.30, 0.37, 0.80, 0.89 and 0.92 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for ten minutes six spots appear at Rf. 0.22, 0.30, 0.37, 0.80, 0.89 0.92 (all grey).

CONSTITUENTS – Phenolic Phytotoxins and Flavonoids.

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Madhura, Tikta
Guṇa : Laghu
Vīrya : Śīta
Vipāka : Madhura
Karma : Kaphapittaśāmaka, Raktapittanāśaka, Dāhaghna, Atisāraghna, Śramahara, Trptikara

IMPORTANT FORMULATIONS - Balāśvagandha Lākṣādi Taila, Madhuyaṣṭyādi Taila, Marma Guṭikā, Mānasa Mitra Vaṭaka, Candrakalā Rasa

THERAPEUTIC USES - Raktapitta, Tṛṣṇāroga, Dāharoga, Visarpa, Tvakaroga, Arocaka, Duḥswapna, Bhūtaroga, Raktapitta, Chardi, Mūrcchā, Raktapradara, Mūtra Dāha

DOSE – 5-10 ml. (Svarasa).

ERAṆḌA (Fresh Leaf)

Eraṇḍa consists of fresh leaf of *Ricinus communis* Linn. with entire petiole (Fam. Euphorbiaceae), a tall glabrous shrub or almost small tree, 2-4 m high; found throughout India, mostly growing wild on waste land and also cultivated for its oil seeds.

SYNONYMS -

Sansk. : Gandharva-hasta, Pañchāṅgul, Vātāri
Assam.: Erri
Beng. : Bherenda
Eng. : Castor Oil Plant
Guj. : Erando
Hindi. : Erand, Rendee, Andu
Kan. : Harlu
Mal. : Abanakka, Avanakku
Mar. : Erand, Erandee
Ori. : Bheranda
Punj. : Erand
Tam. : Amanakku
Tel. : Amudanu, Amudmuchetu
Urdu. : Erand

DESCRIPTION –

Macroscopic :

Leaves green or reddish-green, broad, palmately lobed, with 5-11 lobes, 30-60 cm. dia., nearly orbicular, lobes oblong linear, acute or acuminate, margin serrate, vary from 4-20 cm in length, 2.5 –7.5 cm in width; petiole 10-20 cm long, cylindrical or slightly flattened towards distal and peltately attached to the blade, solid when young, becomes hollow on maturity.

PROPERTIES AND ACTION -

Rasa : Madhura, Katu, Kasaya
Guna : Snigdha, Tiksna, Suksma
Virya : Usna
Vipaka : Madhura
Karma : Kaphavatasamaka, Vrsya, Krmighna, Pittaprakopaka, Raktaprakopaka, Yakrtutejaka

IMPORTANT FORMULATIONS - Caturbhuja Rasa, Caturmukha Rasa, Cintamani Caturmukha Rasa

THERAPEUTIC USES - Krmi, Mutrakrcchra, Gulma, Vatavyadha, Vasti Sula, Arocaka, Vidradhi

DOSE - 10-20 ml. (Svarasa).
2-5 g. (Powder).

ERAṆḌA (Seed)

Eraṇḍa consists of dried seed of *Ricinus communis* Linn. (Fam. Euphorbiaceae); a tall glabrous shrub or almost small tree, 2-4 m high; found throughout India, mostly growing wild on waste land and also cultivated for its oil seeds.

SYNONYMS -

Sansk. : Gandharva-hasta, Pañchāṅgul, Vātāri
Assam.: Erri
Beng. : Bherenda
Eng. : Castor Oil Plant
Guj. : Erando
Hindi. : Erand, Rendee, Andeo
Kan. : Harlu
Mal. : Abanakka, Avanakku
Mar. : Erand, Erandee
Ori. : Bheranda
Punj. : Erand
Tam. : Amanakku
Tel. : Amudamu, Amudmuchetu
Urdu. : Erand

DESCRIPTION –

a) Macroscopic :

Seeds oblong, one face convex and the other slightly flattened, 1-1.5 cm long, 0.6-0.9 cm wide, 0.4-0.8 cm thick, testa hard, glossy, smooth, grey or brown to reddish-brown or black and may be variously marbled or striped, raphe extends from the caruncle to chalaza; odour, not distinct; taste, weakly acrid.

b) Microscopic :

Seed shows a hard testa, membraneous tegmen, a fleshy endosperm, and thin embryo with flat, broad cotyledons; testa consists of hard, single layered epidermis, radially elongated, compactly arranged, slightly curved tabular cells, having reddish-brown contents followed by 8-10 layered, tangentially elongated parenchymatous cells, most of them containing oil globules, fibro-vascular bundles found scattered in this zone; endosperm consisting of oval, irregular cells filled with oil globules, abundant aleurone grains, measuring 8.2 – 13.75 μ in dia.; cotyledons, thin, flat and leafy.

Powder – Dark brown, oily; shows fragments of numerous elongated thick-walled, polygonal cells of testa, reddish-brown tabular cells, thin-walled oval to round parenchyma-

tous cells of endosperm oil globules, numerous aleurone grains measuring upto 13.75 μ in dia. and including crystalloids and globoids within.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 4 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 36 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 6 per cent, Appendix 2.2.7.
Fixed oil	-	Not less than 37 per cent, Appendix 2.2.8.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Ethylacetate (95 : 5) shows under U.V. (366 nm) a fluorescent spot at Rf. 0.95 (sky blue). On exposure to Iodine vapour seven spots appear at Rf. 0.39, 0.50, 0.64, 0.72, 0.80, 0.89 and 0.95 (all yellowish brown). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 105° C seven spots appear at Rf. 0.39, 0.50, 0.64, 0.72, 0.80, 0.89 and 0.95 (all brown).

CONSTITUENTS – Fixed Oil.

PROPERTIES AND ACTION -

Rasa : Madhura, Kaṭu, Kaṣāya
Guṇa : Snigdha, Tīkṣṇa, Sūkṣma
Vīrya : Uṣṇa
Vipāka : Madhura
Karma : Dīpana, Āmapācana, Vidbhedana, Anulomana, Srotośodhana, Vayasthāpana, Medohara

IMPORTANT FORMULATIONS - Bṛhat Saindhavādi Taila, Gandharvahastādi Taila, Siṁhanāda Gaggulu, Miśraka Sneha

THERAPEUTIC USES - Āmavata, Vibandha, Yakṛt Roga, Plīhodara, Arśa, Kaṭi śūla, Gṛdhrasī

DOSE – ½ - 3 g. (Powder).

GAMBHĀRĪ (Stem)

Gambhārī consists of dried stem of *Gmelina arborea* Roxb. (Fam. Verbenaceae), an unarmed, moderate sized, deciduous tree, found scattered in deciduous forest throughout the greater part of India upto an altitude of 1500 m., and the Andamans.

SYNONYMS -

Sansk. : Kāśmarī
Assam. : Gomari
Beng. : Gamar, Gambar
Eng. : Candahar Tree, Cashmere Tree
Guj. : Sawan, Shewan
Hindi. : Gambhari
Kan. : Seevani, Kasmiri-mara
Mal. : Sevana, Kumizhu
Mar. : Sivan
Ori. : Gambhari,
Punj. : Khambhari
Tam. : Perunkurmizh
Tel. : Gummaditeku
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Stem occurs as longitudinally and transversely cut pieces having varying length and thickness; hard, woody, smooth except for a few scars of branches; yellowish-grey externally and cream coloured internally.

b) Microscopic :

Thin stem shows 10-15 or more layers of lignified cork, consisting of tangentially elongated, rectangular cells; secondary cortex 5-10 layers, oval to elliptical, thin-walled cells with tangential groups of fibres; pericycle present in the form of continuous ring consisting of patches of fibres alternating with stone cells; secondary phloem composed of usual elements, phloem fibres absent; in thick stem secondary cortex almost absent; secondary phloem well developed, consisting of usual elements; groups of stone cells and fibres scattered throughout this region; secondary xylem consists of usual elements; vessels solitary or 2-4 in groups having spiral thickening and bordered pits; fibres mostly aseptate but some septate with wide lumen; parenchyma paratracheal, a few in number; medullary rays 3-22 cells high and 1-4 cells wide; starch grains, simple as well as compound having 2-4 components

measuring 3-11 μ in dia., present in secondary cortex, phloem and xylem parenchyma and ray cells.

Powder - Creamish-grey; shows fragments of lignified cork cells, thin-walled, parenchymatous cells, aseptate and a few septate fibre with wide lumen; vessels with spiral thickening and bordered pits, stone cells, simple, round to oval starch grains, measuring 3-11 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more then 2 per cent, Appendix 2.2.2.
Total ash	-	Not more then 3 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more then 0.3 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 4 per cent, Appendix 2.2.7

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (95 : 5) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.39 and 0.48 (both blue). On exposure to Iodine vapour three spots appear at Rf. 0.39, 0.48 and 0.85 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 105 °C three spots appear at Rf. 0.39, 0.48 and 0.85 (all violet).

CONSTITUENTS – Lignans.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta, Kaṣāya, Kaṭu
Guṇa : Guru
Vīrya : Usna
Vipāka : Madhura
Karma : Vātahara, Pittahara, Kaphahara, Dīpana, Pācana, Bhedanī, Medhya, Virecanopaga, Viṣahara, Śramahara

IMPORTANT FORMULATIONS – Karpurādi Kuzambu (Laghu), Candanāsava, Dantādyariṣṭa, Uśīrāsava

THERAPEUTIC USES – Śopha, Jwara, Dāha, Tṛṣnā, Raktadoṣa, Viṣavikāra, Arśa, Śūla, Raktapitta, Bhrama, Śoṣa, Āma Śūla

DOSE – 5-10 g. of the drug for decoction.

GOJIHVĀ

Gojihvā consists of dried leaf and stem portion of *Onosma bracteatum* Wall. (Fam. Boraginaceae); a perennial, hirsute or hispid herb, sparsely distributed in North Western Himalayas from Kashmir to Kumaon at altitudes of 3,500-4,500 m.

SYNONYMS -

Sansk. : Darvīpatra, Vṛsajihvā, Kharaparṇinī
Assam. : --
Beng. : Gojika Sak, Gojialata, Dadisha
Eng. : --
Guj. : Bhonpathari, Galajibhi
Hindi. : Gaujaban, Gojiya
Kan. : Shankha Huli, Aakalanalige, Gojaba
Mal. : Kozhuppu
Mar. : Govjaban, Paatharee
Ori. : Kharsan, Kharaptra
Punj. : Kazban
Tam. : Kharaptra, Dharvipatra, Kozha
Tel. : Yeddunaluka
Urdu. : Gaozaban

DESCRIPTION –

a) Macroscopic :

Stem – Cut pieces available in 5-9 cm long and 3.2 to 4.7 cm in dia., flattened, erect, stout; rough due to white, hard, hispid hairs and cicatrices, and longitudinal wrinkles; colour greenish-yellow; fracture, short; odour and taste not characteristic.

Leaf – Lanceolate to ovate-lanceolate, 12-30 cm long, 1.5-3.5 cm broad, acuminate tubercle-based hispid hairs present on both surfaces; greenish to light yellow on top and white beneath.

b) Microscopic :

Stem – shows single-layered epidermis, covered with thick cuticle, some epidermal cells elongate to form long, warty, tubercle-based unicellular hairs; cortex differentiated in two zones, 5-7 layered outer collenchyma, 3-4 layered inner parenchymatous cells, consisting of thin-walled, round to oval cells; phloem composed of usual elements; phloem fibres absent; xylem consisting of usual elements, vessels mostly solitary or rarely 2-3 in groups having spiral thickening, and fibres and tracheids having blunt tips and simple pits; xylem ray not distinct; pith consisting of round, thin-walled, parenchymatous cells.

Leaf –

Midrib –single layered epidermis with thick cuticle and long warty, tubercle-based unicellular hairs present on both surfaces followed by 5-7 layers of collenchymatous and 3-4 layers parenchymatous cortical cells; vascular bundle situated centrally.

Lamina – isobilateral, single layered epidermis on either surface covered with thick cuticle, long warty, tubercle-based, simple, unicellular hairs present on both surfaces; palisade 2 layered, spongy parenchyma 8-10 layered, stomata paracytic.

Powder – Greenish-brown; shows groups of oval to polygonal, thin-walled straight epidermal cells; spiral vessels; a few fibres entire or in pieces, elongated with blunt tips; long warty, tubercle-based unicellular hairs and a few paracytic stomata.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 26 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 1 per cent, Appendix 2.2.6.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol ; Acetic acid : Water (4 : 1 : 5) shows in visible light six spots at Rf. 0.38 (yellow), 0.55 (grey), 0.62, 0.69 (both yellow), 0.76 (grey) and 0.99 (green). Under UV (366 nm) six fluorescent zones at Rf. 0.30 (pale blue), 0.55 (violet), 0.62, 0.69 (both yellow), 0.76 (green) and 0.99 (red). On exposure to Iodine vapour eight spots appear at Rf. 0.29, 0.38, 0.46 (all yellow), 0.56 (grey), 0.62, 0.66 (both yellow), 0.76 and 0.99 (both grey). On spraying with Vanillin-Sulphuric acid reagent and heating the plate at 105°C for ten minutes, six spots appear at Rf. 0.29, 0.56, 0.62, 0.66, 0.76 and 0.99 (all violet).

CONSTITUENTS – Tannin and Sugars.

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Tikta, Madhura
Guṇa : Laghu
Vīrya : Śīta
Vipāka : Madhura
Karma : Vātala, Pittahara, Kaphahara, Hṛdya, Grāhī

IMPORTANT FORMULATIONS – Mānasa Mitra Vaṭaka, Gojihvādi Kwātha

THERAPEUTIC USES – Raktapitta, Kuṣṭha, Jwara, Śwāsa, Kāsa, Aruci, Prameha, Raktavikāra, Vraṇa, Danta roga

DOSE – 3-6 g. of the drug in powder form.

GRANTHIPARṆĪ (Root)

Granthiparṇī consists of root of *Leonotis nepetaefolia* R. Br. (Fam. Lamiaceae), an ornamental herb or shrub, 1.2 –1.8 m high, cultivated and naturalized throughout the hotter parts of the country.

SYNONYMS –

Sansk. : Kākapuccha
Assam. : Granthika
Beng. : Hejurchei
Eng. : Knod Grass
Guj. : Hatisul
Hindi. : Gathivan
Kan. : --
Mal. : --
Mar. : Dipmal
Ori. : --
Punj. : --
Tam. : --
Tel. : Ranathem
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Root system well developed, numerous lateral roots arise from main root, about 0.8 cm in dia., secondary and tertiary roots thin and fibrous, greyish coloured, main root slightly brownish coloured with a few longitudinal furrows; fracture, hard and short; no characteristic odour and taste.

b) Microscopic :

Mature root shows a thin bark and a very wide xylem; cork exfoliating, generally detached, where present, consists of a few layers of tangentially elongated compressed cells possessing brown contents; secondary cortex, a narrow zone, composed of 3-6 layers or more, rounded, irregular or tangentially elongated, thin-walled, parenchymatous cells having brown contents; secondary phloem consists of thin-walled cells of sieve elements; fibres absent; secondary xylem forms major part of root consisting of vessels, xylem fibres and xylem parenchyma; vessels more or less uniformly distributed throughout secondary xylem; vessels with bordered pits and of various shapes and sizes, a few having elongated projection at one or both ends; xylem fibres elongated, lignified with pointed ends with moderately wide lumen; xylem parenchyma rectangular or square in shape and pitted; medullary rays uni to triseriate, uni and biseriate rays being more common.

Powder – Brown; shows numerous parenchymatous cells of secondary cortex, a few fragments and entire xylem vessels with bordered pits, fibres and xylem parenchyma.

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 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 4 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) on exposure to Iodine vapour shows six spots at Rf. 0.04, 0.05, 0.08, 0.19, 0.23 and 0.35 (all yellow). On spraying with Vanillin Sulphuric acid reagent and heating the plate for ten minutes at 110°C three spots appear at Rf. 0.04, 0.08 and 0.35 (all violet).

CONSTITUENTS – Sterols.

PROPERTIES AND ACTION -

Rasa : Tikta
Guṇa : Laghu, Tīkṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Dīpana, Kaphavātahara, Daurgandhyanāśana

IMPORTANT FORMULATIONS - Bṛhat Guḍūcī Tàila, Mṛtasañjīvanī Surā

THERAPEUTIC USES - Śwāsa, Kaṇḍu, Viṣa

DOSE – 5-10 g. of the drug in powder form.

HAṂSAPADĪ (Whole Plant)

Hamsapadī consists of dried whole plant of *Adiantum lunulatum* Burm. (Fam. Polypodiaceae); a fern found throughout moist places, generally on the slopes of hills, ascending up to an elevation of about 1370 m.

SYNONYMS -

Sansk. : Haṁsapādī, Raktapādī, Kiṭamātā, Tripādikā
Assam. : Sharul Arj, Sharujeena, Parsiyav
Beng. : Kali Jhat
Eng. : Maiden Hair
Guj. : Hansaraja
Hindi. : Hanspadee, Hansaraj
Kan. : Hamsapadi
Kash. : --
Mal. : --
Mar. : Hansaraj
Ori. : --
Punj. : Hamsaraj
Tam. : --
Tel. : Hamsapadi
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Root – Very thin, fibrous, about 10-15 cm long, reddish-black in colour, soft and branched.

Rhizome – Long, upto 2 mm thick, glabrous, prostrate or erect, dark reddish-brown or a black in colour.

Frond – Rachis shiny black, simply pinnate, pinna roughly lunulate, subdimidiate, lower edge nearly in line and oblique with its black shiny petiole, upper edge bluntly rounded and more or less lobed, a few sori in a continuous line on the under surface along the edge, with a false indusium.

b) Microscopic :

Root mature root shows single layered epidermis consisting of thin-walled, small and irregular cells, followed by 3-4 layers of large thick-walled, polygonal, parenchymatous cells of cortex; endodermis single layered composed of square or somewhat rounded cells; pericycle single layered composed of square shaped sclerenchymatous

thick and dark reddish-brown wall; pericycle encloses a diarch stele with a few elements of xylem and phloem.

Rhizome – Mature rhizome consists of thick walled, rectangular, small cells of epidermis, followed by 3-4 layers of sclerenchymatous cells of hypodermis, composed of thick-walled cells; cortex wide, made up of thin-walled, rounded or oval-shaped parenchymatous cells, enclosing an amphiphloic siphonostele; endodermis present; vascular bundle with xylem consisting protoxylem towards both ends and metaxylem in centre; phloem surrounds the xylem externally and also internally; tracheid with scalariform to reticulate thickening present; a central pith consists of thick-walled cells, and fibres, and is sclerenchymatous.

Frond –

Petiole – Shows concave-convex outline; epidermis single layered; hypodermis consists of 2 or 3 layers, lignified, thick-walled, sclerenchymatous cells; ground tissue composed of oval to polygonal, thin-walled parenchymatous cells; stele single, slightly triangular in shape, located centrally and surrounded by pericycle and endodermis.

Pinnule – Shows single layered epidermis on either surface; mesophyll round to oval in shape and not differentiated into palisade and spongy parenchyma; a few stomata present only on lower surface; a few sori also seen.

Powder – Dark reddish-brown in colour; shows dark reddish-brown pieces of sclerenchymatous cells and light coloured crushed cells of cortex, a few tracheids having reticulate thickening, fibres and a few spores.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2	per cent, Appendix 2.2.2.
Total ash	-	Not more than 16	per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 11	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 5	per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4 :1 : 5) shows under UV (366 nm) two fluorescent zones at Rf. 0.80 and 0.96 (both blue). On exposure to Iodine vapour three spots appear at Rf. 0.19, 0.30 and 0.80 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C three spots appear at Rf. 0.19, 0.30 and 0.80 (all yellowish brown).

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Tikta
Guṇa : Guru
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Raktavikārahṛta, Viṣaghna

IMPORTANT FORMULATIONS – Madhuyaṣṭyādi Taila, Mānasa Mitra Vaṭaka, Muktā Pañcāmṛta Rasa, Swarṇabhūpati Rasa, Kālakūṭa Rasa

THERAPEUTIC USES – Visarpa, Vraṇa, Dāha, Atisāra, Lutā Viṣa, Bhūta Graha, Kakṣa Sphoṭa, Rakta Vikāra

DOSE – 1-3 g.

HAPUṢĀ (Fruit)

Hapuṣā consists of dried fruit of *Juniperus communis* Linn (Fam. Cupressaceae); a dense, more or less procumbent shrub, rarely a small tree, found in the Himalayas from Kumaon westwards at an altitude of 1500-4250 m.

SYNONYMS -

Sansk. : Havuṣā, Matsyagandha
Assam. : Arar, Abahal, Habbul
Beng. : Hayusha
Eng. : Juniper Berry, Common Juniper
Guj. : Palash
Hindi. : Havuber, Havúbair
Kan. : Padma Beeja
Mal. : --
Mar. : Hosh
Ori. : --
Punj. : Havulber
Tam. : --
Tel. : Hapusha
Urdu. : Abhal, Aarar

DESCRIPTION –

a) Macroscopic :

Fruit sub-spherical, berry like, purplish-black, occasionally showing a 'bloom', about 0.5-1.0 cm in dia., apex shows triradiate mark and depression indicating the suture of three fleshy-bracts; at the base are six, small, pointed, bracts arranged in 2 whorls, but occasionally 3 or 4 whorls present; three hard, triangular seeds are embedded in the fleshy mesocarp, each with a woody testa bearing large partly sunk oily glands; odour terebinthine and taste bitter.

b) Microscopic :

Outer layer of fruit shows 3-4, large, cubic or tabular cells having thick, brown porous walls externally covered by single layered, colourless cuticle; sarcocarp consists of large, elliptical, thin-walled, loosely coherent cells, containing drops of essential oil and prismatic crystals of calcium oxalate; oval to elongated, elliptical, triangular or irregular shaped cells abundant in this region; seed coat shows 2 or 3 layers of tabular, thin-walled cells covered externally by a thin cuticle and followed internally by a wide zone of thick-walled polygonal sclerenchymatous cells; endosperm and embryo not distinct.

Powder – Brown; shows oval to elongated, elliptical and irregular shaped, thick-walled stone cells; rectangular to hexagonal, straight, thick walled epidermal cells in surface view; prismatic crystals of calcium oxalate and oil globules.

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 0.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 12 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 9 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under UV (366 nm) three fluorescent zones at Rf. 0.11 (light blue), 0.20 (light blue) and 0.58 (blue). On exposure to Iodine vapour ten spots appear at Rf. 0.17, 0.25, 0.30, 0.36, 0.46, 0.58, 0.64, 0.67, 0.90 and 0.96 (all yellow). On spraying with Vanillin Sulphuric acid and heating the plate for ten minutes at 110°C twelve spots appear at Rf. 0.11, 0.17, 0.25, 0.30 (all brown), 0.36 (light brown), 0.46, 0.52 (both brown), 0.58 (dirty yellow), 0.64 (brown), 0.73 (light brown), 0.90 (light brown) and 0.96 (brown).

CONSTITUENTS – Essential Oil and Flavonoids.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṭu,, Kaṣāya
Guṇa : Guru, Mṛdu
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Agnidīpaka, Vātanāśaka, Kaphanāśaka, Viṣaghna

IMPORTANT FORMULATIONS - Kumāryāsava, Saptavinsitika Guggulu, Dādhika Ghṛta, Nārāyana Cūrṇa, Trayodaṣāṅga Guggulu, Pradarāntaka Lauha, Nityānanda Rasa

THERAPEUTIC USES - Pittodara, Arśa, Grahaṇī, Gulma, Śūla, Kṛmi, Vātodara, Plīhāroga

DOSE – 2-6 g. in powder form.

INDRAVĀRUṆĪ (Fruit)

Indrvāruṇī consists of dried/peeled cut pieces of the fruit of *Citrullus colocynthis* Schrad. (Fam. Cucurbitaceae); an annual or perennial creeper growing wild in the warm, arid and sandy tracts of North West, Central and Southern parts of the country.

SYNONYMS –

Sansk. : Gavākṣī, Indravallī, Aendrī
Assam. : Gavadani
Beng. : Rakhal
Eng. : Colocynth
Guj. : Indrayan
Hindi. : Indrayan
Kan. : Havumekke
Mal. : Kattu Vellarikkai, Valiya Pekkummatti
Mar. : Endrayana
Ori. : Gothakakudi, Indrayanalata, Garukhiya
Punj. : Indrayana
Tam. : Peitummatti
Tel. : Chedupuchcha, Peikummatti
Urdu. : Hanjal

DESCRIPTION –

a) Macroscopic :

White or pale yellowish-white, light, pithy fragments upto about 6 cm long and 2 cm thick; externally convex with ridges and flattened areas 5-10 mm wide resulting from peeling with a knife; internally irregularly concave and showing numerous ovoid depressions about 10 mm long, left by the removal of the seeds; pulp bitter, seeds flattened, ovoid, yellowish-white to dark brown, about 7 x 5 x 2 mm; endosperm narrow and oily; cotyledons 2, oily; radicle, small; epicarp woody, about 1 mm thick, buff coloured externally; odourless; taste, intensely bitter.

b) Microscopic :

Pulp consists of large, thin-walled, pitted parenchyma of rounded cells showing oval, flat, pitted areas where they are in contact with many slender bicollateral vascular strands having spiral vessels and occasional associated latex vessels; epicarp, where present, with epidermis of radially elongated cells having thick outer walls and thin inner walls and partially thickened anticlinal walls with occasional stomata of the anomocytic type; the adjacent parenchymatous layer about 15 cells thick, and an inner layer of sclereids, the outer sclereids very thick, smaller, about 15 to 30 μ in diameter, isodiametric and the inner sclereids layer upto about 60 μ, radially elongated,

with thinner walls; seed, testa with outer epidermis of thick-walled unlignified palisade cells having vertical strips of thickening on the anticlinal walls, with inner layers of very thick-walled, striated, pitted, lignified sclereids, and an inner most layer of sclereids with reticulately thickened walls; endosperm and cotyledons parenchymatous with fixed oil and aleurone grains upto 7 μ in diameter.

Powder - Yellowish-brown; shows, groups of pitted parenchymatous cells, annular and spiral vessels, stone cells, oil globules and aleurone grains measuring up to 7 μ dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter - Not more than 2 per cent, Appendix 2.2.2.
Total ash - Not more than 14 per cent, Appendix 2.2.3.
Acid-insoluble ash - Not more than 7 per cent, Appendix 2.2.4.

Light Petroleum soluble-matter : On continuous extraction with light petroleum (b.p. 40° to 60°) and drying at 100°C, not more than 3.0 per cent.

T.L.C. -

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.88 (light blue) and 0.98 (yellow). On exposure to Iodine vapour two spots appear at Rf. 0.88 and 0.98 (both yellow). On spraying with 5% Methanolic-Phosphomolybdic acid reagent and heating the plate for ten minutes at 105°C four spots appear at Rf. 0.65 (blue), 0.84 (blue), 0.96 (blue) and 0.98 (dark blue).

CONSTITUENTS – Resins – Resinous Glycosides (Colocynthin and Colocynthitin), A Phytosterol Glycoside, Citrullol, Pectin and Albuminoids, Cucurbitacins – Cucurbitacin E & I.

PROPERTIES AND ACTION -

Rasa : Tikta
Guṇa : Laghu, Rūkṣa, Tīkṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vāmaka, Recana, Kṛmighna, Ślesmahara, Viṣahara

IMPORTANT FORMULATIONS - Jawaraghni Guṭika (II)

THERAPEUTIC USES – Kṛmiroga, Kāmalā, Swāsa, Kāsa, Kuṣṭha, Gulma, Udararoga

DOSE – 0.125 -0.5- g. of powder.
0.25 -0.5 g. of powder.

INDRAYAVA (Seed)

Indrayava consists of dried seeds of *Holarrhena antidysenterica* Wall. (Fam. Apocynaceae); a small to medium sized tree, found throughout India.

SYNONYMS –

Sansk. : Bhadra Yava, Kalinga, Sakra, Vatsaka
Assam. : Dudhkuri
Beng. : Kurchi
Eng. : Ester Tree, Conessi Seeds
Guj. : Kuda, Kudo
Hindi. : Indraju, Kurchi, Kuraiya
Kan. : Kodasige Beeja
Mal. : Kutakappala
Mar. : Kudayache Beej
Ori. : Kurei, Keruan
Punj. : Indrajau, Kaurasakh, Kura
Tam. : Kudasapalai
Tel. : Kodisapala Vittulu, Palakodisa-Vittulu
Urdu. : Tukhm-e-Kurchi, Indarjao Talkh

DESCRIPTION –

a) Macroscopic :

Seeds compressed, linear, or oblong, elongated, margins curved inside, one side convex and other side concave with a longitudinal striation; 1-2 cm long, 0.2-0.3 cm thick, surface light yellowish- brown; odour, not distinct; taste, bitter.

b) Microscopic :

Seed shows 2-3 layered integument consisting of single layered, rounded, oval or radially elongated, thick-walled, reddish-brown parenchymatous cells, some of them elongate outwards forming small papillose structure, covered by a few unicellular, and uniseriate, multicellular types of trichomes; below this layer, 1 or 2 layers of small rounded or irregular cells, a few having single prismatic crystals of calcium oxalate, followed by a few layers of collapsed, brown coloured cells; endosperm 4-6 layered consisting of rounded, oval or polygonal, thin-walled, parenchymatous cells, containing aleurone grains; most of the cells also contain oil globules; embryo having conical radicle and two foliaceous, convoluted cotyledons consisting of single layered tabular epidermal cells towards dorsal side and rectangular cells towards ventral side, and externally covered with cuticle; rest of the cotyledon cells composed of rounded, oval or rectangular parenchymatous cells containing rosette crystals of calcium oxalate and oil globules.

Powder - Light yellowish-brown; shows fragments of endosperm, pigment cells, oil globules, prismatic and rosette crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 8 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 3 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 12 per cent, Appendix 2.2.6.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (1:1) shows under U.V. (366 nm) four fluorescent zones at Rf. 0.67, 0.72, 0.76 and 0.93 (all blue). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent five spots appear at Rf. 0.15, 0.28, 0.43, 0.59 and 0.67 (all orange).

CONSTITUENTS – Alkaloids –Steroidal Alkaloid, Conessine etc., Fats, Tannin and Resin.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Dīpana, Tridoṣaśāmaka, Saṅgrāhī

IMPORTANT FORMULATIONS - Pañca Nimba Cūrṇa, Palāśa Bījādi Cūrṇa, Laghu Gangādhara Cūrṇa, Kṛmi Kuṭhāra Rasa, Piyūṣavallī Rasa, Jwaraghni Guṭikā, Siddha Prāneśwara Rasa, Ahiphenāsava

THERAPEUTIC USES - Atisāra, Kuṣṭha, Jwarātisāra, Kṛmi, Visarpa, Grahaṇī, Raktātisāra, Śūla, Chardi, Twakroga, Dāha

DOSE – 3-6 g. (Cūrṇa).
20-30 g. (Decoction).

ĪŚVARĪ (Root)

Īśvarī consists of dried root of *Aristolochia indica* Linn. (Fam. Aristolochiaceae); a perennial shrubby, twiner, found throughout the low hills and plains of India.

SYNONYMS -

Sansk. : Gandhnākulī, Nāgadamanī
Assam. : Jarvande
Beng. : Isheri
Eng. : Indian Birthwort, Serpent Root
Guj. : Ruhimool, Iswarimool
Hindi. : Ishwari
Kan. : Iswari Beru, Toppalu
Mal. : Karaleyan
Mar. : Sapsan
Ori. : Gopikaron
Punj. : --
Tam. : Perumarundu, Ichchuramule
Tel. : Iswari, Nallaiswari
Urdu. : Zarawand Hindi

DESCRIPTION –

a) Macroscopic :

Root considerably long, cylindrical, a few irregularly bent; 2-10 mm in dia; surface almost smooth with fine longitudinal wrinkles and transverse cracks; external surface, light greyish-brown; inner whitish; fracture, short and splintery; odour, camphoraceous; taste, strongly bitter.

b) Microscopic :

Cork 8-10 layers, composed of tabular, thin-walled cells excepting the outer most layer, having thick-walled cells externally and filled with brownish content; cork cambium single layered; secondary cortex 15 to 17 layers of thin-walled, somewhat rounded and isodiametric cells in the outer region but tangentially elongated in the inner region; plenty of simple, round to oval starch grains measuring 5-18 μ in dia., and compound starch grains having 2-4 components measuring 10-15 μ in dia., and oil globules present in a few cells; in the middle region stone cells round, rectangular, oval or elongated present in small irregular patches having simple pits and radiating canals; centre occupied by xylem, split into strips of radiating arms by wedge-shaped masses of parenchyma; each xylem arm is capped by thin patches of phloem consisting of sieve elements and phloem parenchyma, phloem fibres, and occasionally stone cells also found in this region; a ring of cambium present between phloem and xylem; xylem consists of large vessels, tracheids, fibres tracheids and paren-

chyma, all being lignified; in older roots, tyloses formation takes place in vessels; medullary rays 8 to 10 in number, multiseriate and dilating towards periphery and alternating with radiating arms of wood; scattered group of stone cells present in a few wider rays; micro-crystals with a few appearing as elongated small prisms and unaffected by acids, are present in a few cortical and ray cells.

Powder – Brownish-yellow; fragments of cork cells, very few, oval to rectangular, lignified, thick-walled stone cells having distinct striations with narrow lumen, vessels with spiral thickenings, non-lignified, thick-walled tracheids, numerous simple, round to oval, starch grains measuring 5-18 μ in dia., and compound grains having 2 to 4 components, measuring 10 – 15 μ in dia., a few crystals and oil globules.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	- Not more than 2 per cent, Appendix 2.2.2.
Total ash	- Not more than 4 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 3 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel `G' plate using Toluene : Ethylacetate (85 : 15) shows under UV (366 nm) four fluorescent zones at Rf. 0.21, 0.60 (both blue), 0.89 (red), 0.96 (blue). On exposure to Iodine vapour six spots appear at Rf. 0.11, 0.21, 0.50, 0.63, 0.96 and 0.98 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C three spots appear at Rf. 0.14, 0.63 (both violet) and 0.96 (brown).

CONSTITUENTS – Alkaloids, Essential Oils, Bitter Principles and Fixed Oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṭu, Kaṣāya
Guṇa : Laghu, Rūkṣa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphavātaśāmaka, Śothahara, Rakṣoghna, Grahabādhāghna

IMPORTANT FORMULATIONS - Mahāviṣagarbha Taila, Gorocanādi Guṭikā

THERAPEUTIC USES - Sarpaviṣa, Lūtā Viṣa, Jalagārdabha, Vṛścikaviṣa, Jwara, Krmi, Vrana

DOSE – 1-2 g. (For external use also).

JĀTĪ (Leaf)

Jāti consists of dried leaves of *Jasminum officinale* Linn. (Fam. Oleaceae); a large climbing shrub with dark green twigs and pinnate leaves, found in Kashmir at an altitude of 900 - 2700 m and cultivated throughout the country.

SYNONYMS -

Sansk. : Mālatī
Assam. : Yasmeen
Beng. : Chamelee
Eng. : Jasmine
Guj. : Chamelee
Hindi. : Chamelee
Kan. : Jati Maltiga, Sanna Jati Mallige
Mal. : Pichi
Mar. : Chamelee
Ori. : --
Punj. : Chamelee
Tam. : Pichi, Jatimalli
Tel. : Jati, Sannajati
Urdu. : Chameli, Yasmeen

DESCRIPTION -

a) Macroscopic :

Leaf single or in groups of 2-7 leaflets, upto 7.5 cm long and upto 2.5 cm broad; imparipinnately compound; terminal leaflet larger; ovate or lanceolate, acuminate; lateral leaflets shorter, acute, sessile or shortly petiolate; brownish-green; taste, bitter.

b) Microscopic :

Rachis - Rachis shows more or less convex outline with two lateral wings; epidermis single layered covered by thick cuticle; hairs mostly unicellular with pointed apex, glandular rarely found only on the upper surface; collenchyma 2 - 5 layered; pericycle represented by slightly lignified small fibre groups; vascular bundles three, median crescent-shaped, small accessory bundle present in each wing.

Midrib – shows similar structure as rachis; 3 - 5 layers of collenchymatous cells towards lower surface; pericycle present in the form of non-lignified fibre groups; vascular bundle single and crescent-shaped.

Lamina - shows dorsiventral structure, epidermis single layered on either side, covered by a thick striated cuticle; hairs as in rachis; palisade 1- 2 layered; spongy parenchyma 4-6 layers; stomata anomocytic only in lower surface.

Powder – Yellowish-green; shows palisade and spongy parenchyma, unicellular hairs, fibres and vessels with spiral thickening, polygonal epidermal cells and anomocytic stomata in surface view.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 6 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractives	-	Not less than 18 per cent, Appendix 2.2.6.
Water-soluble extractives	-	Not less than 25 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under UV (366 nm) three fluorescent zones at Rf. 0.44 (blue), 0.52 (light blue) and 0.91 (blue). On exposure to Iodine vapours ten spots appear at Rf. 0.08, 0.18, 0.38, 0.44, 0.49, 0.53, 0.59, 0.67, 0.81 and 0.91 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent four spots appear at Rf. 0.08, 0.18 (both orange), 0.44 and 0.91 (both light orange). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C many spots of brown, yellow, blue and violet colour appear from the point of application to the solvent front.

CONSTITUENTS – Resin, Salicylic Acid, Alkaloid (Jasminine) and Essential Oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya
Guṇa : Laghu, Snigdha, Mṛdu
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Śirovirecana, Cakṣuṣya

IMPORTANT FORMULATIONS – Jātyādi Taila, Jātyādi Ghṛta, Vasanta Kusumākara Rasa

THERAPEUTIC USES – Śiroroga, Akṣiroga, Viṣaroga, Kuṣṭha, Vraṇa, Arśa, Mukhapāka, Putikarṇa, Stana Śotha, Raktavikāra

DOSE – 10-20 g. of powder for decoction.

KADALĪ (Rhizome)

Kadalī consists of fresh rhizome of *Musa paradisiaca* Linn. (Fam. Musaceae); plant found cultivated throughout India, upto 1200 m.

SYNONYMS -

Sansk. : Vāraṇā, Ambusārā, Rambhā
Assam. : Kal, Talha
Beng. : Kela, Kala, Kanch Kala, Kodali
Eng. : Banana
Guj. : Kela
Hindi. : Kela
Kan. : Bale Gadde
Kash. : --
Mal. : Vazha
Mar. : Kela
Ori. : Kadali, Kadila
Punj. : Kela
Tam. : Vazhai
Tel. : Arati Gadda
Urdu. : Kela

DESCRIPTION –

Macroscopic :

Drug available in 0.1-4 cm thick, transversely cut pieces, pinkish-brown to greyish-brown, occasionally attached with a few roots.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.25 (orange) and 0.33 (green). On exposure to Iodine vapour three spots appear at Rf. 0.11, 0.25 and 0.73 (all yellow).

CONSTITUENTS – Fixed Oil and 4 α –Methyl Sterol Ketone.

PROPERTIES AND ACTION -

Rasa : Madhura, Kaṣāya
Guṇa : Śīta, Guru, Rūkṣa
Vīrya : Śīta
Vipāka : Madhura
Karma : Balya, Kaphahara, Pittahara, Dīpana, Rūcya, Keśya

IMPORTANT FORMULATIONS - Abhraka Bhasma (Śataputī), Kṣāra Taila

THERAPEUTIC USES - Kṛmi, Kuṣṭha, Karṇa Śūla, Somaroga, Amlapitta, Dāha, Raktavikāra, Rajodoṣa, Mutrakṛcchra

DOSE – 10-20 g. in powder form.
10-20 ml. in juice form.

KĀKAJANGHĀ (Root)

Kākajanghā consists of dried root of *Peristrophe bicalyculata* Nees (Fam. Acanthaceae) an erect, hispid, herb or undershrub, 60-180 cm high found in forest undergrowth, hedges and waste lands almost throughout the country.

SYNONYMS -

Sansk. : Nadīkāntā, Kākatiktā, Prācibalā, Sulomaśā
Assam. : --
Beng. : Nasabhaga, Naskaga
Eng. : --
Guj. : Kaliadhedi, Kariadhedi, Lasiadhedi
Hindi. : Atrilal, Itrelal, Masi, Nasbhanga, Kakajangha
Kan. : Cibigid,, Cibirsoppu
Mal. : --
Mar. : Ghatipittapapada, Ramkirayat, Pitpapra
Ori. : --
Punj. : --
Tam. : Chebisa
Tel. : Chebira
Urdu : --

DESCRIPTION –

a) Macroscopic :

Root occurs upto 0.7 cm thick, and upto 4 cm long cylindrical with branched lateral roots, dirty brown; fracture, fibrous; odour and taste not characteristic.

b) Microscopic :

Shows poorly developed cork, consisting of 2-4 layers of tangentially elongated, thin-walled cells; where cork is not developed, epidermis present, consisting of single layered cells; secondary cortex narrow, consisting of 5-7 layers of elliptical or tangentially elongated, thin-walled, parenchymatous cells; secondary phloem narrow, consisting of sieve elements and parenchyma; phloem rays not distinct; secondary xylem consisting of pitted vessels, fibres, tracheids and parenchyma; vessels occur singly or in groups of 2-4 or more and arranged radially throughout secondary xylem; vessels with simple pits, tracheids thick-walled and lignified.

Powder – Dirty-brown; shows parenchymatous cells, aseptate fibres and pitted vessels.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 9 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 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 7 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (93:7) shows under U.V. (366 nm) five fluorescent zones at Rf. 0.15, 0.30, 0.52, 0.90 and 0.98 (all light blue). On exposure to Iodine vapour six spots appear at Rf. 0.07, 0.15, 0.30, 0.43, 0.57 and 0.98 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C five spots appear at Rf. 0.07, 0.30, 0.43, 0.57 and 0.98 (all violet).

CONSTITUENTS – Volatile Oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya
Guna : Sara, Picchila
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Pittahara, Kaphahara, Varṇya

IMPORTANT FORMULATIONS – Āragvadhādi Kvātha Cūrṇa

THERAPEUTIC USES – Vraṇa, Jwara, Raktapitta, Kaṇḍu, Kṛmi, Kuṣṭha, Raktavikāra, Viṣa Vikāra, Siddhma, Ślīpada, Balagraha, Aikāhikjvara, Bādhirya, Anidrā, Rājayjakṣmā, Pradara, Dantkṛimi, Sarpviṣa

DOSE – 1-5 g. in powder form.

KĀKANĀSIKĀ (Seed)

Kākanāsikā consists of dried seed of *Martynia annua* Linn. Syn. *M. diandra* Glox. (Fam. Martyniaceae); an annual herb found throughout the country in waste places.

SYNONYMS –

Sansk. : Kākāṁgī, Sirobal, Cerasnaya
Assam. : --
Beng. : Kurki, Kaih, Baghnoki
Eng. : Tiger's Claw, Devil's Claw
Guj. : --
Hindi. : Bichu Hathajori, Kawathodi
Kan. : Garuda Mugu
Kash. : --
Mal. : --
Mar. : Vinchuachajada
Ori. : --
Punj. : Kaktundi, Bichu, Hathajari
Tam. : Kakatundi
Tel. : Garudamukku, Telukondikaya
Urdu. : --

DESCRIPTION –

Macroscopic :

Seed oblong, hard, woody, 2-5 cm long and 1.5-1.7 cm wide; surface wrinkled, light brown to black; two sharp recurved hooks present at anterior end; four prominent grooves present each on convex and concave side and on lateral sides, 2-4 hairy spines present inside groove on concave side; no taste and odour.

Powder- Black and rough; shows groups of thick-walled cells, numerous fibres, unicellular hairs and oil globules.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 3 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 3 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.66 and 0.95 (both blue). On exposure to Iodine vapour four spots appear at Rf. 0.11, 0.42, 0.57 and 0.95 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 105° C four spots appear at Rf. 0.11, 0.42, 0.57 and 0.95 (all violet).

CONSTITUENTS – Fixed Oil – (Semidrying type).

PROPERTIES AND ACTION -

Rasa : Madhura
Guṇa : Śīta
Vīrya : Śīta
Vipāka : Madhura
Karma : Pittaghna, Dardhyakara, Rasāyana

IMPORTANT FORMULATIONS – Cyavanprāśa, Avaleha, Tryuṣaṇādi Ghṛta

THERAPEUTIC USES – Palita

DOSE - 2-5 g.

KĀKOLĪ (Tuberous Root)

Kākolī consists of dried tuberous root of *Lilium polyphyllum* D.Don (Fam. Liliaceae); a plant found growing in Western temperate Himalayas from 1800-3600 m from Kumaon to Kashmir.

SYNONYMS -

Sansk. : Vāyasolī, Svādumānisi
Assam. :
Beng. : Kakoli
Eng. :
Guj. : Kakoli
Hindi. : Kakoli
Kan. : Kakoli
Mal. : Kakoli
Mar. : Kakoli
Ori. : Kakoli
Punj. :
Tam. : Kakoli
Tel. : Kakoli, Kakoli Moola, Kandhambu
Urdu. : Kakoli

DESCRIPTION –

a) Macroscopic :

Roots straight or curved, dark brown and occur in bunches of 4-15; each root about 2-10 cm long, upto 0.7 cm thick; external surface rough due to presence of longitudinal wrinkles; odour, slightly aromatic; taste, acrid.

b) Microscopic :

Tuberous root shows ridges and furrows in outline; cork 8-10 layered, consisting of thin-walled, tangentially elongated, almost radially arranged cells, upper cells filled with reddish-brown content; secondary cortex consisting of oval to elongated, thin-walled, parenchymatous cells filled with abundant, simple, ovoid to ellipsoidal starch grains, measuring 5-11 μ in dia.; vascular bundles composed of usual elements, vessels arranged alternatively with phloem patches, vessels mostly solitary with spiral thickening; pith composed of oval to polygonal, thin-walled, parenchymatous cells.

Powder - Greenish-yellow; slightly aromatic in smell; shows spiral vessels, fragments of cork cells and simple, ovoid to ellipsoidal starch grains, measuring 5-11 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 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 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 7 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows in visible light two spots at Rf. 0.84 (yellow) and 0.97 (light yellow). Under UV (366 nm) five fluorescent zones visible at Rf. 0.23, 0.31 (both yellow), 0.44 (light yellow), 0.54 and 0.97 (both blue). On exposure to Iodine vapour thirteen spots appear at Rf. 0.15, 0.22, 0.23, 0.25, 0.31, 0.44, 0.54, 0.68, 0.78, 0.84, 0.88, 0.92 and 0.97 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C five spots appear at Rf. 0.44, 0.54, 0.78, 0.84 and 0.97 (all violet).

CONSTITUENTS – Sugars.

PROPERTIES AND ACTION -

Rasa : Madhura
Guṇa : Guru, Śīta
Vīrya : Śīta
Vipāka : Madhura
Karma : Vātahara, Pittahara, Sukrala, Bṛmhaṇa

IMPORTANT FORMULATIONS – Bṛhat Aśwagandhā Ghṛta, Bṛhat Chāgalādya Ghṛta, Daśamulāriṣta, Śivā Guṭikā, Amṛtaprāśa Ghṛta

THERAPEUTIC USES – Raktapitta, Śoṣa, Jwara, Swāsa, Kāsa, Kṣaya, Dāha

DOSE – 3-6 g.

KAMALA (Rhizome)

Kamala consists of dried rhizome with roots attached at nodes of *Nelumbo nucifera* Gaertn. Syn. *Nelumbium nelumbo* Druce, *N. speciosum* Willd. (Fam. Nymphaeaceae); an aquatic herb, with stout creeping rhizome found in lakes and ponds throughout the warmer parts of the country, ascending upto 1000 m.

Sansk. : Padnakanda, Sāluka, Ambhoruha
Assam.: Kamal Kakdi
Beng. : --
Eng. : Sacred Lotus
Guj. : Loda
Hindi : Kamal Kand, Kamal Kakdi
Kan. : Tavare Kanda
Kash. : --
Mal. : Tamara Kizangu
Mar. : Kamal Kand
Ori. : Padma
Punj. : Kaul, Bhein.
Tam. : Tamardi Kizangu
Tel. : Tamara Gadda
Urdu. : Kanwal Kakdi

DESCRIPTION –

a) Macroscopic :

Drug occurs as cut pieces of rhizome with distinct nodes and internodes, cylindrical, 0.5-2.5 cm in dia., longitudinally marked with brown patches, smooth, yellowish-white to yellowish-brown; root adventitious, less developed, 0.5-1 mm thick, attached to node of rhizome; dark brown.

b) Microscopic :

Rhizome – Shows a single layered epidermis followed internally by 2-4 layered lignified cells; cortex differentiated into three regions; outer cortex consisting of a wide zone of isodiametric thin-walled cells of which outer 5-6 layers collenchymatous and rest parenchymatous, having intercellular spaces and groups of fibres; middle cortex mostly composed of air cavities traversed by trabeculae of thin-walled small and nearly isodiametric cells; inner cortex forming central core, consists of spherical cells enclosing large intercellular spaces; vascular strands consists of scattered closed vascular bundles surrounded by thick-walled, lignified sclerenchymatous fibres, resembling a monocotyledonous structure; vessels having spiral and spiro-reticulate thickening; phloem composed of sieve tubes and companion cells; air cavities large, elliptic or rounded, largest at middle cortex and smaller towards inner cortex; air cavities lined by thin-walled, elongated, paren-

chymatous epithelial cells; starch grains abundant, rounded to oval, mostly simple, rarely compound measuring 8-27 μ in dia., loaded in cells.

Root – Appears more or less circular in outline, epidermis consists of oval, thin-walled parenchymatous cells; cortex composed of 5-8 layers of oval to polygonal, thin-walled parenchymatous cells, vascular elements surrounded by slightly lignified endodermis; phloem cells, xylem fibres aseptate with blunt ends; vessels with spiral thickening, rounded to oval, poorly developed and consisting of usual elements; xylem composed of vessels, tracheids and parenchyma; vessels and tracheids have simple pits.

Powder –Light brown; shows groups of oval to elongated, parenchymatous cells, xylem fibres aseptate with blunt ends; vessels with spiral thickening, rounded to oval simple starch grains measuring 8-27 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 14 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 3.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 1.5 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 6.5 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (4:1) shows in visible light one spot at Rf. 0.97 (light yellow). Under U.V. (366 nm) seven fluorescent zones visible at Rf. 0.06 (blue), 0.13 (blue) 0.43 (blue) 0.55 (blue), 0.78 (blue) 0.91 (blue) and 0.98 (reddish). On exposure to Iodine vapour eight spots appear at Rf. 0.13, 0.31, 0.45, 0.64, 0.76, 0.86, 0.93 and 0.96 (all yellow). On spraying with 5% Methanolic-Sulphuric acid and heating the plate for about ten minutes at 110°C four spots appear at Rf. 0.10 (grey), 0.64 (brown), 0.76 (brown) and 0.96 (brown).

CONSTITUENTS – Starch and Reducing Sugars.

PROPERTIES AND ACTION -

Rasa : Tikta, Madhura, Kaṣāya, Katu, Lavaṇa
Guṇa : Guru, Rūkṣa
Vīrya : Śīta
Vipāka : Madhura
Karma : Pittahara, Kaphahara, Rūcya, Viṣtambhakara, Vṛṣya, Cakṣuṣya, Varṇya, Kṛmighna, Dāhaśāmaka, Raktaduṣṭihara, Durjara, Stanyajanana, Sangrāhi, Mutravirecanīya, Viṣaghna, Vātakara

IMPORTANT FORMULATIONS – Guḍucyādi Modaka

THERAPEUTIC USES –Dāha, Tṛṣna, Chardi, Raktapitta, Murchā, Kāsa, Vātagulma, Visarpa, Visphota, Mutrakṛchra, Dansodbhava, Jwara, Bhrama, Soṣa, Hṛdroga

DOSE –10-20 ml. of the drug in juice form.
5-10 g. of the drug in powder form.

KARAVĪRA (Root)

Karavīra consists of dried root of *Nerium indicum* Mill, Syn. *N. odorum* Soland (Fam. Apocynaceae); a large glabrous, evergreen, woody shrub with milky juice, found throughout the year in upper Gangetic plains, Himalayas from Nepal to Kashmir upto 2000 m, Central and Southern India; also cultivated near the temples and gardens.

SYNONYMS -

Sansk. : Divyapuṣpa, Ṣatakumbha, Aśvamāraka, Hayamara
Assam.: Diflee, Sammulhimar
Beng. : Karbbe, Karbee
Eng. : Sweet-Scented Oleander
Guj. : Kaner
Hindi. : Kaner
Kan. : Kanagilu, Kharjahar, Kanigale, Kanagile
Kash. : --
Mal. : Kanaveeram
Mar. : Kanher
Ori. : --
Punj. : Kanir
Tam. : Sevvarali, Arali
Tel. : Kastooripatte, Errugumeru
Urdu. : Kaner

DESCRIPTION –

a) Macroscopic :

Drug available in cut pieces, 0.5-2.6 cm thick, branched, cylindrical, external surface greyish with long irregular streaks caused by rupture of bark, internal surface cream coloured; fracutre, short; taste, bitter.

b) Microscopic :

Root shows cork consisting of 5-12 layered, thin-walled, rectangular, compactly arranged, parenchymatous cells, with a few outer layers occasionally exfoliated; secondary cortex consisting of 6-10 layers of oval, tangentially elongated, thin-walled, parenchymatous cells, a few thick-walled laticiferous cells present in this region; secondary phloem composed of oval to polygonal, thin-walled, parenchymatus cells; secondary xylem consisting of usual elements, having pitted vessels, fibres with pointed tips; xylem rays usually uniseriate and rarely biseriate; prismatic crystals of calcium oxalate and simple starch grains scattered in secondary cortex, secondary phloem and phloem rays; simple, oval to round, elliptical starch grains measuring 3-11 μ in dia., found-scattered in cortical cells, phloem and xylem rays.

Powder – Greyish-brown; shows thin-walled, parenchymatous cells, fragments of cork cells, pitted xylem fibres and vessels, a few prismatic crystals of calcium oxalate, simple, round to oval, elliptical starch grains measuring 3-11 μ in diameter.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1	per cent, Appendix 2.2.2.
Total ash	-	Not more than 7.5	per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 3.5	per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 8	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 the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (8 : 2) shows under U.V. (366 nm) ten fluorescent zones at Rf. 0.11, 0.15 (both yellow) 0.19 (blue), 0.26 (yellow), 0.49 (pink), 0.60, 0.64, 0.72, 0.88 (all blue) and 0.95 (yellow). On exposure to Iodine vapour ten spots appear at Rf. 0.11, 0.22, 0.30, 0.49, 0.53, 0.64, 0.68, 0.72, 0.90 and 0.95 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for about ten minutes eleven spots appear at Rf. 0.05, 0.11, 0.22, 0.30, 0.49, 0.53 (all grey) 0.64 (yellow), 0.68, 0.72 (both grey), 0.90 (violet) and 0.95 (brown).

CONSTITUENTS – Glycosides-Cardiac Glycosides and Resinous Matter.

PROPERTIES AND ACTION -

Rasa	:	Kaṭu, Tikta, Kaṣāya
Guṇa	:	Laghu, Rūkṣa, Tikṣṇa
Vīrya	:	Uṣṇa
Vipāka	:	Kaṭu
Karma	:	Śothaghna, Krmighna, Kaṇḍughna, Kusṭhhara, Śirovirecana, Cakṣuṣya

IMPORTANT FORMULATIONS - Bṛhanmaricādya Taila, Karavirādya Taila

THERAPEUTIC USES - Vraṇa, Upadaṅśa, Kuṣṭha, Jalodara, Kaṇḍu

DOSE – 30-125 mg. of the drug in powder form.

KARAMARDA (Root)

Karamarda consists of dried root of *Carissa carandas* Linn. (Fam. Apocynaceae); a dichotomously branched large shrub or small tree with strong simple or forked thorns in pairs, found throughout the country.

SYNONYMS -

Sansk. : Karamla, Karamardaka
Assam. : --
Beng. : Karamacha
Eng. : --
Guj. : Karamada
Hindi. : Karaonda, Karaondi
Kan. : Karayige
Mal. : Modakam
Mar. : Karabanda
Ori. : --
Punj. : --
Tam. : Kalakkai
Tel. : Vaka, Karavande
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Root considerably long, often irregularly bent, woody, cylindrical; rusty or yellowish-brown; 1-1.5 cm thick; surface smooth; fracture, hard; odour and taste, not distinct.

b) Microscopic :

Mature root shows a stratified cork, lignified and tangentially elongated cells, consisting of alternating bands of smaller and larger cells; a few inner layers filled with red contents; secondary cortex very narrow, composed of 1 or 2 layers of thin-walled cells; secondary phloem composed of usual elements having a number of cavities, present in a row just below the secondary cortex; a number of stone cells present in large compact patches in different rows, in outer and inner phloem regions interrupting phloem rays; phloem rays uni-to biseriate; prismatic crystals of calcium oxalate occur in a number of cells throughout phloem region; cambium not distinct; secondary xylem very wide consisting of xylem vessels, fibres, tracheids and xylem parenchyma, all elements being lignified, xylem rays uni to biseriate, consisting of radially elongated cells; simple, round to oval, starch grains measuring 5.5-11 μ in dia., present throughout.

Powder – Yellowish-brown; shows patches of stratified cork, xylem fibres, stone cells, prismatic crystals of calcium oxalate and simple, round to oval, starch grains, measuring 5.5 – 11 μ in dia.

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 1 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 7 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under U.V. (366 nm) a conspicuous fluorescent zone at Rf. 0.07 (sky blue). On exposure to Iodine vapour four spots appear at Rf. 0.07, 0.26, 0.46 and 0.80 (all yellowish brown). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C five spots appear at Rf. 0.07, 0.26, 0.46, 0.80 and 0.92 (all violet).

CONSTITUENTS : Glycosides –Cardiac Glycosides.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Vāmaka, Mūtrala

IMPORTANT FORMULATIONS - Marma Guṭikā

THERAPEUTIC USES - Mūtra Roga, Visphoṭa, Vidradhī, Vraṇa

DOSE - 1-3 g. of the drug in powder form.

KĀSA (Root Stock)

Kasa consists of dried root stock with attached stem portion of *Saccharum spontaneum* Linn. (Fam. Poaceae), a perennial grass with slender culms, found throughout the country in warmer parts ascending upto 1,800 m in the Himalayas.

SYNONYMS -

Sansk. : Kāśa, Śvetacāmara
Assam. :
Beng. : Chhote-Kase, Kash, Keshe
Eng. : Thatch-Grass
Guj. : Kansado, Kansa, Kansado, Ghans
Hindi. : Kans, Kasa
Kan. : Kirayikagachchha, Kasalu
Mal. : Nannana, Kusa, Kuruvikarimpu
Mar. : Kasai
Ori. : --
Punj. : Kani
Tam. : Nanal, Nanalu, Karumbu, Kasa, Amaver
Tel. : Kakicheraku, Relu
Urdu. : Kansa, Kasa

DESCRIPTION –

a) Macroscopic :

Drug occurs in the form of root stock with attached stem portions having numerous dark brown roots; cylindrical, yellowish-brown to brown, 2-25 cm or more in length and 0.2-1 cm thick; fracture, splintery.

b) Microscopic :

Root stock shows single layered epidermis, consisting of slightly oval, thin-walled cells, a few elongated, pointed, aseptate, long unicellular hairs arise from epidermis; cortex composed of 2-3 layered, elongated, thick- walled, palisade-like cells and 3-4 layers of thin-walled, oval to polygonal parenchymatous cells; endodermis consisting of thin- walled, single layered cells, followed by 6-9 layered, thick-walled, lignified, polygonal, continuous ring of sclerenchymatous cells; pericycle single layered, composed of very small, thin-walled cells beneath endodermis; ground tissues wide, composed of thin-walled, oval to polygonal, elongated parenchymatous cells having numerous, round to oval starch grains measuring 8-24 μ in dia., scattered 'U' shaped vascular bundle with sheath, also seen in this region.

Powder - Dark brown; shows fragments of thin-walled, tabular, somewhat rectangular, epidermal cells in surface view, oval to polygonal, thin-walled parenchymatous and thick-walled polygonal sclerenchymatous cells, pointed unicellular hairs, vessels with reticulate thickening, small round to oval starch grains, measuring 8-24 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 7 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 4 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under U.V. (366 nm) one fluorescent zone at Rf. 0.83 (green). On exposure to Iodine vapour three spots appear at Rf. 0.30, 0.83 and 0.90 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 105°C six spots appear at Rf. 0.13, 0.23, 0.30 (all dull yellow), 0.69,0.83 and 0.90 (all grey).

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta
Guṇa : Sara
Vīrya : Śīta
Vipāka : Madhura
Karma : Pittahara, Balakṛt, Vṛṣya, Srmahara, Rūcikṛt

IMPORTANT FORMULATIONS – Karpūrādyarka, Brahma Rasāyana, Sukumāra Ghṛta, Traikaṇṭaka Ghṛta,Tṛnapancamūla Kvātha Cūrṇa, Mūtravirecanīya Kaṣāya Cūrṇa, Stanyajanana kaṣāya Cūrṇa, Aśmarihara Kaṣāya Cūrṇa

THERAPEUTIC USES – Raktapitta, Mūtarakṛcchra, Aśmarī, Dāha, Raktadoṣa, Śoṣa, Kṣaya

DOSE – 3-6 g. of the drug in powder form.

KATPHALA (Fruit)

Katphala consists of dried fruit of *Myrica esculenta* Buch.- Ham. ex D. Don Syn. *M. nagi* Hook.f. (Fam. Myricaceae); a dioecious, evergreen, small or moderate sized tree, 3-15 m high, found in sub-tropical Himalayas from Ravi eastwards to Assam, and in Khasi, Jaintia, Naga and Lushai hills a elevation of 900-2100 m.

SYNONYMS -

Sansk. : Mahāvalkala
Assam.: Ajooree, Vdulbark
Beng. : Kaychhal, Katphal, Kayphal
Eng. : Box Myrtle, Bay Berry
Guj. : Kayphal
Hindi. : Kayphajl
Kan. : Kadujai Kai, Katphala, Kirisivari, Kirishivane
Mal. : Marut
Mar. : Kaayphal
Ori. : --
Punj. : Kanphal, Kayphal
Tam. : Marudam, Marudampatai
Tel. : Kaidaryamu
Urdu. : Kaiphal

DESCRIPTION –

a) Macroscopic :

Fruit – A drupe, ellipsoid or ovoid, 0.7-1.0 cm long, 0.5-0.7 cm wide, dark brown, surface tubercled, very hard; taste, sourish sweet.

Seed – Ovoid, 0.6 cm long, 0.3 cm wide, surface very smooth, light brown; taste, oily.

b) Microscopic :

Fruit – Shows epicarp cells isodiametric in surface view, mass of reddish-brown, thin-walled, parenchymatous cells, a few elongated tubercled cells with smooth walls; endocarp hard and stony consisting of sclerenchymatous cells.

Seed – Seed coat shows single layered, thick, brown coloured cells; cotyledons composed of single layered, thin-walled epidermal cells containing oil gloubles and aleurone grains; mesophyll cells thin-walled, isodiametric, fully packed with oil gloubles and aleurone grains.

Powder – Yellowish-brown; shows rectangular to hexagonal, thin-walled seed coat and polygonal epidermal cells in surface view; tubercled parenchymatous cells, oil globules and aleurone grains.

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 2.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 15 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 17 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'GF 254' plate using n-Butanol : Acetic acid : Water (4:1:5) shows in visible light five spots at Rf. 0.25, 0.43, 0.57, 0.75 (all grey) and 0.88 (yellowish green). Under U.V. (366 nm) seven fluorescent zones are visible at Rf. 0.09, 0.18 and 0.30 (all light blue), 0.43 (green), 0.49 (blue), 0.65 (blue) and 0.71 (pink). On exposure to Iodine vapour eleven spots appear at Rf. 0.07, 0.09, 0.12, 0.25, 0.30, 0.35, 0.43, 0.52, 0.57, 0.75 and 0.88 (all yellow). On spraying with 5% Methanolic–Sulphuric acid reagent and heating the plate for ten minutes at 110°C six spots appear at Rf. 0.09 (black), 0.30 (black), 0.57 (light brown), 0.71 (light pink), 0.82 (light pink) and 0.88 (yellowish green).

CONSTITUENTS – Waxy Material.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Kaṣāya
Guṇa : Laghu, Tīkṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphavātahara, Dāhahara, Mukharogaśāmaka, Dhātuvikārājit, Rūcya

IMPORTANT FORMULATIONS - Bṛhatphala Ghṛta, Puṣyānuga Cūrṇa, Arimedādi Taila, Balā Taila, Mahāviṣagarbha Taila, Khadirādi Guṭikā (Mukha Roga), Khadirādi Guṭikā (Kāsa), Mahā Vātagajāṅkuśa Rasa

THERAPEUTIC USES - Gulma, Meha, Jwara, Arśa, Grahaṇī, Pāṇḍu Roga, Hṛllāsa, Mukha Roga, Kāsa, Swāsa

DOSE – 3-5 g.

KAṬPHALA (Stem Bark)

Kaṭphala consists of dried stem bark of *Myrica esculenta* Buch.- Ham. ex D. Don, Syn. *M. nagi* Hook.f. (Fam. Myricaceae); a dioecious evergreen, small or moderate sized tree, 3-15 m high, found in subtropical Himalayas from Ravi eastward to Assam, Khasi, Jaintia, Naga and Lushai hills upto an elevation of 900-2100 m.

SYNONYMS –

Sansk. : Mahāvalkala
Assam.: Ajooree Vdulbark
Beng. : Kaychhal, Katphal, Kayphal
Eng. : Box Myrtle, Bay Berry
Guj. : Kayphal
Hindi. : Kayphal
Kan. : Kadujai Kai, Katphala, Kirisivari, Kirishivane
Mal. : Marut
Mar. : Kaayphal
Ori. : --
Puṇj. : Kanphal, Kayphal
Tam. : Marudam, Marudampatai
Tel. : Kaidaryamu
Urdu. : Kaiphal

DESCRIPTION –

a) Macroscopic :

Drug occurs in pieces of variable length, 1-2.5 cm thick, slightly quilled, fissured longitudinally and transversely, outer surface rough, grey to brownish-grey, inner surface dark brown and smooth; fracture, hard; taste, bitter.

b) Microscopic :

Mature stem bark shows multilayered cork, composed of rectangular, tangentially elongated, thin-walled cells, some filled with red contents; secondary cortex a wide zone, composed of thin-walled, rectangular to polygonal, parenchymatous cells, a number of cells filled with red colouring matter and simple, round to oval starch grains measuring 6-11 μ in dia.; a number of stone cells, in singles or in groups, circular polygonal or oval, thick-walled, lignified with simple pits and radiating canals, found scattered throughout secondary cortex; secondary phloem consists of sieve elements, phloem fibres, crystal fibres, stone cells and phloem parenchyma traversed by phloem rays; numerous prismatic crystals of calcium oxalate present in secondary phloem; phloem fibres with blunt or pointed end and highly thick-walled, with very narrow lumen present in groups; stone cells similar to those found in secondary cortex, mostly in singles or in groups of 2-3, sometimes associated with fibre groups in phloem parenchyma; in isolated preparation and tangential sections crystal fibres

show more than twenty chambers having single prismatic crystals of calcium oxalate in each chamber; a number of phloem parenchyma cells containing red colouring matter; phloem rays 1-4 seriate, containing red colouring matter.

Powder – Rusty red; shows a number of stone cells, phloem fibres, crystal fibres and prismatic crystals of calcium oxalate and simple, round to oval, starch grains measuring 6-11 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 4 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 13 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 using Toluene : Ethylacetate (7 : 3) in visible light shows four spots at Rf. 0.08 (grey), 0.32 (yellow), 0.51 (grey) and 0.58 (yellow). Under UV (366 nm) three fluorescent zones appear at Rf. 0.49, 0.67 (both light blue) and 0.86 (blue). On spraying with 5% Methanolic-sulphuric acid reagent and heating the plate at 110°C for ten minutes six spots appear at Rf. 0.08, 0.21 (both grey), 0.35 (Pink), 0.52, 0.67 and 0.80 (all grey).

CONSTITUENTS – Tannin and Glycosides.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Kaṣāya
Guṇa : Laghu, Tikṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphavātahara, Dāhahara, Mukharogaśāmaka, Dhātuvikārājit, Kaṭhaphalādi Nasya

IMPORTANT FORMULATIONS – Bṛhatphala Ghṛta, Puṣyānuga Cūrṇa, Arimedādi Taila, Balā Taila, Mahāviṣagarbha Taila, Khadirādi Guṭikā (Mukha Roga), Khadirādi Guṭikā (Kāsa), Mahā Vātagajāṅkuśa Rasa

THERAPEUTIC USES - Gulma, Meha, Jwara, Arśa, Grahaṇī, Pāṇḍu Roga, Hṛallāsa, Mukha Roga, Kāsa, Śwāsa, Agnimāndhya, Aruchi, Kaṇṭharoga

DOSE – 3-5 g.

KOLA (Fruit Pulp)

Kola consists of dried fruit pulp (devoid of seed) of *Zizyphus mauritiana* Lam. Syn. *Z. jujuba* Lam. (Fam. Rhamnaceae); a small, evergreen sub-deciduous tree, wild and also extensively cultivated throughout the country and found in Himalayan region upto about 1370 m.

SYNONYMS -

Sansk. : Kolī, Badarī
Assam. : Vagari
Beng. : Kul Vadar, Vadar, Vadai, Narkolikul
Eng. : Jujube
Guj. : Bor
Hindi. : Desi Ber
Kan. : Borehannu
Mal. : Lanta, Lantakkura
Mar. : Bor
Ori. : Borakoli
Punj. : Desi ber
Tam. : Ilandai
Tel. : Regi
Urdu. : Ber

DESCRIPTION –

a) Macroscopic :

Pulp pieces irregular in shape, shrunk, with external surface smooth and glossy, 2 mm in thickness, brittle, colour, orange red; odour, not distinct; taste, sour.

b) Microscopic :

Fruit pulp shows single layered epicarp consisting of thin-walled, parenchymatous cells, covered with thin layer of cuticle; mesocarp differentiated into two zones, outer zone consisting of 5-10 layers of rectangular, thin-walled, parenchymatous cells, inner mesocarp consisting of oval to polygonal, thin-walled, crushed parenchymatous cells, most of the mesocarp cells filled with reddish-brown substance, which is tannin when tested; a few fibro- vascular bundles found scattered in this region.

Powder - Orange; shows round to oval, thin-walled, reddish-brown cells of mesocarp, slightly thick-walled, polygonal epicarp cells in surface view.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 4.5 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.2 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 25 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 45 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (9:1:10) shows under UV (366 nm) a fluorescent zone at Rf. 0.34 (light blue). On exposure to Iodine vapour seven spots appear at Rf. 0.11, 0.17, 0.34,0.43,0.54, 0.66 and 0.84 (all yellow). On spraying with 60 % Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 120°C five spots appear at Rf. 0.17,0.34 (both black), 0.43, 0.66 and 0.84 (all grey). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 110°C two spots appear at Rf. 0.17 and 0.34 (both black).

CONSTITUENTS – Vitamin C, Sugars and Minerals.

PROPERTIES AND ACTION -

Rasa : Madhura, Amla, Kaṣāya
Guṇa : Guru, Snigdha
Vīrya : Uṣṇa
Vipāka : Madhura
Karma : Grāhī, Vātahara, Rūcya, Dīpana, Pācana

IMPORTANT FORMULATIONS – Dhānvantara Taila, Yavānī Ṣādhava

THERAPEUTIC USES – Dāha, Raktavikāra, Tṛṣṇā, Aruci

DOSE – 3-6 g. (Dried Pulp).

KOLA (Stem Bark)

Kola consists of dried stem bark of *Zizyphus mauritiana* Lam. Syn. *Z. jujuba* Lam. (Fam. Rhamnaceae); a small, evergreen sub-deciduous tree, wild and also extensively cultivated throughout the country and found on Himalayan region upto about 1370 m.

SYNONYMS –

Sansk. : Kolī, Badara, Badarī, Karkandhū
Assam. : Bagori, Bayur
Beng. : Kula
Eng. : Jujube
Guj. : Bor
Hindi. : Desi Ber
Kan. : Boehannumara
Mal. : Lanta
Mar. : Bor
Ori. : Borakali
Punj. : Desi ber
Tam. : Ilandai
Tel. : Regi, Regu
Urdu. : Ber

DESCRIPTION –

a) Macroscopic :

Bark available in pieces of variable length, usually 0.6 - 1 cm thick, external surface, blackish-grey, hard, rough due to deep furrows and fissures, exfoliating in irregular scales exposing inner brownish-red fibrous zones; no taste or odour.

b) Microscopic :

Stem bark shows a thick portion of rhytidoma, made up of about 25 - 30 alternate bands of cork and dead cells of secondary cortex and secondary phloem; cork consists of thin-walled, rectangular, about 5-6 layered, crushed, parenchymatous cells, mostly filled with dark brown pigment; secondary cortex consists of round, oval and crushed rectangular cells; groups of stone cells, fibres and prismatic crystals of calcium oxalate scattered throughout rhytidoma; secondary phloem consists of sieve elements, phloem fibres, crystal fibres, phloem parenchyma, a few stone cells and phloem rays; phloem fibres arranged in alternate bands with phloem parenchyma; phloem parenchyma consists of rectangular, thin-walled cells, a few contain prismatic crystals of calcium oxalate; crystal fibres present, divided into numerous chambers, each containing single prismatic crystal of calcium oxalate; phloem rays uniseriate to biseriate, upto 10 cells high, consists of round, thin-walled, parenchymatous cells;

stone cells, mostly rectangular, occur associated in groups of 2-4 with bands of phloem fibres.

Powder – Reddish-brown; shows fragments of cork cells, phloem fibres with wide lumen and pointed tips, crystal fibres, phloem rays, rectangular stone cells and prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 13 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 15 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 6 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (95 : 5) shows under U.V. (366 nm) a fluorescent zone at Rf. 0.84 (light blue). On exposure to Iodine vapour two spots appear at Rf. 0.80 and 0.84 (both yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid a spot appears at Rf. 0.84 (orange).

CONSTITUENTS – Tannins and Alkaloids.

PROPERTIES AND ACTION -

Rasa : Kaṣāya
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Visphotaśamanī, Stambhana, Vraṇaśodhana

IMPORTANT FORMULATIONS - Nyagrodhādi Kwātha Cūrṇa

THERAPEUTIC USES - Tvaka, Raktātisāra, Vraṇa

DOSE – 3-5 g. (Powder).
10-20 g. (Decoction).

KOṢĀTAKĪ (Whole Plant)

Koṣataki consists of dried whole plant of *Luffa acutangula* (Linn.) Roxb. (Fam. Cucurbitaceae), a large monoecious, annual climber, found wild and also cultivated throughout the greater part of India.

SYNONYMS -

Sansk. : Kṛtavedhanā, Jālī, Dhāmārg
Assam. : --
Beng. : Zinga
Eng. : Ribbed Gourd
Guj. : Turiya, Kadawa, Turiya
Hindi. : Turai, Satputia
Kan. : Hire-valli
Mal. : Peerkam Kai
Mar. : Dodka Turiya
Ori. : Tarada
Punj. : Turiya
Tam. : Peerkku
Tel. : Beera, Chedu beeha, Varri beera
Urdu. : Turai

DESCRIPTION –

a) Macroscopic :

Root - Occurs in cut pieces, 8-12 cm long, and 0.5-0.7 cm thick, yellowish-brown, almost cylindrical, rough due to longitudinal wrinkles, having a few adventitious roots; fracture, short.

Stem - 0.2-0.4 cm thick, 5 angled, glabrous, scabrid, having tendrils, brownish-yellow.

Leaf - petiole 3-8 cm long, somewhat twisted, wrinkled, scabrid, angular, brownish-yellow; lamina crimpled, curled, corrugated, pale or light-green, 6-9 cm long and broad, palmately 5-7 angled or sublobate, scabrid on both surfaces, base cordate, nerves and veins prominent beneath.

Flower - Male flower in small racemes or single; calyx pubescent, 1.3 cm long, lobes lanceolate, light greenish-yellow; corolla yellow, 2 cm long, spreading, obovate; stamens 3; Female flower solitary, yellow; pedicel 5-10 cm long; ovary strongly ribbed; stigma, trifid.

Fruit - A pepo; 9-12 cm long, and 2-4 cm broad; cylindrical or club-shaped, obovate in shape, tapering towards the base; pale yellowish-brown; outer surface covered with 8-10

prominent longitudinal ribs; three chambers, inner part being fibrous and easily detachable as a whole from the outer part.

Seed - Ovoid-oblong, 0.6-0.8 cm long, and 0.5-0.6 cm wide; much compressed, slightly corrugated on the edges, black; taste, bitter.

b) Microscopic :

Root - Shows wavy outline composed of cork cells, a few outermost layers of secondary cortex disintegrated, remaining outer cortical cells lignified, and a number of large, thin-walled, lignified, variously shaped stone cells with very wide lumen found; inner cortical cells thin-walled and parenchymatous; secondary phloem consisting of thin-walled cells of usual elements; secondary xylem tissues lignified traversed by multiseriate, radially elongated, thin-walled ray cells; xylem vessel simple pitted; a few simple, round to oval starch grains measuring 4-7 μ in dia., having striations and distinct hilum found in secondary cortex.

Stem - Shows 5 prominent ridges; epidermis single layered, covered by cuticle; cortex composed of 6-10 or more layered, oval to polygonal, collenchyma cells under ridges, followed by 4-6 layered, compact band of thick-walled, polygonal, lignified cells; ground tissues composed of round to oval, thin-walled, parenchymatous cells, embedded with 10 bicollateral, open , conjoint, endarch vascular bundles, 5 of outer ring present opposite the ridges while rest 5 of the inner ring face the furrows; secondary phloem and xylem consisting of usual elements; xylem vessel bordered pitted; a few simple starch grains, round to oval, having striations with distinct hilum, measuring 5-8 μ in dia., found scattered in cortical and pith region.

Leaf –

Petiole - shows 6-7 prominent ridges having single layered epidermis, covered by thick cuticle; secondary cortex wide in each ridge, composed of thin-walled, parenchymatous cells; ground tissue a wide zone having 6 or 7 bicollateral, vascular bundles present in each ridge.

Lamina - shows single layered epidermis on both surfaces, having simple unicellular hairs with blunt tips and glandular hairs with unicellular stalk of variable length and spherical head having 3 or 4 cells; mesophyll differentiated into palisade and spongy parenchyma; vascular bundles bicollateral; stomata, anomocytic, present on both surfaces; stomatal number 59 - 64 on lower surface and 29 -39 on upper surface; stomatal index 13-14 on lower surface and 9-10 on upper surface; palisade ratio not over 3; vein islets number. 14-19 per sq. mm.

Fruit – Section shows irregular outline due to 8-10 prominent ribs; epicarp consist of single layered papillose epidermis covered with thick, striated cuticle having a few bristles, followed by 4-6 layers of thin-walled, tangentially elongated parenchymatous cells, some cells especially near the ribs, having brownish contents; below this thick-walled,

polyhedral, continuous band of stone cells present, measuring 24-40 μ in dia.; outer 6-8 layers of this band consists of closely packed thick-walled sclereids, while the inner 2-4 layers, thick-walled and distinctly pitted; mesocarp broad, composed of a zone of rounded to tangentially elongated, parenchymatous cells having bicollateral vascular bundles, followed by 8-10 layers of thick-walled, polyhedral, sclerenchyma and fibres.

Seed – Testa consists of a single layer of rectangular, thick-walled, sclerenchymatous cells, followed by a tegmen, composed of 5 or 6 layered, oval to polygonal, parenchymatous cells and a single layered elongated, lignified, sclerotic palisade-like cells; endosperm composed of thin-walled, parenchymatous cells; cotyledons flat, consisting of thin-walled, oval to polygonal, parenchymatous cells.

Powder - Greyish-brown; shows fragments of cork cells, thick-walled, wavy or sinuous epidermal cells, lignified sclerotic or palisade-like cells of testa, sclerenchymatous cells, pieces of unicellular and glandular hairs, vessel with spiral and reticulate thickening, simple or groups of elongated, lignified stone cells, simple, rounded to oval starch grains having concentric striations and narrow hilum, measuring 4-7 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 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 6 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 13 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (8:2) shows under UV (366 nm) four fluorescent zones at Rf. 0.34, 0.74, 0.80 and 0.91 (all blue). On exposure to Iodine vapour eight spots appear at Rf. 0.13, 0.17, 0.34, 0.51, 0.65, 0.74, 0.78 and 0.96 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for ten minutes three spots appear at Rf. 0.34, 0.78 and 0.96 (all grey).

CONSTITUENTS – Bitter Principles, Saponins, Sapogenins and Fixed Oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṭu, Alpa Kaṣāya
Guṇa : Tikṣṇa, Laghu
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Kaphapittaghna, Malaviśodhanī, Vamanopaga, Tridoṣahara

IMPORTANT FORMULATIONS - Abhayā Lavaṇa

THERAPEUTIC USES - Kuṣṭha, Pāṇḍu, Plīhāroga, Śopha, Gulma, Ādhmāna, Garaviṣa, Arśa, Kāmalā, Gaṇḍamālā

DOSE – 5 – 10 g.

KUMUDĀ (Flower)

Kumudā consists of dried flowers of *Nymphaea alba* Linn. (Fam. Nymphaeaceae); a perennial aquatic herb, very common in ponds, streams and fresh water lakes and upto 1800 m.

SYNONYMS -

Sansk. : Kumudam, Sitolpalam, Śaśikāntā, Śyāmavṛntā
Assam.: --
Beng. : Kumuda, Shandh Shaluka
Eng. : Indian Blue Water Lily
Guj. : Piyanu
Hindi. : Kui, Kanval, Kokka
Kan. : Bilenaydile, Biletavare
Kash. : --
Mal. : Ampal
Mar. : Kamod
Ori. : --
Punj. : --
Tam. : Nalla Kalav, Vellampal, Allittamarai
Tel. : Allikada, Tellakaluva
Urdu. : Kamal

DESCRIPTION –

Macroscopic :

Flower white, solitary, 10-13 cm across; sepals 4, outside greenish to brownish, inside whitish; petals about 10, white; stamens many, outer ones being transformed successively from petals; anthers linear small without appendages; pistil syncarpous, carpels 10-16, sunk in fleshy disk, ovary multicellular and crowned by a large stigma with 16 rays, each with a cylindrical appendages, ovules many, fruit a berry.

Powder – Light-brown; shows polygonal, thin-walled epidermal cells in surface view, stellate hairs and spherical or trigonal pollen grains, measuring 11-24 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 18 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 9 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 20 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (85 : 15) shows under U.V. (366 nm) three fluorescent zones at Rf. 0.66 (red), 0.77 (blue) and 0.88 (blue). On exposure to Iodine vapour three spots appear at Rf. 0.66, 0.92 and 0.96 (all brown).

CONSTITUENTS – Alkaloids and Glycosides.

PROPERTIES AND ACTION -

Rasa : Madhura, Kaṣāya, Tikta
Guṇa : Laghu, Snigdha, Picchila
Vīrya : Śīta
Vipāka : Madhura
Karma : Vātahara, Pittahara, Stambhana, Hṛdya, Garbha Sthāpana, Balya, Sramahara

IMPORTANT FORMULATIONS – Triphalādi Taila, Bala Aśvagandhā Lākṣādi Taila

THERAPEUTIC USES – Raktadoṣa, Dāha, Hṛdroga, Raktapitta

DOSE – 3-6 g.

KUŚA (Root Stock)

Kuśa consists of dried root stock of *Desmostachya bipinnata* Stapf. (Fam. Poaceae); a tall, tufted, perennial grass, 30-150 cm high, found throughout the country in hot and dry places.

SYNONYMS -

Sansk. : Yagyabhūṣaṇa, Sūcyagra
Assam. : Kush
Beng. : Kush
Eng. : Saved Gram
Guj. : Dabb
Hindi. : Kush
Kan. : Darbha Hullu
Mal. : Darbha, Darbhapullu
Mar. : Darbha
Ori. : Kusha
Punj. : Kush, Dale
Tam. : Darbaipul
Tel. : Darbhagaddi
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Drug occurs in 6-20 cm long, 0.3-0.5 cm thick cut pieces, almost cylindrical; internodes smooth, stout, mostly covered with shining sheath, having distinct nodes; brownish-yellow; a few thin, fibrous, ash coloured roots arise at nodes; fracture, short.

b) Microscopic :

Root stock shows single layered epidermis, covered with striated cuticle; hypodermis composed of 3-5 layered, circular to polygonal, sclerenchymatous cells; cortex consisting of 5-9 layered, circular parenchymatous cells with small intercellular spaces; a few collateral vascular bundles found scattered in this zone, followed by 5-8 layered, discontinuous sclerenchymatous ring; ground tissue composed of continuous mass of slightly thick-walled, non-lignified, parenchymatous cells; numerous, collateral, vascular bundles found scattered in this zone and each covered by sclerenchymatous sheath; xylem vessels simple pitted; starch grains simple round to oval, with centric hilum, measuring 8-14 μ in dia., and compound having two components, found scattered in hypodermis, cortex and ground tissues.

Powder - Yellowish-brown; shows fragments of circular to polygonal sclerenchymatous cells with distinct lumen and striations; long, pointed fibres; simple pitted xylem vessels; starch grains simple round to oval with centric hilum measuring 8-14 μ. in dia. and compound having two components.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 9 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 7 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 5 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under U.V. (366 nm) seven fluorescent zones at Rf. 0.06, 0.15, 0.24, 0.36, 0.64, 0.83 and 0.94 (all blue). On exposure to Iodine vapour twelve spots appear at Rf. 0.06, 0.15, 0.24, 0.36, 0.47, 0.55, 0.64, 0.70, 0.76, 0.83, 0.90 and 0.94 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 105°C eight spots appear at Rf. 0.15, 0.24, 0.36, 0.64, 0.76, 0.83, 0.90 and 0.94 (all grey).

CONSTITUENTS – Terpenes.

PROPERTIES AND ACTION -

Rasa : Madhura, Kaṣāya
Guṇa : Laghu
Vīrya : Śīta
Vipāka : Madhura
Karma : Kaphapittahara, Mūtrala

IMPORTANT FORMULATIONS – Karpūrādyarka, Sukumāra Ghṛta, Aśmarīhara Kaṣāya Cūrṇa, Tṛṇapancamūla Kwātha Cūrṇa, Mutravirecanīya Kaṣāya Cūrṇa, Stanyajanana Kaṣāya Cūrṇa

THERAPEUTIC USES – Mūtrakṛcchra, Visarpa, Dāha, Aśmarī, Tṛṣṇā, Bastiroga, Pradararoga, Raktapitta

DOSE – 50-100 g. of powder for decoction.

LĀNGALĪ (Tuberous Root)

Langali consists of dried tuberous root of *Gloriosa superba* Linn.(Fam. Liliaceae) a climber with leaf tendril and large, solitary or corymbose, showy flowers with perianth segments having wavy margins, greenish at first, later becoming yellow and finally scarlet or crimson coloured, and found wild throughout the tropical regions upto 2,000 m.

SYNONYMS -

Sansk. : Kalihārī, Garbhanut, Halinī, Agniśikhā
Assam. : --
Beng. : Bisalanguli
Eng. : Glory Lily
Guj. : Khadiyanag
Hindi. : Kalihari
Kan. : Kolikutumana Gade
Kal. : Mathonni
Mar. : Karianag
Ori. : --
Punj. : Kariyari
Tam. : Kalappoi, Kizhangu
Tel. : Potthidumpa
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Tuberous roots thick, almost cylindrical or slightly laterally flattened, occurring in pieces of 15-30 cm long and 2.5 - 3.8 cm thick, often bifurcated with tapering ends, resembling a plough-share, one arm generally more than double the length of the other; brownish externally and yellowish internally; fracture, short; taste, acrid and bitter.

b) Microscopic :

Tuberous root shows single layered epidermis, externally cuticularised, consisting of rectangular cells, followed by ground parenchyma, with scattered small vascular bundles; parenchyma cells large, thin-walled, polygonal to circular, having conspicuous intercellular spaces, most of the cells specially of the outer layers filled with starch grains, simple, round to oblong, or polyhedral, measuring 8-33 μ in dia., showing clear hilum and concentric striations, occasionally compound with 2-3 components, measuring 24-36 μ in dia.; vascular bundles collateral, numerous, scattered throughout ground tissue, consisting of xylem and phloem; each vascular bundle enclosed by sclerenchymatous sheath, xylem composed of vessels, tracheids

and parenchyma; vessels having mostly reticulate thickening, smaller ones having spiral thickening, tracheids with reticulate thickening; xylem parenchyma cells usually rectangular; phloem consisting of sieve tubes, companion cells and phloem parenchyma; phloem parenchyma cells very small and thin-walled.

Powder - Brown; shows fragments of parenchyma cells, simple starch grains, round to oblong or polyhedral measuring 8-33 μ dia. showing clear hilum and concentric striations, occasionally compound with 2-3 components, measuring 24-36 μ in dia., sclerenchymatous cells, a few xylem vessels and tracheids.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 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 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' plate using Chloroform : Methanol (9 : 1) shows under UV (366 nm) three fluorescent zones at Rf. 0.24 (blue), 0.88 and 0.94 (both black). On exposure to Iodine vapour eight spots appear at Rf. 0.09, 0.16, 0.24, 0.38, 0.59, 0.75, 0.88 and 0.94 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid two spots appear at Rf. 0.88 and 0.94 (both orange).

CONSTITUENTS – Alkaloids and Resins.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya, Kaṭu
Guṇa : Sara, Tikṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Pittahara, Kaphahara, Garbhapātana

IMPORTANT FORMULATIONS - Nirguṇḍī Taila, Kāsīsādī Taila, Mahāviṣagarbha Taila

THERAPEUTIC USES - Kuṣṭha, Śopha, Arśa, Vraṇa, Śūla, Kṛmi, Bastiśūla, Garbha, Śalya, Vātavyādhi

DOSE – 125-250 mg. of purified drug.

LASUNA (Bulb)

Lasuna consists of bulb of *Allium sativum* Linn. (Fam. Liliaceae); a perennial bulbous plant, cultivated as an important condiment crop in the country.

SYNONYMS -

Sansk. : Rasona, Yavanesta
Assam. : Maharu
Beng. : Lasun
Eng. : Garlic
Guj. : Lasan, Lassun
Hindi. : Lahasun
Kan. : Balluci
Mal. : Vellulli, Nelluthulli
Mar. : Lasun
Ori. :
Punj. : Lasan
Tam. : Vellaipoondu
Tel. : Vellulli, Tellapya, Tellagadda
Urdu. : Lahsan, Seer

DESCRIPTION –

a) Macroscopic :

Drug occurs as entire bulb or isolated cloves (bulblets); bulb sub-globular, 4-6 cm in diameter, consisting of 8-20 cloves, surrounded by 3-5 whitish papery membranous scales attached to a short, disc-like woody stem having numerous, wiry rootlets on the under side; each clove is irregularly ovoid, tapering at upper end with dorsal convex surface, 2-3 cm long, 0.5 -0.8 cm wide, each surrounded by two very thin papery whitish and brittle scales having 2-3 yellowish-green folded leaves contained within two white fleshy, modified leaf bases or scales; odour, peculiarly pungent and disagreeable; taste, acrid gives warmth to the tongue.

b) Microscopic :

A clove of bulb shows tri to tetrangular appearance in outline; outer scale consists of an outer epidermis, followed by hypodermal crystal layer, mesophyll made of parenchyma cells and an inner epidermis; both outer and inner epidermis consists of sub rectangular cells; hypodermis consists of compressed, irregular, tangentially elongated cells, each cell having large prismatic crystals of calcium oxalate, while many cells contain small prismatic crystals also, mesophyll several layers of parenchymatous cells having a few vascular tissues with spiral vessels; inner epidermis similar to outer one; inner scale similar to outer scale but outer epidermis composed of sclerenchymatous cells; prismatic crystals in hypodermis slightly smaller.

In surface view cells of outer epidermis elongated, narrow with thin porous wall while those of inner epidermis similar to outer one but non-porous; cells of hypodermal crystals layer

ellipsoidal with thick porous walls, each cell having large prismatic crystals of calcium oxalate, many cells also contain small prismatic crystals in addition to bigger ones; inner scale shows markedly sclerenchymatous cells with greatly thickened walls and very narrow lumen; cells of hypodermal crystal layer somewhat smaller with walls more frequently pitted, size of crystals also smaller.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 4 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 2.5 per cent, Appendix 2.2.6.
Loss on drying	-	Not less than 60 per cent, Appendix 2.2.9.
Volatile oil	-	Not less than 0.1 per cent, Appendix 2.2.10.

TLC. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Isopropanol : Acetic acid : Water (3 : 1: 1 : 1) shows under UV (366 nm) two fluorescent zones at Rf. 0.58 and 0.72 (both light blue). On exposure to Iodine vapour nine spots appear at Rf. 0.18, 0.26, 0.34, 0.38, 0.46, 0.58, 0.72, 0.77 and 0.93 (all yellow). On spraying with Ninhydrin reagent and heating the plate for ten minutes at 110°C seven spots appear at Rf. 0.26, 0.38, 0.46, 0.58, 0.67, 0.72 and 0.93 (all pink). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C seven spots appear at Rf. 0.26, 0.38, 0.46, 0,58, 0.67, 0.72 and 0.93 (all gery).

CONSTITUENTS – Volatile Oil containing Allyl Disulphide and Diallyl Disulphide. It also contains Allin, Allicin, Mucilage and Albumin.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Madhura
Guṇa : Guru, Snigdha, Tikṣna, Sara, Picchila
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Kaphahara, Pitta duṣanakara, Raktadoṣahara, Bhagnasandhānakara, Dīpana, Rasāyena, Balya, Hṛdya, Vṛṣya, Varṇya, Medhya, Jantughna, Kaṇṭhya, Asthi Māṁsa Sandhānkar, Cakṣuṣya

IMPORTANT FORMULATIONS –Laśunādi Vaṭī, Laśunādi Ghṛta and Vacā Laśunādi Taila

THERAPEUTIC USES – Jīrṇa, Jwara, Kṛmiroga, Gulma, Kuṣṭha, Arśa, Kāsa, Swāsa, Pinasa, Śūla, Karṇaśūla Vātavyādhi, Hikkā, Medoroga, Yoni vyāpata, Visucikā, Plīhā Vṛddhi, Kṣaya, Viṣama Jwara, Apasmāra Unmāda, Sasa, Śopha, Hṛdroga, Vātśūla, Trikaśūla, Vraṇa Kṛmi

DOSE - 3- g. of the drug.

MAHĀBALĀ (Root)

Mahābalā consists of dried roots of *Sida rhombifolia* Linn. (Fam. Malvaceae), an erect annual or perennial undershrub, 1.5 m high, distributed throughout the country especially in moist regions, ascending to an altitude of 1800 m in the Himalayas.

SYNONYMS –

Sansk. : Atibalā, Pitapuṣpi
Assam. : --
Beng. : Pitabedela, Kheriti
Eng. : Country Mallow
Guj. : Mahabala
Hindi. : Pitabala, Pitabariyar
Kan. : Kisangihettutti-gida
Kash. : --
Mal. : Anakkuruntotti
Mar. : Mahbala
Ori. : --
Punj. : Khurunti
Tam. : Kurunthotti
Tel. : Gubatada, Pedda Mutheera Pulagum
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Drug occurs as entire root or cut pieces of varying lengths, 7-8 mm in thickness, with wavy lateral roots comparatively thinner than main roots having numerous rootlets, brownish-yellow, surface, rough due to scars of small rootlets and lenticels; fracture, hard and splintery.

b) Microscopic :

Mature root shows cork consisting of 3-10 rows of narrow, rectangular, tangentially elongated, thin-walled, parenchymatous cells, a few containing rosette crystals of calcium oxalate; secondary phloem composed of phloem fibres in wedge-shaped patches with thin-walled parenchyma in between; phloem rays thin-walled, tangentially elongated towards secondary cortex; a few rosette crystals of calcium oxalate found scattered in phloem parenchyma; secondary xylem composed of vessels, fibre, parenchyma and rays; vessels arranged in radial rows, fibres moderately long, thick-walled, lignified with wide lumen and pointed apex; xylem rays 2-3 cells wide, a few containing rosette crystals of calcium oxalate; in Bala (*S. cordifolia* Linn.) 1-3 cells wide with rosette crystals of calcium oxalate; 1 or 2 cells

wide with rhomboidal crystals of calcium oxalate in Atibala (*Abutilon indicum* Sw.), and rosette crystals of calcium oxalate present in secondary cortex and absent in xylem rays in Nagabala (*S. veronicaefolia* Lam.).

Powder - Creamish-grey; shows moderately large, thick-walled, lignified fibres, with wide lumen and pointed tips, fragments of cork cells simple, pitted vessels and a few rosette crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 8 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 3 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 4 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (8 : 2) shows under U.V. (366 nm) five fluorescent zones at Rf. 0.08 (blue), 0.35 (blue), 0.46 (blue), 0.78 (blue) and 0.95 (pink). On exposure to Iodine vapour eight spots appear at Rf. 0.08, 0.15, 0.39, 0.50, 0.66, 0.81, 0.89 and 0.99 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent two spots appear at Rf. 0.04 and 0.74 (both orange).

CONSTITUENTS – Alkaloids (Vasicinone and Vasicine).

PROPERTIES AND ACTION -

Rasa : Madhura
Guṇa : Guru, Snigdha, Picchila
Vīrya : Śīta
Vipāka : Madhura
Karma : Vātaghna, Pittaghna, Grāhī, Śukravṛddhikara, Ojovardhaka, Kāntivardhaka, Balya

IMPORTANT FORMULATIONS - Mahāviṣagarbha Taila, Navratna Rājamṛgāṅka Rasa

THERAPEUTIC USES - Śukrakṣaya, Kṣata, Kṣaya, Viṣamajwara, Daurbalya, Vātavyādhi, Vātarakta, Raktapitta, Sopha

DOSE – 3-6 g of the drug in powder form.

MANJISTHĀ (Stem)

Manjisthā consists of dried stem of *Rubia cordifolia* Linn. (Fam. Rubiaceae); a perennial herbaceous prickly creeper or climber upto 10 m long, found throughout the country ascending to 3750 m.

SYNONYMS -

Sansk. : Yojnavallī, Vastrarajinī, Rakta
Assam. : Phuvva
Beng. : Manjistha, Manjith
Eng. : Indian Maddar
Guj. : Manjitha
Hindi. : Manjitha, Manjit
Kan. : Manjustha
Kash. : --
Mal. : Manjatti
Mar. : Manjihtha
Ori. : --
Punj : Manjistha, Manjit
Tam. : Manjatte
Tel. : Manjishtha
Urdu. : Majeeth

DESCRIPTION –

a) Macroscopic :

Stem slender, more or less cylindrical, slightly flattened, wiry, about 0.5 cm thick, brown to purple coloured; surface scabrous, stiff and grooved with longitudinal cracks; prickles present in the immature stem; nodes distinct having two leaf scars, one on either side; fracture, short.

b) Microscopic :

Mature stem shows exfoliating cork, ruptured at places, forming dome-shaped structure, consisting of 3-12 or more layered radially arranged, squarish and tangentially elongated, thin-walled cells, appearing polygonal in surface view; secondary cortex 3-5 layered consisting of tangentially elongated, thin-walled cells, some of which contain acicular crystals of calcium oxalate as isolated or in bundles; a few cells contain sandy crystals as black granular masses; secondary phloem, a wide zone of reddish colour, composed of sieve elements and phloem parenchyma, fibres absent; phloem parenchyma smaller towards inner side gradually becoming larger and tangentially elongated towards

periphery, a few cells contain sandy crystals of calcium oxalate; secondary xylem forms a continuous cylinder of reddish colour, composed of vessels, tracheids, fibres and xylem parenchyma; vessels numerous, distributed uniformly throughout xylem,larger towards outer side and smaller towards centre; in macerated preparation, vessels show great variation in shape and size having lignified walls and pitted thickening; xylem fibres thick-walled, long and short, longer ones have narrow lumen while shorter ones have wide lumen with pitted thickenings; xylem parenchyma also vary in shape and size having pitted or reticulate thickening; centre occupied by narrow pith consisting of thin-walled, parenchymatous cells, a few cells contain sandy crystals of calcium oxalate.

Powder - Pink; shows numerous fragments of cork, lignified xylem vessels, tracheids, and fibres with pitted and reticulate xylem parenchyma having red coloured contents; acicular and sandy crystals as black granular masses.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 12 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 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 17 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows in visible light two spots at Rf. 0.92 (grey) and 0.98 (green). Under UV (366 nm) two fluorescent zones are visible at Rf. 0.92 (grey) and 0.98 (pink). On exposure to Iodine vapour six spots appear at Rf. 0.28, 0.37, 0.53, 0.72, 0.92 and 0.98 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 110°C six spots appear at Rf. 0.28, 0.37 (both grey), 0.53 (bluish grey), 0.72 (grey), 0.92 (grey) and 0.98 (violet).

CONSTITUENTS – Glycosides.

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Tikta, Madhura
Guṇa : Guru
Vīrya : Uṣna
Vipāka : Kaṭu
Karma : Kaphapittaśāmaka, Varṇya, Swarya, Viṣa, Sothaghna, Kuṣṭhaghna, Prameghaghna, Vṛṣya, Kṛmighna, Stambhan, Artavajanana, Rasāyana, Śonitasthāpana

IMPORTANT FORMULATIONS – Arvindāsava, Aśwagandhāriṣṭa, Uśirāsava, Candanāsava, Bṛhanmanjiṣṭhādi Kwātha, Manjiṣṭhādi Taila, Khadirādi Guṭikā (Mukha)

THERAPEUTIC USES – Yoni Roga, Akṣi Roga, Ślesmaja Śotha, Karṇa Roga, Manjiṣṭhā Meha, Raktātisara, Kuṣṭha, Visarpa, Prameha, Sarpaviṣa, Bhagna, Arśa, Vyanga

DOSE - 2-4 g. of the drug.

MARICA (Fruit)

Marica consists of fully mature dried fruit of *Piper nigrum* Linn. (Fam. Piperaceae); a climber, cultivated from Konkan Southwards, especially in North Konkan Kerala, and also in Assam; fruits ripen from December to March, depending upon climatic conditions; fruits harvested from December to April.

SYNONYMS -

Sansk. : Vellaja, Ucsna, Uṣaṇa
Assam. : --
Beng. : Golmorich, Kalamorich, Morich
Eng. : Black Pepper
Guj. : Kalimori
Hindi. : Kalimirch
Kan. : Karimonaru, Menaru
Kash. : --
Mal. : Kurumulaku
Mar. : Kalamiri
Ori. : --
Punj. : Galmirich, Kalimirch
Tam. : Milagu
Tel. : Miriyalu, Marichamu
Urdu. : Filfil Siyah, Kalimirich

DESCRIPTION –

a) Macroscopic :

Fruits greyish-black to black, hard, wrinkled, 0.4-0.5 cm in dia.; odour, aromatic; taste, pungent.

b) Microscopic :

Fruit consists of a thick pericarp for about one third of fruit and an inner mass of perisperm, enclosing a small embryo; pericarp consists of epicarp, mesocarp and endocarp; epicarp composed of single layered, slightly sinuous, tabular cells forming epidermis, below which, are present 1 or 2 layers of radially elongated, lignified stone cells adjacent to group of cells of parenchyma; mesocarp wide, composed of band of tangentially elongated parenchymatous cells having a few isolated, tangentially elongated oil cells present in outer region and a few fibro-vascular bundles, a single row of oil cells in the inner region of mesocarp; endocarp composed of a row of beaker-shaped stone cells; testa single layered, yellow coloured, thick-walled sclerenchymatous cells; perisperm contains parenchymatous cells having a few oil globules and packed with abundant, oval to round, simple and compound starch grains measuring 5.5-11.0 μ in dia.; having 2-3 components and a few minute aleurone grains.

Powder - Blackish-grey; shows debris with a characteristic, in groups, more or less isodiametric or slightly elongated stone cells, interspersed with thin-walled, polygonal hypodermal cells; beaker-shaped stone cells from endocarp and abundant polyhedral, elongated cells from perisperm, packed tightly with masses of minute compound and single, oval to round, starch grains measuring 5.5-11.0 μ in dia.; having 2-3 component and a few aleurone grains and oil globules.

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 0.5 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 6 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (7 : 3) shows in visible light four spots at Rf. 0.05, 0.08 (both light green), 0.27 (light yellow) and 0.52 (yellow). Under UV (366 nm) ten fluorescent zones are visible at Rf. 0.05, 0.08 (both light brown), 0.20 (light blue), 0.46 (blue), 0.52 (greenish yellow), 0.57 (bluish yellow), 0.66 (light blue), 0.74 (light pink), 0.82 and 0.97 (both blue). On exposure to Iodine vapour eleven spots appear at Rf. 0.05, 0.08, 0.14, 0.20, 0.27, 0.34, 0.46, 0.57, 0.66, 0.74 and 0.97 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent nine spots appear at Rf. 0.05 (light orange), 0.14, 0.20, 0.27 (all orange), 0.46, 0.57 (both yellowish orange), 0.66, 0.74 (both orange) and 0.97 (light orange). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C twelve spots appear at Rf. 0.05, 0.08, 0.20, 0.27, 0.46, 0.52, 0.57, 0.66, 0.74, 0.82, 0.90 and 0.97 (all violet).

T.L.C. OF PIPERINE –

Preparation of the Extract :
Extract 1 g of Pepper powder by heating under reflux for 15 minutes with 10 ml methanol. Filter, evaporate the filtrate so as to reduce it to 2 ml and use for TLC application.

Standard Piperine :

Dilute 5 gm in 5 ml methanol

Adsorbent : Silica gel plate

Solvent System : Toluene : Ethyl acetate (7:3) (saturate the chamber for at least 30 minutes)

Application : Pepper extract : 20 µ
Piperine : 10 µl } band form

Running distance : 10 to 12 cms

Drying : Air drying for 15 to 20 min. and then in an oven for 5 min.

Detection : Cool and spray the plate thoroughly with Vanillin-Sulphuric acid reagent and heat at 110° C for 5-10 min. under observation. When piperine spots appear lemon yellow, the plate is to be taken out. Over-heating turns yellow spots to violet.

Rf. of Piperine : Approximately 0.5 in case of hand made plates

CONSTITUENTS –Alkaloids (Piperine, Chavicine, Piperidine, Piperetine) and Essential Oil.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta
Guṇa : Laghu, Rūkṣa, Tikṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Ślesmahara, Pittakara, Kaphavātājit Vātahara, Chedana, Dīpana, Rūcya, Jantunāśana, Medohara, Chedi, Hṛdroga, Vātaroga

IMPORTANT FORMULATIONS – Maricādi Guṭikā, Maricādì Taila, Trikaṭu Cūrṇa

THERAPEUTIC USES – Swāsa, Śūla, Krmiroga, Tvagroga

DOSE – 250 mg - 1 g. of the drug in powder form.

MĀṢAPARṆĪ (Whole Plant)

Māṣaparṇī consists of dried whole plant of *Teramnus labialis* Spreng. (Fam. Fabaceae), a very variable climbing or spreading hairy herb, found throughout the country.

SYNONYMS –

Sansk. : Mahāsahā, Sūryasani, Kāmboj, Pandutomaṣa Pasṇī
Assam.: --
Beng. : Mashance, Bankalaai, Mashani
Eng. : Vogel-Tephrosis
Guj. : Banudad, Janglee Adad
Hindi. : Mashvan, Banvdad, Mashoni
Kan. : Kadu Uddu
Mal. : Katu Ulandu
Mar. : Ran Udid
Ori. : --
Punj. : Jangali Urad
Tam. : Kattu-Ulandu
Tel. : Karuminum, Mashperni
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Root – Tap root with lateral roots occurs in cylindrical, branched pieces, 3-5 cm long, and upto 1cm in dia., light brown to dark brown, with longitudinal and transverse cracks; lateral roots thin, smooth, moderately woody; fracture, laminated and short.

Stem – Cut pieces 5-8 cm long, upto 0.8 cm in dia, somewhat twisted and branched, or cylindrical, slender, rough due to cracks and longitudinal ridges and furrows, brownish-grey; fracture, short and fibrous.

Leaf – Trifoliate, leaflet ovate-oblong, 6-12 cm long, base round or acute, light brownish-yellow.

Flower – Lax axillary racemes, 5-15 cm long, flowers red, pink, purple or white, slender, more or less hairy rachis.

Fruit – Pod upto 5 cm long, straight or sometimes slightly recurved, brownish-black to dark brown, having 6-8 or 12 seeds.

Seed – Oblong, cylindrical, slightly rounded at the ends; 2-3 mm long upto 2 mm in dia.; dark brown.

b) Microscopic :

Root – Poorly developed cork, 4-10 layered, consisting of tangentially elongated cells with brown walls, exfoliating strips of crushed cork cells occasionally present; secondary cortex consisting of 3-8 rows of tangentially elongated, thin-walled cells; secondary phloem appearing dome-shaped, composed of sieve tubes, companion cells, parenchyma, fibres, and crystal fibres, the whole being traversed by phloem rays that funnel out beyond phloem; phloem parenchyma thin-walled, polygonal; phloem fibres numerous, lignified, thick-walled, septate, occur mostly in groups, among phloem parenchyma; crystal fibres present containing a prismatic crystal of calcium oxalate; cambium not distinct; secondary xylem consisting of vessels, fibres and crystal fibres all traversed by xylem rays; vessels solitary or in groups of 2-3 with pitted thickenings; tracheids present, fibres septate with thick-walls and pointed; xylem parenchyma non-lignified, thick-walled elongated cells; crystal fibres, elongated, thick-walled, divided by transverse partitions into chambers, each chamber containing a prismatic crystal of calcium oxalate; xylem rays, 1 to 6 cells wide, thin-walled radially elongated; prismatic crystals of calcium oxalate, and starch grains present in secondary cortex, phloem fibres, phloem parenchyma and medullary rays; starch grains, numerous, mostly simple, rarely compound, oval to rounded with central hilum measuring 3-14 μ in dia.

Stem – Shows 6-11 layers, thin-walled, rectangular, exfoliated cork cells; secondary cortex consisting of thin-walled, oval to rectangular, parenchymatous cells having numerous groups of cortical fibres, arranged in radial rows; pericycle composed of isolated strands of fibres, occasionally with stone cells between them; secondary phloem composed of usual elements along with secretory cells; secondary xylem composed of usual elements; xylem fibres long, lignified; vessels simple pitted; ray 1 or 2 cells wide, pith composed of oval to polygonal, thin-walled, parenchymatous cells containing secretory cells.

Leaf –

Midrib – single layered epidermis covered by thick cuticle, and having a few unicellular hairs on both surfaces; this is followed by 4 or 5 layered, thick-walled polygonal, collenchymatous cells on both lower and upper surfaces; 2 or 3 layers of oval to polygonal, thin-walled parenchymatous cells present on both surfaces; 'U' shaped vascular bundles having usual elements.

Lamina – single layered epidermis covered by thick striated cuticle and having a few unicellular hairs on both surfaces; single layered palisade cell; 1 or 2 layers of thin-walled, polygonal parenchymatous cells containing chlorophyll on lower surface, a few small vascular bundles having usual elements scattered in central regions; stomata paracytic on both surfaces; stomatal index 28-34 on lower surfaces and 18-24 on upper surfaces; palisade ratio not more than 5; vein-islet number 6-8; veinlet termination number not more than 4.

Fruit – Single layered, thick-walled, radially elongated, epidermal cells, followed by one row of thick-walled, rounded to rectangular, stone cells of various sizes having narrow, lumen and centric striations, 3 or 4 layers of thin-walled radially elongated, parenchymatous cells and several layers of thick-walled, lignified sclerenchymatous cells of mesocarp.

Seed – Testa containing thick-walled, tangentially elongated, lignified, sclerenchymatous cells, followed by 2 layers of thin-walled, palisade-like cells, palisade internally supported by a single layered bearer cells; cotyledons consist of oval to polygonal, thin walled parenchymatous cells.

Powder – Light yellowish-cream; shows fragments of cork, parenchyma, tracheids, unicellular hairs, thick-walled, elongated, polygonal cells of testa, simple pitted vessel, septate, thick-walled and pointed fibres; prismatic crystals of calcium oxalate, simple, oval to rounded starch grains measuring 3-14 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 7 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 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 7 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under UV (366 nm) seven fluorescent zones at Rf. 0.05, 0.10, 0.15 (all blue), 0.26 (light blue), 0.49, 0.74 (both blue) and 0.85 (light blue). On exposure to Iodine vapour four spots appear at Rf. 0.05, 0.10, 0.33 and 0.69 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110° C four spots appear at Rf. 0.05, 0.10, 0.33 (all violet) and 0.96 (dark violet).

CONSTITUENTS – Glycosides.

PROPERTIES AND ACTION -

Rasa : Tikta, Madhura
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Madhura
Karma : Vātapittaśāmaka, Kaphavardhaka, Grāhī, Balya, Vṛṣya, Śukrala

IMPORTANT FORMULATIONS - Amṛtaprāśa Ghṛta, Aśoka Ghṛta, Vidāryādi Ghṛta, Dhanwantara Ghṛta, Nārāyaṇa Taila, Bṛhat Māṣa Taila, Balā Taila, Mahānārāyaṇa Taila

THERAPEUTIC USES - Atisāra, Pravāhikā, Vātapitta Jwara, Śukralpāta, Raktapitta, Raktavikāra, Dāha, Śotha, Śirahśūla

DOSE – 5-10 g. of the powder.

MASŪRA (Seed)

Masūra consists of dried seed of *Lens culinaris* Medic. (Fam. Fabaceae), a small, erect, pubescent herb, 15-75 cm high, cultivated throughout north India, particularly in Uttar Pradesh, Madhya Pradesh, Bihar and West Bengal, and to a smaller extent in Punjab, Rajasthan, Maharashtra and Gujarat.

SYNONYMS -

Sansk. : Supya, Pittabheṣaja
Assam.: --
Beng. : Masuri
Eng. : Lentil
Guj. : Masura, Masoor, Masur
Hindi. : Masur
Kan. : Masura Bele
Mal. : Chanam payar, Vattupparupu
Mar. : Masur, Massora
Ori. : --
Punj. : Masur, Masara
Tam. : Masoor Paruppu
Tel. : Masura Pappu, Masooralu
Urdu. : Masur

DESCRIPTION -

a) Macroscopic :

Seed lens-shaped, smooth, about 4 mm thick, greyish-brown and faintly mottled, cotyledons pink; taste, characteristic.

b) Microscopic :

Seed testa consists of a single layer of epidermis composed of palisade-like cells, columnar and sclerenchymatous, with a tiny projection and shows a light, transparent line; below this, a single layer of hypodermis consisting of beaker or dumbbell shaped cells present; testa followed by cotyledons, consisting of a thin layer of upper and lower epidermis covered with a thin layer of cuticle; epidermis made up of rectangular cells oriented along their long axis; below epidermis, mesophyll consists of thin-walled, rounded or oval shaped,parenchymatous cells, generally filled with simple, round to oval, starch grains many with striations showing a fissured hilum; mostly measuring between 30-40 μ in dia.

Powder - Cream coloured; shows black particles due to pieces of testa; fragments of thick-walled, elongated, oval to polygonal cells of testa and a few sclerenchymatous cells in surface view; irregular, wavy palisade-like cells, and simple, round to oval, starch grains upto 40 μ in dia., with striations and a fissured hilum.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 3 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 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 10 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : water (4:1:5) shows on exposure to Iodine vapour six spots at Rf. 0.11, 0.40, 0.44, 0.50, 0.65 and 0.80 (all yellow). On spraying with Ninhydrin reagent and heating the plate for about ten minutes at 110°C seven spots appear at Rf. 0.11, 0.18, 0.24, 0.33, 0.44, 0.50 and 0.65 (all pink).

CONSTITUENTS – Flavonoids and Vitamins.

PROPERTIES AND ACTION -

Rasa : Madhura, Kaṣāya
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Madhura
Karma : Sangrāhī, Kaphapittaśāmaka, Vātamayakara, Varṇya, Balya

IMPORTANT FORMULATIONS –

THERAPEUTIC USES – Atisāra, Mūttrakṛcchra, Jwara, Raktapitta

DOSE – 10-20 g.

MUDGA (Seed)

Mudga consists of dried seeds of *Phaseolus radiatus* Linn. (Fam. Fabaceae); an erect or sub-erect, much branched, 0.5 -1.3 m tall, annual herb, extensively cultivated all over the country as a pulse crop.

SYNONYMS -

Sansk. : Mungalya
Assam. :
Beng. : Moong
Eng. : Green Gram
Guj. : Mug, Mag
Hindi : Munga
Kan. : Hesara, Hesoruballi
Mal. : Cherupayar
Mar. : Mung
Ori. : Muga, Jaimuga
Punj. : Munga, Mungi
Tam. : Pattchai Payaru, Pasi Payaru, Siru Murg
Tel. : Pesalu, Peachha Peralu,
Urdu. : Moong

DESCRIPTION –

a) Macroscopic :

Seed small, globular, about 0.4 cm long roughly square, smooth with white lateral hilum; usually green but some times yellowish-green; odour, not distinct; taste, slightly sweet.

b) Microscopic :

Seed coat shows a single layered, radially elongated, palisade-like cells, covered with a striated cuticle and supported internally by a single layered,thin-walled bearer cells, followed by 4-6 layered, thin-walled, tangentially elongated, elliptical, parenchymatous cells; cotyledons consist of oval of polygonal, thin-walled, parenchymatous cells having round to oval, simple, starch grains measuring 8-33 μ in dia. and rarely, oil globules.

Powder - Cream coloured; shows palisade-like cells, oval to polygonal, thin-walled, parenchymatous cells; round to oval, simple, starch grains measuring 8-33 μ in dia. and occasional oil globules.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1	per cent, Appendix 2.2.2.
Total ash	-	Not more then 4	per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more then 1	per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 1.5	per cent, Appendix 2.2.6
Water-soluble extractive	-	Not less than 10	per cent, Appendix 2.2.7

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel `G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under UV (366 nm) four fluorescent zones at Rf. 0.56, 0.65, 0.82 and 0.95 (all blue). On exposure to Iodine vapour seven spots appear at Rf. 0.01, 0.34, 0.56, 0.65, 0.78, 0.86 and 0.95 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 105°C seven spots appear at Rf. 0.26 (grey), 0.34 (violet), 0.65 (pink), 0.73 (pink), 0.82 (violet), 0.91 (violet) and 0.95 (pink).

CONSTITUENTS – Saponin, Starch, Albuminoids and Oil.

PROPERTIES AND ACTION –

Rasa : Madhura, Kaṣāyaṣ
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Madhura
Karma : Pittahara, Kaphahara, Grāhī, Balaprada, Varṇya, Netrya

IMPORTANT FORMULATIONS – Balāhathādi Taila, Marma Gutikā, Kāyasthyādi Varti

THERAPEUTIC USES – Jwara, Netra Roga, Amlapitta

DOSE – 50-100 g. for yusa.

MŪLAKA (Seed)

Mūlaka consists of dried seed of *Raphanus sativus* Linn. (Fam. Brassicaceae); a biennial herb, cultivated throughout India, upto 3000 m in the Himalayas and other hilly regions, for its roots.

SYNONYMS -

Sansk. : Śālāmarkaṭaka, Visra, Śāleya, Marusambhava
Assam. : Mulo
Beng. : Mula
Eng. : Radish
Guj. : Mulo
Hindi. : Muli
Kan. : Moolangi, Moolaogi, Mullangi, Mugunigadde
Mal. : Mullanki
Mar. : Mula
Ori. : Mula, Rakhyasmula
Punj. : Moolak, Moolee, Moola
Tam. : Mullangi, Mulakam, Mullangu, Millangi
Tel. : Mullangi
Urdu. : Turb, Mooli

DESCRIPTION –

a) Macroscopic :

Seed reddish-brown, irregularly globose, sometimes flattened, 2-4 mm long and 2 mm wide; surface generally smooth and sometimes wrinkled and grooved at micropylar end; taste, oily.

b) Microscopic :

Seed shows testa, consisting of single layer of nearly rectangular cells, covered with thin cuticle, followed by a layer of radially elongated, reddish-brown columnar cells, and integument 2-3 layers of compressed, thin-walled, parenchymatous cells; cotyledons and embryo consist of oval to polygonal, thin-walled, parenchymatous cells containing aleurone grains and oil globules.

Powder - Brownish-yellow; shows fragments of testa with hexagonal, thin-walled epidermis cells in surface view; oval to polygonal, thin-walled, parenchymatous cells of embryo and cotyledon; oil globules and aleurone grains present.

IDENTITY, PURITY AND STRENGTH

Foreign matter	-	Not more than 2 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 1.5 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 11 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under U.V. (366 nm) a fluorescent zone at Rf. 0.95 (blue). On exposure to Iodine vapour five spots appear at Rf. 0.17, 0.31, 0.39, 0.70 and 0.95 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate at 105°C for ten minutes four spots appear at Rf. 0.17, 0.31, 0.39 and 0.95 (all violet).

CONSTITUENTS – Fixed Oil and Volatile Oil.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Kaṣāya
Guṇa : Laghu, Tikṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Viṣahara, Vātaśleṣmahara, Hṛdya, Vahnidīpana, Kaṇṭhya, Grāhī, Kaphavātahara, Garbthasayasamikocaka, Kaphanissāraka, Mūral, Pācaka, Vitānulomana, Mṛdurecaka

IMPORTANT FORMULATIONS - Sarṣapādi Lepa

THERAPEUTIC USES – Gulma, Hṛdroga, Kaṇṭha roga, Sidhmakuṣṭha Jwara, Swāsa, Nāsikā roga, Akṣi roga, Anārtava

DOSE – 1-3 g. of the drug in powder form.

MUṆḌĪTIKĀ (Leaf)

Muṇḍītikā consists of dried leaf of *Sphaeranthus indicus* Linn. (Fam. Asteraceae); an aromatic, much branched herb,30-60 cm high found abundantly in damp and shady places in plains all over the country, ascending to an altitude of 1,500 m in the hills.

SYNONYMS –

Sansk. : Muṇḍī, Śrāvaṇī, Kadamba, Puṣpikā, Alambusta
Assam.: Kamadarus
Beng. : Surmuriya, Chhagal Nadi, Mudmudiya
Eng. : --
Guj. : Gorakhmundi
Hindi. : Mundi
Kan. : Mundi
Mal. : Mirnagnee, Atookamanni, Mirangnee
Mar. : Mundi, Baras Bondi
Ori. : Buikadam
Punj. : Gorakhmundi
Tam. : Kotook, Karandai, Kottakarthai
Tel. : Bodasaramu, Bodataramu
Urdu. : Mundi

DESCRIPTION –

a) Macroscopic :

Leaf sessile, decurrent, 2-7 cm long, 1-1.5 cm wide, obovate-oblong, narrowed to the base, dentate or serrate, hairy, greenish-brown; odour, slightly aromatic, but disappears on long storage; taste, bitter.

b) Microscopic :

Leaf –

Midrib - Shows a single layered epidermis, covered with ordinary trichomes upto 5 cells high and glandular trichomes having unicellular stalk and group of 4-10 cells head, on both surfaces, followed in turn by 4-6 layered collenchyma and 3-4 layered parenchyma cells at both surfaces; vascular bundles 3-4, situated centrally having usual elements, xylem vessels arranged radially.

Lamina - Shows a single layered epidermis having numerous trichomes similar to those of midrib on both surfaces; mesophyll not differentiated into palisade and spongy parenchyma cells; stomata anisocytic present on both surfaces, stomatal index 32-38 on lower surface and 20- 29 on upper surface, stomatal number 47-54 on lower surface and 15-22 on upper surface, vein islet number 20-26.

Powder - Light greenish-brown; shows fragments of parenchyma, glandular hairs, multicellular trichomes, xylem vessels, polygonal, wavy, thin-walled epidermal cells in surface view, stomata, ordinary trichomes upto 5 cells high and glandular trichomes having unicellular stalk and a head of 4-10 cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 28 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 7 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 12 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (9 : 1) shows three spots at Rf. 0.27, 0.72 and 0.90 (all yellowish green) in visible light. Under U.V. (366 nm) five fluorescent zones are visible at Rf. 0.27,0.42 (both blue), 0.54 (orange), 0.72 and 0.90 (both blue). On spraying with 5% Vanillin-Sulphuric acid reagent and heating the plate at 110°C for ten minutes three spots appear at Rf. 0.27, 0.72 (both grey corresponding to Citral) and 0.96 (blue).

CONSTITUENTS – Essential Oil.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Madhura, Tikta, Kaṣāya
Guṇa : Laghu
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātakaphahara, Medhya, Arśadoṣa, Vināśaka, Viṣaghna

IMPORTANT FORMULATIONS - Navaratnarāja Mṛgāṅka Rasa, Arka Mundī

THERAPEUTIC USES - Gaṇḍamālā, Apaci, Kuṣṭha, Kṛmi, Pāṇḍu,Ślīpada, Medoroga, Apasmāra, Kāsa, Mūtrakṛcchra, Twaka Roga, Stana Śaithalya, Yonirogā, Āmātisara, Āmaroga, Vātaroga, Gudaroga, Plīhāroga, Chardi, Āmavāta, Gātradurgandhya, Sūryāvarta, Ardhāvabhedaka

DOSE – 3-6 g. of the drug.

MUSTĀ (Rhizome)

Mustā consists of dried rhizome of *Cyperus rotundus* Linn. (Fam. Cyperaceae); occurring throughout the country, common in waste grounds, gardens and roadsides, upto an elevation of 1800 m.

SYNONYMS –

Sansk. : Mustaka, Vārida
Assam.: Mutha, Somad Koophee
Beng. : Mutha, Musta
Eng. : Nut Grass
Guj. : Moth, Nagarmoth
Hindi. : Motha, Nagarmotha
Kan. : Konnari Gadde
Mal. : Muthanga, Kari Mustan
Mar. : Moth, Nagarmoth, Motha, Bimbal
Ori. : --
Punj. : Mutha, Motha
Tam. : Korai, Korai-Kizhangu
Tel. : Tungamustalu
Urdu. : Sad Kufi

DESCRIPTION –

a) Macroscopic :

Drug consists of rhizome and stolon having a number of wiry roots, stolon 10-20 cm long having a number of rhizomes, crowded together on the stolons, rhizomes bluntly conical and vary in size and thickness, crowned with the remains of stem and leaves forming a scaly covering, dark brown or black externally, creamish-yellow internally; odour, pleasant.

b) Microscopic :

Rhizome shows single layered epidermis, followed by 2-6 layers, suberised sclerenchymatous cells; epidermis and outer sclerenchymatous layers filled with dark brown content; ground tissue of cortex consists of circular to oval, thin-walled, parenchymatous cells with small intercellular spaces; a few fibro-vascular bundles present in this region; endodermis distinct and surrounding the stele; wide central zone beneath endodermis, composed of circular to oval, thin-walled, parenchymatous cells with intercellular spaces, numerous collateral, closed, vascular bundles surrounded by bundle sheath, scattered in this region; vessels narrow having simple reticulate, and scalariform thickening and oblique pore; simple round to oval starch grains measuring

6-28 μ in dia., a number of pigmented cells filled with reddish-brown content, present throughout the cortex and stele.

Powder – Creamish-brown; shows reddish-brown cells, reticulate and simple pitted vessels; fibre-like, closely packed sclerified cells, narrow vessels with scalariform thickness and oblique pore from the remnants of leaves simple, round to oval, starch grains, measuring 6-28 μ in diameter.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 8 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 5 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 11 per cent, Appendix 2.2.7.
Volatile oil	-	Not less than 1 per cent, Appendix 2.2.10.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under UV (366 nm) a fluorescent zone at Rf. 0.88 (blue). On exposure to Iodine vapour three spots appear at Rf. 0.44, 0.55 and 0.73 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 105°C three spots appear at Rf. 0.44, 0.55 and 0.73 (all violet).

CONSTITUENTS – Volatile Oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṭu, Kaṣāya
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Pittakaphahara, Sthoulyahara, Śothahara, Dīpana, Pācana Grāhī, Tṛṣnānigrahana, Krmighna, Tvakadoṣahara, Jwaraghna, Viṣaghna

IMPORTANT FORMULATIONS - Musakāriṣṭa, Mustākādi Kwātha, Aśokāriṣṭa, Mustakādi Cūrṇa, Mustakādi, Mustakādi Lehya, Dhāmya pañcaka Kvātha Cūrṇa, Piyuṣavallī rasa, Gulmakālānala Rasa, Mahālākṣādi Taila, Ṣhaḍangapāneeya

THERAPEUTIC USES - Agnimāndya, Ajerṇa, Tṛṣnā, Jwara, Saṅgrāhaṇi, Śwāsa, Kāsa, Mūtrakṛcchra, Vamana, Stanyavikāra, Sutikāroga, Atisāra, Āmavāta, Krimiroga

DOSE – 3-6 g. (Powder).
20-30 ml. (Kwatha).

NĀGAVALLĪ (Leaf)

Nāgavallī consists of leaf of *Piper betle* Linn. (Fam. Piperaceae); a dioecious, perennial creeper, climbing by many short adventitious rootlets, widely cultivated in hotter and damper parts of the country.

SYNONYMS -

Sansk. : Tāmbulī
Assam. : Pan
Beng. : Pan
Eng. : Betel Leaf
Guj. : Pan
Hindi. : Pan
Kan. : Veelyadele Ele
Mal. : Vettila
Mar. : Pan, Nagvel, Vidyachepan
Ori. : --
Punj. : Pan
Tam. : Vettilai
Tel. : Tamalapaku, Tamulapaku
Urdu. : Pan

DESCRIPTION –

a) Macroscopic :

Leaf varies greatly in size, 7.5-20.0 cm,ovate cordate, entire, glabrous, apex acuminate to acute, lamina membranous, upper surface deep green and lower surface lighter in colour, primary or sub-primary nerves usually 7, sometimes 5-9; odour, aromatic; taste, stightly pungent.

b) Microscopic :

Leaf –

Petiole – Single layered epidermis composed of cubical to slightly tangentially elongated cells covered with thick, striated cuticle; epidermal cells elongate to form uni to bicellular, occasionally multicellular hairs; epidermis followed by a discontinuous collenchymatous zone in the form of arcs, and a multilayered parenchymatous zone; vascular bundles arranged in the arcs, phloem surrounds xylem; vascular bundles usually of two sizes larger ones 7 in number and smaller ones 2 in number.

Midrib – Epidermis single layered, composed of colourless cubical cells, covered with wavy cuticle; epidermis followed by 2-3 layers of irregular colourless cells of hypodermis and a few layers of collenchyma, towards lower side collenchyma multilayered; vas-

cular bundle shows phloem surrounding xylem; lower epidermis single layered and covered with wavy cuticle; some epidermal cells elongate to form uni to bicellular, occasionally multicellular hairs.

Lamina – Shows dorsiventral structure; epidermis single layered, tangentially elongated, covered with thick striated cuticle on both sides; hypodermis 2-3 layered, having chloroplasts, occasionally with secretory cells; mesophyll differentiated into palisade and spongy parenchyma; palisade single layered; spongy parenchyma 3-4 layered composed of irregularly round cells, a few secretory cells also present in this region; hairs a few uni to bicellular, occasionally multicellular, all being uniseriate present on both surfaces; stomata anisocytic palisade ratio not over 4; stomatal index 11-13; vein islet number 2-7.

Powder – Greyish-green; shows polygonal epidermal cells in surface view, simple pitted vessels and a few uni to tricellular hairs, anisocytic type of stomata, palisade and spongy parenchyma cells and simple pitted vessel.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 17 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 3 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 20 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows in visible light five spots at Rf. 0.11 (green), 0.18 (light green), 0.23 (yellow), 0.34 (grey) and 0.61 (greyish green). Under U.V. (366 nm) seven fluorescent zones are visible at Rf. 0.11, 0.16 (both pink), 0.23 (brown), 0.34 (pink), 0.43 (pink), 0.61 (pink) and 0.76 (grey). On exposure to Iodine vapour seven spots appear at Rf. 0.08, 0.11, 0.18, 0.34, 0.61, 0.76 and 0.88 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C seven spots appear at Rf. 0.08, 0.11, 0.18 (all the three greenish grey), 0.34 (grey), 0.43 (violet), 0.61 and 0.76 (both light green).

CONSTITUENTS – Essential Oil, Amino Acids, Vitamins and Enzymes.

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Tikta, Kaṭu
Guṇa : Tikṣṇa, Sara, Laghu, Viṣada
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Rūcya, Balya, Śleṣmahara, Mukhadourgandhyahara, Mukhamalahara, Vāta Hara, Śramahara, Raktapittakarni, Svaryam, Vṛṣya

IMPORTANT FORMULATIONS - Lokanātha Rasa, Puṣpadhanvā Rasa, Bṛhat Sarwajwarahara Lauha, Laghu Sutaśekhara Rasa, Bṛhat Viṣamajwarāntaka Rasa

THERAPEUTIC USES - Kaṇḍu, Hṛllāsa, Agnimāndya, Jwara, Hṛdroga, Swarabheda

DOSE - 10-20 ml. of Swarasa.

NĀRIKELA (Endosperm)

Nārikela consists of dried endosperm of *Cocos nucifera* Linn. (Fam. Arecaceae), a tall palm, bearing a crown of large pinnate leaves, cultivated in coastal and deltaic regions of South India.

SYNONYMS -

Sansk. : Nārikela, Trnarāja
Assam.: Khopra
Beng. : Narikel, Narkel
Eng. : Coconut Palm
Guj. : Naliar, Nariyel, Shriphal, Koprun
Hindi. : Nariyal, Gola
Kan. : Khobbari, Tenginamara, Temgu, Thengu, Thenginamara
Mal. : Nalikeram, Ten, Thengu, Keram
Mar. : Naral
Ori. : Nariyal
Punj. : Narela, Khopra, Garigola
Tam. : Tenkai, Kopparai
Tel. : Narikelamu, Tenkay, Kobbari
Urdu. : Narjil, Narial

DESCRIPTION –

a) Macroscopic :

Drug available whole as well as in broken pieces of endosperm, whole drug 8-14 cm in size; ovoid, three angled, outer surface brown, somewhat rough due to shallow, reticulated striations; transversely broken; whole drug shows 0.8-1.2 cm thick, white endosperm and a large central cavity; fracture, short; odour, faint; taste, sweetish and oily.

b) Microscopic :

Endosperm shows testa, consisting of irregularly arranged, brown, compact, parenchymatous cells; beneath testa a very wide zone, consisting of outer 2-3 layers, thin-walled, smaller and angular parenchymatous cells, followed by radially elongated, larger and thin-walled parenchymatous cells, containing numerous aleurone grains, raphides, prismatic crystals of calcium oxalate and oil globules.

Powder - White and oily; shows thin-walled,parenchymatous cells, fragments of polyhedral, thin-walled, testa cells in surface view, aleurone grains, oil globules, raphides, a few prismatic crystals of calcium oxalate and vessels.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	- Nil -
Total ash	-	Not more than 2.5 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 13 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 10 per cent, Appendix 2.2.7.
Fixed oil	-	Not less than 59 per cent, Appendix 2.2.8.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (93 : 7) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.91 and 0.98 (both blue). On exposure to Iodine vapour three spots appear at Rf. 0.33, 0.91 and 0.98 (all yellow). On spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate at 105°C for fifteen minutes three spots appear at Rf. 0.33, 0.91 and 0.98 (all violet).

CONSTITUENTS – Fixed Oil.

PROPERTIES AND ACTION -

Rasa : Madhura
Guṇa : Guru, Snigdha
Vīrya : Śīta
Vipāka : Madhura
Karma : Vātahara Pittahara, Kaphakara, Balya, Vṛṣya, Bṛmhaṇa, Hṛdya, Bastiśodhaka, Viṣṭambhi

IMPORTANT FORMULATIONS - Nārikela Khaṇḍa, Nārikela Lavaṇ

THERAPEUTIC USES - Dāha, Kṣata, Kṣaya, Raktapitta, Tṛṣnā, Śoṣa, Śūla

DOSE – 10-20 g. of the drug in powder form.

NICULA (Fruit)

Nicula consists of dried fruit of *Barringtonia acutangula* (Linn.) Gaertn. (Fam. Lecythidaceae); a moderate sized, evergreen, glabrous tree, fairly common in sub-Himalayan tracts Bihar, Orissa, Bengal, Assam, Central and South India. It prefers moist situations but is not found in mangrove forests.

SYNONYMS -

Sansk. : Hijjala, Vidula
Assam. : Hindole
Beng. : Hijjala
Eng. : --
Guj. : Samudraphala
Hindi. : Hijjala, Samudraphala
Kan. : Nerruganegalu, Holegonvamara
Mal. : Manjal Kadamba, Manjal Kadam
Mar. : Samudraphala
Ori. : Kijolo
Punj. : Samuderphal
Tam. : Samudrapullarni, Samutrapalam
Tel. : Kanapu, Kadaps
Urdu. : Hijjal

DESCRIPTION –

a) Macroscopic :

Fruit - A drupe, yellowish-brown, oblong, 2.5-3.3 by 1.00 - 1.3 cm, bluntly quadrangular, broadest in the middle, slightly narrow and truncate at each end, fibrous; no characteristic odour and taste.

Seed - Single, 2-2.5 by 0.7-1.0 cm, wrinkled longitudinally, dark brown in colour.

b) Microscopic :

Fruit – Epicarp shows several layers of tangentially elongated, thin-walled parenchymatous cells; mesocarp composed of several layers of loosely arranged, thin-walled parenchymatous cells with intercellular spaces forming cavities; vascular bundles found scattered in this region; endocarp not distinct; a few rosette crystals of calcium oxalate in the form of irregular cluster, present in this region.

Seed - Shows two integuments, endosperm and embryo; outer integument consists of single layered epidermis, 2-3 layered sclereids and 7-10 layered closely arranged cells;

vascular bundles also found scattered in this region; inner integument consists of 1-2 layered, crushed cells; endosperm and embryo consists of isodiametric cells having small intercellular spaces; abundant, irregular starch grains, single and compound found scattered in cells of endosperm simple, 4-27 μ in dia., round to oval.

Powder - Whitish-purple; shows a few parenchymatous, brown coloured cells rosettes of calcium oxalate crystals in cluster numerous simple and compound starch grains, measuring 4-27 μ in dia. a few xylem vessels with spiral thickening.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 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 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 9 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under U.V. (366 nm) three fluorescent zones at Rf. 0.56 (blue), 0.81 (black) and 0.94 (blue). On exposure to Iodine vapour eight spots appear at Rf. 0.41, 0.48, 0.56, 0.61, 0.81, 0.87, 0.92 and 0.96 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for ten minutes eight spots appear at Rf. 0.14 (brown), 0.41, 0.48, 0.56, 0.61 (all violet), 0.87 (blue), 0.92 (violet) and 0.96 (brown).

CONSTITUENTS – Saponins and Sapogenins.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya, Kaṭu
Guṇa : Rūkṣa, Laghu
Virya : Uṣṇa
Vipāka : Kaṭu
Karma : Saṁgrāhī, Vraṇasodhana, Kaphahara, Recaka, Rakṣoghna, Viṣaghna, Vāmaka, Vātahara

IMPORTANT FORMULATIONS – Mahāpancagavya Ghṛta, Lakṣmī Vilāsa Rasa (Nārdīya), Nyagrodhādi Gaṇa Kwātha

THERAPEUTIC USES – Raktapitta, Āmātisāra, Cakṣusrāva, Galganda, Bhūtabādhā Grahabādhā, Prameha

DOSE – 1-3 g.

NĪLĪ (Whole Plant)

Nili consists of dried whole plant of *Indigofera tinctoria* Linn. (Fam. Fabaceae); a shrub, 1.2-1.8 m high, found nearly throughout the country and widely cultivated in many parts of the country.

SYNONYMS -

Sansk. : Nīlinī, Nīlpuṣpa, Kālkeśī
Assam. : Nilbam
Beng. : Nil
Eng. : Indigo Plant
Guj. : Nil, Gali
Hindi. : Nili
Kan. : Kadu Nili, Nili
Mal. : Avuri, Amari
Mar. : Nili, Neel
Ori. : --
Punj. : Neel
Tam. : Avuri
Tel. : Nili, Kondannili
Urdu. : Neel

DESCRIPTION –

a) Macroscopic :

Root - Tap root having lateral roots, pale yellow to light yellowish-brown, hard, woody, cylindrical, nearly smooth except for a few having scattered lenticels; odour, not distinct; taste, slightly bitter.

Stem - Pieces woody, hard, slender, cylindrical, 0.1 to 1.5 cm in dia., surface, smooth, lenticels present; yellowish-green to greyish-brown in colour; no characteristic odour and taste.

Leaf - Compound, imparipinnate; leaflets, 1-5 cm long and 0.3-1.2 cm wide, oblong or oblanceolate with short mucronate tip; pale green to greenish-black; no characteristic odour and taste.

Flower - Numerous in nearly sessile spicate racemes, 10.0 cm long; calyx 1.2-1.5 mm long, hairy outside, teeth triangular, acute, as long as tube; corolla pink, papilionaceous, 4 mm long, back of standard petal pubescent, stamen 10, diadelphous; ovary sessile, linear, downy; stigma capitate.

Fruit - Pod nearly cylindrical, straight or slightly curved, apiculate, 2-3.2 cm long and 0.15-0.2 cm in dia., having 8-12 seeds; smooth, brown to dark brown.

Seed - Somewhat quadrangular with truncate ends, 0.2 cm long and 0.1 cm wide, smooth, yellowish-brown to greenish-brown in colour.

b) Microscopic :

Root - Shows a narrow zone of cork, consisting of 4-10 layers of tangentially elongated, rectangular, thin-walled cells, with lenticels; secondary cortex a narrow zone, consisting of rectangular to polygonal, thin-walled cells containing rhomboidal to hexagonal crystals of calcaim oxalate; and groups of fibres; secondary phloem composed of usual elements; secondary xylem consisting of xylem parenchyma, vessels, fibres and rays; fibres large aseptate with pointed end; vessels solitary or 2-4 in groups having simple pits; medullary ray 1-4 cells wide; prismatic crystals of calcium oxalate present in secondary cortex, phloem, xylem parenchyma and rays; oil globules present in cortex and phloem parenchyma; starch grains simple, round to oval, measuring 3-11 μ in dia. present in cortex, phloem, xylem parenchyma and rays.

Stem - Young stem furrowed and ridged in outline;epidermis single layered, 5-10 layers of collenchymatous cells present in ridges; mature stem shows 5-15 layers of tangentially elongated, rectangular, thin-walled cork cells, broken by lenticels, a few upper rectagular cells filled with reddish-brown contents; secondary cortex consists of 5-7 layers of oval to elliptical, thin-walled, parenchymatous cells, pericycle a discontinuous ring of fibres; secondary phloem and secondary xylem composed of usual elements; xylem traversed by rays; vessels solitary or 2-7 in radial rows, isolated vessels show spiral thickening and simple pits; fibres having narrow lumen and pointed ends; tracheids pitted; crystal fibres 4-12 chambered; each containing 1or 2 prismatic crystals of calcium oxalate; pith occupied by isodiametric, thin-walled, parenchymatous cells; a few cells of secondary cortex, phloem and pith contain brown coloured substances; prismatic crystals of calcium oxalate and simple starch grains measuring 3-6 μ in dia. found in secondary cortex, phloem and xylem parenchyma, pith and rays.

Leaf -

Petiole - appears nearly circular in outline having two lateral wings; epidermis single layered, covered externally with thin cuticle and followed internally by single layered collenchymatous hypodermis; unicellular hairs scanty to moderate with blunt tip; cortex 4-6 layered, consisting of oval to polygonal, elongated, thin-walled chlorenchymatous cells; pericycle scanty, present in the form of continuous or discontinuous ring; vascular bundle collateral and three in number, large one present in centre and two smaller in lateral wings; pith composed of rounded to oval, thin-walled parenchymatous cells; a few prismatic crystals of calcium oxalate present in phloem and pith region.

Midrib - shows a similar structure of epidermis, cuticle and hairs as in petioles;lower and upper epidermis followed by single and 2 or 3 layers of collenchymatous hypodermis re-

spectively; parenchyma 2 or 3 layered, present on both sides; vascular bundle single, collateral, crescent-shaped, present centrally.

Lamina - shows a dorsiventral structure; epidermis, cuticle and hairs as in petiole and midrib; palisade 2 layered; spongy parenchyma 2-4 layered; a few patches of veins scattered between palisade and spongy parenchyma; a few prismatic crystals of calcium oxalate present in mesophyll cells; stomata paracytic and unicellular hairs present on both surface but abundant on lower surface; palisade ratio not more than 4; stomatal index 18-40 on lower surface and 10-16 on upper surface; vein islet number 15-18.

Fruit - Shows single layered epicarp; mesocarp 7-8 layered, more or less elliptical, tangentially, elongated, thin-walled, parenchymatous cells, a few upper cells contain reddish brown content; vascular bundle present in the mesocarp region towards both ends, covered by sclerenchymatous sheath; endocarp present in the form of 3-5 layers of sclerenchymatous cells.

Seed - Shows a single layered, radially elongated, thin-walled, palisade-like cells, covered externally by a thin cuticle and internally, followed by a single layer of bearer cells; beneath bearer cells 2-4 tangentially elongated elliptical, thin-walled parenchymatous cells present; cotyledons consists of oval to angular,elongated, thin-walled parenchymatous cells.

Powder - Yellowish grey; shows aseptate fibres, vessels with spiral thickening and simple pits; groups of mesophyll cells, unicellular hairs; pieces of hexagonal, straight walled, epidermal cells in surface view; prismatic crystals of calcium oxalate, rarely oil globules, and simple, rounded to oval, starch grains measuring 3-11 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 5.2 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1.0 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 2.5 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 7.5 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : glacial Acetic acid : Water (5 :1: 4) in visible light shows three spots at Rf. 0.38, 0.75 and 0.88 (all grey). On exposure to Iodine vapour seven spots appear at Rf. 0.15, 0.38, 0.50, 0.59, 0.67, 0.75 and 0.88 (all yellow). On spraying with 5% Methanolic-sulphuric acid reagent and heating the plate at 110°C for ten minutes nine spots appear at Rf. 0.15, 0.25, 0.38, 0.50, 0.59, 0.67, 0.75, 0.84 and 0.88 (all grey).

CONSTITUENTS – Glycoside (Indican).

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṭu
Guṇa : Sara
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Kaphahara, Recanī, Keśya, Viṣaghna, Jantughna

IMPORTANT FORMULATIONS – Nīlikādya Taila, Gorocanādi Vaṭī

THERAPEUTIC USES –Vāta Rakta, Udararoga, Plīhāroga, Kṛmiroga, Moha, Bhrama, Udāvartta, Kaṭivata, Kāsa, Āmaroga, Viśodara, Jwara, Kṣaya, Kṛmidanta

DOSE – 10-20 g. of the drug for decoction.

NIRGUṆḌĪ (Leaf)

Nirguṇḍī consists of dried leaf of *Vitex negundo* Linn. (Fam. Verbenaceae); a large aromatic shrub or a small tree, upto 4.5 m in height, common throughout the country ascending to an altitude of 1500 m in the outer Himalayas. It is common in waste places around villages, river banks, moist localities and in the deciduous forests.

SYNONYMS -

Sansk. : Sinduvāra, Samphālika, Nīla
Assam. : Aslak
Beng. : Nirgundi, Nishinda
Eng. : Five Leaved Chaste Tree
Guj. : Nagod
Hindi. : Nirgundi, Sinduar, Sambhalu
Kan. : Lakkigida, Nekkigida
Mal. : Indranee, Nirgundi
Mar. : Nirgundi
Ori. : --
Punj. : Sambhalu, Banna
Tam. : Karunochchi, Nocchi
Tel. : Nallavavilli, Vavili
Urdu. : Sambhalu, Panjangusht

DESCRIPTION –

a) Macroscopic :

Leaves palmately compound, petiole 2.5 - 3.8 cm long; mostly trifoliate, occasionally pentafoliate; in trifoliate leaf, leaflet lanceolate or narrowly lanceolate, middle leaflet 5- 10 cm long and 1.6 -3.2 cm broad, with 1- 1.3 cm long petiolule, remaining two sub-sessile; in pentafoliate leaf inner three leaflets have petiolule and remaining two sub-sessile; surface glabrous above and tomentose beneath; texture, leathery.

b) Microscopic :

Petiole - shows single layered epidermis having a number of unicellular, bicellular and uniseriate multicellular covering trichomes and also glandular trichomes with uni to tricellular stalk and uni to bicellular head; cortex composed of outer collenchymatous tissue and inner 6 - 8 layers of parenchymatous tissue; collenchyma well developed in basal region and gradually decreases in middle and apical regions; pericyclic fibres absent in basal region of petiole and present in the form of a discontinuous ring in apical region surrounding central horse shoe-shaped vascular bundle; a few smaller vascular bundles

present ventrally between arms of central vascular bundle and two, or rarely three, bundles situated outside the arms.

Lamina - shows single layered epidermis having mostly unicellular hairs, bi and multicellular and glandular trichomes being rare; hypodermis 1 - 3 layered interrupted at places by 4- 8 palisade layers containing chlorophyll; a large number of veins enclosed by bundle sheath traverse mesophyll; stomata present only on the ventral surface, covered densely with trichomes; vein-islet and vein termination number of leaf are 23-25 and 5-7 respectively .

Powder - shows number of pieces or whole, uni-bi and multicellular covering trichomes, glandular trichomes, palisade tissues with hypodermis, and upper and lower epidermis, xylem vessels with pitted walls.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 8 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 10 per cent, Appendix 2.2.6.
Water-soluble extractives	-	Not less than 20 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.18 (blue) and 0.47 (red). On exposure to Iodine vapour four spots appear at Rf. 0.16, 0.47, 0.67 and 0.91 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and on heating the plate for ten minutes at 105° C four spots appear at Rf. 0.07, 0.47, 0.58 and 0.67 (all blue).

CONSTITUENTS – Alkaloids and Essential Oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṭu, Kaṣāya
Guṇa : Laghu
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphaśāmaka, Vātaśāmaka, Śophahara, Keśya, Cakṣuṣyam Viṣaghna, Smtriprada, Anulomna

IMPORTANT FORMULATIONS – Vatagajāṅkuśa Rasa, Mahāvata Vidhvansana Rasa, Ykṛtptihāra Lauha, Daśamula Taila, Trivikrama Rasa, Nirguṇḍī Taila, Tribhuvan Kīrti Rasa, Viṣa Tinduka Taila

THERAPEUTIC USES – Śūla, Śopha, Vātavyādhi, Āmavāta, Kuṣṭha, Kaṇḍu, Kāsa, Pradara, Ādhmāna, Pihā roga, Gulma, Arśi, Kṛmi, Vraṇa, Nāḍī Vraṇa, Karṇaśūla, Sūtikā, Jwara

DOSE – 10-20 ml. (Swarasa).

PADMAKA (Heart Wood)

Padmaka consists of heart wood of *Prunus cerasoides*_ D. Don (Fam. Rosaceae); a middle or large sized tree, found in temperate Himalayan region from Garhwal to Sikkim upto an elevation of 910-1820 m.

SYNONYMS -

Sansk. : Padmagandhi, Pitarakta
Assam.: Diengsoh-iog-Krems
Beng. : Padmakastha
Eng. : Biyd Cherry
Guj. : Padmakastha, Padmaka
Hindi. : Padmakha, Padma Kastha, Paja
Kan. : Padmaka
Mal. : Pathimukam
Mar. : Padmakastha, Padmaka
Ori. : --
Punj. : Pajja
Tam. : Padmakashdham
Tel. : Padmakashthamu
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Drug available in variable pieces, yellowish-brown to orange, to which some whitish portion of sap wood still attached; heavy, dense, moderately hard and very strong, odour, very faint; no taste.

b) Microscopic :

Mature heart wood consisting of vessels, fibres, tracheids and xylem parenchyma traversed by xylem rays; vessels lignified, moderately thick-walled, reticulate thickening, fairly large, with bordered pits having an oval-shaped, lateral perforation at each end, measuring, upto 220 μ in length and upto 68 μ in width; fibres occur mostly in groups, usually found associated with other xylem elements, moderately thick-walled, narrow lumen, pointed at both ends, 55-137 μ long; tracheids usually thick-walled, lignified, elongated cells; xylem parenchyma composed of thick-walled, found associated with vessels and fibres, oval to elongated, polygonal cells; xylem rays uni to multiseriate, uni and biseriate more common, multiseriate, generally 3-6 cells wide, 40-50 cells high; cut materials, when treated with ferric chloride solution turn the yellow pigments blue or black, indicating tannin.

Powder – Reddish-brown; shows fragments of abundant groups or single pointed fibres measuring 55-137 μ in length, moderately thick-walled, fairly large vessels with reticulate thickening and bordered pits, thick-walled, lignified tracheid cells, pieces of ray cells and xylem parenchyma cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 1 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 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 1 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under UV (366 nm) a fluorescent zone at Rf. 0.64 (blue). On exposure to Iodine vapour seven spots appear at Rf. 0.15, 0.32, 0.42, 0.53, 0.59, 0.64 and 0.76 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 105°C four spots appear at Rf. 0.15, 0.32, 0.53 and 0.59 (all violet).

CONSTITUENTS – Flavonoids.

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Tikta
Guṇa : Laghu
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Garbhasthāpana, Rūcya, Vātala

IMPORTANT FORMULATIONS - Khadirādi Guṭikā, Guḍucyādi Kwātha Cūrṇa, Bṛhacchāgatādya Ghṛta, Śatāvaryādi Ghṛta, Guḍucyādi Taila, Uśirāsava, Candanāsava, Daśamūlāriṣṭa, Mṛtasañjivanī Surā, Karpūrādhyarka

THERAPEUTIC USES - Viṣphoṭa, Dāha, Kuṣṭha, Raktapitta, Vami, Tṛṣā, Bhrama, Visarapa

DOSE – 1-3 g. (Curna).

PĀṬALĀ (Root)

Pāṭalā consists of dried root of *Stereospermum suaveolens* DC. (Fam. Bignoniaceae); a large deciducus tree upto 18 m high and 1.8 m in girth with a clear bole of about 9 m, found throughout the moist parts of the country.

SYNONYMS -

Sansk. : Amoghā, Madhudūtī, Kṛṣṇvṛntā, Tāmrapuṣpī
Assam.: Parul
Beng. : Parul
Eng. : Rose Flower Fragrant
Guj. : Podal
Hindi. : Padal
Kan. : Padramora
Mal. : Padiri
Mar. : Padal
Ori. : Boro, Patulee
Punj. : Padal
Tam. : Padari
Tel. : Kaligottu, Kokkesa, Podira
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Root occurs in about 6-9 cm long, 1-1.5 cm thick cut pieces, cylindrical, externally brown to creamy, rough due to vertical fissures, cracks, ridges and transverse fine lenticels, internally dark brown, lamellation or stratification due to presence of concentric bands of fibres; fracture tough and fibrous; odour, not distinct; taste, bitter.

b) Microscopic :

Root cork consists of 25-35 layers of rectangular cells with 3-5 stratified layers, lignification being more prominent where the stratification starts, arranged with 1-3 tangential rows of narrow cells alternating with 3-5 tangential rows of wider cells; cork cambium composed of 1-2 layers of tangentially elongated cells; secondary cortex arranged more or less radially, becomes polyhedral to isodiameteric in inner region, a few cells getting converted into stone cells which are regular in shape and show projection; secondary phloem wide, forms cerantenchyma between two obliquely running rays; some rays and phloem cells get converted into irregular, polygonal shaped stone cells, measuring 10-150 μ in width, phloem parenchyma being intact; medullary rays multiseriate, being 3-4 cells wide, and 8-11-15 cells high; fibres tapering, pointed or slightly blunt, with a small peg-like projection at both ends; sieve tube gets collapsed in outer region forming strips of ceratenchyma; a few small

microsphenoidal crystals of calcium oxalate present in phloem parenchyma and rays; secondary xylem wide having usual elements; vessels simple, pitted, lignified; fibres large, pointed, aseptate; rays multiseriate, 2-3 cells wide.

Powder - Dark brown; shows fragments of rectangular cork and phloem parenchyma cells; groups of single, thick- walled, cubical to rectangular, lignified stone cells having striations and wide lumen; a number of microsphenoidal crystals of calcium oxalate, intact and scattered outside.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 8 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 6 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 20 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows in visible light three spots at Rf. 0.62, 0.85 and 0.92 (all light yellow). Under UV (366 nm) five fluorescent zones are visible at Rf. 0.47, 0.53 (both light blue), 0.62 (bluish pink), 0.74 (blue) and 0.85 (light green). On exposure to Iodine vapour seven spots appear at Rf. 0.14, 0.28, 0.47, 0.53, 0.74, 0.85 and 0.92 (all yellow). On spraying with 5% Methanolic Phosphomolybdic acid reagent and heating the plate for ten minutes at 110°C four spots appear at Rf. 0.47, 0.74, 0.85 and 0.92 (all bluish grey).

CONSTITUENTS – Bitter Substances, Sterols, Glycosides and Glyco-Alkaloids.

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Tikta
Guṇa : Laghu, Rūkṣa
Vīrya : Anūṣṇa
Vipāka : Kaṭu
Karma : Tridosahara, Rucya

IMPORTANT FORMULATIONS - Amṛtāriṣṭa, Daśamūlāriṣṭa, Bhārangī Guḍa, Indu Kānta Ghṛta, Dhānwantari Taila, Daśamūla Kwātha Cūrṇa

THERAPEUTIC USES - Śwāsa, Śotha, Arśa, Chardi, Hikkā, Tṛṣā, Amlapitta, Rakta Vikāra, Mūtravikara, Agnidagdha, Vraṇa Rujā, Visphoṭa, Medoroga

DOSE – 5-10 g. (Powder).
25-50 ml. (Decoction).

PHALGU (Fruit)

Phalgu consists of dried fruits of *Ficus hispida* Linn. f. (Fam. Moraceae); a moderate sized tree or shrub, distributed throughout the outer Himalayan range from Chenab eastwards to Bengal, Central and South India and Andaman Islands.

SYNONYMS -

Sansk. : Kākodumbur, Malayu, Malpu
Assam.: Khoskadumar, Tanvardi, Teenbarree
Beng. : Kakdumur, Kathdumur, Kakadumbar
Eng. : Wild Fig, Devil Fig
Guj. : Tedumbaro, Dhedadambaro, Dhedhumbro, Dhedhumbro
Hindi. : Konea-dumbar, Kathumar
Kan. : Kadaatti, Arjeeru Hamu, Anjeeru, Onagida, Hanna, Adane
Mal. : Peyatti, Kattatti, Erumanakku, Parakasimi
Mar. : Rambal, Kalodumbar, Bhuiumbar
Ori. : Dimiri, Ani Dambura
Punj. : Rumbal
Tam. : Peyatti
Tel. : Brahma medi, Kakimedi
Urdu. : Kath Gular

DESCRIPTION –

a) Macroscopic :

Dried syconus fruit, ovoid with a central circular hole and short stalk, 1-2 cm in dia., wrinkled; greyish-brown; seeds less than 1 mm in dia. and yellowish-brown in colour, odour and taste not characteristic.

b) Microscopic :

Fruit shows a sinlge layered epidermis, covered with thick cuticle having a few unicellular trichomes, epidermis, followed by 4-6 layers of hexagonal to polygonal, collenchymatous cells, a few cells contain rosette crystals of calcium oxalate; mesocarp composed of large, oval to polygonal, thick-walled parenchymatous cells, a few vascular vessels showing spiral thickening.

Powder – Greyish-brown; shows groups of oval to polygonal, thin-walled cells of mesocarp and endosperm, fragments of polyhedral, thick-walled epidermal cells in surface view, spiral vessels and abundant unicellular trichomes.

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 1.5 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 12 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract of the drug on Silica gel 'G' plate using n-Butanol : Acetic acid : water (4:1:5) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.36 and 0.92 (both blue). On exposure to Iodine vapour four spots appear at Rf. 0.20, 0.36, 0.41 and 0.92 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 105°C two spots appear at Rf. 0.20 (grey) and 0.92 (brown).

CONSTITUENTS – Tannins and Saponins.

PROPERTIES AND ACTION -

Rasa : Madhura, Amla, Katu, Tikta, Kaṣāya
Guṇa : Snigdha, Guru
Vīrya : Sīta
Vipāka : Madhura
Karma : Vātahara Pittahara, Kaphahara, Mānsakara, Sukrakara, Mala Stambhana, Tṛptikāraka, Grāhi, Bṛmihaṇa, Vistambhī

IMPORTANT FORMULATIONS - Citrakādi Taila

THERAPEUTIC USES - Vraṇa, Śveta Kuṣta, Pāṇḍu, Arśa, Kāmalā, Atisāra, Dāha, Kṣata, Viṣaroga, Tvakaroga, Raktavikāra, Kaṇḍu, Kuṣtha, Śopha, Raktapitta, Vātapittajaroga

DOSE – 10-20 g.

PHALGU (Root)

Phalgu consists of dried root of *Ficus hispida* Linn. f. (Fam. Moraceae); a moderate sized tree or shrub, distributed throughout the outer Himalayan range from Chenab eastwards to Bengal, Central and South India and Andaman Islands.

SYNONYMS -

Sansk. : Kākodumbur, Malāyu, Malpu
Assam.: Khoskadumar, Tanvardi, Teenbarree
Beng. : Kakdumur, Kathdumur, Kakadumbar
Eng. : Wild Fig, Devil Fig
Guj. : Tedumbaro, Dhedadambaro, Dhedhumbro, Dhedhumbro
Hindi. : Konea-dumbar, Kathumar
Kan. : Kadaatti, Arjeeru Hamu, Anjeeru, Onagida, Hanna, Adane
Mal. : Peyatti, Kattatti, Erumanakku, Parakasimi
Mar. : Rambal, Kalodumbar, Bhuiumbar
Ori. : Dimiri, Ani Dambura
Punj. : Rumbal
Tam. : Peyatti
Tel. : Brahma medi, Kakimedi
Urdu. : Kath Gular

DESCRIPTION :

a) Macroscopic -

Roots 4 -17 cm long, 1.0-2.5 cm thick, almost cylindrical, occasionally somewhat compressed at places, external surface brown to dark brown with deep, elliptical cracks and tangentially arranged rows of lenticels; fracture, splintery.

b) Microscopic –

Root shows 5-10 layers of cork, consisting of thin-walled, compressed cells, outer layers exfoliating; secondary cortex a wide zone consisting of irregularly arranged, tangentially elongated, thin-walled, parenchymatous cells, some of which contain rosette crystals of calcium oxalate and dark red coloured contents; secondary phloem consisting of usual elements, comprising of thin-walled cells; cellulosic phloem fibres found scattered throughout secondary phloem in singles and in groups of 2-3; a few phloem parenchyma and phloem ray cells contain rosette crystals of calcium oxalate; secondary xylem situated centrally, consisting of usual elements, all being lignified; xylem vessels numerous, equally distributed throughout secondary xylem region, in singles as well as in groups of 2-6, xylem rays numerous, straight and 1-5 cells wide.

Powder - Yellowish-brown; shows cellulosic phloem fibres, xylem vessels in broken pieces with pitted thickenings and rosette crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 7 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1.5 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 6 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) on exposure to Iodine vapour shows six spots at Rf. 0.05, 0.15, 0.30, 0.34, 0.92 and 0.98 (all yellow). On spraying with Dragendorff reagent followed by 5% aqueous Sodium Nitrite solution four spots appear at Rf. 0.30, 0.34, 0.92 and 0.98 (all light brown).

CONSTITUENTS – Alkaloids.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya
Guṇa : Guru, Śīta
Vīrya : Śīta
Vipāka : Madhura
Karma : Pittahara, Kaphahara, Malastambhaka

IMPORTANT FORMULATIONS - Mahāpancagavya Ghṛta

THERAPEUTIC USES - Śvitra, Kaṇḍu, Kuṣṭha, Vraṇa, Raktapitta, Śopha, Pāṇḍu, Raktavikāra, Kāmalā, Arśa

DOSE – 1-3 g. of the drug in powder form.

PRAPUNNĀḌA (Seed)

Prapunnāḍa consists of dried seed of *Cassia tora* Linn. (Fam. Fabaceae); a herbaceous annual occurring as a weed throughout the country in plains, ascending 1500 m in the Central Himalayas.

SYNONYMS –

Sansk. : Eḍagaja, Dadrughna
Assam. : Kulb
Beng. : Chavuka, Chakunda, Panevar
Eng. : Ring Worm Plant, Fetid Cassia
Guj. : Kovaraya
Hindi. : Pavand
Kan. : Tagache
Mal. : Tagaraa
Mar. : Tankala
Ori. : --
Punj. : Panwal, Chakunda, Chakwad
Tam. : Vshittgarai
Tel. : Tagiris
Urdu. : Panwar

DESCRIPTION –

a) Macroscopic :

Seed hard, 1 cm long, 3-4 mm thick, oblong or rhombohedral, both ends appear as if cut off obliquely, greenish-brown to brownish-black, smooth and shiny; odourless; taste, bitter.

b) Microscopic :

Seed shows seed coat consisting of longitudinally elongated cells, covered with thick, smooth cuticle, followed by palisade layer composed of closely packed, radially arranged, non-lignified, thickened columnar cells, and by a single layer of dumb-bell shaped, thick-walled, parenchymatous cells; a wide zone of thick-walled, parenchymatous cells forming inner layer of testa present, differentiated into outer 8 – 10 layers of tangentially elongated, parenchymatous cells and a single layer of broad cells which are squarish in shape; a few vascular bundles scattered in this zone; embryo consists of radicle, plumule and two cotyledons; epidermis of cotyledon consists of a single layer, externally covered with cuticle, followed by two layers of palisade-like cells of mesophyll; mesophyll of ventral side composed of rectangular to polygonal cells filled with round to oval starch grain, measuring 8-12 μ in dia., a few vascular bundles and a few rosette crystals of calcium oxalate upto 49 μ in dia.; scattered in this region.

Powder - Light brown; shows fragments of testa, parenchymatous cells, very small, numerous, simple, round to oval, starch grains measuring 8-12 μ in dia., and a few rosette crystals of calcium oxalate upto 49 μ in diameter.

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 0.2 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 14 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows in visible light three spots at Rf. 0.33, 0.47 and 0.57 (all light yellow). Under UV (366 nm) three fluorescent zones are visible at Rf. 0.33 (blue), 0.47 (light pink) and 0.57 (blue). On exposure to Iodine vapour seven spots appear at Rf. 0.27, 0.33, 0.47, 0.57, 0.62, 0.71 and 0.82 (all yellow).

CONSTITUENTS – Anthraquinones, Fixed Oil.

PROPERTIES AND ACTION -

Rasa : Kaṭu
Guṇa : Laghu, Rūkṣa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphavātasāmaka Kṛmighna, Recana, Lekhana, Kusṭhaghna, Viṣaghana Tvaka, Varṇaprasādakaram, Twacya

IMPORTANT FORMULATIONS - Nimbādi Cūrṇa, Kāsīsādi Ghṛta, Mahā Viṣagarbha Taila, Bṛhanmariayādi Taila

THERAPEUTIC USES - Kaphavātajanya Vikāra, Kuṣṭha, Vraṇa Vikāra, Dadru, Pakṣāghāta, Vibandha, Gulma, Kṛmi, Pāmā, Kaṇḍu, Śwāsa, Kāsa

DOSE – 1-3 g. of powder.

RAKTACANDANA (Heart Wood)

Raktacandana consists of heart wood of *Pterocarpus santalinus* Linn. f. (Fam. Fabaceae); a medium sized, deciduous tree upto 10-11 m high and 1.5 m in girth, mostly found in Andhra Pradesh and neighbouring area of Chennai and Karnataka at an altitude of 150-900 m.

SYNONYMS –

Sansk. : Raktāṅga, Kṣudracndana, Raktaśara
Assam.: Sandale, Sandal Ahmar
Beng. : Raktachandana
Eng. : Red Sanders, Red Sandal Wood
Guj. : Ratanjali, Lalchandan
Hindi. : Raktachandana, Lalchandana
Kan. : Raktha Chandanam
Mal. : Rakta Chandanam
Mar. : Rakta Chandana
Ori. : --
Punj. : Lal Chandan
Tam. : Sanchandanam
Tel. : Erra Chandanamu
Urdu. : Sandal Surkh

DESCRIPTION –

a) Macroscopic :

Drug occurs as irregular pieces, deep blood-red to dark purplish-red or almost black, hard, but can be easily split, odourless; taste, slightly astringent.

b) Microscopic :

Heart wood shows alternating bands of darker and lighter zones; vessels large, mostly isolated and connected by fine, bright red rays, consisting of xylem parenchyma; prismatic crystals of calcium oxalate occur in a few cells; red colouring matter present in a number of cells of vessels and other cells; fibres abundant; xylem rays mostly uniseriate.

Powder - Red or purplish-red; shows a number of fibres, vessels and xylem parenchyma cells and prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH –

Identification –

Fluorescence test on aqueous and alcoholic extracts :-

i) 5 g. powder extracted in 100 ml of water and filtered shows in day light – pale yellow to brownish-red colour; under U.V. light (366 nm) emerald green, and under U.V. light (254 nm) light green.

ii) 5 g. powder extracted in 100 ml of alcohol and filtered shows in day light – brownish – red colour; under U.V. light (366 nm) reddish –brown, and under U.V. light (254) yellowish-green colour.

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 2 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.3 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 1 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows in visible light a spot at Rf. 0.37 (light pink). Under U.V. (366 nm) five fluorescent zones are visible at Rf. 0.07 (blue), 0.13 (grey), 0.30 (blue), 0.37 (grey), and 0.57 (blue). On exposure to Iodine vapour eight spots appear at Rf. 0.07, 0.13, 0.16, 0.26, 0.37, 0.43, 0.74 and 0.80 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C seven spots appear at Rf. 0.04 (violet), 0.07, 0.13 (both light violet), 0.37, 0.43 (both violet), 0.74 and 0.80 (both light violet).

CONSTITUENTS – Glycosides, Colouring Matter.

PROPERTIES AND ACTION -

Rasa : Tikta, Madhura
Guṇa : Guru, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Pittahara, Netraroga, Viṣaghna, Vṛṣya

IMPORTANT FORMULATIONS – Candana Balā Lakṣādi Taila, Candanādi Lauha

THERAPEUTIC USES – Chardi, Tṛṣṇā, Raktadoṣahara, Twara, Vraṇa

DOSE – 3-6 g. of the drug (Powder).

RAKTAPUNARNAVA (Root)

Raktapunarnava consists of dried root of *Boerhaavia diffusa* Linn. (Fam. Nyctaginaceae); a trailing herb with stout root stock and many diffused, slender, prostrate or ascending branches, occurring thought the plains of India.

SYNONYMS -

Sansk. : Sothaghni, Rakta Puspa
Assam. : Ronga Punarnabha
Beng. : Rakta Punarnava
Eng. : Hog Weed
Guj. : Saturdi
Hindi : Gadapurna, Lalpunarnava
Kan. : Kommeberu
Mal. : Chuvanna Tazhutama
Mar. : Rakta Punarnava
Ori. : Laalapuiruni
Punj. : Iteit (Lal), Khattan
Tam. : Mookarattai (Shihappu)
Tel. : Atikamamidi, Erragalijeru
Urdu. : Surkh Punarnava

DESCRIPTION –

a) Macroscopic :

Root well developed, fairly long, somewhat tortuous, cylindrical, 0.2 - 1.5 cm in dia.; yellowish-brown to brown; surface, rough due to minute longitudinal striations and root scars; fracture, short; odour, not distinct; taste, slightly bitter.

b) Microscopic :

Mature root shows anomalous growth; cork composed of thin-walled, tangentially elongated cells in the outer few layers; cork cambium 1-2 layers of thin-walled cells; secondary cortex consists of 2-3 layers of parenchymatous cells, followed by cortex composed of 5-12 layers of thin-walled, oval to polygonal cells; several concentric bands of xylem tissue, alternating with zone of parenchymatous tissue, present below cortical region; number of bands vary according to thickness of root and consist of vessels, tracheids and fibres; vessels mostly found in groups of 2-8 in radial rows, having simple pits and reticulate thickening; tracheids, thick-walled with simple pits; fibres aseptate, elongated, thick-walled with pointed ends; phloem occurs as hemispherical or crescent patches outside each group of xylem vessels and composed of sieve elements and parenchyma; a broad zone of parenchymatous tissue, in between two successive rings of xylem elements, composed of thin-walled, more or less rectangular cells arranged in

radial rows; central region of root occupied by primary vascular bundles; numerous raphides in single or in group present in cortical region and in parenchymatous and xylem tissue; starch grains simple and compound, having 2-4 components, found in abundance in most of the cells of cortex and xylem elements; simple starch grains mostly round in shape, measuring 2.75-11 μ in dia.

Powder - Light yellow; shows vessels with reticulate thickening or simple pits, fibres, fragments of cork cells, raphides of calcium oxalate and simple, rounded, starch grains, measuring 2.75 - 11 μ in dia., and compound starch grains having 2-4 components.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2	per cent, Appendix 2.2.2.
Total ash	-	Not more then 10	per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more then 0.8	per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 4	per cent, Appendix 2.2.6
Watter-soluble extractive	-	Not less than 10	per cent, Appendix 2.2.7

T.L.C. -

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (8 : 2) shows under UV (366 nm) six fluorescent zones at Rf. 0.11, 0.38 (both blue), 0.70, 0.84 (both light blue), 0.90 (light pink) and 0.94 (light blue). On exposure to Iodine vapour seven spots appear at Rf. 0.05, 0.11, 0.28, 0.38, 0.43, 0.84 and 0.94 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent two spots appear at Rf. 0.08 and 0.94 (both orange).

CONSTITUENTS - Alkaloid, Hentriacontane, β–Sitosterol, Ursolic Acid.

PROPERTIES AND ACTION –

Rasa : Tikta, Kaṣāya, Kaṭu, Madhura
Guṇa : Laghu, Rūkṣa, Śīta, Sara
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Śophaharra, Kaphaghna, Dīpana, Vātakara, Pittahara

IMPORTANT FORMULATIONS – Kumaryāsava, Dādhika Ghṛta, Dhānvantara Ghṛta, Punarnavādyariṣta

THERAPEUTIC USES – Śopha, Pāṇdu, Hṛdroga, Kāsa, Arśa, Vraṇa, Urahkṣatasūla, Śotha

DOSE – 1-3 g. of powder.
10-20 ml. (Fresh Juice).

RĀMASITALIKĀ (Whole Plant)

Rāmasitalikā consists dried whole plant of *Amaranthus tricolor* Linn.; Syn. *A. gangeticus* Linn.; *A. melancholicus* Linn. *A. polygamus* Linn. Hook. f., *A. tristis* Linn.; (Fam. Amaranthaceae), an erect, diffuse, stout, annual herb, found throughout the country.

SYNONYMS -

Sansk. : Mārisarakta, Ārāmasītalikā
Assam. : --
Beng. : Lal Shak
Eng. : --
Guj. : Tandaljo (Lal)
Hindi. : Lal Marsa
Kan. : Dantu, Harave Soppu, Dantina Soppu, Chikkarive
Kash. : --
Mal. : Aramaseetalam
Mar. : Mash
Ori. : --
Punj. : Lal Marsa Sag
Tam. : Mulaikkeerai
Tel. : Erra Tatakura
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Root –Tap root, cylindrical, yellowish, 0.3-0.5 cm thick, with a few secondary roots and numerous rootlets.

Stem - Stem cylindrical with longitudinal ridges and furrows, branched, light greenish-yellow, 0.2-0.4 cm thick; fracture, short.

Leaf - Leaf simple, 5-12 cm long, 2.5-7 cm wide, very variable in shape, rhomboid-ovate, lanceolate or deltoid-ovate, obtuse, petiolate, membranous.

Flower – Flowers clustered in the axils and forming a long terminal, more or less interrupted spike; bracteole 3 mm long, lanceolate, membranous, perianth 4 mm long; sepals 3, white with pinkish tinge, stamens three, anthers dorsifixed.

Seed - Seed 1.5 mm in dia., biconvex, smooth, shiny black.

b) Microscopic :

Root - Shows cork consisting of 3-6 rows of thin-walled cells, a few outer layers exfoliating; secondary cortex consisting of 6-11 rows of tangentially elongated, tabular, thin-walled parenchymatous cells, a few of them containing microsphenoidal crystals of calcium oxalate; secondary phloem arranged in continuous ring, consisting of thin-walled cells; phloem parenchyma cells containing microsphenoidal crystals of calcium oxalate; secondary xylem arranged in the form of a ring, beneath which there are scattered vascular bundles consisting of xylem and phloem; vascular bundles, situated in the centre are comparatively larger; ground tissue consisting of thin-walled, parenchymatous cells, a few cells containing microsphenoidal crystals of calcium oxalate.

Stem - Shows many thick-walled, oval to polygonal, collenchymatous cells present in the ridges seen in outline; epidermis single layered with tabular cells under a thick-cuticle; cortex differentiated into 3-9 layered, thick-walled, tangentially elongated, chlorenchyma cells having a few microsphenoidal crystals of calcium oxalate; vascular bundles collateral arranged in a concentric band consisting of phloem and xylem elements; inside the band, in the ground tissue a number of conjoint vascular bundles found scattered; ground tissue consisting of oval or round, thin-walled, parenchymatous cells, these cells are smaller toward periphery and larger towards centre, a few of these cells contain microsphenoidal crystals of calcium oxalate.

Leaf –

Petiole - Shows two notches which are lateral in position, epidermis single layer, followed by, 1 or 2 layers ventrally and 1 to 7 layers dorsally of collenchyma; rest of the cortex consisting of thin-walled parenchymatous cells, a few of them containing microsphenoidal crystals of calcium oxalate; vascular bundles arc-shaped in three separate patches, elongated in the notches central one nearly circular, each consisting of xylem and phloem.

Midrib - Shows single layered epidermis on both surfaces, followed by 1-2 layered collenchyma; rest of the cortex consisting of thin-walled, parenchymatous cells a few of them containing microsphenoidal crystals of calcium oxalate; vascular bundles 4 in number in basal region and single in number towards apical region.

Lamina - Shows single layered epidermis on both surfaces; upper epidermal cells, thin-walled, oval to polygonal, with a few uni-to bicellular pointed hairs, sinuous walls and a few stomata in surface view; lower epidermal cells composed of thin-walled cells oval to polygonal, having a number of rosette crystals of calcium oxalate and a few microsphenoidal crystals of calcium oxalate; walls sinuous, stomata both anomocytic and anisocytic type; palisade parenchyma 2 or 3 layered; spongy parenchyma 3 or 4 layered consisting of circular, irregularly arranged cells.

Powder -Light green; shows lignified vessels with spiral thickening, rosette and microsphenoidal crystals of calcium oxalate, fragments of irregular, sinuous, polyhedral,

thin-walled, parenchymatous epidermal cells and palisade cells, anomocytic and anisocytic type of stomata.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more then 17 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more then 2.6 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 17 per cent, Appendix 2.2.7

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under U.V. (366nm) four fluorescent zones at Rf. 0.05, 0.17, 0.34 and 0.40 (all pink). On exposure to Iodine vapour five spots appear at Rf. 0.17, 0.34, 0.40, 0.56 and 0.98 (all yellow). On spraying with 5% Methanolic-Phosphomolybdic acid reagent and heating the plate at 105°C for ten minutes three spots appear at Rf. 0.17, 0.56 and 0.98 (all violet).

CONSTITUENTS – Fatty Oils, Sitosterol, Calcium and Magnesium.

PROPERTIES AND ACTION –

Rasa : Madhura, Tikta
Guṇa : Rūkṣa, Kincit Guru, Sara
Vīrya : Sita
Vipāka : Kaṭu
Karma : Pittahara

IMPORTANT FORMULATIONS – Candrakalā Rasa

THERAPEUTIC USES – Dāha, Soṣa, Visphoṭa, Vraṇa

DOSE – 10-20 ml of the drug in juice form.

RĀSNĀ (Leaf)

Rasna consists of dried leaf of *Pluchea lanceolata* Oliver & Hiern.(Fam. Asteraceae); an annual, ashy and pubescent, undershrub having spreading roots extending to several metres; it grows abundantly in sandy soils in upper Gangetic plain and Rajasthan. It flowers during cold season.

SYNONYMS -

Sansk. : Suvahā, Sugandhā, Yuktā
Assam. : Rasnapat
Beng. : Rasna
Eng. : --
Guj. : --
Hindi. : Rayasan, Rayasana, Rasna
Kan. : Rasna, Dumme-Rasna
Mal. : --
Mar. : Rasna, Rayasana
Ori. : --
Punj. : Reshae
Tam. :
Tel. : Sanna Rashtramu
Urdu. : Rauasan, Rasna

DESCRIPTION –

a) Macroscopic :

Leaves simple, 3-5 cm long, 0.6-2 cm broad; sessile, obtuse, lanceolate to ovate- lanceolate; margin entire or toothed around the apex, unequal at base; both surfaces pubescent, distinct small hairs more prominent near veins; texture, brittle, papery; odour, characteristic; taste, astringent and slightly bitter.

b) Microscopic :

Leaf –

Midrib - shows single layered epidermis covered by thick, striated cuticle; collenchyma 2-5 layered towards xylem, 1-3 layered towards phloem; beneath collenchyma 2-5 layers of parenchyma present on both sides; central portion occupied by a large vascular bundle, xylem facing towards upper and phloem towards lower epidermis; vascular bundle surrounded by sclerenchymatous sheath appearing as a cap above and below; vascular bundle consists of wide phloem, a thin cambium and xylem; phloem consists of phloem parenchyma and a few phloem fibres; xylem consists of tracheids, vessels and xylem parenchyma; vessels arranged radially; parenchyma and palisade cells of leaf contain oil globules, scattered rosette crystals of calcium oxalate are both in lamina and midrib.

Lamina - shows isobilateral structure with palisade occurring in upper and lower mesophyll regions; epidermal cells tangentially elongated, covered by thick, striated cuticle; uniseriate, unbranched covering trichomes 2-3 cells long, present on both surfaces, basal cell short and slightly swollen, apical cells long; stomata, anisocytic and anomocytic present on both surfaces but more on lower surface; palisade tissue 2 or 3 layered on both sides, composed of radially elongated, thin-walled cells; spongy parenchyma composed of thin-walled, circular to elliptical, parenchymatous cells containing abundant chloroplasts with prominent intercellular spaces; a number of small veins, surrounded by a sclerenchymatous sheath present in mesophyll; vascular tissue much reduced and represented by a few phloem and xylem elements; average value of stomatal index on upper surface 14-24 and on lower surface 20-24; palisade ratio not more than 5; average value of vein islet number 27.

Powder - Light green; shows fragments of parenchyma, palisade cells, pointed 2-5 celled trichomes, a few oil globules and rosette crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 22 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 7 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 8 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 23 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows in visible light three spots at Rf. 0.37, 0.71 and 0.82 (all grey). Under U.V. (366 nm) three fluorescent zones are visible at Rf. 0.27, 0.71 and 0.82 (all dark brown). On exposure to Iodine vapour seven spots appear at Rf. 0.08, 0.37, 0.62, 0.67, 0.71, 0.82 and 0.92 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C eight spots appear at Rf. 0.08 (greyish brown), 0.17 (violet), 0.37 (brown), 0.62 (violet), 0.67, 0.71, 0.82 (all greyish brown) and 0.92 (violet).

CONSTITUENTS – Flavonoids – Quercetin and Isorhamnetin.

PROPERTIES AND ACTION -

Rasa : Tikta
Guṇa : Guru
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphavātahara, Āmapācana

IMPORTANT FORMULATIONS – Daśamūlāriṣṭa, Devadārvāriṣṭa, Kārpāsāsthyādi Taila, Rāsnādi Kwātha Cūrṇa, Rāsnaairaṇḍādi Kwātha Cūrṇa

THERAPEUTIC USES – Śotha, Vātavyādhi, Śwāsa, Kāsa, Jwara, Udararoga, Sidhma, Āḍhyavāta, Āmavāta, Vātarakta

DOSE – 25-50 g. (Decoction).

SAHACARA (Whole Plant)

Sahacara consists of dried whole plant of *Barleria prionitis* Linn.(Fam. Acanthaceae); a bushy, prickly undershrub, 0.6-1.5 m high, found throughout hotter parts of the country and also cultivated as a hedge plant.

SYNONYMS –

Sansk. : Kurantaka, Koranda, Kerandaka
Assam. : Shinti
Beng. : --
Eng. : --
Guj. : Kanta-Saerio, Kantasalio
Hindi : Sahacara
Kan. : Sahacara
Mar. : Koranta, Koranti
Mal. : Kirimkurunji, Karim Kurunni
Ori. : Dasakeranda
Punj. : Sahacar
Tam. : Sammulli
Tel. : Mulu Gorinta Chettu
Urdu. : Pila Bansa, Piya Bansa

DESCRIPTION –

a) Macroscopic :

Root - Well developed, upto 1 cm thick at the top, cylindrical and tapering, bearing lateral branches and numerous rootlets; surface rough due to numerous dot-like lenticels and root scars of fallen roots; external surface greyish-brown, bark thin with smooth internal surface; wood cream coloured; fracture, hard and laminated; odour and taste not characteristic.

Stem - Erect,1-8 mm thick, terete, hard, glabrous, nodes swollen, branching at nodes, young stem grey, slightly four angled, usually with 3-4 divaricate spines at axil of leaf; mature stem cylindrical with longitudinally arranged or scattered dot-like lenticels; externally greyish to light brown; a few mature stem slightly hollow.

Leaf - Dorsiventral, variable in size,6-9.5 cm long, 2.5 - 3.5 cm wide, simple, elliptic, acuminate, entire, acute, reticulate, unicostate, glabrous above, glabrous or pubescent beneath; petiole short.

Flower - Sessile, often solitary in the lower axils, becoming spicate above; bracts foliaceous, 16 by 4.5 mm, oblong or lanceolate, acute, bristle-tipped, nearly glabrous; bracteoles 1.3 cm long, narrowly linear, subulate (almost spinous), bristle-tipped; calyx, divided almost to the base, one of the outer sepals rather more than 1.3 cm long, the opposite sepal rather less than 1.3 cm long, 3.4 mm broad, both oblong-lanceolate,

mucronate; the 2 inner sepals 1.5 mm wide and as long as the shorter of the outer ones, linear lanceolate, mucronate; corolla, 3.2-4.5 cm long, yellow, slightly pubescent outside,glabrous inside, somewhat 2 lipped; upper lip 2 cm long or more, deeply 4 lobed, the lobes oblong-obovate, round; lower lip oblong-obovate, round, entire; tube 1.9 - 2.2 cm long; stamens 2 fertile and 2 staminodes; filaments of the fertile stamens exserted beyond the corolla tube, those of the staminode very short; ovary superior of two fused carpels; style, simple, usually long with two stigma.

Fruit - Capsules,2-2.5 cm long,ovoid with a long tapering solid beak; 2 seeded.

Seed- Compressed,0.8 cm in diameter and clothed with silky appressed hairs.

b) Microscopic :

Root - Mature root shows cork of 6-25 layers of thin-walled, tangentially elongated cells; cork cambium single layered; secondary cortex composed of large, tangentially elongated, parenchymatous cells with small intercellular spaces; secondary phloem consists of sieve tubes, companion cells, phloem parenchyma, and traversed by phloem rays, phloem fibres found scattered throughout phloem region in single and groups, single fibres elongated, thick-walled with narrow lumen; secondary xylem wide, vessels, tracheids, parenchyma, xylem fibres present; vessels, pitted, with transverse to oblique articulation; tracheids slightly broader in middle with tapering ends having pitted walls; xylem fibres thick-walled, lignified and pitted; xylem parenchyma rectangular with lignified walls; xylem rays uni to biseriate, uniseriate rays more common.

Stem - Cork 6-24 or more layers of rectangular and radially arranged cells; secondary cortex composed of thin-walled, tangentially elongated, 8-15 layers of parenchymatous cells, filled with brown contents; secondary phloem narrow, consisting of heterogenous type of cells; phloem fibres found scattered uniformly throughout phloem region in singles or in groups; fibres moderate in length, lignified with pointed tips; secondary xylem consists of vessels, tracheids, fibres, xylem parenchyma traversed by xylem rays; vessels numerous, vary in size, distributed throughout xylem region vessels having tail-like projections at one or both ends and transverse to oblique perforations with spiral or pitted thickenings; tracheids pitted having pointed tips; xylem parenchyma mostly rectangular, thick-walled, lignified with simple pits; xylem rays usually uniseriate, occasionally biseriate; pith isodiametric of parenchymatous cells most of which contain single or group of acicular crystals of calcium oxalate, measuring 19-28 μ in length and 3 μ in width.

Leaf -

Petiole – A single layered upper and lower epidermis covered externally with a thick cuticle, a few epidermal cells elongate to form unicellular hairs,cystolith develops in some epidermal cells; 2-6 layers of collenchymatous cells present in both upper and lower epidermis; parenchyma 3-8 layered in upper surface and 7-10 layered in lower surface towards proximal end and 5-7 layered at distal end, circular to polygonal and thin-walled; some contain raphides of calcium oxalate; vascular bundle semilunar,

situated centrally in parenchymatous ground tissue; xylem vessels arranged in radial rows, protoxylem towards centre; two smaller vascular bundles present on either sides of central vascular bundle.

Midrib - Single layered epidermis on both surfaces covered externally with thick cuticle; collenchyma 2-5 layered on both surfaces, followed by 3-6 layers, thin-walled, parenchymatous cells; vascular bundle single, crescent-shaped having usual elements.

Lamina - Single layered epidermis covered with thick cuticle on both surfaces, glandular trichomes present on both surfaces, while the non-glandular, unicellular, elongated with pointed tips, present only on lower surface; palisade single layered; spongy parenchyma thin-walled, irregular in shape; stomata diacytic and present on both surfaces but more abundant on lower surface; a few veins present in this region.

Powder - Green; shows fragments of cork, xylem vessels with spiral and pitted thickening, acicular crystals of calcium oxalate, measuring 19-28 μ in length and 3 μ in width, fibres, fragments of lamina of leaf with palisade and mesophyll cells; glandular and non-glandular hairs, epidermal cells with diacytic stomata.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 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 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 10 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows four spots at Rf. 0.57, 0.77, 0.91 and 0.94 (all light yellow) in the visible light. Under U.V. (366 nm) four fluorescent zones are visible at Rf. 0.57, 0.77, 0.91 (all blue) and 0.94 (black). On exposure to Iodine vapour six spots appear at Rf. 0.18, 0.43, 0.57, 0.77, 0.88 and 0.94 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105° C for ten minutes five spots appear at Rf. 0.57 (yellow), 0.77, 0.88 (both pink), 0.84 and 0.94 (both violet).

CONSTITUENTS – Alkaloids, β-Sitosterol, Potassium.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta (Amla)
Guṇa : Snigdha
Vīrya : Kaṭu
Vipāka : Uṣṇa
Karma : Kaphahara, Keśya, Kāsa, Ranjana, Viṣahara

IMPORTANT FORMULATIONS - Sahacarādi Taila, Nīlikādya Taila, Aṣṭavarga Kvātha Cūrṇa, Rasnārandādi Kvātha Cūrṇa

THERAPEUTIC USES – Kuṣṭha, Kaṇḍu, Vātarakta, Palit

DOSE - 50-100 g. of the drug for decoction.

SAHADEVI (Whole Plant)

Sahadevi consists of dried whole plant of *Vernonia cinerea* Lees. (Fam. Asteraceae); an erect, rarely decumbent, branched herb, 12-75 cm high, found throughout India ascending to an altitude of 1800 m.

SYNONYMS -

Sansk. : Uttamkanyaka, Dandotpalā
Assam.: Schdevi
Beng. : Kuksim
Eng. : Purple Fleabane, Fleabane
Guj. : Sadoree, Sadodee
Hindi. : Sahadei
Kan. : Sahadevee, Okarchendhi
Mal. : Poovan Kuruntala, Mukkuthaipo
Mar. : Sadodee, Sahdevee
Ori. : --
Punj. : Sehdei
Tam. : Naichotte Poonde
Tel. : Garita Kammi, Sehadevi
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Root - 5-12 cm long, 1-7 mm thick, oblique and gradually tapering, bearing a few rootlets; external surface, dirty brown; fracture, short.

Stem - Glabrous, cylindrical, hairy, slightly branched; 10-17 cm long, 1-8 mm thick, grooved and ribbed; basal region of branches greenish-brown, apical region dark green, bearing a number of flowers; fracture, short.

Leaf - Simple, dark-green, smooth, alternate, opposite, exstipulate, 2.5-5 cm long, 1.8-3.6 cm broad, elliptical, lanceolate, obtuse or acutely toothed; shape and size variable; petiole short; odour, slightly characteristic.

b) Microscopic :

Root - Mature root shows 4-5 layered cork, consisting of tabular, tangentially elongated, thick-walled cells filled with reddish-brown contents; secondary cortex consists of a wide zone of thin-walled, parenchymatous cells having a few resin ducts; secondary phloem, a narrow zone, composed of sieve elements and phloem parenchyma, traversed by phloem rays; xylem well-developed, composed of vessels, tracheids, fibres and xylem paren-

chyma, traversed by 1-5 seriate xylem rays; xylem vessels usually solitary or 2-4 in groups with reticulate thickening; fibres aseptate and pointed.

Stem - Mature stem shows several bulges at places and consists of a single layered epidermis, externally covered with a striated cuticle; a number of epidermal cells elongate to form multicellular covering and T-shaped trichomes with 2-6 celled stalk; cortex 3-5 layers of thin-walled, tangentially elongated parenchymatous cells, a few filled with reddish-brown content, bulges show a few layers of collenchyma between epidermis and parenchymatous cortex; endodermis single layered, composed of barrel-shaped cells; pericycle occurs in the form of groups of pericyclic fibres; phloem consists of strands of sieve tubes, companion cells and phloem parenchyma; xylem consists of vessel, parenchyma and fibres; xylem vessls show reticulate thickening; parenchyma in abundance and paratracheal; fibres thick-walled, aseptate, short, with pointed ends; medullary rays 2-11 cells wide; central portion occupied by pith composed of hexagonal to polygonal, thin-walled parenchymatous cells; a few simple starch grains present in cortical cells; cluster crystals of calcium oxalate occasionally found in pith.

Leaf -

Petiole - shows a somewhat circular outline with two lateral projections one on each side; epidermis on both surfaces, covered externally with striated cuticle and have both type of trichomes as described in case of stem, followed by 2-3 layers of collenchyma on upper and lower side; stele composed of three collateral vascular bundles located in centre, central one larger and lateral two smaller; ground tissue composed of thin-walled parenchymatous cells, a few having oil globules and rosette crystals of calcium oxalate.

Midrib - shows similar structure as described in petiole except for 1 or 2 layers of collenchymatous cells below both epidermis and a single vascular bundle in centre; oil globules and rosette crystals of calcium oxalate present in a few cells of ground tissue.

Lamina - shows dorsiventral structure; epidermis single layered on either surface, composed of thin-walled, tangentially elongated cells, covered externally with striated cuticle; trichomes similar to those of stem; palisade single layered; spongy parenchyma 4-5 layered, loosely arranged cells; vascular bundles embedded in spongy parenchyma; rosette crystals of calcium oxalate and oil globules present in this region; anomocytic stomata present on both surfaces.

Powder - Greenish-brown; shows reticulate vessels, thick-walled fibres, a few rosette crystals of calcium oxalate, multicullular covering and T-shaped trichomes with 2-6 celled stalk, and epidermal cells irregular in shape in surface view, showing anomocytic stomata.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 14 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 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 15 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (95 : 5) shows on exposure to Iodine vapour two spots at Rf. 0.55 and 0.96 (both yellowish brown). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C three spots appear at Rf. 0.40, 0.55 and 0.96 (all violet).

CONSTITUTENTS – Saponins, Sapogenins, Flavonoids.

PROPERTIES AND ACTION -

Rasa : Tikta, Katu
Guṇa : Laghu, Rūkṣa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphavātasāmaka, Śothahara, Śwaraghna, Nidrākara

IMPORTANT FORMULATIONS - Candrakalā Rasa, Alamottādi Kaṣhāyam (S.Y.)

THERAPEUTIC USES - Jwara, Viṣamajwara, Sidhma, Visphota, Bhūtabādhā, Grahabādhā, Sphoṭaka, Pradara, Ślipada

DOSE – 10-20 ml. (Swarasa).
5-10 g. (Powder for external use only).

SAILEYA (Lichen)

Saileya consists of the whole thallus of *Parmelia perlata* (Huds.) Ach. (Fam. Parmeliaceae), a perennial lichen found on rocks or dead wood in temperate Himalayas.

SYNONYMS -

Sansk. : Sitasiva, Silāpuspa
Assam.: --
Beng. : Shailaj
Eng. : Stone Flower, Rock Moss
Guj. : Patthar Phool, Chhadilo
Hindi. : Charela, Chharila, Chhadila
Kan. : Shilapushpa, Kalluhoo
Mal. : Sheleyam, Kalppuvu
Mar. : Dagad phool
Ori. : --
Punj. : Ausneh, Chhadila
Tam. : Kalpashee
Tel. : Ratipuvvu
Urdu. : Chhadila

DESCRIPTION –

a) Macroscopic :

Thallus consists of a flattened, foliose structure with a more or less deeply incised upper surface, yellowish-white on top and black on the lower surface, leathery to touch; delicate rhizoids arise from lower surface; odour and taste not distinct; bud-like bodies known as soredia are also present on the upper surface of the thallus.

b) Microscopic :

Thallus shows upper cortex consisting of compact hyphae of fungus, followed by gonidial layers with algal cells; medulla consisting of loosely arranged mass of fungal hyphal tissue; lower cortex black, consisting of compact mass of fungal hyphae; a few asci with ascospores embedded in the upper portion of the thallus; thallus on soaking in water gives orange colour.

Powder – Brown, shows fungal hyphae, gonidia, compact mass of cortex and spores, and algal cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 9 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 3 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 5 per cent, Appendix 2.2.7.

T.L.C.

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4 : 1 : 5) shows in visible light four spots at Rf. 0.11, 0.28, 0.40, 0.91. (all grey). Under U.V. (366 nm) six fluorescent zones are visible at Rf. 0.11 (dark blue), 0.28 (dark blue), 0.40, 0.61 (both blue), 0.83 (dirty yellow) and 0.91 (light yellow). On exposure to Iodine vapour six appear at Rf. 0.11, 0.28, 0.40, 0.61, 0.83 and 0.91 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and on heating the plate for ten minutes at 105°C six spots appear at Rf. 0.11, 0.28, 0.40, 0.61, 0.83 and 0.91 (all grey).

CONSTITUENTS –Lichen acids - Atranorin and Lecanoric acid.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya
Guṇa : Laghu, Snigdha
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Hṛdya, Kaphapittahara, Rucya, Stambhaka, Pittahara

IMPORTANT FORMULATIONS - Vāsācandanādi Taila, Jīrakādi Modaka, Saubhāgya Sunṭhī, Candanādi Taila, Dhānvantara Taila, Nārāyaṇa Taila, Mahānārāyaṇa Taila, Tārkṣya Guḍa, Agarvadya Taila, Saileyādi Taila, Mṛta-sanjwani Surā, Dnjana Vaṭi

THERAPEUTIC USES - Kaṇḍu, Kuṣṭha, Aśmarī, Dāha, Viṣa, Hṛllāsa, Tṛṣnā, Vraṇa, Hṛdayaroga, Rakta Vikāra, Śwāsa, Jwara, Mūtrakṛchra, Mūtraghāta, Śriah Śūla

DOSE – 1-3 g.

SAKA (Heart Wood)

Saka consists of dried heart wood of *Tectona grandis* Linn. f. (Fam. Verbenaceae); a large deciduous tree found in peninsular region and Madhya Pradesh extending to parts of Rajasthan, Southern Uttar Pradesh and Orissa, and also in plantations.

SYNONYMS -

Sansk. : Bhūmisaha, Dwāradāru, Kharacchada
Assam. : Chingjagu Sagun
Beng. : Segunagachh
Eng. : Indian Teak
Guj. : Sagwan, Sag, Saga
Hindi. : Sagwan, Sagauna, Sagu
Kan. : Tegu, Sagawani, Thega
Kash. : --
Mal. : Thekku
Mar. : Sagwan
Ori. : Saguana, Sagan, Sagun
Punj. : Sagwan
Tam. : Tekku
Tel. : Teku, Pedda
Urdu. : Sagwan

DESCRIPTION –

a) Macroscopic :

Drug available in pieces of varying length and thickness, moderately hard, ring porous, texture, coarse, light brown to golden brown in colour; odour, characteristic.

b) Microscopic :

Heart wood shows well developed xylem, consisting of vessels, parenchyma, fibres and medullary rays; vessels solitary or 2-4 in groups, arranged in radial rows, a few having tyloses; medullary rays multiseriate, thin-walled, oval to elongated, 2-4 celled wide.

Powder - Light brown; shows simple pitted vessels, a few with tyloses, aseptate fibres with pointed ends and parenchymatous cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 2 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 3 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 1.5 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows in visible light five spots at Rf. 0.08 (pink), 0.31 (pink), 0.37 (pink) 0.81 (light yellow), and 0.92 (light yellow). Under U.V. (366 nm) five fluorescent zones are visible at Rf. 0.08, 0.31, 0.71, 0.81 and 0.92 (all grey). On exposure to Iodine vapour ten spots appear at Rf. 0.03, 0.05, 0.08, 0.31, 0.37, 0.48, 0.64, 0.71, 0.81 and 0.92 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C seven spots appear at Rf. 0.03, 0.05, 0.08, 0.31, 0.48, 0.71 and 0.92 (all violet).

CONSTITUENTS – Resin, Essential Oil, Fatty Oil and Tectoquinone.

PROPERTIES AND ACTION -

Rasa : Kaṣāya
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Pittahara, Kaphahara, Raktaprasādana, Garbhasthairyakara

IMPORTANT FORMULATIONS - Ayaskṛti

THERAPEUTIC USES - Kuṣṭha, Raktapitta, Mūtraroga, Pāṇḍu, Prameha, Medoroga, Dāha, Śrama, Tṛṣṇā, Kṛmiroga, Garbhasrāva, Garbhapātana

DOSE – 3 - 6 g. of the drug in powder form.
30 - 60 g. of the drug for decoction.

SĀKHOṬAKA (Stem Bark)

Sākhoṭaka consists of stem bark of *Streblus asper* Lour. (Fam. Moraceae); an evergreen, rigid gnarled tree upto 15 m high and 1.5 m in girth, having a bole of 4-7 m distributed in the Himalayas from Himachal Pradesh to West Bengal and in hills and plains of Assam and Tripura, ascending to an altitude of 450 m; also occurs both in the peninsular India upto 600 m, especially in drier parts, and in Andamans.

SYNONYMS -

Sansk. : Śākhoṭa, Pītaphalaka, Bhūtāvāsa, Kharacchada
Assam. : --
Beng. : Sheoda
Eng. : Sand Paper Mulberry
Guj. : Sahoda
Hindi. : Sahora, Sihoda, Sihar
Kan. : Mittlamara
Mal. : Pirayan, Pirai
Mar. : Sahod, Karvatee
Ori. : Sahod
Punj. : Shebda
Tam. : Pirayan pirai
Tel. : Barrenka, Barninka
Urdu. : Sehoda

DESCRIPTION –

a) Macroscopic :

Mature stem bark occurs in channelled pieces; thickness varies from 0.3-1 cm; outer surface light grey to silvery brown with faint ridges and a number of lenticels making the surface quite rough; inner surface smooth and brownish in colour; fracture, tough, brittle on the outer portion and fibrous in the inner portion; no taste and odour.

b) Microscopic :

Shows a cork consisting of 4-10 layers of thin-walled, rectangular and tangentially arranged cells; cork cambium single layered; secondary cortex consists of 3-4 layers of thin-walled, somewhat rectangular or circular to polygonal cells; a number of stone cells present either in singles or in groups in tangential bands; stone cells of two types, one having thick-walled and narrow lumen while the other having comparatively thinner wall and wider lumen; they vary in shape, being rectangular, oval, circular to conical, each with simple pits on their walls and radiating canals; secon-

dary phloem consists of sieve elements, parenchyma, phloem fibres and stone cells, traversed by phloem rays; phloem parenchyma thin-walled, circular to oval in shape, phloem fibres moderately thick-walled and lignified with wide lumen, occurring in singles or in groups and radially arranged; stone cells similar to those present in cortical region, occur throughout the phloem; phloem rays thin-walled, rectangular and radially elongated in transverse section, a few ray cells also converted into stone cells; prismatic crystals of calcium oxalate occur throughout the tissues of bark.

Powder – Light-grey; shows, phloem fibres, thick and thin-walled stone cells and a large number of oblique, rectangular, prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent; Appendix 2.2.2.
Total ash	-	Not more than 15 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 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 12 per cent, Appendix 2.2.7.

T.L.C.

T.L.C. of the alcoholic extract on Silica gel `G' plate using Toluene : Ethylacetate (9:1) shows under UV (366 nm) six fluorescent zones at Rf. 0.11, 0.18 (both light blue), 0.28 (pink), 0.36 (blue), 0.41 (pink) and 0.93 (blue). On exposure to Iodine vapour eight spots appear at Rf. 0.11, 0.28, 0.41, 0.52, 0.60, 0.76, 0.86 and 0.93 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C seven spots appear at Rf. 0.11, 0.28 (both light brown), 0.36, 0.41, 0.52, 0.76 (all light violet) and 0.93 (dark brown).

CONSTITUENTS – Glycosides, Saponins and Sapogenins.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya
Guṇa : Rūkṣa, Laghu
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātaśleṣmahara, Medohara, Śothahara

IMPORTANT FORMULATIONS – Bṛhanmanjiṣṭhādi Kwātha Cūrṇa

THERAPEUTIC USES – Raktapitta, Arśa, Ślīpada, Apacī, Prameha, Kuṣṭha, Gaṇḍamālā

DOSE – 1-3 g. (Powder).
10-20 g. (for decoction).

SĀLAPARṆĪ (Root)

Sālaparṇī consists of dried root of *Desmodium gangeticum* DC. (Fam. Fabaceae), a nearly erect under shrub, 0.6 –1.2 m high, growing wild almost throughout India in the plains and Western Ghats, and upto 1500 m in the north upto Sikkim.

SYNONYMS -

Sansk. : Sthirā, Vidārigandhā, Aṁśumatī
Assam. : --
Beng. : Salparni
Eng. : --
Guj. : Salwan
Hindi. : Sarivan, Salaparni
Kan. : Murelchonne
Kash. : --
Mal. : Moovila
Mar. : Salparni, Salwan
Ori. : Saloporni
Punj. : Shalpurni
Tam. : Moovilai
Tel. : Kolakuponna, Nakkatokaponna, Kolaponna
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Tap root, poorly developed, but lateral roots 15-30 cm long, and 0.1 –0.8 cm thick, uniformly cylindrical with a number of branches; surface smooth bearing a number of transverse, light brown lenticels, bacterial nodules frequently present; light yellow; fracture fibrous; odour not characteristic; taste, sweetish and mucilaginous.

b) Microscopic :

Mature root shows cork, 3-7 layers of thin-walled, tangentially elongated cells, having a few prismatic crystals of calcium oxalate; cork cambium single layered; secondary cortex 4-10 layers of thin-walled, tangentially elongated cells having a few isolated cortical fibres; secondary phloem composed of parenchyma, sieve tubes, companion cells and fibres, traversed by phloem rays; sieve tubes collapsed in outer region, but intact in inner region; phloem fibres slightly elongated, lignified; phloem rays uni to multiseriate, 1-4 cells wide and 4-15 cells high; outer phloem region having occasionally prismatic crystals of calcium oxalate; cambium 2-3 layers; secondary xylem having 1-2 growth rings, consisting of vessels, tracheids,

xylem parenchyma, and xylem fibres, traversed by xylem rays; vessels, lignified, large, narrow, with both reticulate thickening or bordered pits; xylem parenchyma with rectangular or slightly elongated cells, resembling those of phloem parenchyma in shape but larger in size and xylem fibres resemble those of phloem fibres in shape but larger in size; xylem rays thick-walled possessing simple pits, 1-5 cells wide and 4-12 cells high; simple, round to oval starch grains measuring 7-25 μ in dia. and prismatic crystals of calcium oxalate present in secondary phloem and secondary xylem.

Powder –Light brown; shows fragments of rectangular cork cells, vessels having reticulate thickening and bordered pits, xylem fibres, ray cells, prismatic crystals of calcium oxalate and simple round to oval starch grains, measuring 7-25 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 6 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 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 6 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (9:1) shows under UV (366 nm) three fluorescent zones at Rf. 0.40, 0.85 and 0.96 (all blue). On exposure to Iodine vapour three spots appear at Rf. 0.40, 0.85 and 0.96 (all yellow).

CONSTITUENTS – Alkaloids.

PROPERTIES AND ACTION -

Rasa : Tikta, Madhura
Guṇa : Guru
Vīrya : Uṣna
Vipāka : Madhura
Karma : Tridoṣahara, Balya, Angamardaprasamana, Vṛṣya, Sukhaprasawakara Sarvadoṣahara, Vātadoṣajit, Rasāyanī, Bhramhara, Viṣahara, Santāpanāśinī

IMPORTANT FORMULATIONS - Daśamūlāriṣṭa, Indukānta Ghṛta, Amṛtaprāśa Ghṛta, Daśamūlaṣaṭapalaka Ghṛta, Dhānwantara Taila, Nārāyaṇa Taila, Mahāviṣagarbha Taila, Mahānarāyaṇa Taila

THERAPEUTIC USES - Jwara, Meha, Arsa, Chardi, Sopha, Swāsa, Kāsahara Krmi, Rajayakṣmā, Netra roga, Hṛdaya roga, Rakta Gata Vāta, Vāta Ardhvābhedaka, Mūdha Garbha

DOSE – 5 -10 g. of the drug in powder form.
10-20 g. for decoction.

SĀLĪ (Fruit)

Sālī consists of dried fruit of *Oryza sativa* Linn.(Fam. Poaceae); an annual herb, cultivated throughout India.

SYNONYMS -

Sansk. : Tandulama, Dhānya
Assam. : --
Beng. : Dhan, Chaval, Chanval
Eng. : Rice, Paddy
Guj. : Bhat, Chorya, Chokha
Hindi. : Chaval, Dhan
Kan. : Akkiege, Nellu
Mal. : Ari
Mar. : Tandul, Sali Bhat
Ori. : --
Punj. : --
Tam. : Arshee, Nellu, Arishi
Tel. : Dhanyamu, Vadlu, Biyyamu,
Urdu. : --

DESCRIPTION –

a) Macroscopic:

Fruit small, one seeded, caryopsis, about 0.6-1 cm long and 0.2-0.3 cm wide, oblong to ovoid, somewhat angular, blunt, sometimes pointed; surface rough due to minutes trichomes, faintly longitudinal ridges and furrows, mostly 6 rows, somewhat compressed , flattened and tightly enclosed by lemma and palea; yellowish-brown; seed, smooth upto 0.6 cm long, oval to oblong, slightly flattened; blunt, oblique, slightly angled in embryo region; light creamy to white; odour not characteristic; taste, sweet.

b) Microscopic :

Fruit shows wavy irregular outline; pericarp and testa fused together; pericarp consists of single layered, thick, lignified sclerenchymatous outer epidermis with clear pits, covered by a few thick, blunt, sometimes pointed trichomes and 2-3 layered circular to oval fibre, followed by 3-5 layered, tangentially elongated, thick-walled, tabular parenchymatous cells, having a few scattered fibro vascular bundles and single layered, thin, elongated, slightly wavy inner epidermal cells; testa consists of thin-walled, elongated, 2-3 layered parenchymatous cells with a interrupted tube cells followed by single layered, oval to rectangular, parenchymatous layer containing aleurone grains; endosperm albuminous, consisting of wide, thin-walled, elongated to polygonal, parenchymatous cells packed with numerous, minute, single polyhedral starch grains, having, hilum without concentric striations, measuring 3-12 μ in dia.,

compound starch grains 2-150 components; empryo small, lying in a groove at one end of the endosperm, separated by a layer of epithelium; empryo consists of a shield-shaped cotyledon known as scutellum.

Powder - Light cream; fragments of elongated thick-walled, lignified sclerenchymatous cells, endosperms cells filled with starch grains, parenchymatous cells of endosperm filled with granules, small pieces of blunt trichomes; minute, single, polyhedral with starch granules having hilum without concentric striations, measuring 3-12 μ in dia., and compound starch granules with 2-150 components.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 6 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 1 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under UV (366 nm) eight fluorescent zones at Rf. 0.11, 0.15, 0.17 (all blue), 0.21 (green), 0.27 (blue), 0.30 (blue), 0.35 (green) and 0.94 (blue). On spraying with 5% Methanolic-Phosphomolybdic acid reagent and heating the plate for about ten minutes at 110°C three spots appear at Rf. 0.21, 0.30 and 0.94 (all blue).

CONSTITUENTS – Carbohydrate –Starch.

PROPERTIES AND ACTION -

Rasa : Madhura, Anuras, Kaṣāya
Guṇa : Ṣnigdha, Laghu
Vīrya : Śīta
Vipāka : Madhura
Karma : Swalpa Vātakara, Swalpa Kapha Kara, Pittahara, Hṛdya, Rucikara, Vṛsya, Mūtral, Bṛhamma, Viṣaghna, Baddhavarcasaka, Swarya

IMPORTANT FORMULATIONS – Laśunādi Ghṛta, Dādhik Ghṛta, Tamdulodanam

THERAPEUTIC USES – Jwara, Tṛṣnā, Vraṇa, Atisāra, Bālātisāra, Pradara

DOSE - 100 ml. Tandulodaka.

SALMALI (Stem Bark)

Salmali consists of the mature stem bark of *Bombax ceiba* Linn. Syn. *B. malabaricum* DC., *Salmalia malabarica* Schott. & Endl. (Fam. Bombacaceae), a deciduous tree attaining a height upto 40 m and a girth upto 6 m or more and distributed throughout the hotter parts of the country upto 1500 m or more.

SYNONYMS -

Sansk. : Moca, Picchila, Raktapuspa, Kantakādhya, Tūlinī
Assam. : Semul
Beng. : Shimul, Simul
Eng. : Silk-Cotton Tree
Guj. : Shemalo
Hindi : Semal, Semar
Kan. : Kempuburuga
Mal. : Mullilavu
Mar. : Sanvar, Katesavar
Ori. : --
Punj. : Simble
Tam. : Elavam
Tel. : Buruga
Urdu. : Sembhal

DESCRIPTION –

a) Macroscopic :

Bark 0.5-1 cm thick, pale-ashy to silvery-grey externally, brownish internally, external surface rough with vertical and transverse cracks, mucilaginous on chewing; fracture, fibrous.

b) Microscopic :

Stem bark shows 10-15 layered, transversely elongated, radially arranged, thin-walled, cork cells with a few outer layers having brown coloured contents; rhytidoma present at certain places interrupting the cork; secondary cortex con- sists of moderately thick-walled, parenchymatous cells containing orange brown contents; stone cells in singles or in groups, thick-walled, oval to irregular, and tangential bands of stone cells having striations with narrow lumen, measuring 13-33 μ in dia., occur throughout the secondary cortex; secondary phloem consists of usual elements traversed by phloem rays, elements in the outer region form tangential bands of ceratenchyma; a number of concentric bands of fibres alternating with groups of sieve elements also present; fibres lignified having narrow lumen and pointed tips; phloem

rays numerous and wavy, 1-6 seriate, cells being radially elongated and moderately thick-walled; rosette crystals of calcium oxalate scattered throughout the secondary cortex, phloem parenchyma and ray cells; mucilage canals and tannin cells present in the parenchymatous cells of cortex.

Powder – Reddish-brown; shows fragments of cork cells, parenchymatous cells, single or groups of thick-walled, oval to irregular, stone cells having striations with narrow lumen, measuring 13-33 μ in dia., rosette crystals of calcium oxalate, phloem fibres and numerous reddish-brown coloured masses and tannin cells.

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 2 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 7 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under U.V. (366 nm) one fluorescent zone at Rf. 0.59 (blue). On exposure to Iodine vapour four spots appear at Rf. 0.11, 0.44, 0.59 and 0.92 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C three spots appear at Rf. 0.44, 0.59 and 0.92 (all violet).

CONSTITUENTS – Saponins, Tannins and Gums.

PROPERTIES AND ACTION -

Rasa : Madhura, Kaṣāya
Guṇa : Laghu, Singdha, Picchila
Vīrya : Śīta
Vipāka : Madhura
Karma : Śothahara, Dāhaprasamana, Pittahara, Vātahara, Kaphavardhaka

IMPORTANT FORMULATIONS -

THERAPEUTIC USES - Raktapitta, Vraṇa, Dāha, Yuvānapidikā

DOSE - 5-10 g. (Powder).

SANA (Seed)

Sana consists of dried seed of *Crotolaria juncea* Linn. (Fam. Fabaceae), an erect. shrubby annual, cultivated nearly throughout the country, and also found wild as an escape.

SYNONYMS -

Sansk. : Sana, Malya Puspa
Assam. : Ausa, Suila
Beng. : Shanpat,
Eng. : Sunnhemp
Guj. : Sun, Hemp
Hindi. : Sunn, San
Kan. : Senabu
Mal : Chanampayaru, Pulivanji
Mar. : Sanavu
Ori. : Champal Beeja
Punj. : Sann
Tam. : Sanal
Tel. : Giliginta
Urdu. : San

DESCRIPTION –

a) Macroscopic :

Seed 0.5-0.7 cm long, 0.3-0.4 cm wide, flat and compressed,, asymmetrically reniform; surface, glossy; colour, olive- green to grey; taste, mucilaginous.

b) Microscopic :

Seed shows testa, consisting of palisade like macrosclereids, covered externally by smooth, thick cuticle, followed by single layer of lignified flask shaped cells with intercellular spaces; the tissue beneath, consisting of tangentially elongated, thin-walled, crushed parenchymatous cells; endosperm consisting of an aleurone layer containing aleurone grains and associated parenchymatous cells; cotyledons two, consisting of many layered, thin-walled, compactly arranged parenchymatous cells containing abundant aleurone grains.

Powder – Greyish-yellow; shows polygonal, slightly thick-walled cells of the testa in surface view, beaker or flask shaped cells, palisade like macrosclereids, oval to polygonal, thin walled parenchymatous cells and aleurone grains.

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 0.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 5.5 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 16 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under U.V. (366 nm) three fluorescent zones at Rf. 0.05 (blue), 0.32 (faint sky blue) and 0.94 (sky blue). On exposure to Iodine vapour eight spots appear at Rf. 0.05, 0.20, 0.26, 0.39, 0.67, 0.74, 0.94 and 0.98 (all yellow). On spraying with 5% Methanolic-Phosphomolybdic acid reagent and heating the plate for about ten minutes at 105°C eight spots appear at Rf. 0.05, 0.20, 0.26, 0.39, 0.67, 0.74 (all grey), 0.94 and 0.98 (both blue).

CONSTITUENTS – A bitter principle 'Corchorin' .

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Amla, Kaṣāya
Guṇa : Rūkṣa, Tīkṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Kaphahara, Pittahara, Garbh Anulomaka, Vantikṛt, Rakta Pravartaka

IMPORTANT FORMULATIONS – Sarsapādi, Pralepa, Daśamūlādya Ghṛta, Muktādya Cūrṇa, Kulatthādya Ghṛta

THERAPEUTIC USES – Agnimāndya, Jwara, Hṛdroga, Mukharoga, Raktadoṣa, Carma roga, Timra, Aṅgamarda, Garbhasrābakara

DOSE – 1-3 g. of the drug in powder form.

SARA (Root)

Sara consists of dried roots of *Saccharum bengalense* Retz. Syn. *S. sara* Roxb.; *S. munja* Roxb. (Fam. Poaceae); an erect grass attaining a height of 5.5 m, found mainly in Punjab, Uttar Pradesh, Bihar, Bengal and Orissa.

SYNONYMS -

Sansk. : Bhadra Munja
Assam.: --
Beng. : Sara
Eng. : --
Guj. : Sarkat
Hindi. : Sarkand, Moonja
Kan. : Munji Hullu, Hodake Hullu
Mal. : Ama, Amaveru, Sara, Munjappullu
Mar. : Munja, Trikande
Ori. : Sara
Punj. : Moonja, Sarkanda
Tam. : Munjipul, Munjappullu
Tel. : Munja
Urdu. : Munja, Sarkanda

DESCRIPTION –

a) Macroscopic :

Roots numerous, arising from a common root stock, cylindrical, 5-30 cm long, 0.1-0.5 cm in dia., pale straw coloured with attached rootlets, bark papery; fracture splintery.

b) Microscopic :

Root shows single layered epidermis consisting of cubicular to rectangular, thin-walled cells; hypodermis single layered composed of parenchymatous cells; beneath hypodermis continuous ring of 2-5 layered, thick-walled, lignified, sclerenchymatous cells found scattered; cortex consisting of oval to round, thin-walled parenchymatous cells, those of inner layers becoming smaller in size and rectangular in shape; endodermis single layered forming a ring around stele, consisting of tangentially elongated cells; pericycle single layered composed of thin-walled cells; xylem and phloem form equal number of bundles, arranged alternately in rings consisting of usual elements; metaxylem elements much bigger than protoxylem; pith distinct consisting of thin-walled, polygonal, parenchymatous cells having intercellular spaces.

Powder - Light greyish-brown; shows lignified, thick-walled, sclerenchymatous cells, and vessels with reticulate thickenings.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 6 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 3.5 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic Acid : Water (4:1:5) shows in visible light two spots at Rf. 0.69 and 0.97 (both grey). Under UV (366 nm) five blue fluorescent zones appear at Rf. 0.10,0.19,0.35, 0.69 and 0.97. On exposure to Iodine vapour eight spots appear at Rf. 0.05, 0.10, 0.19, 0.35, 0.44, 0.69, 0.80 and 0.97 (all yellowish brown). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 110°C for ten minutes eight spots appear at Rf. 0.10, 0.19, 0.35, 0.61 (all grey), 0.80 (violet), 0.92 (grey), 0.95 and 0.97 (both violet).

CONSTITUENTS – Sugars.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta, Kaṣāya
Guṇa : Laghu
Vīrya : Anūṣṇa
Vipāka : Madhura
Karma : Kaphahara, Tṛtdoṣahara, Balya, Vṛṣya, Cakṣuṣya, Dāhahara, Tṛṣnāhara

IMPORTANT FORMULATIONS - Tṛṇapancamūla Kvātha Cūrṇa, Brāhma Rasāyana, Sukumāra Ghṛta

THERAPEUTIC USES - Dāha, Akṣiroga, Tṛṣnā, Visarpa, Mūtrakṛcchra, Bastiśūla Mūrchā, Bhrama

DOSE - 20-50 g. of Kvātha Cūrṇa for decoction.
6-10 g. (Powder).

SARALA (Heart Wood)

Sarala consists of dried heart wood of *Pinus roxburghii* Sargent (Fam. Pinaceae), a large tree upto 30 m high and 2.5 m in girth, growing on the Himalayas from 600 m to 1830 m.

SYNONYMS –

Sansk. : Surdhiasuka, Pīta Vṛkṣa
Assam.: --
Beng. : Tarper Telargaach, Sarala Gach
Eng. : Long Leaved Pine
Guj. : Saral
Hindi. : Cheed
Kan. : Saral
Mal. : Saral, Saralam
Mar. : Saral
Ori. : --
Punj. : Cheel
Tam. : Saral, Shirsal
Tel. : Saral
Urdu. : Cheer, Sanobar

DESCRIPTION –

a) Macroscopic :

Drug available as chips of heart wood, yellowish-brown when fresh and becoming brown on exposure; surface, smooth; fracture, short; resin canal strands and growth rings seen on fractured surface; taste, not distinct; odour, resinous and aromatic.

b) Microscopic :

Wood non-porous; medullary rays and schizogenous resin ducts present, alternating bands of autumn wood and spring wood present; tracheids of spring wood, large, polygonal in shape and thinner than autumn tracheids; autumn tracheids small and nearly squarish in shape with several bordered pits arranged uniseriately on the radial walls of tracheids; medullary rays mostly uniseriate and upto 6 cells high, biseriate rays, upto 20 cells high, but only occasionally seen; schizogenous resin ducts fairly abundant in autumn wood and spring wood; each duct associated with some thin walled, cellulosic parenchyma.

Powder - Yellowish-brown; shows numerous tracheids and pieces of medullary rays, and a few resin debris.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1	per cent, Appendix 2.2.2.
Total ash	-	Not more than 1	per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.3	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 1	per cent, Appendix 2.2.7.

T.L.C. :-

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (8 : 2) shows under UV (366 nm) four fluorescent zones at Rf. 0.14 (yellow), 0.28, 0.48 and 0.55 (all sky blue). On exposure to Iodine vapour five spots appear at Rf. 0.14, 0.19, 0.24, 0.28 and 0.61 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and on heating the plate at 105°C for ten minutes three spots appear at Rf. 0.28, 0.61 and 0.92 (all violet).

CONSTITUENTS – Oleo-resin and Flavonoids.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta, Kaṭu
Guṇa : Laghu, Snigdha, Tīkṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphavātaśāmaka, Vraṇaśodhaka, Swedahara

IMPORTANT FORMULATIONS - Karpūrādyarka, Rajanyādi Cūrṇa, Sudarśana Cūrṇa

THERAPEUTIC USES - Karṇaroga, Kaṇṭha roga, Akṣiroga, Dāha, Mūrcchā, Vraṇa, Kāśa, Swarabhraṁśa, Yūkā

DOSE – 1-3 g. in powder form.

SARALA (Root)

Sarala consists of dried root of *Pinus roxburghii* Sargent. (Fam. Pinaceae); a large tree upto 30 m high and 2.5 m in girth, growing on the Himalayas from 600 m to 1830 m.

SYNONYMS -

Sansk. : Surabhidāruka, Pīta Vṛkṣa
Assam. : --
Beng. : Tarpin Telargaach, Sarala Gaach
Eng. : Long Leaved Pine
Guj. : Sarala
Hindi. : Cheel
Kan. : Sarala
Mal. : Sarala, Saralam
Mar. : Sarala
Ori. : --
Punj. : Cheel
Tam. : Sarala, Shirsal
Tel. : Sarala
Urdu. : Cheer, Sanobar

DESCRIPTION –

a) Macroscopic :

Root well-developed, 3-3.5 cm thick, hard, woody, cylindrical; reddish-brown; surface rough due to longitudinal and transverse striations; fracture, hard; no smell and taste.

b) Microscopic :

Mature root shows 10-15 layers of thin-walled, tangentially elongated cork cells filled with tannin; secondary cortex consists of a wide zone of thin-walled, rectangular to polygonal elongated cells mostly filled with starch grains, and of embedded resin canals; phloem a narrow strand composed of sieve tubes, parenchyma and phloem rays; tannin and starch grains also present in this region; xylem composed of tracheids, medullary rays and embedded resin ducts; tracheids thick-walled, with bordered pits; xylem rays 1-2 cells wide and filled with starch grains; simple, round to oval, rarely elongated starch grains, measuring 11-25 μ in dia.

Powder – Reddish-brown; shows fragments of cork cells, tracheids with bordered pits, resin canals, simple round to oval, starch grains measuring 11-25 μ in dia. and fragment of phloem and xylem rays filled with starch grains.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 1 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.3 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 8 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 alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (9:1) shows under U.V. (366 nm) three fluorescent zones at Rf. 0.75, 0.88 and 0.96 (all blue). On exposure to Iodine vapour five spots appear at Rf. 0.17, 0.53, 0.75, 0.88 and 0.96 (all yellow). On spryaing with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for ten minutes three spots appear at Rf. 0.75, 0.88 and 0.96 (all grey).

CONSTITUENTS – Resins – Oleo-resin.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta, Kaṭu
Guṇa : Laghu, Snigdha, Tīkṣna
Vīrya : Uṣna
Vipāka : Kaṭu
Karma : Kaphavātaśāmaka, Vraṇaśodhaka, Swedahara

IMPORTANT FORMULATIONS – Karpūrādyarka, Rajanyādi Cūrṇa, Sudarśana Cūrṇa

THERAPEUTIC USES – Karṇa roga, Kantha roga, Akṣi roga, Dāha, Vraṇa, Kāsa, Swarabhraṁsa

DOSE - 1-3 g. in powder form.

SARSAPA (Seed)

Sarsapa consists of dried seed of *Brassica campestris* Linn. (Fam. Brassicaceae), an erect, stout, simple or branched, glaucous, annual herb, 50 to 60 cm tall with amplexicaul leaves, commonly cultivated in Bengal, Bihar, U.P. and Punjab, and also found occasionally as an escape in waste places and fields.

SYNONYMS -

Sansk. : Kaṭusneha, Siddhārtha
Assam. : --
Beng. : Sarisa
Eng. : Mustard
Guj. : Sarasad, Rai
Hindi. : Saraso
Kan. : Saṣuve, Sasuvae, Sasive
Mal. : Katuka
Mar. : Mohari
Punj. : Sarayo, Sarson
Tam. : Kadugu
Tel. : Avalu
Urdu. : Sarson

DESCRIPTION –

a) Macroscopic :

Seeds small, slightly oblong, pale or reddish-brown, bright, smooth, 1.2- 1.5 mm in dia.; under magnifying glass it is seen to be minutely reticulated; taste, bitter and sharp.

b) Microscopic :

Seed shows single layered colourless testa followed by 3-5 layered, non-lignified, hexagonal, thick-walled cells filled with yellowish-brown contents; embryo and endosperm consists of hexagonal, thin-walled parenchymatous cells containing oil globules.

Powder – Yellow in colour with brown particles and oily, slightly bitter and sharp in taste; shows frequently thick-walled, fragments of reddish-brown cells of hypodermis, yellowish hyaline masses.

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 0.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 8 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 16 per cent, Appendix 2.2.7.
Fixed oil	-	Not less than 35 per cent, Appendix 2.2.8.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under UV (366 nm) two fluorescent zones at Rf. 0.12 and 0.59 (both blue). On exposure to Iodine vapour three spots appear at Rf. 0.12, 0.59 and 0.70 (all yellow). On spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate for ten minutes at 105° C three spots appear at Rf. 0.12, 0.59 and 0.70 (all violet).

CONSTITUENTS – Fixed Oil.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta
Guṇa : Tīkṣṇa, Snigdha
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Kaphahara, Vātahara, Pittakara, Dīpana, Vidāha, Hṛdya

IMPORTANT FORMULATIONS - Mahā Yogarāja Guggulu, Kārpāsasthyādi Taila, Kuṁkumādi Taila, Prabhanjana Vimardana Taila, Vajraka Taila

THERAPEUTIC USES - Kaṇḍu, Kuṣṭha, Kosṭhakṛmi, Grahabādhā

DOSE - 0.5-1 g. in paste form.

SATAPATRIKA (Flower)

Satapatrikā consists of dried flower of *Rosa centifolia* Linn. (Fam. Rosaceae); a small erect shrub, 1-1.8 m high, cultivated in gardens.

SYNONYMS –

Sansk. : Devataruṇī, Karnikā,
Assam. : Varde Ahamar
Beng. : Golap
Eng. : Rose
Guj. : Moshamee Gulab
Hindi. : Gulab
Kan. : Rojahu
Mal. : Rosappoovu
Mar. : Gulab
Ori. : --
Punj. : Gulab
Tam. : Rojapoo
Tel. : Rojapuvvu, Gulabi
Urdu. : Gulab, Ward

DESCRIPTION –

a) Macroscopic :

Flower stalked, pinkish-yellow, consists of sepals, petals and stamens attached to pedicel with thalamus at the base; stalk 0.6-3.5 cm long, light green, slender, covered with numerous prickles and hairs; thalamus 1.0-1.8 cm long, light greenish-brown, covered with numerous prickles and hairs; sepal 5, free, 1.3-2.4 cm long, unequal, leaf-like, upper part creamish-green and light yellowish-green on lower part, having glandular hairs; petals numerous, pinkish-yellow, 1.5-4.2 cm long, 1.3-2.5 cm wide, smooth obovate to sub-cordate; stamens numerous, free, unequal, dorsifixed, dark-brown; filament 0.3-0.5 cm long; carpels many free, ovary inferior; styles lateral, hairy, free; stigma terminal; taste, astringent; odour, aromatic.

b) Microscopic :

Sepal – Shows single layered epidermis on both surfaces; numerous long, unicellular hairs present on upper surface, a few glandular hairs on lower surface; both epidermises followed by a wide zone of mesophyll consisting of round to oval, thin-walled, parenchymatous cells; a number of vascular bundles found scattered in this region.

Petal – Shows lower epidermis papillose and without cuticle; upper epidermis single layered with thin striated cuticle, followed by mesophyll consisting of oval to polygonal,

elliptical, thin-walled, parenchymatous cells; a number of vascular bundles found scattered in this zone.

Powder – Light-brown in colour; fragments of petal of epidermis consisting of thin-walled, sinuous cells extended to form papillae; xylem vessel with spiral thickenings long, pointed, uniseriate, unicellular hair and stalked capitate glandular hairs; abundant, smooth, spherical pollen grains, measuring 27- 41 μ in dia., containing clear intine and exine with three distinct pores.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 7.5 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 15 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 24 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' using n-Butanol : Acetic acid : Water (5:1:4) shows in visible light six spots at Rf. 0.42 (violet), 0.50 (pink), 0.66, 0.82, 0.87 and 0.92 (all yellow). Under U.V. (366 nm) five fluorescent zones are visible at Rf. 0.42 (blue), 0.50 (pink), 0.82, 0.87 and 0.92 (all blue). On exposure to Iodine vapour six spots appear at Rf. 0.42 (grey), 0.50 (pinkish grey), 0.66, 0.82, 0.87 and 0.92 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C eight spots appear at Rf. 0.19 (greyish black), 0.32 (greyish black), 0.42, 0.50 (both violet), 0.66, 0.82, 0.87 and 0.92 (all brown).

CONSTITUENTS – Essential Oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya
Guṇa : Laghu
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Vātahara, Pittahara, Kaphahara, Śukrakara, Netrya, Dīpana, Hṛdya, Varṇya

IMPORTANT FORMULATIONS – Vasanta Kusumākara Rasa, Taruṇārka (Gulabajala), Pravāla Piṣṭi, Muktā Piṣṭi, Zahara Mohara Piṣṭi, Tṛnakānta Maṇi Piṣṭi

THERAPEUTIC USES – Kuṣṭha, Dāha, Mukhasphoṭa, Raktapitta, Raktavikāra

DOSE – 3-6 g. of the drug in powder form.

SIMSAPA (Heart Wood)

Simsapa consists of dried heart wood of *Dalbergia sissoo* Roxb. (Fam. Fabaceae), a medium sized, deciduous tree, found in western Himalayas upto 1220 m altitude and from Sikkim to upper Assam, and extensively planted throughout the country.

SYNONYMS -

Sansk. : Kṛsaṇa sāra, Śyāmā
Assam.: --
Beng. : Shishu
Eng. : Sissoo Tree
Guj. : Sisam
Hindi. : Seesam
Kan. : Eragundimavu, Bindi
Mal. : Irupoola
Mar. : Sisu, Shisav
Ori. : Sisu, Sinsapa
Punj. : Sheesham,
Tam. : Irupoolai
Tel. : Irugudu, Virugudu, Sissoo
Urdu. : Sheesham

DESCRIPTION –

a) Macroscopic :

Drug consists of pieces of wood of variable lengths and widths, brown, very hard and strong; close-grained, annual ring not distinct, rays fine, pores uniformly distributed joined by wavy concentric bands; fracture hard and tough.

b) Microscopic :

Heart wood shows well developed xylem, consisting of usual elements, vessels simple pitted, solitary or 2-3 in groups, arranged in radial rings, a few contain reddish-brown content; parenchyma thick walled and paratracheal; medullary rays 1-3 cells wide; fibres abundant in numbers and present in groups alternating with the bands of xylem parenchyma.

Powder – Brown; under microscope shows fibres, tracheids and parenchymatous cells.

IDENTITY, PURITY AND STRENGTH -

Identification –

Fluorescence test on aqueous and alcoholic extracts :

i) 5 g. extracted in 100 ml of water and filtered shows in day light – light-brown colour; under U.V. light (366 nm) greenish-brown, and under U.V. light (254 nm) yellowish-green.

ii) 5 g. extracted in 100 ml of alcohol and filtered shows in day light – dark-brown colour; under U.V. light (366 nm) dark-brown, and under U.V. light (254) dark-brown.

Foreign matter	- Not more than 1	per cent, Appendix 2.2.2.
Total ash	- Not more than 2	per cent, Appendix 2.2.3.
Acid-insoluble ash	- Not more than 0.1	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 7	per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (7 : 3)) in visible light shows nine spots at Rf. 0.14, 0.19, 0.27 (all grey), 0.52 (yellow), 0.56, 0.62, 0.70, 0.75 and 0.86 (all grey. Under UV (366 nm) five fluorescent zones appear at Rf. 0.19 (yellowish blue), 0.27, 0.42 (both light blue), 0.52 and 0.70 (both blue). On spraying with 5% Methanolic-sulphuric acid reagent and heating the plate for ten minutes at 110°C eleven spots appear at Rf. 0.19(orange), 0.27, 0.30 (both grey), 0.36 (yellowish grey), 0.47 (grey), 0.52 (green), 0.56 (grey), 0.62 (light green), 0.70 (grey), 0.86 (geen) and 0.88 (grey).

CONSTITUENTS – Fixed Oil, Essential Oil, Tannins and Flavonoids.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Kaṣāya
Guṇa : Guru, Picchila
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātahara, Pittahara, Kaphahara, Medohara, Kaphaviśoṣaṇa, Medoviśoṣaṇa, Śukradośahara, Varṇya, Saiya, Rucikara Gabrhapātinī Śoṣahai Pipana

IMPORTANT FORMULATIONS - Ayaskṛi, Narasiṁiha Ghṭra, Mahākhadira Ghṛta

THERAPEUTIC USES - Kuṣṭha, Kṛmi, Dāha, Śvitra, Vraṇa, Mūtraśarkarā, Basti roga, Hikkā, Prameha, Arśa, Jwara, Gulma, Aśmarī, Atisāra, Rakta Vikāra, Soṣa, Sopha, Pāṇḍu, Chardi, Pīnasa, Duṣṭa Vraṇa, Vasāmeha, Sarvajwara

DOSE – 1. 5-10 g. of the drug in powder form.
10-20 g. for decoction.

SIṂSAPĀ (Stem Bark)

Siṁsapa consists of dried stem bark of *Dalbergia sissoo* Roxb. (Fam. Fabaceae); a medium sized, deciduous tree, found in Western Himalayas upto 1220 m altitude, and from Sikkim to upper Assam, and extensively planted throughout the country.

SYNONYMS -

Sansk. : Kṛṣṇa sāra, Śyāmā
Assam.: --
Beng. : Shishu
Eng. : Sissoo Tree
Guj. : Sisam
Hindi. : Seesam
Kan. : Eragundimavu, Bindi
Mal. : Irupoola
Mar. : Sisu, Shisav
Ori. : Sisu, Sinsapa
Punj. : Sheesham,
Tam. : Irupoolai
Tel. : Irugudu, Virugudu, Sissoo
Urdu. : Sheesham

DESCRIPTION –

a) Macroscopic :

Bark 3-5 cm long, curved or flat, fibrous, cut pieces; external surface rough with shallow, broad longitudinal fissures, exfoliating in irregular, woody strips and scales; pale yellow to dark reddish-brown; fracture, fibrous.

b) Microscopic :

Mature stem bark consists of 6-25 or more rows of rectangular, thin-walled, radially arranged cork cells, a few outer layers exfoliating; secondary cortex wide consisting of round or oval, thin-walled, parenchymatous cells, a number of groups of sclerenchymatous cells, found scattered throughout secondary cortex, a few cortical cells contain prismatic crystals of calcium oxalate; secondary phloem very wide consisting of usual elements of thin-walled cells and tangential strips of phloem fibres; collapsed, thin-walled, parenchymatous cells present in tangential strips throughout the secondary phloem; most of phloem fibres and parenchyma cells contain prismatic crystals of calcium oxalate; phloem rays short, uni to triseriate, consisting of radially elongated, thin-walled, parenchymatous cells.

Powder - Light brown; shows thin-walled parenchymatous cells, phloem fibres, fragments of cork cells and prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 14 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 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 7 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under UV (366 nm) five fluorescent zones at Rf. 0.28,0.59,0.71,0.78 and 0.93 (all blue). On exposure to Iodine vapour six spots appear at Rf. 0.34, 0.51, 0.59, 0.71, 0.75 and 0.78 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for fifteen minutes at 105° C six spots appear at Rf. 0.34, 0.51, 0.59, 0.71, 0.75, 0.78 (all violet).

CONSTITUENTS – Flavonoids.

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Kaṭu, Tikta
Guna : Laghu, Rūkṣa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Tridoṣahara, Vraṇsodhana, Garbhapātkar, Balya, Rucikara, Medoara, Vāmaka

IMPORTANT FORMULATIONS – Narasiṁhaghṛta Rasāyana

THERAPEUTIC USES – Kuṣṭha, Śvitra, Kṛmi, Bastiroga, Dusta, Vraṇa, Dāha, Kaṇḍu, Hikkā, Sopha, Visarpa, Pīnasa

DOSE - 3-6 g. of the drug in powder form.
50-100 ml. of the drug for decoction.

SIRĪṢA (Stem Bark)

Sirīṣa consists of stem bark of *Albizzia lebbeck* Benth. (Fam. Fabaceae), a large tree, common throughout the country, ascending to 1200 m on the Himalayas.

SYNONYMS -

Sansk. : Bhandi, Sitapuṣpa, Sukapriya, Mrdupuṣpa
Assam. : --
Beng. : Sirish, Siris
Eng. : Siris Tree, Lebbeck Tree
Guj. : Shirish
Hindi. : Siris, Shiris
Kan. : Bagey, Bage Mara, Hombage
Mal. : Vaka, Nenmenivaka
Mar. : Siris
Ori. : Sersuan, Sirisha
Punj. : Sirish, Sareehn
Tam. : Vakai
Tel. : Dirisena
Urdu. : Siris

DESCRIPTION –

a) Macroscopic :

Bark 1.5 - 2.5 cm thick, external surface dark brown, rough due to longitudinal fissures and transverse cracks, rhytidoma forming major part of bark and peeling off in flakes exposing buff coloured surface, middle bark brown, inner bark much fibrous, light yellow to grey; fracture, laminated in outer region and fibrous in inner region; taste, very astringent.

b) Microscopic :

Mature bark about 2 cm thick, shows dead tissue of rhytidoma; cork consists of a few layers of thin-walled, transversely elongated and radially arranged cells; secondary cortex wide, composed of radially elongated to squarish, moderately thick-walled cells containing orange to reddish-brown contents; a few of the cells contain prismatic crystals of calcium oxalate; stone cells, variable in shape and size, present in singles or in groups throughout the region; secondary phloem consists of sieve elements, phloem parenchyma, phloem fibres and crystal fibres, traversed by phloem rays; prismatic crystals of calcium oxalate present in most of the phloem parenchyma cells; tangential bands of ceratenchyma present in middle and outer phloem region; phloem fibres, elongated, thick-walled, lignified, present in many concentric strips, mostly enclosed by crystals sheath throughout the middle and inner regions of phloem; crystal fibres having a number of septa, each chamber containing a single prismatic crystal of calcium oxalate; phloem rays numerous, radially elongated,

somewhat wavy in outer phloem region and bi to multiseriate in the inner phloem region, being 2 - 5 cells wide and 7 - 25 cells high.

Powder - Greyish-brown; shows large number of stone cells, prismatic crystals of calcium oxalate, crystal fibres and phloem fibres.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 8 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 12 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 the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under UV (366 nm) a fluorescent zone at Rf. 0.63 (blue). On exposure to Iodine vapour two spots appear at Rf. 0.07 and 0.21 (both yellow). On spraying with 5% Methanolic-Phosphomolybdic acid reagent and heating the plate at 105°C for ten minutes two spots appear at Rf. 0.07 and 0.21 (both light blue).

CONSTITUENTS – Saponins and Tannins.

PROPERTIES AND ACTION -

Rasa : Tikta, Kaṣāya, Madhura, Kaṭu
Guṇa : Laghu
Vīrya : Anūṣna
Vipāka : Kaṭu
Karma : Viṣaghna, Tvagdoṣa, Tridoṣahara, Śothahara, Varṇya

IMPORTANT FORMULATIONS – Vajraka Taila, Daśāṅga lepa, Ayaskṛti, Devadār vāriṣṭa, Bṛhanmaricyādi Taila

THERAPEUTIC USES – Pāmā, Kuṣṭha, Kaṇḍu, Visarpa, Kāsa, Vraṇa, Śotha, Śwāsa, Mūṣaka visa, Śīta Pitta, Raktaduṣṭi, Pīnasa, Viṣamajwara, Pratiśyāya, Sarpadaṅśa,(Casake),Viṣaduṣṭi, Suryāvarta, Ardhāvabhedaka, Krmi roga, Netrābhiṣanda

DOSE – 25-50 g. (Kwātha).
3-6 g. (Cūrṇa).

STHAUṆEYA (Leaf)

Sthauṇeya consists of dried leaf of *Taxus baccata* Linn. (Fam. Taxaceae); an evergreen conifer, about 6.5 m high, distributed in the temperate Himalayas at altitudes between 1800-3300 m and in the hills of Meghalaya and Manipur at an altitude of 1500 m.

SYNONYMS -

Sansk. : Sukapuṣpa, Vikarṇa
Assam. : --
Beng. : Birmi, Bhirmie, Talish Patra, Bhada Getela
Eng. : Himalayan Yew
Guj. : Gethela Barmi
Hindi. : Thuner, Talispatra Bhed
Kan. : Sthauneyak
Mal. : Thuriangam, Tuniyankam
Mar. : Sthauney Barmi
Ori. : Talisabhed, Chalisa Patra
Punj. : Birmi
Tam. : Taiispatri-Bhedam
Tel. : Taleesa Patri Bhedamu
Urdu. : Birmi, Zarnab

DESCRIPTION –

a) Macroscopic :

Drug occurs as whole or broken leaf pieces, entire leaf flattended, linear with recurved margins, 1.3-4.0 cm long and 0.1-0.3 cm wide, tip sharp pointed and prickly, entire, thick, brown above, but paler below; petiole, very short; odour, pleasant; taste, acrid, bitter and disagreeable.

b) Microscopic :

Leaf –

Lamina – shows dorsiventral structure, margin slightly turned downward; upper epidermis single layered covered with thick, striated cuticle; lower epidermis single layered with papillate projection;sunken stomata present only on lower surface, overhung by subsidiary cells; palisade two layered; spongy parenchyma 3-5 layered, thin-walled, oval or irregular in shape, containing reddish-brown contents; vascular bundle single, present in the midrib within an endodermis.

Powder - Brown; shows fragments of reddish-brown spongy parenchyma cells and very rarely xylem tracheids, polygonal epidermal cells with striated cuticle and a few sunken stomata in surface view.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 6 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1.5 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 16 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4 : 1 : 5) shows under UV (366 nm) three fluorescent zones at Rf. 0.67 (pink), 0.95 (grey) and 0.98 (pink). Under visible light shows three spots at Rf. 0.91 (pink), 0.95 (pink) and 0.98 (greenish yellow). On exposure to Iodine vapour seven spots appear at Rf. 0.08, 0.29, 0.60, 0.70, 0.82, 0.91 and 0.95 (all yellow).

CONSTITUENTS – Alkaloids - Taxine, Ephedrine, Glycoside, Tannins, Resins, Reducing Sugars and Formic Acid.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Tikta, Madhura
Guṇa : Ṣnigdha, Guru
Vīrya : Śīta
Vipāka : Madhura
Karma : Medhya, Śukravardhaka, Kaphahara, Vātahara, Pittaśāmaka, Jantughna, Varṇa Prasādana, Lomasanjanana

IMPORTANT FORMULATIONS - Mahānārāyaṇa Taila, Balā Taila

THERAPEUTIC USES - Rakta Vikāra, Tṛṣṇā, Tila Kālaka, Dāha, Kuṣṭha, Krmi Roga, Piḍikā, Arbuda (Karkaṭa)

DOSE – 1-3 g. of the drug in powder form.

SŪRAṆA (Corm)

Sūraṇa consists of dried corm of *Amorphophallus campanulatus* (Roxb.) Blume. (Fam. Araceae); a stout, herbaceous plant, cultivated throughout the plains of the country.

SYNONYMS -

Sansk. : Arśoghna, Kandala
Assam.: --
Beng. : Ole
Eng. : Elephant Foot
Guj. : Sooran,
Hindi. : Suranakanda, Zamikanda
Kan. : Suranagadde
Mal. : Chena, Kattuchena, Kattuchenai, Cena Karana
Mal. : Jungli Suran, Suran
Ori. : Olooakanda, Suran
Punj. : Gimikanda
Tam. : Karunai Kizhangu
Tel. : Mancai Kanda Durada Gadda
Urdu. : Zamin-qand, Zamikand

DESCRIPTION –

a) Macroscopic :

Drug occurs as cut pieces of different shapes and sizes; external surface of cork blackish-brown, rough due to numerous scars and a few adventitious roots, internal portion creamish white; fracture, short; taste, acrid.

b) Microscopic :

Corm shows a wide zone of cork consisting of 5-25 tangentially elongated, rectangular, thin-walled cells, a few inner layers containing rosette crystals of calcium oxalate, and plenty of simple and compound starch grains; ground tissue very wide consisting of thin-walled, parenchymatous cells; a few cells containing both rosette and acicular crystals of calcium oxalate; starch grains both simple and compound, spherical in shape consisting of 2-4 components, measuring 3-31 μ in diameter; vascular bundles poorly developed, scattered in ground tissue; vessels arranged in groups of 2-3, having spiral thickenings; a few parenchyma cells of ground tissue containing yellowish cell contents.

Powder – Creamish-grey; shows abundant simple and compound starch grains, measuring 3-31 μ in dia., fragments of cork cells, a few rosette and acicular crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 8 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 2 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 9 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Benzene : Ethylacetate (9 : 1) on exposure to Iodine vapour shows for four spots at Rf. 0.09, 0.66, 0.74 and 0.85 (all yellow). On spraying with 5% Methanolic-Phosphomolybdic acid and heating the plate at 105°C for ten minutes four spots appear at Rf. 0.09, 0.66, 0.74 and 0.85 (all grey).

CONSTITUENTS – Betulinic Acid, β-Sitosterol, Stigmasterol, Lupeol, Triacontane, Glucose, Galactose, Rhamnose and Xylose.

PROPERTIES AND ACTION -

Rasa : Kaṭu, Kaṣāya
Guṇa : Laghu, Rūkṣa, Viśada
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātakara Pittakara, Kaphahara, Dīpana, Vistambhī, Rucya, Gudakīlahṛt, Raktapittakara, Dadrukara, Kusthakara

IMPORTANT FORMULATIONS - Suranāvaloha, Sūrṇavaṭaka, Sāmudradya Cūrṇa

THERAPEUTIC USES - Arśa, Plīhagulma, Śwāsa, Kāsa, Āsthīlā

DOSE – 2-10 g. of the drug in powder form.

SVETACANDANA (Heart Wood)

Svetacandana consists of dried heart wood of *Santalum album* Linn. (Fam. Santalaceae), an evergreen, semiparasitic tree, 8 to 18 m in height and 2 to 4 m in girth, widely distributed in the country, commonly found in the dry regions of peninsular India from Vindhya mountains southwards, especially in Karnataka and Tamilnadu; it is cultivated for its aromatic wood and oil.

SYNONYMS -

Sansk. : Srikhanda, Swetacandana
Assam. : Sandale Avyaj
Beng. : Chandan
Eng. : Sandal Wood
Guj. : Sukhad
Hindi. : Chandan, Safed Chandan
Kan. : Shrigandhamara, Shrigandha, Chand
Mal. : Chandanam
Mar. : Chandan
Ori. : --
Punj. : Chandan
Tam. : Chandana maram, Sandanam, Ingam
Tel. : Gandhapu Chekka, Manchi Gandham, Tella Chandanam, Sriga
Urdu. : Sandal Safed

DESCRIPTION –

a) Macroscopic :

Yellowish-brown to pale-reddish orange, heavy, dense, hard but split easily; transversely smooth surface shows alternating light and dark concentric zones with numerous pores, traversed by very fine medullary rays; odour, persistently aromatic; taste, slightly bitter.

b) Microscopic :

Wood consists of tracheids, vessels, fibres, xylem parenchyma and traversed by medullary rays; vessels numerous scattered singly throughout the region, rarely two together, barrel-shaped, pitted and with transverse to oblique perforation with tail-like projections, at one or both ends; a few tracheids elongated with tapering ends and possess bordered pits on their walls; fibres many, lignified with pointed tips; xylem parenchyma mostly rectangular, a few of them contain prismatic crystals of calcium oxalate; xylem rays numerous, run straight, uni to triseriate, mostly biseriate, thick-walled, radially elongated having golden yellow to brownish contents and contain a few prismatic crystals of calcium oxalate.

Powder - Light-brown and aromatic; shows pitted vessels with tails, isolated or associated with fibres, fragments of fibres, square to rectangular-shaped parenchyma, prismatic crystals of calcium oxalate, and numerous oil globules.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1	per cent, Appendix 2.2.2.
Total ash	-	Not more than 1	per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.2	per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 8	per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 1	per cent, Appendix 2.2.7.
Volatile oil	-	Not less than 1.5	per cent, Appendix 2.2.10.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (93 : 7) shows on exposure to Iodine vapour six spots at Rf. 0.05, 0.10, 0.27 (all yellowish brown), 0.60 (dark brown), 0.82 and 0.91 (both yellowish brown). On spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C six spots appear at Rf. 0.05, 0.10, 0.27 (all bluish violet), 0.60 (violet). 0.82 and 0.91 (both bluish violet).

CONSTITUTENTS – Volatile oil (α- and β- Santalol)

PROPERTIES AND ACTION -

Rasa : Ttikta, Madhura
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Pittahara, Kaphahara, Durgandhahara, Dāhaprasámana, Varṇya, Hṛdya, Tṛsnāhar, Vṛsya, Kṛmighna, Viṣaghna

IMPORTANT FORMULATIONS - Ayaskṛti, Asvagandhādyariṣṭa, Sārivadyāsava, Arimedādi Taila, Balādhātryādi Taila, Marma Guṭikā, Candanāsava, Candanādi Cūrṇa Candanādi Taila

THERAPEUTIC USES - Śoṣa, Dāha, Raktapitta, Raktārśa, Hikkā, Vamana, Raktā tisāra, Pradara, Śukrameha, Netra Roga, Mutraghāta, Bhrama, Raktavikāra, Kṛmi Roga

DOSE – 3-6 g. of the drug in powder form.

SYONĀKA (Root)

Syonaka consists of dried root of *Oroxylum indicum* Vent. (Fam. Bignoniaceae); a small tree, distributed throughout the country, chiefly in evergreen forest upto 600 m.

SYNONYMS -

Sansk. : Dīrghavṛnta, Prthsuimba, Katvaṅga
Assam.: Kering
Beng. : Sonagachh
Eng. : --
Guj. : Tentoo
Hindi. : Sonapatha, Shyonak, Tentoo
Kan. : Tigudu
Mal. : Palagripayanni
Mar. : Tentoo
Ori. : Pamponiya
Punj. : Tatpaling, Talvarphali
Tam. : Peruvagai
Tel. : Dundilumu, Gumpena, Pampini
Urdu. : Sonapatha

DESCRIPTION –

a) Macroscopic :

Drug available in cut pieces, having secondary roots, greyish-brown to light brown, cut surface brownish-cream, cylindrical, ribbed at few places, 5-16 cm long, 1-3 cm thick, external surface rough due to longitudinal and transverse cracks, fracture, short; taste, slightly sweet.

b) Microscopic :

Root mature root shows 10-30 or more layers of tangentially elongated, radially arranged cork cells filled with reddish-brown content; secondary cortex composed of oval to polygonal, parenchymatous cells; stone cells, thick-walled, lignified of various shapes and sizes with narrow lumen, distinct pits and striations; secondary phloem composed of sieve tubes, parenchyma, fibres and groups of stone cells; groups of fibres traversed by 2-8 cells wide phloem rays; secondary xylem consists of usual elements; xylem vessels of various sizes, occur in singles and groups of 2-5 cells arranged radially having reticulate thickening; xylem rays 2-4 cells wide; fibres having wide lumen and pointed tips, and tracheids present.

Powder – Brownish-cream; shows groups of stone cells, fragments of cork, phloem fibres with wide lumen and pointed tips and reticulate vessels and tracheids.

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 20 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 42 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4 : 1 : 5) shows under UV (366 nm) a fluorescent zone at Rf. 0.10 (blue). On exposure to Iodine vapour six spots appear at Rf. 0.10, 0.30, 0.58, 0.70, 0.85 and 0.95 (all yellow). On spraying with 5% Methanolic-Sulphuric acid and heating the plate for ten minutes at 105°C five spots appear at Rf. 0.25, 0.58, 0.70, 0.85 and 0.95 (all grey).

CONSTITUENTS – Flavonoids and Tannins.

PROPERTIES AND ACTION -

Rasa : Kaṣāya, Tikta
Guṇa : Laghu, Rūkṣa
Vīrya : Śīta
Vipāka : Kaṭu
Karma : Kaphapittaśāmaka, Dīpana, Grāhi

IMPORTANT FORMULATIONS - Amṛtāriṣṭa, Dantyādyariṣṭa, Daśamūlāriṣṭa, Nārāyaṇa Taila, Dhānawantara Ghṛta, Brāhma Rasāyana, Daśamūla Kwātha Cūrṇa, Cyavanaprāśa, Awaleha

THERAPEUTIC USES - Vātātisāra, Kāsa, Aruci, Basti roga, Āmavāta, Udara roga, Urustambha, Vātavyādhi, Karṇa roga, Śotha

DOSE – 5-10 g. in powder form.
25-50 g. in decoction.

TĀLA (Inflorescence)

Tāla consists of dried male inflorescence of *Borassus flabellifer* Linn. (Fam. Araceae); a tall, stout, dioecious palm tree having a height of 11.8-30 m and girth 1-2 m, bearing a terminal crown of 30-40 large fan like leaves, 90 cm - 1.6 m in width, cultivated and also found wild throughout India in the Peninsular coastal areas and in fields.

SYNONYMS -

Sansk. : Lekhyapatra
Assam.: --
Beng. : Tala
Eng. : Palmyra Palm
Guj. : Tada, Tad
Hindi. : Tal
Kan. : Talimera, Oleyagida, Nelatalea Talimara
Mal. : Panavirala
Mar. : Tada, Toad
Ori. : --
Punj. : Tad
Tam. : Panaimaram, Panai
Tel. : Tadi, Tati
Urdu. : Taad

DESCRIPTION –

Macroscopic :

Drug available in transversely cut pieces of inflorescence, measuring upto 1 cm thick and 2.5 - 3 cm in dia., transversely cut surface shows a central axis with a number of male flowers arranged around it, external surface yellowish-grey and rough due to scales; flower unisexual, actinomorphic, sessile, arranged in a close spiral on the inflorescence axis, 3-4 mm long, reddish-brown in colour; perianth consists of 6 sepals, tough, persistent, free, valvate; stamen 6, in two whorls of three each, 1-1.5 mm long, yellowish in colour; filament free, united at base into a ring; anther linear and basifixed; no smell and taste.

Powder –Reddish-brown; shows fragments of thin-walled, slightly wavy, large, oval to polygonal parenchymatous cells of perianth epidermis in surface view; numerous, simple, yellowish-orange, spherical-shaped pollen grains, measuring 16-44 μ in dia., with distinct exine and intine; large brown pieces of thick-walled, single layered pollen sac, 3-4 layered, endothelial cells having a few small pollen grains.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 7.5 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1.5 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 8 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4 : 1 : 5) shows under UV (366 nm) a blue fluorescent zone at Rf. 0.93. On spraying with 5% Methanolic-Sulphuric acid and heating the plate for about ten minutes at 110°C four spots appear at Rf. 0.44, 0.61, 0.73 (all light brown) and 0.93 (brown).

CONSTITUENTS – Kernels contain Galactomannan (Polysaccharide).

PROPERTIES AND ACTION -

Rasa : Madhura
Guṇa : Śīta, Guru, Snigdha
Vīrya : Śīta
Vipāka : Madhura
Karma : Śukrala, Bṛṁhaṇa, Vṛṣya, Tarpaka, Sirovirecaka, Vastiśuddhikara, Medakara, Vātahara, Pittahara, Vraṇāśaka, Kṛmighna

IMPORTANT FORMULATIONS - Avlttolādi Bhasma(Kṣāra), Panviralādi Bhasma, (Tāla Puspodbhava Kṣāra) Guḍa Pippalī

THERAPEUTIC USES - Raktapitta, Urahkṣata, Śwāsa, Dāha, Kṛmi, Mūtrakṛcchra, Śophaghna, Vandhyakara

DOSE – 1-3 g.

TRIVRT (Root)

Trivrt consists of dried root of *Operculina turpethum* (Linn.) Silva Manso Syn. *Ipomoea turpethum* R. Br. (Fam. Convolvulaceae); a large perennial twiner with milky juice and fleshy roots, found growing wild nearly throughout the country, ascending to 900 m, also occasionally grown in gardens; the roots being fleshy, care is taken in drying as they decay easily, roots therefore cut into pieces and the cut portions are exposed to sun for a day or so, after which it is finally dried in shade.

SYNONYMS -

Sansk. : Śyāmā, Tribhaṇḍī
Assam. : --
Beng. : Teudi, Tvuri, Dhdhakalami
Eng. : Terpeth Root, Indian Jalap
Guj. : Kala Nasottara
Hindi. : Nishothra
Kan. : Vili Tigade
Mal. : Trikolpokanna
Mar. : Nisottar
Ori. : Dudholomo
Punj. : Nisoth
Tam. : Karum Sivadai
Tel. : Tella, Tegada
Urdu. : Turbud, Nishoth

DESCRIPTION -

a) Macroscopic :

Roots occur in pieces, 1.5-15 cm long, 1-5 cm dia., usually unbranched, cylindrical, elongated, bearing thin rootlets; thicker pieces, occasionally split and show central wood portion; surface dull grey, reddish-grey to light brown, showing deep furrows or longitudinal wrinkles giving a rope-like or columnar appearance; transversely cut surface shows thick, whitish bark and light yellow centre; fracture in bark, short; in wood, fibrous; odour, indistinct; taste, slightly acrid and nauseating when kept in mouth for some time

b) Microscopic :

Mature root shows thin cork, consisting of 3-5 rows of brown cells; secondary cortex 4-6 layered, composed of tangential elongated, thin-walled cells; some of the cortical cells become thick-walled appearing as isolated, oval to subrectangular sclerenchymatous cells having wide lumen; secretory cavities surrounded by subsidiary cells and resin canals found scattered in secondary cortex; secondary phloem, a wide zone,consisting of sieve elements and phloem parenchyma; vascular bundles arranged in a continuous and a discontinuous ring, traversed by uni and biseriate medullary rays; numerous resin cells also seen in phloem in longitudinal

rows; xylem shows 3-5 radiating arms;small patches of intraxylary phloem often formed; xylem vessels in singles or 2-3 in groups, having simple pits on their walls; calcium oxalate crystals as prisms and rosettes found scattered in cortex, phloem parenchyma, xylem parenchyma and medullary ray cells; starch grains, both simple and compound, simple ones elliptical to spherical with central cleft hilum, compound grains consisting of 2-4 components, size vary from 5-44 μ in dia., found scattered in cortex, phloem parenchyma, xylem parenchyma and medullary ray cells.

Powder - Greyish to light brown; shows parenchymatous cells, cellulosic fibres with pointed tips, vessels with simple pits, simple and compound starch grains elliptical to spherical with central cleft, measuring 5-44 μ in dia., having 2-4 components, rosette and prismatic crystals of calcium oxalate.

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 1.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractives	-	Not less than 10 per cent, Appendix 2.2.6.
Water-soluble extractives	-	Not less than 8 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under UV (366 nm) three fluorescent zones at Rf. 0.08, 0.21 (both light blue) and 0.58 (blue). On exposure to Iodine vapour seven spots appear at Rf. 0.21, 0.41, 0.49, 0.58, 0.71, 0.90 and 0.97 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C seven spots appear at Rf. 0.21, 0.41, 0.49 (all light violet), 0.58, 0.70, 0.90 and 0.97 (all violet).

CONSTITUENTS – Resinous Glycosides.

PROPERTIES AND ACTION -

Rasa : Madhura, Kaṭu, Tikta, Kaṣāya
Guṇa : Rūkṣa, Laghu, Tīkṣṇa
Vīrya : Uṣṇa
Vipāka : Kaṭu
Karma : Vātala, Virecana, Kaphapittahara, Sukhavirecanaka, Pittahara, Jwarahara

IMPORTANT FORMULATIONS – Hrdyavirecana Leha, Aśwagandharisṭa, Avipattikara Cūrṇa, Manibhadra Guḍa

THERAPEUTIC USES – Malabandha, Gulma, Udara Roga, Jwara, Sopha Pāndu, Plihā, Vraṇa, Krmi, Kuṣṭha, Kaṇḍu

DOSE – 1-3 g of the drug in powder form.

TUMBINĪ (Fresh Fruit)

Tumbinī consists of fresh fruit (devoid of stalk) of *Lagenaria siceraria* (Mol.) Standl. Syn. *L. leucantha* Rusby., *L. vulgaris* Ser. (Fam. Cucurbitaceae); a large, pubescent, climbing or trailing herb, cultivated throughout the country.

SYNONYMS -

Sansk. : Alābu, Tumbī
Assam.: --
Beng. : Laus, Loki
Eng. : Bottle Gourd
Guj. : Dudi, Tumbadi
Hindi. : Lauki, Ghia
Kan. : Isugumbala, Tumbi
Mal. : Chorakka, Churan, Choraikka, Piccura, Tumburini, Cura, Tumburu
Mar. : Phopla
Ori. : --
Punj. : Tumbi, Dani
Tam. : Shorakkai, Surai, Suraikkai
Tel. : Sorakaya, Anapakaya
Urdu. : Ghiya, Lauki

DESCRIPTION –

Macroscopic :

Fruit a pepo, 30 - 60 cm long, bottle, mace or club-shaped, hard when ripe; external surface, smooth; pale green in colour.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	- Nil -
Total ash	-	Not more than 12 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.6 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 25 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (85 : 15) shows under UV (366 nm) three fluorescent zones at Rf. 0.13 (light blue), 0.66 (pink) and 0.88 (light pink). On exposure to Iodine vapour three spots appear at Rf. 0.13, 0.33 and 0.57 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 110°C two spots appear at Rf. 0.13 and 0.57 (both light brown).

CONSTITUENTS – Saponin and Fatty Oil.

PROPERTIES AND ACTION -

Rasa : Madhura
Guṇa : Snigaha
Vīrya : Śīta
Vipāka : Madhura
Karma : Pittahara, Kaphahara, Bhedaka, Rucikara, Hṛdya, Vṛṣya

IMPORTANT FORMULATIONS - Mahāviṣagarbha Taila

THERAPEUTIC USES - Jwara, Kāsa, Śvāsa Viṣa roga, Śopha, Vraṇa, Śūla

DOSE – 10-20 ml. of fresh drug in juice form.

UDUMBARA (Fruit)

Udumbara consists of dried fruit of *Ficus glomerata* Roxb. Syn. *F. racemosa* Linn. (Fam. Moraceae); a large deciduous tree distributed throughout ever green forests in India, upto an elevation of 1800 m, in moist localities and bank of streams, and also often planted in villages for shade and its edible fruits.

SYNONYMS -

Sansk. : Jantuphala, Hemadugdhā
Assam.: Jambhaij, Jamij
Beng. : Jogmadumur
Eng. : Cluster Fig
Guj. : Umardo
Hindi. : Gullar, Gular, Umra
Kan. : Athimaro
Mal : Atti
Mar. : Umbar
Ori. : Dumburi, Dumuri
Punj. : Gullar, Umbra, Rumbn
Tam. : Atti
Tel. : Atti, Medi
Urdu. : Goolar, Gular

DESCRIPTION –

a) Macroscopic :

Dried syconus fruit, sub-globose with persistent peduncle; 1.0 -2.3 cm long, 0.7 - 1.8 cm in dia., brownish-grey, wrinkled ostiole in apex region, inner hollow receptacle, a few insect debris also found in inner walls of syconus; odour, not distinct; taste, astringent or acrid in unripe fruit.

b) Microscopic :

Fruit shows single layered epidermis covered with thick-cuticle having numerous unicellular hooked hairs and reddish-brown content; epidermis followed by 5-8 layers oval to polygonal, collenchymatous cells and oval to polygonal, thin-walled parenchymatous cells respectively; a few rosette crystals of calcium oxalate and reddish content found in collenchymatous cells; vascular traces, laticiferous cavities and pitted, round to oval lignified stone cells, with wide lumen present in parenchymatous zone.

Powder - Brown; shows unicellular hooked hairs, epidermal cells and stone cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 9 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 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 15 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under UV (366 nm) eight flourescent zones at Rf. 0.05 (light blue), 0.14 (blue), 0.24 (light blue), 0.38 (light blue), 0.45 (light blue), 0.55 (blue), 0.93 (blue) and 0.96 (blue). On exposure to Iodine vapour nine spots appear at Rf. 0.05, 0.24, 0.38, 0.45, 0.51, 0.55, 0.65, 0.93 and 0.96 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 110°C nine spots appear at Rf. 0.05, 0.24, 0.38, 0.45, 0.51, 0.55, 0.63, 0.93 and 0.96 (all grey).

CONSTITUENTS – β-Sitosterol, Lupeol Acetate and Carbohydrates.

PROPERTIES AND ACTION -

Rasa : Madhura, Kaṣāya
Guṇa : Rūkṣa, Guru
Vīrya : Śīta
Vipāka : Madhura
Karma : Pittahara, Kaphahara, Varṇya, Vraṇa Ropaṇa, Vraṇa Śodhana, Bhagna Sandhānaka, Raktadoṣahara

IMPORTANT FORMULATIONS - Marma Gutikā

THERAPEUTIC USES – Raktapitta, Mūrcchā, Dāha, Tṛṣṇā, Pradara, Granthi Roga

DOSE - 10-15 g. of the drug in powder form.

USIRĀ (Root)

Usira consists of dried fragrant fibrous roots of *Vetiveria zizanioides* (Linn.) Nash (Fam. Poaceae); a densely tufted grass, found throughout the plains and lower hills of the country, especially on the banks of rivers and rich marshy soil, ascending to an altitude of 1200 m.

SYNONYMS -

Sansk. : Vīrana, Ādhaya, Sevya
Assam. : Usir, Virina
Beng. : Venarramula, Khaskhas
Eng. : Cuscus Grass
Guj. : Sugandhi Valo, Valo
Hindi. : Khasa, Gandar, Bena, Khas
Kan. : Mudivala, Baladaberu, Lamanch, Bala Daberu
Mal. : Ramaceam, Vetiver, Lamajja, Ramacham
Mar. : Bala, Vala
Ori. : Ushira, Benachera
Punj. : Panni, Khas
Tam. : Vetiver, Vilamichaver
Tel. : Vetivelu, Vettiveru
Urdu. : Khas

DESCRIPTION –

a) Macroscopic :

Clusters of wiry roots upto 2 mm in diameter, minute, longitudinally grooved; colour varies from cream, grey or light yellow to brown; fracture, short and splintery; odour, strong aromatic; taste, slightly bitter.

b) Microscopic :

Root shows an epidermis consisting of tangentially elongated cells having brownish content, followed by a layer of hypodermis, consisting of thin-walled cells, similar to epidermis; cortex consisting of 2-3 layers of thick-walled, lignified sclerenchymatous cells towards periphery and aerenchymatous cells towards centre; endodermis, single layered of barrel-shaped cells with highly thickened inner walls; pericycle many layered with thick-walled, sclerenchymatous cells enclosing radial vascular bundles arranged in a ring; simple, round to oval, starch grains measuring 8-12 μ in diameter present in aerenchyma, pericycle and pith cells.

Powder - Ash-coloured; odour, strongly aromatic and bitter in taste, shows fibres in groups, isolated, xylem vessels, simple, round to oval, starch grains measuring 8-12 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 9 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 6 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 5 per cent, Appendix 2.2.7.
Volatile oil	-	Not less than 1 per cent, Appendix 2.2.10.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.49 and 0.72 (both blue). On exposure to Iodine vapour three spots appear at Rf. 0.28, 0.75 and 0.94 (all yellow). On spraying with 5% Methanolic Sulphuric acid reagent and heating the plate at 105°C for ten minutes four spots appear at Rf. 0.19, 0.33, 0.73 and 0.94 (all grey).

CONSTITUENTS – Essential Oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Madhura
Guṇa : Laghu, Snigdha
Vīrya : Śīta
Vipāka : Madhura
Karma : Vātaghna, Dabaklāntihara, Pittaghna, Pācana, Stambhana, Kaphapttahṛt

IMPORTANT FORMULATIONS – Uśīrasava, Yogarajaguggulu, Ṣaḍanga Kwātha Cūrṇa

THERAPEUTIC USES – Jwara, Tṛṣnā, Mūtrakṛcchra, Vraṇa

DOSE – 3 - 6 g. of the drug in powder form for infusion.

UTPALA (Flower)

Utpala consists of dried flower of *Nymphaea stellata* Willd. (Fam. Nymphaceae); an aquatic herb, generally found in tanks and ponds throughout the warmer parts of the country.

SYNONYMS -

Sansk. : Kumuda, Nīlotpal
Assam.: --
Beng. : Kumud, Sundi
Eng. : Indian Blue Water Fily
Guj. : Poyanu
Hindi. : Neel Kamal, Kumudinee
Kan. : Neeltare
Mal. : Ambal Poovu,
Mar. : Kamoda, Neel Kamal
Ori. : --
Punj. : Neela Kamal, Kamalini
Tam. : Alli, Ambal
Tel. : Allitamara, Kaluvapoovu
Urdu. : Neelofar

DESCRIPTION –

a) Macroscopic :

Drug occurs mostly in broken form of varying sizes of dried pieces of flowers and buds, dark brown, attached with a pedicel of 0.5-1.0 cm long when present; sepals-5 - 6 cm long, 1.5 - 2.0 cm wide, oblong, lanceolate, tip acute or subacute, free, adnate to base of disc; petals - 3.5 - 4.5 cm long 2.0-2.5 cm wide, linear-oblong or lanceolate, yellowish-brown; stamen- 6 to indefinite, free, adnate to fleshy thalamus; filaments-dilated at base; anther - with lingual appendages, introrse, dithecous; gynoecium 3 to indefinite, enclosed by thalamus; style short; ovary unilocular.

b) Microscopic :

Sepal - Single layered epidermis on either side, unicellular hairs present on upper epidermis; both epidermis followed by 4-6 layers of collenchymatous cells with angular thickenings; central region occupied by 4-5 layers of elongated, thin-walled, spongy parenchymatous cells; large stellate air canals and vascular tissues present in this region; tanniniferous content present in collenchymatous cells.

Petal -Epidermis on either side, followed by 2-3 layers of collenchymatous cells, central region composed of 3-4 layers, elongated spongy parenchyma; stellate air canals and

vascular stellate tissues present in this region; tanniniferous contents also found scattered in petals.

Stamen - Single layered upper and lower epidermis, followed by 2-3 layers, rounded to oval, large parenchymatous cells; 3-4 layers elongated parenchymatous cells present in centre; stellate air canals present in this region; anther shows 4 splitting pollen chambers attached with parenchymatous connective tissues, vascular tissues and stellate idioblasts present in this region, endothecium consisting of single layered columnar cells, stromium in both the chambers and a few rounded 22 – 27 μ in dia., pollen grains having thick smooth, exine and a thin intine.

Powder - Brown; shows groups of parenchymatous cells, stellate air canals, uniseriate hairs, yellowish-brown rounded pollen grains, measuring 22 – 27 μ in dia., having thick, smooth, exine and thin intine.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 8 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.5 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 22 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform : Ethylacetate : Formic acid (5 : 4 : 1) shows in visible light three spots at Rf. 0.59, 0.68 and 0.81 (all bluish grey). On spraying with 10% Ferric Chloride solution (aqueous) two spots appear at Rf. 0.68 and 0.81 (both blue and correspond to that of Tannic acid).

CONSTITUENTS – Tannins.

PROPERTIES AND ACTION -

Rasa : Madhura, Kaṣāya
Guṇa : Pichila, Snigdha
Vīrya : Śīta
Vipāka : Madhura
Karma : Rucya, Rasāyana, Keśya, Dahapaustikara, Medhya, Dāha, Dradhykara, Pittanāśaka, Raktaprasādak

IMPORTANT FORMULATIONS - Aśokāriṣta, Arvindāsava, Uśīrāsava, Candanāsava, Kalyānaka Ghṛta, Samangādi Cūrna, Kanaka Taila, Jātyādi Taila, Tungadrumādi Taila, Manjesthādi Taila, Candanādi Lauha, Triphalā Ghṛta

THERAPEUTIC USES - Pipāsā Dāha, Raktapitta, Chardi, Mūrcchā, Hṛdraoga, Mūtra-Kecchra, Jwarātisāra

DOSE – 3-6 g. of the drug.

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 require the 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 a 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.

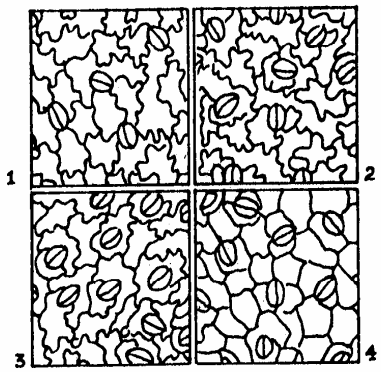

Fig. 1 Various types of stomata

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 microscopial 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.

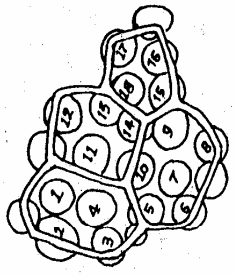

Fig. 2 Palisade ratio $\frac{18.4}{4} = 4.5$

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 temperature 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.

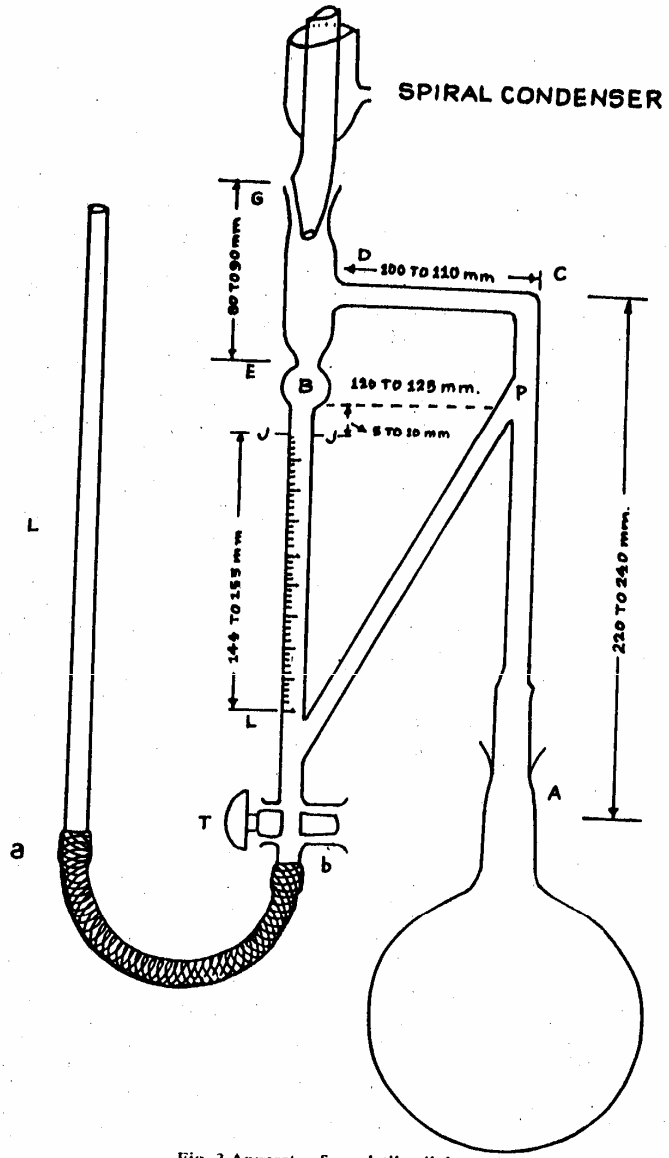

Fig. 3 Apparatus for volatile oil determination

(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).

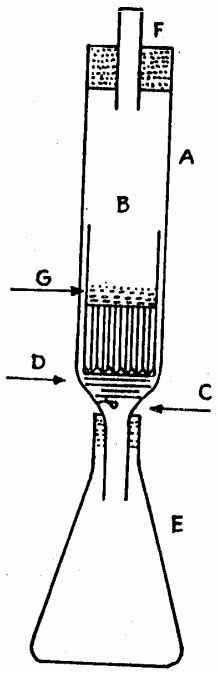

Fig. 4 Apparatus for the continuous extraction of Drugs

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.

2.3. 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* dissolved 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 Gravity

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 $C_2H_4O_2$.

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 NH_3 (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; insolubel 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 additonal 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 $Na_2B_4O7.10.H_2O$.

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 – Br_2 =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 $C_{19}H_{19}Br_4O_5S$ = 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 ent) 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 –$C_{10}H_{16}O$ = 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 $C_{10}H_{16}O$.

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; $C_{12}H_{18}O_5S$ = 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 *sodium 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 *sodium 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 ; $C_{14}H_{15}N_3$ = 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 – $(C_2H_5)_2$ O = 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 solution as indicator added towards the end of titration. Each ml of 0.*1 N sodium thiosulphate* is equivalent to 0.01622 g of $FeCl_3$.

Ferrous Sulphate – $FeSO_4. 7H_2O = 278.0$

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 CH_2O.

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 – I_2 = 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 *dilute 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; $(CH_3CO_2)_2Pb, 3H_2O$ = 379.33

Contains not less than 99.5 per cent and not more than the equivalent of 104.5 per cent of $C_4H_6O_4Pb, 3H_2O$.

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 $HgCl_2$;

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, 0.02 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 requird.

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 HNO_3 (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 tet 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_3PO_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_3PO_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 car-*

bonate, 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 –K_2CO_3 = 138.21

Contains not less than 98.0 per cent of K_2CO_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 additon 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 K_2CO_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 sufficent *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** –Disslove 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 additon 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 descibed 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 d*ilute 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,* using *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 con-

tinuously. 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 – $Ag_2CO_3 = 214$

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 *phenolhthalein solution* and sufficent *ammonia solution* dropwise to give the solution a faint pink colour. Cool and dilute to 25 ml with *water, Appendix 2.3.3.*

Chlorides –Dissovle 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, dissovle 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 ($Na_2S_2O_3$) 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 additon 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 persistant 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 efforesces 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 followng 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 additon 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 sufficent 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 – H_2SO_4 = 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 carefuully 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 requird to change the colour to yellow.

Titanous Chloride Solution –General reagent grade of commerce containing about 15 per cent w/v to $TiCl_3$.

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
	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 REFERENCES

आढ़की (मूल)

आढ़की कफ पित्तघ्नी वातला,
(च.सू.अ. 27/33)

आढ़की तुवरा रुक्षा मधुरा शीतला लघुः ।
ग्राहिणी वातजननी वर्ण्या पित्तकफास्रजित् ।।52।।
(भा.नि., धान्यवर्ग, 52)

आढ़की कफ पित्तघ्नी किं चन्मारुतकोपनी ।
कषाया स्वादु संग्राही कटुपाका हिमा लघुः ।।83।।
मेदः श्लेष्मास्रपित्तेषु हिता लेपोपसेकयोः ।
(ध.नि. धान्यानि वर्ग, 83)

आढ़की तु कषाया च मधुरा कफपित्तजित् ।
ईषद्वातकरा रुच्या विदुला गुरूग्राहिका ।।101।।
(रा.नि.शाल्यादि वर्ग, 101)

अग्निमंथ (मूल)

अग्निमंन्थ ---------- गोक्षुरका इति दशेमानि श्र्वयथुहराणि भवन्ति ।

(च.सू.,अ.4; 38)

अग्निमन्थ श्योनाका इति दशेमान्यनुवासनोपगानि भवन्ति ।।

(चरक सू., अ. 4.26)

अग्निमन्थो जयः सस्याच्छीपर्णी गणिकारिका ।
जया जयन्ती तर्कारी नादेयी वैजयन्तिका ।।
अग्निमन्थः श्वयथुनुद्वीर्योष्णः कफवातहृत् ।
पाण्डुनुत्कटुकस्तिक्तस्तुवरो मधुरोऽग्निदः ।।

(भा.प्र.,गुडुच्यादि वर्ग ; 23.24)

अग्निमन्थोऽग्निमन्थनस्तर्कारी वैजयन्तिका ।
वह्निमन्थोऽरणी केतु : श्रीपर्णीकर्णिका जया ।।
तर्कारी कटुकातिक्तातथोष्णाऽनिलपाण्डुजित् ।
शोफश्लेष्माग्निमान्द्याम विबन्धाश्च विनाशयेत् ।।

(धन्व.नि., गुडुच्यादि वर्ग- 108- 110)

अग्निमन्थो गुणैस्तद्वद्विशेषाद्वात शोफहा ।

(कै. नि., ओषधिवर्ग, 27.)

अग्निमन्थो मथः केतुररणिर्वैजयन्तिका ।
अग्निमन्थः श्वयथुहद्वीर्योष्णः कफवातनुत् ।।

(म.नि.,अभयादि वर्ग; 46)

अम्बठकी (मूल)

1. अम्बष्ठाघातकी कुसुमसमंगाकट्वंगमधुक बिल्वेपेशिका-
सावररोध्रपलाश नन्दीवृक्षाः पहनकेशराणि चेति ।(46)
गणौ प्रियंग्वम्बष्ठादी पक्वातीसारनाशनौ ।
सन्धानीयौ हितौ पित्ते व्रणानां चापि रोपणौ ।(47)
(सु.सं सूत्र 38/46-47)

2. अम्बष्ठा मधुकं नमस्करी नन्दीवृक्षापलाश कच्छुराः ।
रोध्रंधातकि बिल्वपेशिके कट्वंङ्ग कमलोभ्दवं राजः ।(38)
गणौ 'प्रियङ्ग्वम्बष्ठादी' पक्वातीसारनाशनौ ।
सन्धानीयौ हितौ पित्ते व्रणानामपि रोपणौ (39)
(अ.ह.सूत्र 15/38-39)

3. अम्बाष्ठा सा कषायाम्ला कफकण्ठरूजापहा।
वातामयबलासहनी रूचिकृद्दीपनी परा।(79)
(रा.नि.शताह्वादि वर्ग, 79)

4. अम्बाष्ठा मधुरा तिक्ता लघ्वम्ला रसपाकयो।
कफपित्तहरा कण्ठया पक्वातीसारनाशिनी।(784)
(कै.नि.ओषधिवर्ग, 784)

आम्र (बीज मज्जा)

आम्रश्चूतो रसालश्च सहकारोऽतिसौरभः ।
कामाङ्गो मधुदूतश्च माकन्दः पिकवल्लभः ।।
आम्रबीजं कषायं स्याच्छर्धतीसारनाशनम् ।
ईषदम्ल च मधुरं तथा हृदयदाहनुत् ।।
(भा.प्र.आम्रादिफलवर्ग17)

रूक्षश्चूतस्य संग्राही कृमिवातप्रकोपणः ।
कषायमधुरो मज्जा, ग्राहिणी त्वक् च दाहनुत् ।।
(कै.नि. औषधि वर्ग;343)

आम्र (शा.त्वक्.)

आम्र त्वचा कषाया च मूलं सौंगधि तादृशम् ।
रुच्यं संग्राहि शिशिरं ।

(रा.नि.आम्रादि वर्ग, 23)

आम्रान्तस्त्वग् ग्राहिणी तु तुवरा दाहकारिणी ।
पित्तमेहकफानाहनाशिनी योनिशुद्धकृत् ।।

(निघण्टु रत्नाकर)

रक्तातिसारे ---------- आम्रार्जुनत्वचः ।

(वृन्द)

आम्रात (शाखा)

आम्रातक:पीतनश्च मर्कटाम्र: कपीतन:।
आम्रामम्लं वातघ्नं गुरूष्णं रूचिकृत्सरम् ।19।।
पक्वन्तु तुवरं स्वादु रसे पाके हिमंस्मृतम् ।
तर्पणं श्लेष्मलं स्निग्धं वृष्यं विष्टम्भि बृंहणम् ।।
गुरू बल्यं मरूत्पित्तक्षतदाहक्षयास्रजित् ।।20।।

(भा.प्र., आम्रादि फल वर्ग, 19-20)

आम्रातक: पीतनक: कपिचूतोऽम्लवाटक: ।
श्रृंड्.गी कपी रसाढ्यश्च तनुक्षीर: कपिप्रिय:।।9।।
आम्रातकफलं वृष्यं पित्तास्रकफवह्निकृत् ।
शीतं कषायं मधुरं किन्चिन्मारूतकृद्गुरू ।।10।।।

(धन. नि., आम्रादि वर्ग 9-10)

आम्रातकस्तनुक्षीरो वर्षापाकी फलीशक: ।।409।।
कपिचूतश्चाम्रवटो दुष्फलोऽथ कपीतन: ।
आम्रातमम्लं वातघ्नं रुच्यं पित्तकफास्रकृत।।410।।
सरं गुरूष्णं पक्वं तु स्वादुपाकरसं हिमम् ।
तर्पणं श्लेष्मलं स्निग्धं वृष्यं विष्टंभि बृंहणम।।411।।
गुरू:बल्यं मरुत्पित्तदाहक्षतक्षयास्रजित् ।
आम्रातकप्रबालं तु ग्राहि दीपनरोचनम् ।।412।।

(कैयदेव निघण्टु, औषधि वर्ग 409-412)

अपामार्ग (मूल)

1. अपामार्गः सरस्तीक्ष्णो दीपनस्तिक्तः कटुः ।
पाचनो रोचनश्छर्दि कफमेदोऽनिलापहः।
निहन्ति हृद्रुजाध्मार्शः कण्डूशूलोदरापचीः।।220)।।
(भा.प्र.नि.,गुडुच्यादिवर्ग, 220)

2. अपामार्गस्तु तिक्तोष्णः कटुश्च कफनाशनः।
अर्शः कण्डूदरामघ्नो रक्तहृदग्राहिवान्तिकृत्।।262।।
(ध.नि. गुडुच्यादि वर्ग, 262)

3. प्रत्यकपुष्पा शिरोविरेचनानां ।।
(च.सू. 25/40)

अरलुक (शा.त्वक्.)

महानिम्बो हिमो रुक्षस्तिक्तो ग्राही कषायकः ।।98।।
कफपित्तभ्रमच्छर्दि कुष्ठहल्लास रक्तजित् ।
प्रमेह श्वास गुल्मार्शो मूषिका विषनाशनः ।।99।।
(भा.प्र.गुडूच्यादि वर्ग; 98-99)

अरलुः कफहद्ग्राही दीपनः कृमिकुष्ठहृत् ।
कटुकः शीतलः तिक्तो बस्तिरोगहरः परः ।।
(नि. रत्नाकर)

श्योनाकयुगलं तिक्तं शीतलं च त्रिदोषजित् ।
पित्तश्लेष्मातिसारघ्नं सन्निपातज्वरापहम् ।
[(रा.नि.)प्रभद्रादिवर्ग,30]

अर्क (शा.त्वक्.)

----- अर्क इति भेदनीयानि भवन्ति ।4।
----- अर्क इति स्वेदोपगानि भवन्ति ।22।
(च.सू. 414,22)

अर्कस्तु कटुरूष्श्च वातह्वद्दीपनः सरः ।
शोफव्रणहरः कण्डूकुष्ठप्लीहकृमीन्जयेत् ।।13।।
(ध.नि.करवीरादिवर्ग 13)

अर्कः क्षीरदलः पुच्छी प्रतापः क्षीरकाण्डकः ।
विक्षीरो भास्कर क्षीरी खर्जूघ्नः शिवपुष्पकः।।126।।
सूर्याह्वश्रच सदापुष्पो रविरास्फोटकस्तथा । 27
अर्कस्तु कटुरूष्णश्रच वातजिद्दीपनीयकः।।
शोफब्रणहरः कण्डू कुष्ठक्रिमिविनाशनः ।।128।।
(रा.नि.,करवीरादि वर्ग, 126-128)

अर्कद्वयं सरं वातकुष्ठविषव्रणान ।
निहन्ति प्लीहगुल्मार्शः श्लेष्मोदरार्शकृमीन् ।।69।।
(भा.प्र.नि.,गु.वर्ग,69)

असन (शा.त्वक्.)

यथा सर्वाणि कुष्ठानि हतः खदिरबीजकौ ।
(सु.सू., 6/19)

असनादिर्विजयते श्वित्रकुष्ठकफक्रिमीन् ।
पाण्डुरोगं प्रमेहं च मेदोदोषनिबर्हणः ।।20।।
(अष्टांगहृदय सू. 15/20)

बीजकः पीतसारश्च पीतशालक इत्यपि ।
बन्धूकपुष्पः प्रियकः सर्जकश्चासनः स्मृतः ।।28।।
बीजकः कुष्ठवीसर्पश्वित्रमेहगुदक्रिमीन ।
हन्ति श्लेष्मास्रपित्त च त्वच्यः केश्यो रसायनः ।।29।।
(भा.प्र.नि., वटादिवर्ग, 28-29)

असनः कटुरुष्णश्च तिक्तो वातार्त्तिदोषनुत् ।
सारको गलदोषघ्नो रक्तमण्डलनाशनः ।।133।।
(रा.नि., प्रभद्रादिवर्ग,133)

बीजकः सकषायश्च कफपित्तास्रनाशनः।।115।।
(ध.नि., आम्रादि वर्ग 115)

अस्थिसंहृत (शाखा)

अस्थिसंहारकः प्रोक्तो वातश्लेष्महरोऽस्थियुक्।
उष्णः सरः कृमिघ्नश्च दुर्नामघ्नोऽक्षितरोगहृत।।
रुक्षः स्वादुर्लघुर्वृष्यः पाचनः पित्तलः स्मृतः।
भिषग्वरैर्यथानामफलं चापि प्रकीर्कित्तम्।।
(भा.प्र.नि.226-227 गुडुच्यादि वर्ग)

वज्रप्रोक्तास्थिसंहारो वज्रांगी क्रोष्टुघंटिका।।1593।।
अस्थिश्रृङ्खलिका ज्ञेया ग्रंथिला वज्रवल्लरी।
वज्रवल्ली सरा रुक्षा कृमिदुर्नामनाशिनी।।1594।।
दीपन्युष्णा विपाके च स्वाद्वी वृष्या बलप्रदा।
अस्थिसंधान जननी वातश्लेष्महरा गुरूः।।1595।।
(कैयदेव निघण्टु, ओषधिवर्ग, 1593-95)

आत्मगुप्ता (बीज)

कपिकच्छूफलं वृष्यं शीतं स्वादुरसं गुरू ।
रक्तपित्तानिलहरं दुष्टव्रणविशोधनम् ।।609।।
(कै.नि. औषधि वर्ग 609)

कपिकच्छूरात्मगुप्ता वृष्या प्रोक्ता चमर्कटी ।
अजडा कण्डुरा व्यङ्गा दुःस्पर्शा प्रावृषायणी ।।129।।
लाङ्गली शूकशिम्बी च सैव प्रोक्ता महर्षिभिः ।
कपिकच्छूर्भृशं वृष्या मधुरा बृंहणी गुरूः।
तिक्ता वातहरी बल्या कफपित्तास्त्रनाशिनी ।।130।।
(भा.प्र. नि.,गुडूच्यादि वर्ग;129-130)

भारङ्गी (मूल)

1. भार्गी भृगुभवा फञ्जी ब्राह्मणयष्टिका।
ब्राह्मण्यंगारवल्ली च खरशाकश्च हञ्जिका।।182।।
भार्गी रूक्षा कटुस्तिक्ता रूच्योष्णा पाचनी लघुः।
दीपनी तुवरा गुल्मरक्तनुन्नाशयेद् ध्रुवम्।।

शोथकासकफश्वासपीनसज्वरमारूतान्। 183।
(भा.प्र.नि.,हरितक्यादि वर्ग;182-183)

भार्गी गर्दभशाकं च पद्मा ब्राह्मयष्टिका।
अङ्गारवल्ली फञ्जी च सैव ब्रह्मासुवर्चसा।।
शक्रमाता च कासघ्नी भृङ्गजाभार्गवा मता।

भार्गी स्यात् स्वरसे तिक्ता चोष्णा श्वासकफापहा।
गुल्मज्वररासृग्वातघ्नी यक्ष्माणं हन्ति पीनसम्।(68)
(धन्व.नि., गुडुच्यादि वर्ग 67-68)

खरशाकं शुक्रमाता भार्गी ब्राह्मणृयष्टिका।
फंजी पद्माऽङ्गारपर्णी महागर्दभगन्धिका।।(1134)
भृगुजा भंगुरा हंसी पालिंदी मार्गपर्वणी।
भार्गी तिक्ता कषायोष्णा दीपनी पाचनी लघुः।।(1135)
कट्वी रूक्षा ज्वरश्वासकासशोफकफानिलान्।
पीनसारूचिगुल्मास्त्रयक्ष्माणं विनियच्छति।।(1136)
(कैयदेव नि., औषधि वर्ग1134-1136)

बीजपूर (फल)

शूलेऽरुचौविबन्धे च मन्देऽग्नौ मद्यविप्लवे। हिक्काश्वासे च वन्यां वर्गोगदेषु च ।
वातश्लेष्मसमुत्थेषु सर्वेप्वेपदिश्यते । केसरं मातुलुंङ्गस्य लघु शेषमतोऽन्यथा ।। 148।।
(च. सू. स्थान,अध्याय ....,148)

लघ्वम्लं दीपनं हृद्यं मांतुलुंङ्.गमुदाहृतम्। त्वक् तिक्ता दुर्जरा तस्य वातकृमिकाफापहा ।।149।।
स्वादु शीतं गुरू स्निग्धं मांसं मारूतपित्तजित्। मेध्यं शूलानिलच्छर्दिकफारोचकनाशनम्।।150।।
दीपनं लघु संग्राहि गुल्मार्शोघ्नं तु केसरम्। शूलाजीर्णविबन्धेषु मन्देऽग्नौ कफमारूते।।151।।
(सु.सू.,अ.46;149-151)

बीजपुरो मातुलुंङ्गो रूचकः फलपूरकः। बीजपूरफलं स्वादु रसेऽम्लदीपनं लघु।।(130)
रक्तपित्तहरं कण्ठजिह्वाहृदयशोधनम्। श्वासकासरूचिहरं हृद्यं तृष्णाहरं स्मृतम्।।(131)
(भा.प्र.नि.,आम्रादिफलवर्ग, 130-131)

बीजपुरफलमम्लकटूष्णं श्वासकासशमनं पाचनं च।कण्ठशोधनपरं लघु हृद्यं दीपनं च रूचिकृज्जरणं च।।148।
(रा.नि.आम्रादिवर्ग; 148)

श्वासकासारूचिहरं तृष्णाघ्नं कण्ठशोधनम्। लघूष्णं दीपनं हृद्यं मातुलुंङ्.गमुदाहृतम्।।19।।
त्वत्तिक्ता दुर्जरा तस्य वातकृमिकफापहा। स्वादु शीतं गुरू स्निग्धं मांसं मारूतपित्तकृत्।।20।।
मेध्यं शूलार्तिच्छार्दिघ्नं कफारोचकनाशनम्। दीपनं लघु संग्राहि गुल्मार्शोघ्नं तु केशरम्।।21।।

पित्तमारूतकृदबल्यं दीपनं वृद्धकेशरम्। हृदयं वर्णकरं रूच्यं रक्तमांसबलप्रदम्।।22।।
शूलाजीर्णविबन्धेषु मन्दाग्नौ कफमारूते। अपची श्वास कासेषु रसस्तस्योपयुज्यते।।23।।
रसोऽतिमधुरो हृद्यो शुक्रपित्तानिलापहः। कफकृद्दुर्जरा पाके मातुलुंङ्.गजटा कटुः।।24।।
मूल चैव कृमिन्हन्ति पुष्पं बीजं च गुल्मजित्। (धन्व.नि., आम्रादि वर्ग19-24)

लुंङ्.गं पित्तकरं हृद्यं रूच्याम्लं दीपनं लघु। ।।254।।
(पित्तास्त्रदूषणं रुच्यं जिह्वास्यकण्ठशोधनम्)
उष्णं वातकफश्वासकासतृष्णांवमिप्रणुत्।।255।।
तद्रसः पार्श्वहृदबस्तिशूलश्लेष्मसमीरणाम्।
कासश्वासारूचिच्छर्दिवह्निमान्द्यं निमच्छति।।258-259।।
(कैयदेव नि., 254, 255,258-259)

बिल्व (मूल)

जटा दोषवमीकृच्छंशूलघ्नी मधुरा लघुः।
कफवातामशूलघ्नो .....।।20।।
(कै.नि. औषधि वर्ग, 20)

बिल्वमूलं त्रिदोषघ्नं छर्दिघ्नं मधुरं लघु ।।106।।
(ध.नि., गुडुच्यादि वर्ग106)

बिम्बी (सं. व.)

बिम्बी रक्तफला तुण्डीतुण्डकेरी च बिम्बिका ।
ओष्ठोपमफला प्रोक्ता पीलुपर्णी च कथ्यते ।।73।।
बिम्बीफलं स्वादुशीतं गुरू पित्तास्रवातजित् ।
स्तभनं लेखनं रुच्य विबन्धाध्मानकारकम् ।।74।।
(भा.प्र., शाकवर्ग; 73-74)

तुण्डिका कफपित्तासृक्शोफपाण्डुज्वरापहा ।
श्वासकासापहं स्तन्यं फलं वातकफापहम् ।।201।।
(धन्वंतरी नि.; गुडुच्यादि वर्ग 201)

बिम्बी तु मधुरा शीता पित्तश्वासकफापहा ।
असृग्ज्वरहरा रम्या कासजिद्गृहविम्बिका ।।
(रा.नि., मूलकादिवर्ग; 190)

तुण्डिका कफपित्तासृक्शोथपाण्डुज्वरापहा ।
श्वासकासापहं स्तन्यं फलं वातकफापहम् ।।
तिक्तं प्रसूनं पित्तध्नं तत्परं कामलापहम् ।
(कै.नि. ओषधि वर्ग,585)

तिक्ताबिम्बीफलं तिक्तं पित्तघ्नं वातकोपनम् ।।586।।
विषघ्नं अतिरुच्यं स्यात् गुरू श्लेष्मकरं न च ।
शोफास्रपाण्डून् जयति न मेध्यं छर्दिकृत् परम् ।।587।।
(कै.नि.ओषधि वर्ग, 586-587)

चांङ्गेरी (सं.व.)

चाङ्गेंरी दीपनी रुच्या रुक्षोष्णा कफवातनुत् ।
पित्तलाम्ला ग्रहण्यर्शः कुष्ठातीसारनाशिनी ।।24।।
(भा.प्र.शाकवर्ग 24)

चाङ्गेरी कफवातघ्नी ग्राहिण्युष्णा च पित्तकृत् ।
ग्रहण्यर्शोविकारघ्नी सामवाते कफे हिता ।।31।।
(ध.नि.आम्रादि वर्ग 31)

चाङ्गेर्यम्ला कषायोष्णा मधुरा दीपनी लघुः ।
पित्तला हन्त्यतीसार ग्रहण्यर्शःकफानिलान ।।698।।
(कै.दे.नि; ओ.वर्ग 698)

चाङगेरीशाकमत्युष्णं कटु रोचनपाचनम् ।
दीपनं कफवातार्शः संग्रहण्यतिसारजित् ।।
(रा.नि.)

चिराबिल्व (फल)

श्रीफलस्तुवरस्तिक्ता ग्राही रुक्षोऽग्निपित्तकृत।
वातश्लेष्महरोबल्यो लघुरुष्णश्च पाचनः।।13।।

(भा.प्र., गुडुच्यादि वर्ग, 13,)

दन्ती (मूल)

दन्ती तीक्ष्णोष्ण कटुका कफवातोदरान जयेत्।
अर्शो व्रणाश्मरीशूलान् हन्ति दीपनशोधनी।।224।।
(ध.नि.गुडुच्यादि प्रथमवर्ग 224)

दन्तीद्वयम् सरं पाके रसे च कटु दीपनम्।
गुदांकुराश्मशूलार्शः कण्डू कुष्ठ विदाहनुत्।।
तीक्ष्णोष्ण हन्ति पित्तास्रकफशोथोदर कृमीन्।
(भा.प्र.नि.गुडुच्यादिवर्ग)

तीक्ष्णोष्णान्याश्याशुकारीणि विकाशीनि गुरूणि च।
विलाययन्ति दोषौ द्वौ मारुतं कोपयन्ति च।।
(च.क. 12)

तयौंमूलानि संग्राह्य स्थिराणि बहलानि च।
हस्तिदन्त प्रकाराणि श्यावताम्राणि बुद्धिमान्।।
पिप्पलीमधुलिप्तानि स्नेदयेत् मृत्कुशान्तरे।
शोषयेदातपेन्यकौ हतो ह्येषां विकाशिताम्।।
(च.क. 12)

दन्ती द्रवन्ती स्नेहास्तिक्तकटुकषायाः अधोभाग।
दोषहरा कृमि कुष्ठकफानिलहराः दुष्ट व्रण शोधनाश्च।।
(सु.सू. 45)

दन्ती कटूष्णा शूलाम् त्वग्दोषशमनी च सा।
अर्शो व्रणाश्मरी शल्य शोधनी दीपनी परा।।(160)
(रा.नि.पिप्पल्यादि वर्ग, 160)

दन्ती द्रवन्तिका चोष्णा कटु पाकरसा लघुः।
विकाषिणी सरा तीक्ष्णा दीपनी पाचनी हरेत्।।(1010)
कफपित्तोदरानाह शोफशूल गुदांकुरान्।
विदाहकण्डूकुष्ठास्रप्लीह गुल्माश्मरी कृमीन्।।(1011)
(कै.द.नि.औषधिवर्ग 1010-10)

धत्तूर (बीज)

धत्तूरः कनको धूर्त्तो देवता कितवः शठः।
उन्मत्तको मदनकः कालिश्च हरवल्लभः।।6।।
धत्तूरः कटुरूष्णश्च कान्तिकारी व्रणार्तिनुत्।
कुष्ठानि हन्ति लेपेन प्रभावेण ज्वरं जयेत्।।7।।
त्वग्दोष कृच्छ्र कण्डूतिज्वरहारी भ्रमावहः।
(ध.नि.करवीरादिवर्गः 6-7)

धत्तूरः कितवोः धूर्त्त उन्मत्तः कनकाह्वयः।
शठो मातुलकः श्यामो मदनः शिवशेखरः।।17।।
खर्जूरघ्नः काहलापुष्पः खलः कण्टफलस्तथा।
मोहन कलमोन्मत्तः शैवः सप्तदशाह्वयः।।18।।
धत्तूरः कटुरूष्णश्च कान्तिकारी व्रणार्तिनुत्।
त्वग्दोषखर्जू ज्वरहारी भ्रमप्रदः ।।19।।
(रा.नि.करवीरादि वर्ग, 17-19)

धस्तुरो मदनो धूर्तो देवता कितवः शठः।।1545।।
उन्मत्तस्तरलस्तूरी धत्तूरः कनकाह्वयः।।
व्यालहा मातुलस्तस्य फलं मातुलपुत्रकः।।1546।।
धत्तूरो मधुरस्तिक्तस्तीक्ष्णोष्णस्तुवरो गुरूः।।
उन्मादावांतिमंदाग्निकांतिदो ज्वरकुष्ठनुत्।।1547।।
यूकालिक्षाव्रणश्लेष्मकृमिकण्डूविषापहा।
(कै.नि. ओषधि वर्ग;1545-1547)

धत्तूरधूर्त्तधत्तूरा उन्मत्तः कनकाह्वयः।
देवता किववस्तूरी महामोही शिवप्रियः।।85।।
मातुलो मदनश्चास्य फले मातुलपुत्रकः।
धत्तूरो मदवर्णाग्निवातकृज्जवरकुष्ठतुत्।।86।।
कषायो मधुरस्तिक्तो यूकालिक्षाविनाशकः।
उष्णो गुरुर्व्रणश्लेष्मकण्डूकृमिविषापहः।।87।।
(भा.प्र.गुडूच्यादिवर्गः 85-87)

द्राक्षा (फल)

1. तृष्णा दाह ज्वर श्वास रक्तपित्त क्षत क्षयान्।
वातपित्त मुदावर्तं स्वरभेदं मदात्ययम्।।125।।
तिक्तास्य तामास्य शोषं कासं चाशुव्यपोहति ।
मृद्विका बृंहणी वृष्या मधुरा स्निग्धशीतला।।126।।
(च.सू.स्था.अ.27, 125-126)

2. द्राक्षा चारुफला कृष्णा प्रियाला तापसप्रिया।
काश्मीरिका विनिर्दिष्टा रसाला करमर्दिका।।49।।
द्राक्षा हृद्यरसा स्वर्या मधुरा स्निग्धशीतला।
रक्तपित्त ज्वर श्वास तृष्णा दाह क्षयापहा।।50।।
(धन नि. आम्रादि वर्ग 49-50)

3. द्राक्षा स्वादुफला प्रोक्ता तथा मधुरसाऽपि च।
मद्वीका हारहूरा गोस्तनी चापि कीर्तिता।।
द्राक्षा पक्वा रसा शीता चक्षुष्या बृंहणी गुरूः।
स्वादु पाक रसा स्पर्या तुवरा सृष्टमूत्रविद्।। 111।।
कोष्ठमारुतकृद् वृष्या कफपुष्टिरुचिप्रदा।
हन्ति तृष्णा ज्वर श्वास वात वातास्र कामला।।
कृच्छ्रास्रपित्त संमोह दाहशोषसमदात्ययान्।112।।
(भा.प्र.नि. आम्रादि फलवर्ग 111-112)

दूर्वा (बीज)

दूर्वा शीता कषाया च रक्तपित्तकफापहा।

(ध.नि., चन्दनादि वर्ग)

दूर्वाः कषायाः मधुराश्च शीताः पित्ततृषारोचक वान्तिहन्त्र्यः।
सदाहमूर्च्छाग्रहभूतशान्ति श्लेष्म श्रमध्वंसनतृप्तिदाश्च।।117।।

(रा.नि., शाल्मल्यादि वर्ग,117)

दूर्वा स्वाद्वी हिमा तिक्ता कषाया जीवनी जयेत्।
कफपित्तास्र विसर्प तृषादाहत्वगामयान्।।1237।।

(कै.दे.नि;ओषधिवर्ग, 1237)

नीलदूर्वा हिमा तिक्ता मधुरा तुवरा हरेत्।
कफपित्तास्रवीसर्पतृष्णादाहत्वगामयान्।।173।।

(भा.प्र. गुडुच्यादि वर्ग 173)

एरण्ड (पत्र)

एरण्डपत्रं वातघ्नं कफक्रिमिविनाशेनम्।
मूत्रकृच्छ्रहरं चापि पित्तरक्तप्रकोपणम्।
वातार्यग्रदलं गुल्मबस्तिशूलहरं परम्।।64।।
कफवातकृमीन्हन्ति वृद्धि सप्तविधामपि।
(भा.प्र.नि.,गुडूच्यादिवर्ग, 64)

एरण्डो मधुरो वृष्यो गुरुष्णो मार्गशोधनः।
कफपित्तानिलश्वासकासवर्ध्माश्मनाशनः।।115।।
गुल्मप्लीहोदरानाहकटीवस्तिशिरोरुजि।
मेहज्वरामवातास्रशूलशोफेषु शस्यते।।116।।
एरण्डपत्रं वातघ्नं कफक्रिमिविनाशनम्।
रक्तपित्तप्रकोपि स्यात् मूत्रदोषं जयेदपि।।117।।
गुल्मं च वस्तिशूलं च वृद्धिं सप्तविधां तथा।
कफवातकृमिंश्चापि हन्यादेरण्डपल्लवम्।।118।।
(कै.दे.नि.ओषधिवर्ग 115-118)

एरण्डेऽपि रसे तिक्तः स्वादूष्णोऽनिलनाशनः।
उदावर्तप्लीहगुल्मवस्तिशूलान्त्र वृद्धिनुत्।।297।।
गुरुर्वातप्रशमनो विकाराञ्शौणिताञ्जयेत्।
फलं स्वादु च सक्षारं लघूष्णं भेदि वातजित्।।298।।
(ध.नि., 297-298)

एरण्ड (बीज)

एरण्डफलमत्युष्णं गुल्मशूलानिलापहम्।।65।।
यकृत्पलीहोदरार्शोघ्नि कटुकं दीपनं परम्।
तद्वन्मज्जा च विड्भेदी वातश्लेष्मोदरापहा।।66।।
(भा.प्र.नि. गुडुच्यादिवर्ग, 65-66)

निष्कुष्यैरण्डबीजानि पिष्ट्वा क्षीरं विपाचयेन्।
तत्पानं तु कटिशूले गृध्रस्यां परमौषधम्।।37।।
(भा.नि., म.ख.चि.8/137)

आमवातगजेन्द्रस्य शरीरवन चारिणः।
एक एव निहन्तायमेरण्ड स्नेहकेशरी।।50।।
(भा.प्र.म.ख.चि. 8/50)

एरण्डतैलं मधुरमुष्णं तीक्ष्णं कटु कषायानुरसं सूक्ष्मं
स्रोतोविशोधनं त्वच्यं वृष्यं मधुरविपाकं वयः स्थापनं
योनिशुक्र विशोधनमारोग्य मेधा कान्ति स्मृतिबलकरं
वातकफहरमधोभाग दोषहरं च।।4।।
(सु .सू. स्थान 45/114)

गंभारी (शाखा)

काश्मर्य. . . . . विरेचनोपगानि भवन्ति।(च.सू.4/24)

काश्मर्य. . . . . इति दशेमानि श्वयथुहराणि भवन्ति। (च.सू. 4/38)

गंभारी भद्रपर्णी च श्रीपर्णी मधुपर्णिका।
कृष्णवृन्ता मधुरसा महाकुसुमिकाऽपि च।
काश्मरी तुवरातिक्ता वीर्योष्णा मधुरा गुरुः।।
दीपनी पाचनी मेध्या भेदिनी भ्रमशोषजित्।
दोषतृष्णाऽऽमशूलार्शोविष दाहज्वरापहा।।
(भा.प्र. गुडुच्यादिवर्ग 14-16)

काश्मर्या काश्मरी हीरा काश्मर्यो मधुपर्ण्यपि।
श्रीपर्णी सर्वतोभद्रा गंभारी कृष्णवृन्तका।।
श्रीपर्णी स्वरसे तिक्ता गुरूष्णा रक्तपित्तजित्।
त्रिदोष श्रम दाहार्त्ति ज्वरं तृष्णाविषा जयेत्।।
(ध.नि.गुडूच्यादिवर्ग 114-115)

काश्मरी कटुका तिक्ता गुरूष्णा कफशोफनुत्।
त्रिदोष विषदाहार्त्ति ज्वर तृष्णास्रदोषजित।
(रा.नि.प्रभद्रादिवर्ग 38)

गंभारी कट्फला हीरा काश्मर्या मधुपर्णिका।
कृष्णवृन्ता भद्रपर्णी कुंभारी सफला मही।।
श्रीपर्णी मधुरा तिक्ता वीर्योष्णा तुवरा गुरूः।
दीपनी पाचनी मेध्या भेदनी भ्रमशोषजित्।।
दोषतृष्णामशूलार्शोविषदाहज्वरापहा
(कै.नि.ओषधिवर्ग 29-30)

काश्मरी ज्वर शूलघ्नी वीर्योष्णा मधुरा गुरूः।।
(म.नि.अभयादिवर्ग 51)

गोजिह्वा (को. पत्र)

गोधूमिका दर्विपत्री दर्विका कोष्ठशूलिका।
गोभी गोली च गोजिह्वा विज्ञेया भूमिकालिका।।733।।
गोजिह्वा तुवरा तिक्ता स्वादुपाकरसाः हिमा।
वातघ्ना ग्राहिणी हृद्या कफपित्तहरा लघुः।।734।।
हन्यात् कासारुचिश्वासप्रमेहास्रज्वरव्रणान्।
(कैयदेव नि., ओषधि वर्ग733-734)

ग्रन्थिपर्णी (मूल)

ग्रन्थिपर्णं ग्रन्थिक च काकपुच्छ च ।
नीलपुष्पं सुगन्ध च कथितं तैलपर्णकम् ।
ग्रन्थिपर्णं तिक्ततीक्ष्णं कटूष्णं दीपनं लघु ।
कफवात विषश्वास कण्डू दौर्गन्ध्यनाशनम् ।।108।।

(भा.प्र., कर्पूरादि वर्ग108)

हंसपदी (सं.व.)

हंसपादी हंसपदी कीटमाता त्रिपादिका ।
हंसपादी गुरूः शीता हन्ति रक्तविषव्रणान् ।
विसर्पदाहातीसारलूताभूताग्निरोहिणीः ।।256।।
(भा.प्र., गुडुच्यादि वर्ग 256)

रक्तपाद्यपरा प्रोक्ता विषग्रन्थिस्त्रिपाद्यपि ।
हंसपादी हंसपदी घृतमण्डलिका च सा ।।99।।
रक्तप्रसादनी शीता, दाहवीसर्पनाशिनी ।
व्रणप्ररोपणी हंसपदिका हंसपादिका ।।100।।
(धन्व. नि., करवीरादि वर्ग 99-100)

प्रह्लादनी विषग्रन्थिस्त्रिपादी त्रिपदी पदी ।
हंसपादी हंसपदी रक्तपादी मधुस्रवा ।।766।।
कीटनामा कीटमारी घृतमंडालसेलका ।
हंसपादी हिमा गुर्वी रोपणी हन्ति शोणितम् ।।767।।
दाहातीसारविसर्पलूताभूतविषव्रणान् ।
(कैयदेव नि., ओषधि वर्ग 766-767)

हपुषा (फल)

हपुषा . . . . . मत्स्यागन्धाप्लीहहन्त्री विषघ्नीघ्वांक्षनाशिनी ।।
हपुषा दीपनी तिक्ता मृदूष्णा तुवरा गुरूः ।
पित्तोदरसमीरार्शो ग्रहणी गुल्मशूलहृत् ।।100।।
(भा.प्र.नि., हरीत्क्यादि वर्ग, 100)

हपुषा कटु तिक्तोष्णा गुरूर्वातवलासजित् ।
अर्शांसि गुल्मशूलानि हन्ति जन्तूदरैः सह ।।10।।
(ध.निघण्टु, शतपुष्पादिवर्ग, 10)

इन्द्रवारूणी (फल)

गवादनीयद्वयं तिक्तं पाके कटु सरं लघु।।204।।
वीर्योष्णं कामलापित्तकफप्लीहोदरापहम्।।205।।
श्वासकासापहं कुष्ठगुल्मग्रन्थिव्रणप्रणुत्।
प्रमेहमूढगर्भामगंडामयविषापहम्।।206।।

(भा.प्र.नि. गुडुच्यादिवर्ग, 204-206)

इन्द्रवारूणिकाऽत्युष्णा रेचनी कटुका तथा।
कृमिश्लेष्माव्रणान हन्ति हन्ति सर्वोदराण्यपि।।

(ध.नि. गुडुच्यादिवर्ग, 241)

इन्द्रायन (कुट्ज बीज)

कुटजः कटुको रूक्षो दीपनस्तुवरो लघुः ।।54।।
अशेडिलिसारपित्तास्त्रकफतृष्णामपित्तनुत ।।
तत्पुष्पं शीतलं तिक्तं कषायं लघु दीपनम् ।
वातलं कफपित्तास्त्रकुष्ठातीसार जन्तुजित् ।
तस्य शिम्बिभवं शां भंजनं चामवातजित् ।
रूच्यं कफध्नं रक्तातिसारं कुष्ठ कृमीन् जयेत् ।।
(म.नि.)

कुटजः कटु-तिक्तोष्णः कषायश्चतिसारजित् ।
तत्रसितश्च पित्तध्नः त्वग्दोषार्शोनिकृन्तनः ।।54।।
(रा.नि. प्रभद्रादि वर्ग, 54)

कुटजः कटुकः तिक्तः कषायो रूक्षशीतलः ।
कुष्ठातिसारपित्तास्त्रगुदजानि विनाशयेत् ।।14।।
(ध.नि.शतपुष्पापदि वर्ग, 14)

कुटजः कटुको रूक्षो दीपनस्तुवरो हिमः ।
अशेऽितिसारापित्तास्त्रकफतृष्णाऽऽमकुष्ठनुत् ।।18।।
(भा.नि. गुडुच्यादि वर्ग, 118)

कफपित्तहरं पुष्पं कुष्ठध्नं कुटजस्य च ।।
(सुश्रुत सू. 46. 284)

इन्द्रयव (बीज)

इन्द्रयवस्त्रिदोषघ्नः संग्राही शीतलः कटुः ।
ज्वरातिसाररक्तार्शः कृमिवीसर्पकुष्ठनुत् ।।
(म.नि.)

इन्द्रयवः कटुतिक्ताः शीतः कफवातपित्तहराः।
दाहातिसारशमनाः नानात्वग्दोषशूलघ्नाः।।57।।
(रा.नि. प्रभद्रादिवर्ग, 57)

शक्राह्वाः कटुतिक्तोष्णास्त्रिदोषघ्नश्च दीपनाः।
रक्तार्शास्यितिसारं च घ्नन्ति शूलवमी स्तथा ।।16।।
(ध.नि. शतपुष्पादिवर्ग, 16)

इश्वरी (मूल)

1. इश्वरी नामदमनी महायोगेश्वरी तथा।
महायोगेश्वरी तिक्ता कटुका हरते व्रणान्।
रक्षोग्रहं विषं सर्प लूतागर्दभ लाजकान्।।
(कै.दे.नि.औषधिवर्ग780)

2. नाकुली तुवरा तिक्ता कटुकोष्णा नियच्छति।
भोगिलूता वृश्चिकारवुविषज्वरकृमिव्रणान्।।166।।
(भा.प्र.नि. हरीतक्यादि वर्ग, 166)

जाती (पत्र)

जातीयुगं तिक्तमुष्णं तुवरं लघु दोषजित्।
शिरोऽक्षिमुखदन्तार्त्ति विषकुष्ठानिलास्रजित्।।28।।
(भा.प्र.नि. पुष्पवर्ग 28)

मालती तुवरा तिक्ता कटूष्णा दोषनाशिनी ।
शिरोऽक्षिमुखदन्तार्त्ति विषकुष्ठाव्रणास्रजित्।।1474।।
(कै.दे.नि. ओषधि वर्ग 1474)

कदली (प्रकन्द)

1. कदली मधुरा शीता, रम्या पित्तहरा मृदुः।
कदल्यास्तु फलं स्वादु कषायं नीति शीतलम्।।69।।
रक्तपित्त हरं वृष्यं रुच्यं कफकरं गुरु।
कंदस्तु वातलोरुक्षः शीतोऽसृक्कृमिकुष्ठनुत्।।70।।
(ध.नि. करवीरादिवर्ग 69-70)

2. शीतलःकदलीकन्दो बल्यः केश्योऽम्लपित्तजित्।
वह्निकृद्दाहहारी च मधुरो रुचिकारकः।।105।।
(भा.प्र.शाकवर्ग 105)

3. बल्यःकदल्याःकन्दः स्यात् कफपित्तहरो गुरु।।283।।
वातलो रक्तशमनः कषायो रूक्ष शीतलः।।
कर्ण शूलं रजोदोषं रोमरोगं नियच्छति।284।।
(कै.दे.नि.औषधि वर्ग 283-284)

कदली .....एषरोध्रादिको नाम मेदः कफहरोगणः।
योनिदोषहरः स्तम्भी वर्ण्यो विषनाशनः।।(27)
(अ.हृ.सू.स्था. 15, 27)

क्रिमिंहारि कन्दं ।।(38)
(रा.नि.आम्रादि वर्ग 38)

काकजङ्घा (मूल)

काकजङ्घा नदीकान्ता काकतिक्ता सुलोमशा।
पारावतपदी दासी काका चापि प्रकीर्तिता ।।250।।
काकजंघा हिमा तिक्ता कषाया कफपित्तजित्।
निहन्ति ज्वरपित्तास्त्रव्रणकण्डूविषक्रिमीन्।।251।।
(भा.नि. पृष्ठ गुडुच्यादि वर्ग, 250-251)

काकजङ्घा च तिक्तोष्णा रक्तपित्तज्वरापहा।
कृमिदोषहरा वर्ण्या विषदोषहरामता ।।21।।
(ध.नि., करवीरादि वर्ग, 21,)

काकजंघा हिमा तिक्ता कषाया कफपित्ताजित्।।713।।
निहन्ति ज्वर कुष्ठास्त्रव्रणकण्डूविषकृमीन्।।
(कै.नि., ओषधिवर्ग, 713,)

काकनासिका (बीज)

1. काकनासा तु मधुरा शिशिरा पित्तहारिणी।
रसायनी दार्ढ्यकरी विशेषात् पलितापहा।।(108)

(रा.नि.गुडूच्यादिवर्ग 108)

काकोली (प्रकन्द)

काकोली मधुरा शुक्ला क्षीरा ध्वांक्षोलिकास्मृता ।
वयस्था स्वादुमांसी च वायसोली चे कर्णिका ।।128।।

काकोली स्वादुशीता च वातपित्तज्वरापहा ।
दाहघ्नी क्षयहन्त्री च श्लेष्म शुक्र विवर्धिनी ।।129।।

(ध.नि., गुडुच्यादि वर्ग,128-129)

काकोली युगलं वृष्यं मधुरं शीतलं गुरू ।।85।।
बृंहणं वातपित्तस्नदाहशोषज्वरापहम् ।।

(कै.नि., औषधि वर्ग, 85)

कमल (कन्द)

1. पद्मोत्पलनलिन ..... इति दशेमानि मूत्र विरजनीयानि भवन्ति।
(च.सू. 4/34)

2. उत्पल रक्तोत्पल कुमुद सौगंधिक कुवलयपुण्डरीकाणि मधुकं चेति।

उत्पलादिरयं दाह पित्त रक्तविनशानः।
पिपासा विषहृद्रोगच्छर्दि मूर्छाहरो गणः।
(सु.सू.39/52-53)

3. मृणालं शीतलं वृष्यं पित्तदाहास्रजिद् गुरुः।
दुर्जरं स्वादुपाकं च स्तन्यानिल कफप्रदम।।
संग्राहि मधुरं रूक्षं शालूकमपि तदगुणम।
कमलं शीतलं वर्ण्यं मधुरं कफपित्तजित्।।
तृष्णा दाहास्र विस्फोट विष वीसर्प नाशनम्।
(भा.प्र. पुष्पवर्ग 3,6,7,13)

4. पद्ममूलं तु शालूकं सफलं करहाटकम्।
शालीनं पद्मकन्दं च जलालुकं निगद्यते।।
पद्मकन्दः कषायः स्यात् तिक्तः स्वादुर्विपाकतः।
शीतवीर्योऽस्रपित्तोत्थरोगभङ्गाय कल्पते।।
(ध.नि.करवीरादि वर्ग 144-145)

5. पद्मकन्दस्तु शालूकं पद्ममूलं कडाह्वयम्
शालीनं च जलालूकं स्यादित्येवं षडाह्वयम्।।
शालूकं कटु विष्टम्भि रुक्षं रुच्यं कफापहम्।
कषायं कासपित्तघ्नं तृष्णादाह निवारणम्।
(रा.नि.करवीरादि वर्ग 190-191)

करवीर (मूल)

करवीरःश्वेत पुष्पः शतकुम्भोऽश्वमारकः।
द्वितीयोरक्तपुष्पश्च चण्डातो लगुडस्तथा ।।82।।
करवीरद्वयं तिक्तं कषायं कटुक च तत् ।
व्रण लाघव कृन्नेत्र कोप कुष्ठ व्रणापहम् ।।83।।
वीर्योष्णं कृमिकण्डूघ्नं भक्षितं विषवन्मतम् ।।84।।
(भावप्रकाश निघण्टु, गुडुच्यादि वर्ग 82-84)

करवीर कटुस्तीक्ष्णः कुष्ठकण्डूर्तिनाशनः ।
व्रणार्तिविष विस्फोट-शमनोऽश्र्वमृतिप्रदः ।।131।।
(रा.नि., करवीररादि वर्ग, 13)

करवीरः कटुस्तिक्तो वीर्ये चोष्णो ज्वरापहः ।
चक्षुष्यः कुष्ठकण्डूघ्नः प्रलेपाद्विषमन्यथा ।।
करवीरं द्वयं तिक्तं सविषं कुष्ठनित्कटुः ।।3।।
(ध.नि., करवीरादि वर्ग, 3)

करमर्दक (मूल)

1. करमर्दः सुषेणः स्यात्कृष्णपाकफलस्तथा।
तस्माल्लघुफला या तु सा ज्ञेया करमर्दिका।।
करमर्दद्वयं त्वामम्लं गुरू तृषाहरम्।
उष्णं रूचिकरं प्रोक्तं रक्तपित्तकफप्रदम्।।
तत्पक्वं मधुरं रुच्यं लघु पित्तसमीरजित्।।
(भा.प्र.नि. आम्रादिफलवर्ग 81-82)

2. करमर्दकमाविग्नं सुषेण पाणिमर्दकम्।
कराम्लं करमर्द च कृष्णपाकफलं मतम्।।
अम्लं तृष्णापहं रूच्यं पित्त कृत्करमर्दकम्।
पक्वं च मधुरं शीतं रक्तपित्तहरं मतम्।।
(ध.नि.आम्रादिवर्ग 92-93)

3. करमर्दः सुषेणश्च कराम्लः करमर्द्दकः।
करमर्दः सतिक्ताम्लो बालो दीपनदाहकः।।
पक्वस्त्रि दोषशमनोऽरूचिघ्नो विषनाशनः।
(राजनिघण्टु आम्रादिवर्ग 207-20)

काश (मूल)

1. वीरण. . . . . दर्भकुशकाश. . . . . इति दशेमेमानि स्तन्य जननानि भवन्ति।

(च.सू.अ. 4/17)

2. कुशकाश नल दर्भ काण्डेक्षुका इति तृणसंज्ञक:।
मूत्रदोष विकार च रक्तपित्तं तथैव च।
अन्त्य: प्रयुक्त: क्षीरेण शीघ्रमेव विनाशयेत्।।

(सु.सू.अ.39/76-77)

3. कास: कासेक्षुरूद्दिष्ट: सस्यादिक्षुरस्तथा।
इक्ष्वालिकेक्षुगन्धा च तथा पोटगल: स्मृत:।।
कास: स्यान्मुधुरस्तिक्त: स्वादुपाको हिम: सर:।
मूत्रकृच्छ्राश्म दाहास्रक्षयपित्तज रोगजित्।।

(भा.प्र.गुडूच्यादि वर्ग 161-162)

4. काश: स्वादु रसे तिक्तो विपाके वीर्यतो हिम: ।
तर्पणो बलकृद्वृष्य: श्रमशोष क्षयापह: ।।
काशद्वयं च पित्तास्रकृच्छ्रजिन्मधुरं हिमम्।।

(धन्व. नि.,करवीरादि वर्ग 115-116)

5. काशश्च शिशिरो गौल्यो रूचिकृत पित्तदाहनुत्।
तर्पणो बलकृदावृष्य आमशोषक्षयापह:।।

(रा.नि.शाल्मल्यादि वर्ग 89)

6. काश: सुकाण्ड: काशेक्षुर्ऋषीक: श्वेतवासर:।
इक्ष्वारिकेक्षुकाशश्च स चैवेक्षुरस: स्मृत:।
कास कृच्छ्राश्मदाहास्र पित्तक्षयकरो हिम:।।

(म.नि.अभयादि वर्ग 37)

कट्फल (शा.त्वक्.)

कट्फलः कफवातघ्नो गुल्ममेहाग्निमान्द्यजित्।
रूचिष्यो ज्वर-दुर्नाम-ग्रहणी-पाण्डुरोगहा।।74।।
(ध.नि.,गुडुच्यादि वर्ग, 74)

कट्फलः कटुरूष्णश्च कासश्वासज्वरापहः।
उग्रदाहहरो रुच्यो मुखरोगशमप्रदः।।21।।
(रा.नि., प्रभद्रादि वर्ग, 21)

कट्फलस्तुवरस्तिक्तः कटुर्वातकफज्वरान्।
हन्ति श्वासप्रमेहार्शः कासकण्ठामयारुचीः।।181।।
(भा.प्र.नि.हरीतक्यादि वर्ग, 181)

कट्फलं कफरोगघ्नं श्वासकासज्वरापहम्।
(राजवल्लभः)

कटफल (शा.त्वक्.)

1. मधुक मधुपर्णीपृश्निपर्ण्यम्बष्ठकी - - - - कट्फलानीति । दशेमानि सन्धानीयानि भवन्ति।।5।।

2. सारिवेक्षु - - - कैटर्य- - - कट्टकारिका इति दशेमानि कण्ठयानि भवन्ति।।9।।

3. कुष्ठैलवालुक कटफल - - - उशीरापीति शुक्रशोधनानि भवन्ति।।20।।

4. शाल कटफल - - - - - - अशोक इति दशेमानि वेदना स्थापनानि भवन्ति।।47।।

(च.सू. 5,9,20,47)

5. कट्फलः सोमवल्कश्च कैटर्य्यः कुम्भिकाऽपि च।
कट्फलस्तुवरस्तिका कटुर्वात कफज्वरान्।।
हन्ति श्वासप्रमेहार्शः कासकण्ठामयारुचीः।।81।।

(भा.नि., हरीतक्यादिवर्ग 181)

6. कट्फलः कफवातघ्नो गुल्ममेहाग्निमान्द्यजित्।
रुचिष्यो ज्वरदुर्नाम ग्रहणीपाण्डुरोगहा।।74।।

(ध.नि. गुडूच्यादिवर्ग, 74)

7. कट्फलः कटुरुष्णश्च कासश्वासज्वरापहः।
उग्रदाहहरो रुच्यो मुखरोगनाशमप्रदः।।21।।

(रा.नि., प्रभद्रादिवर्ग 21)

8. कट्फलं कटुकं तिक्तं कषायं कफवातनुत्।
निहन्ति मेह गुल्मार्शः श्वासकासारुचिज्वरान्।।113।।

(कै.नि., ओषधिवर्ग 113)

9. कट्फलं तुवरं तिक्तं कटु वातकफज्वरान्।
हन्ति श्वासप्रमेहार्शः कासकण्ठामयारुचिः।।

(म.नि. 3)

कोल (फल मज्जा)

बदरं मधुरं कषायमम्लं परिपक्वं मधुराम्लमुष्णमेतत् ।
कफकृत्पचनातिसाररक्तश्रमशोषार्ति विनाशनं च रुच्यम ।।
(रा.नि.आम्रादि वर्ग - 138.)

भूबदरी मधुराम्ला कफवात विकारहारिणी पथ्या ।
दीपन पाचनकर्त्री किं चतत्पित्तासुकारिणी रुच्या।
(रा.नि., आम्रादि वर्ग. 143.)

सौवीरं लघु सपक्वं मधुरं कोल मुच्यते ।।74।।
कोलन्तु बदरं ग्राहि रुच्यमुष्णन्च वातहृत् ।।
(भा.प्र.नि.आम्रादि वर्ग; 74-1/2)

कोल (शा.त्वक्)

पुंसि स्त्रिया च कर्कन्धूर्बदरी कोलमित्यपि ।।71।।
फेनिलं कुवलं घोण्टा सौवीरं बदरं महत् ।
अजप्रिया कुहा कोली विषमोभयकण्टका ।।72।।
पच्यमानं सुमधरं सौवीरं बदरं महत् ।
सौवीरं बदरं शीतं भेदनंगुरूशुक्रलम् ।।73।।
वृहणं पित्तदाहास्रक्षयतृष्णानिवारणम् ।
सौवीरं लघु सम्पक्वं मधुरं कोलमुच्यते ।।74।।
कोलन्तुः बदरं ग्राहि रुच्यमुष्ण च वातहृत्।
कफपित्तकरं चापि गुरू सारकमीरितम्।।75।।
कर्कन्धेः क्षुद्रबदरं कथितं पूर्वसूरिभिः ।
अम्लं स्याक्षुद्रबदरं कषायं मधुरं मनाक्।।76।।
स्निग्धं गुरू च तिक्त च वातपित्तापहं स्मृतम् ।
शुष्कं भेद्यग्निकृबत्सर्वं लघु तृष्णावलमास्रजित् ।।77।।
(भा.प्र.नि.,फलवर्ग;71-77)

कोषातकी (सं.व.)

क्ष्वेडस्तिकः कटुस्तीक्ष्णोऽप्रगाढश्च प्रशस्यते।
कुष्ठपाण्ड्वामयप्लीहशोफगुल्मगरादिषु।।191।।
(ध.नि.गुडुच्यादि वर्ग,191)

कोशातकी तु शिशिरा कटुकाऽल्पकषायका।
पित्तवातकफघ्नी च मलाध्मानविशोधिनी।।49।।
(रा.नि.गुडुच्यादि वर्ग 49)

"राजकोषातकी" गरे गुल्मोदरे कासे वातश्लेष्मामये स्थिते।
कफे च कण्टवकास्थे कफसंचयजेषु च।
(चरक क.अ. 4)

कोषातकी कफार्शोघ्नी पक्वामाशयशोधिनी।।(राजव्ल्लभ)

कुमुद (पुष्प)

कुमुदं पिच्छिलं स्निग्धं मधुरं ह्लादि शीतलम्।।15।।
(भा.प्र.नि., पुष्प वर्ग 15)

उत्पल कुमुद पद्म किञ्जल्कः सांग्राहिकरक्तपिततप्रशमनानम्।।39।।
(च.सू. 25;39)

कुमुदोत्पलनालास्तु सपुष्पाः सपेफलाः स्मृताः।।117।।
शीताः स्वादुकषायास्तु कफमारुतकोपनाः।
(च.सू.स्थान.27;117)

मधुरं पिच्छिलं स्निग्धं कुमुदं ह्लादि शीतलम्।।
(सु.सू.46;285)

कुमुदं शीतलं स्वादुपाके तिक्तकफापहम।
रक्त दोषहरं दाहश्रमपित्त प्रशान्तिकृत।।137।।
(ध.नि. करवीरादि वर्ग,137)

कुश (मूल)

1. दर्भद्वयं त्रिदोषघ्नं मधुरं तुवरं हिमम्।
मूत्रकृच्छ्राश्मरीतृष्णाबस्तिरूक्प्रदरास्रजित्।।
(भा.प्र., गुडुच्यादि वर्ग 166)

2. दर्भ युग्मं पवित्रं स्यान्मूत्रकृच्छ्रघ्नशीतलम्।
रक्तपित्त प्रशमनं केवलं पित्तनाशनम्।।(119)
(धन्वः नि. करवीरादि वर्ग119)

लांङ्गली (प्रकन्द)

कलिहारी तु हलिनी लांङ्गली शक्रपुष्प्यापी।
विशल्याग्निं शिखाऽनन्ता वह्निवक्त्रा च गर्भनुत।।
कलिहारी सरा कुष्ठ्शोफार्शोव्रणशूलजित्।।80।।
सक्षारा श्लेष्मजितिक्ता कटुका तुवराऽपिच।
तीष्णोष्णा क्रिमहल्लघ्वी पित्तला गर्भपातिनी ।।81।।
(भा.नि. गुडुच्यादि वर्ग, 81)

लांगली कटुरूष्णा च कफवातविनाशनी।
तिक्ता सराच श्वयथुगर्भशल्यव्रणापहा।।9।।
(ध.नि.,करवीरादि वर्ग, 9)

लशुन (कन्द)

1. कृमि कृष्ठकिलासघ्नो वातघ्नो गुल्मनाशनः।
स्निग्धश्चोष्णश्च वृष्यश्च लशुनः कटुको गुरुः।।
(च.सू.27/76)

2. शिरोविदेचनद्रव्याणि पुनरापामार्ग ..... लशुन. . . च।
(च.वि.8/151)

3. लशुनो भृशस्तीक्ष्णोष्णः कटुपाकरसः सरः।
हृद्यः केश्यो गुरूः वृष्यः स्निग्धोरोचनदीपनः।।
भग्नसन्धानकृद्वल्यो रक्तपित्त प्रदूषणः।
किलासकुष्ठ गुल्मार्शो मेहकृमि कफानिलान्।
सहिध्ममापीनसश्वासकासान् हन्ति रसायनम्।
(अ.हृ.6/109-111)

4. लशुनस्तु रसोनः स्यादुग्रगन्धो महौषधम्।।217।।
कटुकश्चापि मूलेषु तिक्तः पत्रेषु संस्थितः।।220।।
रसोनो बृंहणो वृष्यः स्निग्धोष्णः पाचनः सरः।
रसे पाके च कटुकः तीक्ष्णो मधुरको मतः ।।221।।
भग्नसन्धानकृत्कण्ठयो गुरूः पित्तास्रवृद्धिदः।
बलवर्णकरो मेधाहितो नेत्र्यो रसायनः।।222।।
हृद्व्रोगजीर्णज्वर कुक्षिशूल-विबन्धगुल्मारूचिकासशोफान।
दुर्नामकुष्ठानलसादजन्तु समीरणश्वासकफांश्च हन्ति।।223।।
(भा.प्र.हरीतक्यादिवर्ग 217, 220-223)

5. रसोन उष्णः कटुपिच्छिलश्च स्निग्धो गुरूः स्वादुरसोऽतिबल्यः।
वृष्यश्च मेधास्वरवर्णचक्षुर्भग्नास्थिसंधानकरः सुतीक्ष्ण।।
(ध.नि.करवीरादि वर्गः, 61-62)

6. रसोनोऽम्लरसोनः स्यात गुरूष्णः कफवातनुत्।
अरूचिक्रिमि हवद्रोग-शोफघ्नश्च रसायन।
(रा.नि.मूलकादिवर्ग 50)

महाबला (मूल)

महाबला पीतपुष्पा सहदेवी च सा स्मृता ।
हरेन्महाबला कृच्छ्रम भवेद्वातानुलोमनी ।।
बलाचतुष्टयं शीतं मधुरं बलकान्तिकृत् ।
स्निग्धं ग्राहि समीरास्रपित्तास्रक्षतनाशनम् ।।
(भा.प्र. गुडुच्यादिवर्ग 142-146)

महाबला वाट्यपुष्पी तथा वाट्यायनी स्मृता ।
सहदेवा देवसहा पीतपुष्पा बृहत्फला ।।
महाबला तु हृद्रोगवातार्शः शोफनाशिनी ।
शुक्रवृद्धिकरी हन्याद् विषमं च ज्वरं नृणाम् ।।
(ध.नि. गुडूच्यादिवर्ग 272-273)

महाबला तु हृद्रोग वातार्शः शोफनाशनी ।
शुक्रवृद्धिकरी बल्या विषमज्वरहारिणी ।।
(रा.नि.शताह्वादिवर्ग 100)

वाट्यायनी वीरपुष्पी वाट्या वीर्या बृहद्बला ।
महाबलास ऋष्यप्रोक्ता भारद्वाजी सुकर्णिका ।।
ऋष्यपुष्पी पीतपुष्पी ज्ञऋष्यगन्धा महासहा ।
बला चतुष्टयं स्निग्धं मधुरं रसपाकयोः ।
शीतलं ग्राहि धात्योजोबलायुः कान्तिवर्धनम् ।।
हन्ति वातास्रपित्तास्रदोषत्रयक्षतक्षयान् ।।
(कै.नि.ओषधिवर्ग 1053-1057)

महाबला वीरपुष्पी सहदेवी सहदेवी बृहद्बला ।
वाट्यायनी देवसहा वाट्या स्यात्पीतपुष्पिका ।।
बला चतुष्टयं शीतं मधुरं बलकान्तिकृत् ।।
स्निग्धं ग्राहि समीरास्रपित्तास्रक्षतनाशनम् ।
आसां बृहद्बला कृच्छ्रं हन्ति वातानुलोमनी ।।
(म.नि.अभयादिवर्ग; 83,86,87.)

मंजिष्ठ (शाखा)

1. मञ्जिष्ठा मधुरा तिक्ता कषा्या स्वरवर्णकृत्
गुरूरूष्णा विषश्लेष्मशोथ योन्यक्षिककर्णक
रक्तातीसार कुष्ठास्रवीसर्पव्रणमेहनुत्।(191)
(भा.प्र.नि. हरीतक्यादि वर्ग191)

2. मञ्जिष्ठातुवरा तिक्ता स्वर्योष्णा मधुरा गुरू:
कर्णाक्षियोनिरोगघ्नी कफशोफविषापहा।(1426)
विसर्पमेहकुष्ठार्शोव्रणरक्तातिसारजित्
शाकं स्वादु लघु स्निग्धं दीपनं वातपित्तजित्।(1427)
(कै.दे.नि.ओषधिवर्ग 1426-1427)

3. मञ्जिष्ठा मधुरा स्वादे कषायोष्णा गुरूस्तथा
कफोग्रव्रणमेहास्र विष नेत्रामयाञ्जयेत्। (19)
(ध.नि.गुडूच्यादिवर्ग 19)

मरिच (फल)

1. नात्यर्थ उष्णम् मरिचमवृष्यं लघु रोचनम्।
छेदित्वात्शोषणत्वाच्च दीपनं कफवातजित्।।298।।
(च.सू. 298)

2. मरिचं कटुतिक्तोष्णं पित्तकृच्छ्रश्लेष्मनाशनम्
वायु निवारयत्येव जन्तुसन्ताननाशनम्।(86)
(धन्व:नि. शतपुष्पादिवर्ग 86)

3. मरिचं वेल्लजं कृष्णमूषणं धर्मपत्तनम्
मरिचं कटुकं तीक्ष्णं दीपनं कफवातजित्।
उष्णं पित्तकरं रूक्षं श्वासशूलं कृमीन्हरेत्। (60)
(भा.प्र.हरीतक्यादि वर्ग 59-60)

4. मरिचं कटु तिक्तोष्णं लघुश्लेष्मविनाशनम्
समीर कृमिहृवद्रोग-हरञ्च रूचिकारकम्। (32)
(रा.नि. पिप्पल्यादि वर्ग 32)

माषपर्णी (सं.व.)

1. माषपर्णी हिमा तिक्ता रूक्षा शुक्रबलासकृत
मधुरा ग्राहिणी शोथवातपित्तज्वरास्रजित्।(56)
(भा.नि.,गुडुच्यादि वर्ग, 56)

2. माषपर्णी हिमा रूक्षा मधुराः कफशुक्रला
तिक्ता संग्राहिणी वातपित्तदाहज्वरास्रजित्।।106।।
(कै.दे.नि. ओषधि वर्ग, 106)

3. माषपर्णी रसे तिक्ता शीतला रक्तपित्तजित्।।133।।
(ध.नि. गुडुच्यादि वर्ग,133)

मसूर (बीज)

मङ्गल्यको मसूरः स्यान्ममङ्गल्या च मसूरिका।
मसूरो मधुरः पाके संग्राही शीतलो लघुः।।
कफपित्तास्रजिद्रूक्षो वातलो ज्वरनाशनः ।।50।।
(भा.प्र.नि., धान्यवर्ग, 50)

मसूराः मधुरा सूप्या पृथवः पित्तभेषजम्।
मसूरो मधुरः शीतः संग्राही कफपित्तहा।
वातामयकरश्चैव मूत्रकृच्छ्रहरो लघुः।।84।।
(ध.नि. सुवर्णादिवर्ग, 84)

मसूरिका मसूराव्या मंगल्या पाण्डुरा तथा।
मसूरा मधुराः पाके कषाया मधुरा हिमाः।।71।।
लघवो ग्राहिणो रुक्षा रक्तपित्तकफापहा
वर्ण्या वातोल्वणा बल्यास्तेषा शाकं सतिक्तकम्।।72।।
ऋते मुद्गमसूराभ्यामन्ये त्वाध्मानकारकाः।
(कै.दे.नि., धान्यवर्ग, 71-72)

मुद्ग (बीज)

1. वरोत्र मुद्गोऽल्पचलः . . . . . (अ.हृ.सू. 6/18)

2. अत्र एषु च शिम्बीधान्येषु मध्ये मुद्गउत्तमः।
(अरुणदत्त टीका)

3. मुद्गो रुक्षो लघुर्ग्राही कफपित्तहरो हिमः।
स्वादुरल्पानिलो नेत्र्यो ज्वरघ्नो वनजस्तथा।
मुद्गो बहुविधः श्यामो हरितः पीकस्तथा
श्वेतो रक्तश्च तेषान्तु पूर्वः पूर्वोलघुः स्मृतः।
(भा.प्र.धान्यवर्गः 38-39)

4. मुद्गः किलाटो मांगल्यो हरितः शारदोऽपि च
पित्तप्रेसेको वसुको माधवः प्रवरोऽसितः
मुद्गो रूक्षो लघुर्ग्राही कफपित्तहरो हिमः
स्वादुरल्पानिलो नेत्र्यो वन्योऽप्येतद्गुणः स्मृतः।
हरितः प्रवरस्तेषां तच्छाकं तिक्तंमुत्तमम्
कृष्णमुद्ग वरको राजमुद्गस्तु खण्डकः।
(ध.नि.सुवर्णादिवर्गः 70-72)

5. मुद्गो रूक्षो लघुर्ग्राही कफपित्तहरोहिमः।
(मदनपाल नि., 32)

6. मुद्गोऽत्र प्रवरो रूक्षः कषायो मधुरो हिमः
कफपित्तहरो ग्राही लघुहृष्टिप्रसादनः।
अल्पानिलोऽत्र हरितो वर्ण्यः पुष्ठिबलप्रदः
वन्यो मुद्गः समस्तेषां शाकं श्रेष्ठं सतिक्तकम्।
(कै.दे.नि. धान्यवर्ग, 52-53)

मूलक (बीज)

विशुष्कं तु मूलकं कफवातजित्।
(चरक सू.स्थान.अ. 27/168)

त्रिदोषशमनं शुष्कं विषदोषहरं लघु।
(ध. नि. करवीरादिवर्ग 31)

वातश्लेष्महरं शुष्कं सर्वमामं तु दोषलम्।
(अ. हृदय सू. 6/104)

मूलकं तीक्ष्णमुष्णच कटूष्णं ग्राहि दीपनम्।
दुर्नाम गुल्म हद्रोग वातघ्नं रूचिदं गुरू।।
(रा. नि., मुलरादिवर्ग 10)

कटुतिक्तरसा हृद्या रोचनी वह्नि दीपनी।
सर्वदोषहरा लघ्वी कण्ठ्या मूलकपोतिका।।
(सु. सं. सू. 46/240)

शुष्कं लघु हरेच्छोफं विषं दोषत्रयं तथा।
तत्पुष्पं कफपित्तघ्नं फलं तु कफवातजित्।।
(के. नि. ओषधिवर्ग 673)

मुण्डीतिका (पत्र)

मुण्डीतिका कटुः पाके वीर्योष्णा मधुरालघुः।
मेध्या गंडापची कुष्ठ कृमियोन्यर्तिपाण्डुनुत् ।।217।।
श्लीपदारुच्यपस्मार प्लीहमेदोगुदात्तिहृत ।।
महामुण्डी च तत्तुल्या गुणैरुक्ता महर्षिभिः।।218।।
(भा.प्र.नि. गुडूच्यादि वर्ग 217-218)

मुण्डिका कटुतिक्ता स्याद् अनिलास्रविनाशिनी ।
आमारुचिहन्यपस्मारगण्डश्लीपदनाशिनी ।।157।।
(ध.नि. गुडुच्यादि वर्ग, 157)

श्रवणीमधुरा तिक्ता कटुपाका कटुर्लघुः ।।989।।
वीर्योष्णा तुवरा मेध्या स्थिरा वातकफापहा ।
जयेत् गण्डापचीप्लीहमेदोऽपस्मार पाण्डुताः।।990।।
श्लीपदारुचियोन्यर्तिकासकृच्छ्र गुदकृमीन ।
(कैयदेव निघण्टु, औषधिवर्ग, 989-990)

श्रावणी तु कषाया स्यात् कटूष्णा कफपित्तनुत् ।
आमातीसार कासघ्नी विषच्छर्दि विनाशिनी ।।18।।
महामुण्डयुष्णतिक्ता च ईषद् गौल्या मरूच्छिदा ।
स्वर कृद्रोचनी चैव मेहकृच्च रसायनी ।।21।।
(रा.नि., पर्पटादिवर्ग, 18, 21)

मुस्ता (कन्द)

मुस्तकं न स्त्रियां मुस्तं त्रिपु वारिदनामकम् ।
कुरूविन्दश्च संख्यातोऽपरःक्रोडकसेरूकः ।।92।।
भद्रमुस्त च गुन्द्रा च तथा नागरमुस्तकः ।
मुस्तं कटु हिमं ग्राहि तिक्तं दीपनपाचनम् ।।93।।
कषायं कफपित्तास्रतृड्ज्वरारुफचिजन्तुहृत् ।
अनूपदेशे यज्जातं मुस्तकं तत्प्रशस्यते ।
तत्रापि मुनिभिःप्रोक्तं वरं नागरमुस्तकम् ।।94।।

(भा.प्र.कर्पूरादि वर्ग, 92-94)

मुस्ता चाम्बुधरो मेधो घनो राजकसेरूकः ।
भद्रमुस्तो वराहोऽब्दो गाङ्गेयः कुरूविन्दकः ।।39।।
जीमूतोऽतोथ वृषध्वाङ्.क्षी जलदोऽथं जलावहः ।।
नादेयः पिण्डमुस्तोऽन्यो नागरः परिकीर्तितः ।।40।।
मुस्ता तिक्तकषायाऽतिशिशिरा श्लेष्मरक्तजित् ।
पित्तज्वरातिसारघ्नी तृष्णाकृमिविनाशिनी ।।41।।

(ध.नि., गुडुच्यादि वर्ग, 39-41)

मुस्तोऽम्भोदो घनं मुस्तं गाङ्गेयी कुरूविन्दुकः ।
भद्रमुस्तो वराहादः पिठरं पिण्डमुस्तकम् ।।1357।।
पूर्णकोष्ठो भद्रहंसो प्राच्यो राजकसेरूकः ।
मुस्तं तिक्तं हिमं ग्राहि दीपनं पाचनं कटु ।।1358।।
कषायं कफपित्तास्रतृड्ज्वरारूचिजन्तुर्जित् ।

(कैयदेव नि., ओषधि वर्ग,1357-1358)

नागवल्ली (पत्र)

ताम्बूलवल्ली ताम्बूली भागिनी नागवल्लरी ।
ताम्बूलं विशदं तीक्ष्णोष्णं तुवरं सरम् ।।11।।
वश्यं तिक्तं कटु क्षारं रक्तपित्तकरं लघु ।
बल्यं श्लेष्मास्यदौर्गन्ध्यमल वातश्रमापहम् ।।12।।
(भा.प्र., गुडुच्यादि वर्ग 11-12)

ताम्बूलवल्ली ताम्बूली नागवल्ली च नागिनी ।।511।।
ताम्बूलवल्लिकापत्रं तिक्तं पाकरसोषणम् ।
तीक्ष्णोष्णं तुवरं क्षारं दीपनं विशदं सरम् ।।512।।
रोचनं स्रंसनं स्वर्यं रक्तपित्तविवर्धनम् ।
कफवातास्यदौर्गन्ध्यकण्डूक्लेदमलापहम् ।।513।।
(कैयदेव नि., ओषधि वर्ग,511-513)

नारिकेल (फल मज्जा)

----------नारिकेलफलानि च ।
बृंहणस्निग्धशीतानि बल्यानि मधुराणि च।(च.सू.27/130)

नालिकेर -------- मधुराणि मधुरविपाकानि
वातपित्तप्रशमनानि शीतवीर्याणि - अभिष्यन्दीनि
सृष्टमूत्राण्यग्निसादनानि चेति । (सु.सू.45/120)

नालिकेरं गुरू स्निग्धं पित्तघ्नं स्वादुशीतलम् ।
बलमांसप्रदं हृद्यं बृंहणं बस्तिशोधनम् ।। (सु.सू. 46/180)

------ नारिकेल ----- । ------ बृंहणं गुरू शीतलम् ।
दाहक्षतक्षयहरं रक्तपित्तप्रसादनम्।
स्वादुपाकरसं स्निग्धं बिष्टम्भिकफशुक्रकृत।। (अ. हृ. सू. 6/119-121)

नारिकेलफलं शीतं दुर्जरं बस्तिशोधनम् ।
विष्टम्भि बृंहणं बल्यं वातपित्तास्रदाहनुत् ।। 39।।
(भा. नि.,आम्रादिवर्ग, 39)

नारिकेलं गुरू स्निग्धं पित्तकृत् स्वादु शीतलम् ।
बलमांसप्रदं वृष्यं बृंहणं बस्तिशोधनम् ।। 68।।
(ध.नि., आम्रादिवर्ग, 68)

नालिकेरं हिमं स्निग्धं स्वादुपाकरसं गुरू ।
तर्पणं पाचनं वृष्यं बृहणं बलमांसकृत् ।।268।।
विष्टम्भि दुर्जरं हृद्यं श्लेष्मलं बस्तिशोधनम् ।
दाहक्षतक्षयहरं वातपित्तास्रनाशनम् ।।269।।
(कै.नि.ओषधिवर्ग268-269)

नारिकेलो गुरूः स्निग्धः शीतः पित्तविनाशनः ।
अर्द्धपक्वस्तृषा-शोष शमनो दुर्जरः परः।। 41।।
(रा.नि., आम्रादिवर्ग, 41)

नारिकेल फलं शीतं दुर्जरं वस्तिशोधनम् ।
विष्टम्भि बृंहणं-वृष्यं वातपित्तास्रदाहजित् ।।15।।
(म.नि.,फलादिवर्ग, 15)

निचुल (फल)

1. इज्ज्लो हिज्जलश्चापि निचुलश्चाम्बुजस्तथा।
जलवेतसवद्वेद्यो हिज्जलोऽलं विषापहः ।(138)
(भा.प्र.नि. गुडूच्यादिवर्ग, 138)

2. हिज्जलः कटूष्णश्च पवित्रोभूतनाशनः
वातामयहरोनानाग्रहसंचार दोषजित्।।155।।
(रा.नि., शाल्मल्यादि वर्ग, 155)

3. ..... निचुलानि च पक्वाशयगते दोष विरेकार्थ प्रयोजयेत्।
(च.सू. 2/10)

4. हिज्जलः कफवातघ्नो रेचनो वामकस्या।
(सु.सू. 39)

नीली (सं.व.)

1. नीली तु नीलिनी तूणी काला दोला च नीलिका
नीलिनी रेचनो तिक्ता केश्या मोहभ्रमापहा।
उष्णा हन्त्युदरप्लीहवातरक्त कफानिलान्
आमवात मुदावर्त मदं च विषमुद्धम।(207)
(भा.प्र. गुडूच्यादिवर्ग, 207)

2. नीलिनी नीलिका काला ग्राम्या दोला विशोधनी
तुस्या श्रीफलिका मोचा भारवाही च रञ्जनी।
नीली तिक्ता रसे चोष्णा कटिवात कफापहा
केश्या विषोदरं हन्ति वातासृक्कृमिनाशिनी।(227-228)
(ध.नि.गुडच्यादिवर्ग, 227-228)

3. नीली तु कटुतिक्तोष्णा केश्या कासकफामनुत्
मरूद्विषोदरव्याधि-गुल्मजन्तुज्वरापहा।(83)
(राज नि. शताह्वादिवर्ग, 83)

4. नीली तिक्ता रसे पाके सरोष्णा भ्रममोहकृत्
कफानिलहराकेश्या प्लीहोदर विषापहा।
वातरक्तमुदावर्त्तमामवातगदं हरेत्।(792)
(कै.दे.नि.ओषधिवर्ग, 792)

5. नीलिनी रेचनी तिक्ता केश्या मोहभ्रमापहा
उष्णा हन्त्युदरप्लीहवातपित्तकफानिलान्।(29)
(म.नि.अभयादिवर्ग, 29)

निर्गुण्डी (पत्र)

1. सिन्दुवारः श्वेतपुष्पः सिन्दुकः सिन्दुवारकः
नीलपुष्पी तु निर्गुण्डी शेफाली सुबहा च सा।।113।।

2. सिन्दुकः स्मृतिदस्तिक्तः कषायः कटुको लघुः।।114।।
सिन्दुरवारदलं जन्तुवातश्लेष्महरं लघु।।115।।
(भा.नि., गुडुच्यादि वर्ग, 113-115)

3. निर्गुण्डी कटुतिक्तोष्णा कृमिकुष्ठरूजापहा
वातश्लेष्मप्रशमनी प्लीहगुल्मारूचीर्जयेत्।।74।।
(ध.नि., करवीरादि वर्ग, 74)

पद्मक (का.म.)

पद्मकं पद्मगन्धि स्यात्तथा पद्माह्वयं स्मृतम्।
पद्मकं तुवरं तिक्तं शीतलं वातलं लघु।।30।।
वीसर्पदाहविस्फोटकुष्ठश्लेष्मास्रपित्तनुत्।
गर्भसंस्थापनं रुच्यं वमिव्रणतृषाप्रणुत्।।31।।
(भा.नि., कर्पूरादि वर्ग, 30-31)

पद्मकं शिशिरं स्निग्धं कषायं रक्तपित्तनुत्।
गर्भस्थैर्यकरं प्रोक्तं ज्वरच्छर्दिविषापहम्।।88।।
मोहदाहज्वरभ्रान्तिकुष्ठविस्फोटशान्तिकृत्।
(धन्व. नि. चन्दनादि वर्ग 88)

पाटला (मूल)

1. पाटला तुवरा तिक्ताऽनुष्णां दोषत्रयापहा
अरूचिश्वासशोथास्रच्छर्दिहिक्कातृषाहरी।(21)
(भा.नि., गुडुच्यादि वर्ग, 21)

2. पुष्पं कषायं मधुरं हिमं हृदयं कफास्रनुत्
पित्तांतिसारहृत्कण्ठयं फलं हिक्काऽस्रपित्तहृत। (22)
(भा.नि., गुडुच्यादि वर्ग, , 22)

3. पाटलाऽनुष्णा तिक्ता दोषत्रयापहा
अरूचिश्वासशोफास्रच्छर्दिहिध्मातृषापहा।(37)
(कै.नि., ओषधि वर्ग, 37)

4. पाटलाऽपि रसे तिक्ता गुरूष्णा पवनास्रजित् तु।
पित्तहिक्कावमी शोफकफारोचक नाशिनी।।117।।
(धन्व.नि., गुडुच्यादि वर्ग, 117)

फल्गु (फल)

1. विष्टम्भिमधुरं स्निग्धं फल्गुजं तर्प्णं गुरू।(196)
(सु.सू. 46)

2. काकोदुम्बरिका फल्गुर्मलयूर्जघनेफला
मलयु: स्तम्भकृत्तित्का शीतला तुवरा जयेत्।
कफपित्त व्रणश्चित्रकुष्ठपाण्ड्वर्शकामला: ।(10)
(भा.प्र.वर्ग,10)

3. फल्गुस्तु तुवरा तिक्ता शीतला स्तम्भनी जयेत्।(449)
कफपित्त व्रणश्वित्रकुष्ठ पाण्ड्वस्त्रकामला: ।
फलं तु शीतलं स्वादु कषायं गुरू तर्पणम्।(450)
शुक्रलं मधुरं पाके स्निग्धं विष्टम्भि बृंहणम्
ग्राहि वातकफपित्तक्षतदाहविषास्त्रजित्।(451)
(कै.नि. ओषधि वर्ग, पृ.449-451)

4. तर्पणं बृंहणं फल्गु गुरू विष्टम्भि शीतलम्।(386)
(च.स.)

5. काकोदुम्बरिका शीता पक्वा गौल्याऽम्लिका कटु:
त्वग्दोषपित्तरक्तघ्नी तद्वल्कं चातिसारजित्। (134)
(रा.नि. आम्रादि वर्ग, 134)

6. काकोदुम्बरिका श्वित्रकण्डूकुष्ठव्रणापहा
रक्तपित्तहरा शोफ पाण्डुश्लेष्महरा च सा।(82)
(ध.नि.वर्ग आम्रादि वर्ग, 82)

फल्गु (मूल)

1. काकोदुम्बरिका फल्गुर्मलयूर्जवनेफला
मलयु: स्तम्भकृत्तिक्ता शीतला तुवरा जयेत्।
कफपित्त व्रणश्वित्र कुष्ठपाण्ड्वर्शकामला: ।(10)
(भा.प्र.वटादिवर्ग, 10)

2. फल्गुस्तु तुवरा तिक्ता शीतला स्तम्भनी जयेत्।।449।।
कफपित्तव्रणश्वित्र कुष्ठपाण्ड्वस्रकामला: ।।450।।
(कै.दे.नि. ओषधि वर्ग, 449-450)

3. काकोदुम्बरिका श्वित्रकण्डू कुष्ठव्रणापहा
रक्तपित्तहरा शोफा पाण्डु श्लेष्महरा च सा।(82)
(ध.नि.पृ. आम्रदि वर्ग, 82)

4. काकोदुम्बरिका शीता कषाया दद्रुघातनी
रक्तारिसार हन्त्री च मुखनासास्रघातिनी।(शोढल)

चक्रमर्द (प्रपुन्नाड) (बीज)

चक्रमर्दः प्रपुन्नाटो द्रुघ्नो मेषलोचनः ।
पद्माटः स्यादेड जश्चक्री पुन्नाट इत्यपि ।।110।।

चक्रमर्दो लघुः स्वादू रुक्षः पित्तानिलापहः ।
हृद्यो हिमः कफश्वासकुष्ठदद्रुकृमीन्हरेत्।।211।।

हन्त्युष्णं तत्फलं कुष्ठकण्डूदद्रुविषानिलान् ।
गुल्मकासक्रिमिश्वासनाशनं कटुकं स्मृतम्।।212।।
(भा.प्र.,हरीतक्यादि वर्ग,110-112)

चक्रमर्दस्त्वेडगजो मेषाक्षिकुसुमस्तथा ।
प्रपुन्नाटस्तरवटश्चक्राह्वश्चक्रिकस्तथा ।।4।।
(धन्व. नि., करवीरादि वर्ग, 4)

दद्रुघ्नः स्थादेजगजः क्षोडको मर्दकस्तथा ।
आर्वतकस्त्वेडगजः चक्रमर्दश्च च चक्रिका ।।699।।

पद्माड़ो मेषकुसुमः प्रपुन्नाटप्रपुन्नटः ।
प्रपुन्नाटो हिमो रुक्षो हृद्यः स्वादुःपटुर्लघुः ।।700।।

विष्टंभी सृष्टविण्मूत्रः कुर्यात् पित्तानिलौ हरेत् ।
कफकुष्ठज्वरश्वासकासमेहारुचिकृमीन् ।। 701।।

प्रपुन्नाटस्य शाकं तु कफकुष्ठानिलापहम् ।
पित्तप्रकोपणं बल्यं दद्रुपामाहरं गुरू ।।702।।

तत्फलं कटुकं सोष्णं जयेत् कुष्ठकफानिलान्।
विषकण्डूगुल्मदद्रुश्वासकासकृमीन् जयेत् ।।703।।
(कैयदेव नि., ओषधि वर्ग, 699-703)

रक्त चन्दन (का.म.)

रक्तचन्दनमाख्यातं रक्ताङ्गं क्षुद्रचन्दनम् ।
तिलपर्ण रक्तसारं तत्प्रवालफलं स्मृतम्।।16।।

रक्तं शीतं गुरू स्वादुच्छर्दितृष्णाऽस्रपित्तहृत् ।
तिक्तं नेत्रहितं वृष्यं ज्वरव्रणविषापहम् ।।17।।
(भा.प्र., कर्पूरादि वर्ग, 16-17)

रक्तचन्दनमष्याहु रक्षोघ्नं तिक्तशीतलम् ।
रक्तोद्रेकहरं हन्ति पित्तकोपं सुदारुणम् ।।5।।
(धन्व. नि.,चन्दनादि वर्ग, 5)

चन्दनं शीतलं रूक्षं तिक्ताभं ह्लादनं लघु ।
श्रमशोषविषश्लेष्मतृष्णापित्तास्रदाहत् ।।
(कैयदेव नि., ओषधि वर्ग, 1257)

रक्तपुनर्नवा (मूल)

तेषु पौनर्नवं शाकं विशेषाच्छोफनाशनम् ।।255।।
(सु., सूत्र स्थान 46,255)

रक्तपुनर्नवा तिक्ता सारिणी शोफनाशिनी ।
रक्तप्रदर दोषघ्नी पाण्डुपित्तप्रमर्दिनी ।।
(रा.नि., पर्पटादि वर्ग, 120)

पुनर्नवाऽरुणा तिक्ता कटुपाका हिमा लघुः।।
वातला ग्राहिणी श्लेष्म पित्त रक्त विनाशिनी ।।233।।
(भा.प्र., गुडुच्यादि वर्ग. 233)

पुनर्नवा भवेदुष्णा तिक्ता रुक्षा कफापहा ।
सशोफ पाण्डुहृद्रोगकोसोरः क्षतशूलनुत् ।।275।।
(धन्व.नि.गुडुच्यादिवर्ग, 275.)

वर्षाभूर्मधुरा तिक्ता कषाया कटुका सरा ।।753।।
(कै.नि. ओषधि वर्ग, 753.)

रामशीतलिका (सं.व.)

1. रक्तमाषौ गुरूर्नाति सक्षारो मधुरः सरः
श्लेष्मलः कटुकः पाके स्वल्पदोष उदीरितः ।।11।।
(भा.प्र.नि. शाकवर्ग, 11)

2. आरामशीतला तिक्ता शीतला पित्तहारिणी
दाहशोषप्रशमनी विस्फोटव्रणरोपणी।(172)
(रा.नि.करवीरादिवर्ग 172)

रास्ना (पत्र)

1. रास्नाऽऽमपाचिनी तिक्ता गुरूष्णा कफवातजित्
शोथश्वाससमीरास्नवातशूलोदरपहा कास ज्वर
विषाशीतिवातिकामयसिध्महत्। (163-164)
(भा.प्र.नि.हरीत्क्यादिवर्ग,163-164)

2. रास्ना तिक्ता गुरूष्णामपाचनी कफपित्तहा
निहन्ति शोफवातस्रश्वासकासविषज्वरान्।(1043)
हिध्माशीतावाताढ्य वातशूलोदराणि च।
(कै.दे.नि. ओषधिवर्ग 1043)

3. रास्नागुरूश्च तिक्तोष्णा विषवातास्त्रकासजित्।
शोफकम्पोदरश्लेष्मशमन्यामस्य पाचनी।।261।।
(ध.नि., गुडुच्यादि वर्ग, 261)

सहचर (सं.व)

सैरयकः श्वेतपुष्पः सैरेयः कटसारिका।
सहाचरः सहचरः स च भिन्द्यपि कथ्यते ।।51।।
कुरण्टकोऽत्रपीते स्याद्रक्त कुरबकः स्मृतः ।
नीले बाणाद्वयोरुक्तो दासी चार्तगलश्च सः ।।52।।
सैरेयः कुष्ठवातास्रकफकण्डू विषापहः ।
तिक्तोष्णो मधुरोऽनम्लः सुस्निग्धः केशरञ्जन ।।53।।
(भा.प्र., पुष्पवर्ग, 51-53)

सैरेयकः सहचरः सैरेयो मृदुकण्टकः ।।1047।।
कोमलप्रसवो दासी वर्णाख्यः किंकिरातकः ।
झिण्टी सहचरोऽम्लानः सैर्यकश्च महासहा ।।1048।।
रक्तपुष्पः कुरबकः पीतपुष्पः कुरण्टकः ।
नीलपुष्पस्त्वार्त्तगलो राजसैरेयकः स्मृतः ।।1049।।
बाणस्त्वोदनपाकी स्यात् शाणकः केशरञ्जनः ।।1050।।
केश्यो बलासवातास्रकुष्ठकण्डूविषं जयेत् ।
(कै.दे.नि.ओषधिवर्ग, 1047-1050)

सहदेवी (सं.व.)

1. सहदेवीशिफा बद्धा श्वेतमूत्रेण कन्यया
निहन्ति दक्षिणे पाणौ ज्वरमूतग्रहादिकान्।

(वै.म.)

2. ज्वरं हन्ति शिरोबद्धा सहदेवीजटा यथां ।

(च.सू. 26)

शैलेयम (सं.व.)

1. शैलेयम शीतलं हृदयं कफपित्तहरं लघु
कण्डूकुष्ठाश्मरीदाहविष हृद् गुदरक्तहृत्।।91।।
(भा.प्र., कर्पूरादिवर्ग- 91)

2. शैलेयं पलितं वृद्धं जीर्णकालानुसार्यकम्
स्थविरं च शिलाद्द्रु शिलापुष्पं शिलोद्भवम्।।72।।

3. शैलेयकं हिमं प्रोक्तं दाहजिद्विषनाशनम्
रक्तदोषहरं चैव कण्डू निर्मूलनं स्मृतम्।।73।।
शैलेयं तिक्तकं शीतं सुगन्धि कफपित्तजित्
दाहतृष्णावमिश्वासब्रणदोषविनाशनम्।।74।।
(धन्व.नि., चन्दनादिवर्ग 72-74)

4. शैलेयं स्थविरं वृद्ध शैलेजं पलितं ग्रहम्
शिलापुष्पं शिलाद्द्रु जीर्ण कालानुसार्यकम्।।88।।
शैलेयं शीतलं रूच्यं लघु श्लेष्मज्वरापहम्
निहन्ति विषदाहास्रकण्डुकुष्ठाश्महृद्गदान्।।89।।
(कैयदेव नि., धातुवर्ग, 88-89)

शाक (का.म.)

परूषकं ---------- फलम् ।
राजाह्वं ----------शाकं तृणमूत्रामय वातजित् ।।
(अ.ह.सू., परूषकादिगण, 15/13)

असनति ---------- प्रकीर्याः ।
त्रिहिमतल पलाशा जोड्.गकः शाकशालौ ।
असनादि र्विजयते श्विव्त्र कुष्ठ कफक्रिमीन् ।
पाण्डुरोगं प्रमेहं च मेदोदोष निबर्हणः ।।
(अ.ह.सू., असनादि गण, 15/19-20)

भूमिसहो द्वारदारूर्वरदारूः खरच्छदः।
भूमिसहस्तु शिशिरो रक्तपित्तप्रसादनः ।।
(भा.प्र.वटादिवर्ग, 77)

शाकः कषायः शिशिरो रक्तपित्त प्रसादनः ।।
कुष्ठश्लेष्मानिल हरो गर्भ संधानस्थैर्य्यकृत ।।
(कै.नि., ओषधिवर्ग, 806-807)

शाखोटका (शा.त्वक्.)

1. शाखोटो रक्तपित्तार्शोवातश्लेष्मातिसारजितं।।64।।

(भा.प्र.नि. वटादिवर्ग 64)

2. शाखोटोवल्कलक्वाथं गोमूत्रेण युतं पिबेत्
श्लीपदानां विनाशाय मेदोदोषनिवृत्तये।

(शा.)

3. शाखोटः स्याद .....
कौशिक्योऽजाक्षीरनाशश्च सूक्तस्तिक्तोष्णोऽयं
पित्तकृद् वातहारी ।।123।।

(रा.नि., प्रभद्रादिवर्ग, 123)

शालपर्णी (मूल)

1. स्थिरा. . . . . इति दशोमानि बल्यानि भवन्ति।(7)

2. विदारिगन्धा. . . . . इति दशेमानि अंगमर्दप्रशमनानि भवन्ति।।44)।।

(च.सू. स्थान अ.4)

3. विदारिगन्धा वृष्य सर्व दोषहराणाम्।।40।।

(च.सू. स्थान अ. 25, 40)

4. शालपर्णी रसे तिक्ता गुरूष्णा वातदोषजित्
विषम ज्वरमेहार्शः शोफसन्तापनाशनी।।88।।

(ध.नि.गुडूच्यादिवर्ग 88)

5. शालपर्णी स्थिरा सौम्या त्रिपर्णी पीवरी गुहा
विदारिगन्धा दीर्घाङ्गी दीर्घपत्रांऽशुमत्यपि।।31।।
शालपर्णी गुरूश्छर्दिज्वरश्वासातिसारजित्।।32।।
शोषदोषत्रयहरी बृंहण्ययुक्ता रसायनी।
तिक्ता विषहरी स्वादुः क्षतकासकृमिप्रणुत्।।33।।

(भा.प्र.नि. गुडूच्यादिवर्ग 31-38)

शाली (फल)

1. शालयो मधुराः स्निग्धा बल्या बद्धाल्पवचर्सः
कषाया लघवो रूच्याः स्वर्या वृष्याश्च बृंहणाः।
अल्पानिलकफाः शिताः पित्तघ्ना मूत्रलास्तया।।7।।
(भा.नि., धान्यवर्ग, 7)

2. शीतो गुरूस्त्रिदोषघ्नो मधुरो गौरषष्टिकः
किञ्चित् ततो गुरूस्तस्मादपरो रसपाकतः।(64)
(ध.नि.64, सुवर्णादिवर्ग)

3. शालयो लघवः स्निग्धा मधुरा रसपाकतः।।7।।
कषाज्ञयानुरसा हृद्या रूच्याबद्धाल्पवर्चसः
शीतला बृंहणा वृष्या लघुपाकातिमूत्रलाः।।8।।
पित्तघ्नाल्पानिलकफा बल्याः स्वर्याः ज्वरापहाः।
(कै.नि.धान्यवर्ग 7-8)

शाल्मली (शा.त्वक्.)

शाल्मलिस्तु भवेन्मोचा पिच्छिला पूरणीति च
रक्तपुष्पा स्थिरायुश्च कण्टकाढया च तूलिनी।।54।।
शाल्मली शीतला स्वाm द्वी रसे पाके रसायनी
श्लेष्मला पित्तवातास्रहारिणी रक्तपित्तजित्।।55।।
(भा.नि.वटादि वर्ग 54-55)

शण (बीज)

शणस्तु माल्यपुष्पः स्याद्वमनः कटुतिक्तकः
निशावनो दीर्घशाखस्तवकसारो दीर्घपल्लवः ।।75।।
शणस्त्वम्लः कषायश्च मलगर्भास्रपातनः
वान्तिकृद्वातकफनुज्ज्ञेयस्तीव्राङ्गमर्दजित्।
(रा.नि.शताह्वदिवर्ग 75-76)

शर (मूल)

शरद्वयं स्यान्मधुरं सतिक्तं कोष्णं कफभ्रान्तिमदापहारि ।
बलं च वीर्यं च करोति नित्यं निषेवितं वावकरं च किञ्चित् ।।121।।
(धन्वन्तरि निघण्टु, करवीरादिश्चतुर्थो वर्ग, 121)

मुञ्जद्वयन्तु मधुरं तुवरं शिशिरं तथा ।।
दाहतृष्णाविसर्पास्र मूत्रकृच्छ्राक्षिरोगजित् ।
दोषत्रयहरं वृष्यं मेखलासूपयुज्यते ।।160।।
(भा.प्र.नि., गुडूच्यादि वर्ग 159-160)

शरद्वयं स्यान्मधुरं सुतिक्तं कोष्णं कफभ्रान्तिमदापहारि ।
बलञ्च वीर्यञ्च करोति नित्यं निषेवितं वातकरंच किञ्चित ।।83।।
(राजनिघण्टु, शाल्मल्यादि वर्गः, 83)

मुञ्जः कषायो मधुरोऽनुष्णो वृष्योऽक्षिरोगजित् ।
दोषास्रदाहतृण्मूत्रवस्तिशूल विसर्पनुत् ।।244।।
(कै.दे.नि. ओषधिवर्ग, 1244)

सरल (का.म.)

सरल:पीतवृक्षः स्यात्तथा सुरेभिदारुकः।
सरलो मधुरस्तिक्तो कटुपाकरसो लघुः।।26।।
स्निग्धोष्णः कर्णकण्ठाक्षिरोगरक्षोहरः स्मृतः।
कफानिलस्वेददाहकासमूर्च्छाव्रणापहः।।27।।
(भा.प्र.नि., कर्पूरादिवर्ग 26-27)

सरलः पूतिकाष्ठं च चीडा पूतिद्रुमोमतः।
दीपावृक्षः स्निग्धदारुः प्रोक्तो मारीच पत्रकः।।77।।
सरलः स्निग्ध तिक्तोष्ण कफमारुतनाशनः।
वक्त्रस्रावस्वरभ्रंशनेत्ररोग व्रणान्त कृत।।78।।
(धन्व. नि., चन्दनादिवर्ग, 77-78)

उत्थितः सरलः चीडः खलिर्मरिचपत्रकः।।1311।।
पीतवृक्षो दीपवृक्षः पूतिदारु कलिद्रुमः।
नमेरु र्नन्दनो दारुः सुरदारु सुदारु च।।1312।।
सरलो मधुरस्तिक्तः कटुपाकरसो लघुः।
स्निग्धोष्णः कर्णकण्ठाक्षिरोगघ्नो विनियच्छति।।1313।।
रक्षोऽलक्ष्मीव्रणस्वेदयूका कासकफानिलान्।
(श्रीवासः सरलस्रावः श्रीवेष्टो वृक्षधूपकः)
श्रीवेष्टो दधिसाह्वस्तु श्रीवासः श्रीनिवासकः।।1314।।
चीडास्रावः क्षीरशीर्षः पायसोः रक्तशीर्षकः।
वेष्टको विष्टको दासी कलिद्रुस्तडितस्तडी।।1315।।
श्रीवासो मधुरस्तिक्तः स्निग्धोष्णस्तुवरः सरः।
पित्तलो वातमूर्द्धाक्षिस्वररुक्कफपीनसान्।।1316।।
रक्षोघ्नः स्वेददौर्गन्ध्ययूकाकण्डूव्रणान् जयेत्।
(कैयदेव निघन्टु, ओषधिवर्ग, 1311-1316)

सरल (मूल)

1. उत्थितः सरलः चीडः खलिर्मरिचपत्रकः।।1311।।
पीतवृक्षो दीपवृक्षः पूतिदारु कलिद्रुमः।
नमेरु र्नन्दनो दारुः सुरदारु सुदारु च।।1312।।
सरलो मधुरस्तिक्तः कटुपाकरसो लघुः।
स्निग्धोष्णः कर्णकण्ठाक्षिरोगघ्नो विनियच्छति।।1313।।
रक्षोऽलक्ष्मीव्रणस्वेदयूका कासकफानिलान् ।

2. श्रीवेष्टो दधिसाह्वस्तु श्रीवासः श्रीनिवासकः।।1314।।
चीडास्रावः क्षीरशीर्षः पायसोः रक्तशीर्षकः।
वेष्टको विष्टको दासी कलिद्रुस्तडितस्तडी।।1315।।
श्रीवासो मधुरस्तिक्तः स्निग्धोष्णस्तुवरः सरः।
पित्तलो वातमूर्द्धाक्षिस्वररुक्कफपीनसान्।।1316।।
रक्षोघ्नः स्वेददौर्गन्ध्ययृकाकण्डूव्रणान् जयेत्।
(कैयदेव निघन्टु ओषधिवर्ग)

3. सरलः पूतिकाष्ठं च चीडा पूतिद्रुमोमतः।
दीपवृक्षः स्निग्धदारुः प्रोक्तो मारीच पत्रकः।।77।।

4. सरलः स्निग्ध तिक्तोष्ण कफमारुतनाशनः।
वक्त्रस्रावस्वरभ्रंशनेत्ररोग व्रणान्त कृत्।।78।।
(धव. नि. चन्दनादिवर्ग, 78)

5. सरलःपीतवृक्षः स्यात्तयो सुरेभिदारुकः।
सरलो मधुरस्तिक्तो कटुपाकरसो लघुः।।26।।
स्त्रिग्धोष्णः कर्णकण्ठाक्षिरोगरक्षोहरः स्मृतः।
कफानिलस्वेददाहकासमूर्च्छाव्रणापहः।।27।।
(भा.प्र.नि., कर्पूरादिवर्ग 26-27)

सर्षप (बीज)

सर्षपः कटुकः पाके रसे हृद्यः सतिक्तकः ।
तीक्ष्णोष्णो कफवातघ्नो रक्तपित्ताग्निवर्द्धनः ।।91।।
किञ्चिद्रूक्षो जयते कुष्ठं कण्डूकंठग्रहक्रमीन् ।

(कै.नि.,धान्यवर्ग 91-1/2)

गौर सर्षप कोऽत्युष्णो रक्षोघ्नः कफवातजित् ।
कृम्यामकण्डूकुष्ठघ्नः श्रुतिशीर्षानिलार्जित् ।
तद्वद्रक्तस्तु सिद्धार्थस्तिक्तः स्निग्धोष्णकः कटु ।।40।।

(धन्व.नि., करवीरादिवर्ग 40)

शतपत्रीका (पुष्प)

शतपत्री हिमातिक्ता कषाया कुष्ठनाशनी।
मुखस्फोटहरा रुच्या सुरभिः पित्तदाहनुत्।।80।।

(रा.नि., करवीरादिवर्ग 80)

शतपत्री तरुण्युक्ता कर्प्पिका चारुकेशरा।
महाकुमारी गन्धाढ्या लाक्षा पुष्पातिमंजुला।।18।।
शतपत्री हिमाह्वया सारिणी शुक्रला लघु।
वातपित्तास्रजिद वर्ण्या कट्वी तिक्त च पाचनी।।19।।

(भा.प्र.पुष्पवर्ग 18-19)

शिंशपा (का.म.)

1. साल. . . . शिंशपा. . . . . कालीयकं चेति
सालसारादिरित्येष गणः कुष्ठविनाशनः ।
मेहपाण्ड्मयहरः कफमेदोविशोषणः।
(सु.सू. 38/8-9)

2. मुष्क . . . . . शिंशपा. . . . . त्रिफला चेति।
मुष्ककादिर्गणो ह्योष मेदोघ्नः शुक्रदोषहृत् ।
मेहार्शः पाण्डु रोगाश्म शर्करानाशनः परः।
(सु.सू. 38/20-21)

3. सरल देवदारूशिंशपागुरूण्डीरसारस्नेहास्तिक्त कटुकषाया
दुष्टव्रणशोधनाः कृमिकफकुष्ठानिल हराश्च।
(सु.सू. 45/123)

4. असनतिनिश . . . . . शिंशिपामेषश्रृङ्गयः।
- - - - - - - - - - - - - - - अश्वकर्णाः।।
असनादिर्विजयते श्वित्रकुष्ठकफक्रिमीन्।
पाण्डुरोगं प्रमेह च मेदोदोषनिवर्हणः।
(अ. ह .चि. 15/17-20)

5. मुष्कक . . . . . शिंशपाः
गुल्ममेहाश्मरीपाण्डुमेदोर्शः कफशुक्रजित्।
(अ. ह.चि. 15/32)

6. शिंशपाक्षारसिद्धं च क्षीरमाशु ज्वरापहम्।
(अ.ह.चि. ।/115)

7. शिंशपा पिच्छिलाश्यामा कृष्णसारा च सा गुरू
कपिला सेव मुनिभिर्भस्मगर्भेतिकीर्त्तिता ।।24।।
शिंशपा कटुका तिक्ता कषाया शोषहारिणी
उष्णवीर्या हरेन्मेदः कुष्ठश्वित्रवमिक्रिमीन।
बस्तिरूग्व्रणदाहास्रबलासान गर्भपातिनी।।25।।
(भा.प्र.वटादिवर्ग, 24-25)

8. शिंशपा तु महाश्यामा कृष्णसारा स्मृताऽगुरूः
कुशिंशपाऽन्या कपिला भस्मगर्भा वसादनी ।
शिंशपायुगलं वर्ण्यं हिक्काशोफौ विसर्जयेत्
पित्तदाहप्रशमनं बल्यं रूचिकरं परम्।
(ध.नि.आम्रदिवर्ण 111-112)

9. श्यामादि शिंशपा तिक्ता कटूष्णा कफवातनुत्
नष्टाजीर्णहरा दीप्याशोफतीसारहारिणी।।127।।
(रा.नि.प्रभद्रादिवर्ग, 127।।)

10. शिंशपा कटुका तिक्ता कषाया गर्भपातिनी
उष्णवीयां हरेन्मेदः कफदाहवमिव्रणान्।
शोषकुष्ठकृमिश्वित्रबस्तिरूक्पीनसानपि।।979।।
(कै.नि.औषधिवर्ग 979)

शिंशपा (शा.त्वक्.)

1. शिंशपा कटुका तिक्ता कषाया शोषहारिणी
उष्णवीर्या हरेन्मेदः कुष्ठश्वित्रवमिक्रिमीन।
बस्तिरूग्व्रणदाहास्रबलासान गर्भपातिनी।
(भा.प्र.वटादिवर्ग, 25)

6. शिंशपासारस्नेहास्तिक्त कटुकषाया दुध्व्रणशोधनाः
कृमिकफकुष्ठानिलहराश्च ।
(सु.सू. 45)

7. शिंशपायुगलं वर्ण्य हिक्काशोफौ विसर्जयेत्
पित्तदाहप्रशमनं बल्यं रूचिकरं परम्।।112।।
(ध.नि., आम्रादिवर्ग, 112)

8. शिंशपा कटुका तिक्ता कषायागर्भपातनी
उष्णवीर्या हरेन् मेदः कफदाहवमिव्रणान्।।979।।
शोष कुष्ठ कृमिश्वित्र बस्तिरूक्पीनसानपि।
(कै.नि. औषधिवर्ग 979)

शिरीष (शा.त्वक्.)

शिरिषो मधुरोऽनुष्णस्तिक्तश्च तुवरो लघुः
दोषशोथविसर्पघ्नः कासव्रण विषापहः ।।14।।
(भा.प्र.नि.वटादि वर्ग- 14)

तिक्तोष्णो विषहा वर्ण्यस्त्रिदोषशमनो लघुः
शिरीषः कुष्ठकण्डूत्वग दोष श्वास कासहा ।।103।।
(ध.नि.आम्रादिवर्ग 103)

शिरीषो मधुरोऽनुष्णः सतिक्तस्तुवरो लघुः
निहन्ति दोषसर्प शोफ कास विषव्रणान्।।975।।
(कै.नि.औषधिवर्ग 975)

शिरीषः कटुकः शीतो विषवातहरः परः
पामासृक्कुष्ठकण्डूति त्वगदोषस्य विनाशनः।।60।।
(रा.नि. प्रभद्रादिवर्ग 60)

शिरीषो विषहनानाम्।
(च.सू.अ .....)

स्थौणेय (पत्र)

एला ------- स्थौणेयक ------- नागकेशरं चेति ।
एलादिकोवातकफौ निहन्याद्विषमेव च ।
वर्णप्रसादनः कण्डूपिडकाकोठनाशनः।।

(सुश्रुत सं. सूत्र 38/25)

स्थौणेयकं बर्हिबर्हं शुकबर्हञ्च कुक्कुरम् ।
शीर्णरोगशुकञ्चापि शुकपुष्पं शुकच्छदम्. ।।109।।
स्थौणेयकं कटु स्वादु तिक्तं स्निग्धं त्रिदोषनुत् ।।110।।
मेधाशुक्रकरं रुच्य रक्षोघ्नं ज्वरजन्तुजित्।।
हन्ति कुष्ठासतृड्दाह दौर्गन्ध्यतिलकालकान् ।।111।।

(भा.प्र. कर्पूरादिवर्ग, 109-111)

स्थौणेयकं बर्हिचूडं शुकपुष्पं शुकच्छदम्।
विकर्णं शुकबर्हं च हरित शीर्णरोमकम् ।।68।।
स्थौणेयं कफवातघ्नं सुगन्धि कटुतिक्तम् ।
पित्तप्रकोपशमनं बलपुष्टिविवर्धनम् ।।69।।

(ध.नि., चन्दनादिवर्ग, 68,69)

स्थौणेयकं बर्हिशिखं शुकच्छदं मयूरचूड़ं शुकपुच्छकं तथा ।
विकीर्णरोमापि च कीरवर्णकं विकर्णसंज्ञं हरितं नवाह्वयम् ।।129।।
स्थौणेयं कफवातघ्नं सुगन्धि कटुतिक्तकम् ।
पित्तप्रकोपशमनं बलपुष्टिविवर्द्धनम् ।।130।।

(राजनिघण्टु, चन्दनादिवर्ग,129-130)

स्थौणेयकं तिक्तकं स्निग्धं गुरू स्वादु त्रिदोषनुत् ।
मेधा शुक्रकरं रुच्यं रक्षाघ्नं ज्वरजन्तुजित् ।।
हन्ति कुष्ठास्रतृड्दाह दौर्गन्ध्यतिलकालकान् ।

(कै.नि.ओषधिवर्ग,380)

स्थौणेयकं बहिश्चूडं शुकच्छदम् ।।
स्थौणेयकं शीतलं वृष्यं मेध्यं दोषत्रयास्रजित् ।।

(म.नि. कर्पूरादि वर्ग,52)

सूरण (कन्द)

सूरणः कन्द ओलश्च कन्दलोऽर्शोघ्न इत्यपि ।
सूरणो दीपनोरूक्षः कषायः कण्डुकृत् कटुः ।।91।।
विष्टम्भी विशदो रूच्यः कफार्शःकृन्तनो लघुः।
विशेषादर्शसे पथ्यः प्लीहगुल्मविनाशनः ।
सर्वेषां कन्दशाकानां सूरणः श्रेष्ठ उच्यते ।।92।।
दद्रूणां कुष्ठिनां रक्तपित्तिनां न हितो हि सः ।
सन्धानयोगं सम्प्राप्तः सूरणो गुणवत्तरः ।।93।।
(भा.नि. शाकवर्ग;91-93)

अर्शोघ्नः सूरणः कन्दो कण्डूलश्चित्रदंडकः ।
समष्ठीलोऽपरश्चौल्ल उल्ल ओल्लोवनोद्भवः।।
सूरणो विशदो रूक्षः कषायः कटुको लघुः ।
विष्टम्भी दीपनो रूच्योबलास गुदकीलहृत् ।।
(कै.नि.ओषधीवर्ग;1588-1589)

सूरणः कटुकरूच्यदीपनः पाचनः क्रिमिकफानिलापहः ।
श्वासकासवमनार्शसां हरः शूल्गुल्मशमनोऽस्त्रदोषकृत् ।।
(रा.नि., मूलकादि वर्ग, 64)

श्वेत चन्दन (का.म.)

1. चन्दनं शीतलं रूक्षं तिक्तमाह्यदनं लघु
श्रमशोषविषश्लेष्मतृष्णापित्तास्रहनुत ।।13।।
(भा.नि.कर्पूरादिवर्ग 13)

2. चन्दनं दुर्गंधहरदाहनिर्वापणलेपनानाम्।
(च.सू.25)

3. चन्दनं शीतलं स्वादु तिक्तं पित्त विनाशनम्
रक्तप्रसादनं वृष्यमन्तर्दाहापहाारकम्।।2।।
पित्तास्रविषतृड्दाह कृमिघ्न गुरू रुक्षणम्
सर्वसतिक्त मधुरं चन्दनं शिशिरं परम्।।3।।
(ध.नि., चन्दनादि वर्ग, 2-3)

श्योनाक (पत्र)

1. श्योनाको दीपनः पाके कटुकस्तुवरो हिमः
ग्राही तिक्तोऽनिलश्लेष्म पित्त कास प्रणाशनः।।26।।
(भा.प्र.नि.गुडूच्यादिवर्ग 26)

2. श्योनाक कटुकः पाके कषायस्तिक्तको हिमः
संग्राही दीपनः कासश्लेष्म पित्तामवातजित्।
(कै.दे.नि. औषधिवर्ग 41)

3. टिण्टुकः शिशिरस्तिक्तो वस्तिरोगहरः परः
पित्तश्लेष्ममामवातातीसार कासारूचीर्जयेत्।।113।।
(ध.नि., गुडुच्यादि वर्ग, वर्ग, 113)

ताल (पु.मंजरी)

ताल प्रलम्बं स्यादुर:क्षतरुजापहम् ।।115।।
खर्जूरं तालशस्यं च रक्तपित्तक्षयापहम् ।
(च सू. स्थान 27. 115)

तालोध्वजद्रुमः प्रांशुदीर्घस्कन्धो दुरारुहः ।
तृणराजो दीर्घ तरुरव्यपत्रो द्रुमेश्वरः ।।61।।
फलं स्वादु रसे पाके तालजं गुरू पित्तजित्
तद्बीजं स्वादुपाकं तु मूलं स्याद् रक्तपित्तजित् ।।62।।
(धन्वन्तरि निघण्टु : आम्रादि वर्ग, 61-62)

तालनालिकेरपनसमोचप्रभृतीनि ।।77।।
स्वादुपाकरसान्याहुर्वात पित्तहराणि च ।
बलप्रदानि स्निग्धानि वृहंणानि हिमानि च ।।178।।
फलं स्वादुरसं तेषां तालज गुरूपित्तजित् ।
तद्बीजं स्वादुपाकं तु मूत्रलं वातपित्तजित् ।।179।।
(सु. संहिता सू.स्थान, 46; 177-179)

तालस्तु मधुरः शीतो मेदः श्लेष्मबलप्रदः ।
शुक्रलो बृंहणो हन्ति वातपित्तव्रणकृमीन् ।।473।।
फलं तस्य गुरू स्निग्धं स्वादु बल्यं हिमं सरम् ।
विष्टंभि बृंहणं वृष्यं तर्पणं कफमांसकृत्।।474।।
रक्तपित्तानिलश्वास क्षयदाहक्षतव्रणान् ।
बीजं स्वादु रसे पाके मूत्रलं वातपित्तजित्।।475।।
पक्वं तालफलं पित्तश्लेष्मरक्तविवर्धनम् ।
दुर्जरं बहुमूत्रं च तन्द्राऽभिष्यन्दि शुक्रलम् ।।476।।
तालमज्जा तु तरुणः किंचित् मदकरो लघुः।
श्लेष्मलो वातपित्तघ्नः सस्नेहो मधुरः सरः ।।477।।
श्लेष्मापहं स्याद् विष्टंभि पित्तकृत् शुक्रलं गुरू ।
तालस्य मस्तकं ज्ञेयं बस्तिशुद्धिकरं परम् ।।479।।
(कैयदेव निघण्टु, ओषधिवर्ग, 473-477 व 479)

त्रिवृत (मूल)

1. त्रिवृत सुखविरेचनानाम् ।(च.सू. 25,श्लोक सं.2)
श्वेता त्रिवृद्रेचनी स्यात्स्वादुरूष्णा समीरहृत्।
रूक्षा पित्तज्वरश्लेष्मपित्तशोथोदरापहा। (194)
(भा.प्र. गुडूच्यादि वर्ग 194)

2. कषाया मधुरा चोष्णा विपाकेकटुका त्रिवृत
कफपित्त प्रशमनी रूक्षा चानिलकोपनी। (239)
(ध.नि.गुडूच्यादिवर्ग 239)

3. त्रिवृदुष्णा कटुस्तिक्ता रूक्षा स्वाद्वी विरेचनी।

4. कषाया कटुका पाके वातला कफपित्तहा
ज्वर शोफोदर प्लीह पाण्डुव्रणविनाशिनी ।।1016।।
(कै.दे.नि., ओषधिवर्ग, 1016)

5. त्रिवृत्तिक्ता कटूष्णा च क्रिमिश्लेष्मो दरार्त्तिजित्
कुष्ठकण्डूव्रणान हन्ति प्रशस्ता च विरेचने।(167)
(रा.नि. पिप्पल्यादिवर्ग 167)

तुम्बिनी (फल)

वचौभेदीन्यलाबूनि रूक्षशीतगुरूणि च ।
(च.सं.सू.27/112)

लम्बाऽथ कटुकालाबूस्तुम्बी पिण्डफला तथा ।
इक्ष्वाकुः फलिनी चैव प्रोच्यते ---------- ।।
कासश्वास विषच्छर्दिज्वरार्ते कफकर्षिते ।
प्रताम्यति नरे चैव वमनार्थं तदिष्यते् ।।
(च.कल्प . 3/3-4)

अलाबुर्भिन्नविट्का तु रुक्षा गुर्व्यतिशीतला ।
तिक्तालाबुरहृद्या तु वामिनी वातपित्तजित् ।।
(सु.सू. 46/215)

तुम्बं रूक्षतरं ग्राहि ---------- !! (अ.ह.सू.6/89)

मिष्टतुम्बीफलं हृद्यं पित्तश्लेष्मापहं गुरू ।
वृष्यं रुचिकरं प्रोक्तं धातुपुष्टिविवर्धनम् ।।167।।
इक्ष्वाकुः कटुतुम्बी स्यात्सा तुम्बी च महाफला ।
कासश्वासच्छर्दिहरो विषार्ते कफकर्षिते ।
इक्ष्वाकुर्वमने शस्त्रः प्रताम्यति च मानवे ।।168।।
कंटुतुम्बी कटुस्तिक्ता वातकृच्छ्वासकासजित् ।
कफघ्नी शोधनी शोफव्रणशूलविषापहा ।।169।।
(ध.नि. गुडुच्यादि वर्ग)
167-169

कटुतुम्बी कटुफला तुम्बिनी कटुतुम्बिनी ।
कटुतुम्बी कटुस्तीक्ष्ण वान्तिकृत् श्वासवातजित् ।
कासघ्नी शोधनी शोफ व्रणशूलविषापहा ।।
(रा.नि.गुडुच्यादिवर्ग;56-57)

अलाबुनालिका गुर्वी मधुरा पित्तनाशिनी ।
वातश्लेष्मकरी स्निग्धा शीतला मलभेदिनी ।।
तुम्बी तिक्ता कटु पाके वामनी वातपित्तजित् ।
अहृद्या शीतला कासश्वासज्वर विषापहा ।।

(कै.नि.ओषधिवर्ग;540-543)

मिष्टं तुम्बीफलं वृष्यं कफपित्तहरं गुरू ।
कटुतुम्बी हिमा हृद्या पित्तकास विषापहा ।।

(म.नि.शाकवर्ग;10-11)

उदुम्बर (शु.फल)

उदुम्बरो हिमो रूक्षो गुरूः पित्तकफास्त्रजित् ।
मधुरस्तुवरो वर्ण्यो व्रणशोधनरोपणः ।।9।।
(भा.नि., वटादिवर्ग, 9)

औदुम्बरं कषायं स्यात् पक्वं तु मधुरं हिमम् ।
कृमिकृत रक्तपित्तघ्नं मूर्च्छादाह तृषापहम् ।।87।।
(ध.नि., आम्रादिवर्ग, 87)

उदुम्बरं कषायं स्यात्पक्वस्तु मधुरं हिमम्।
कृमिकृत्पित्तरक्तघ्नं मूर्च्छादाहतृषापहम् ।।128।।
(रा.नि., आम्रादिवर्ग, 128)

उदुम्बरो हिमो रूक्षः कषायो मधुरो गुरूः ।।426।।
भग्नसंधानकृद् वर्ण्यो व्रणशोधनरोपणः।
स्तंभनानि कषायाणि श्लेष्मघ्नानि हितानि च ।।427।।
(कै. नि., ओषधिवर्ग, 426-427)

उशीर (मूल)

उशीरं दाहत्वग्दोषस्वेदापनयन प्रलेपानाम् ।
(च.सू., 25/40)

उशीरं चामृणालं स्यादभयं समगन्धिकम् ।
रणप्रियं वीरतरु वीरं वीरणमूलकम् ।
उशीरं शीतलं तिक्तं दाहक्लान्तिहरं च तत् ।
वातघ्नं ज्वरतृण्मेहनुद्रक्तं हन्ति योगतः ।।
उशीरं स्वेददौर्गन्ध्य पित्तघ्नं स्निग्धतिक्तकम् ।
(ध.नि., चन्दनादि वर्ग 13-14)

वीरणस्य तु मूलं स्यादुशीरं नलदञ्च तत् ।
अमृणालञ्च सेव्यञ्च समगन्धिक मित्यपि ।।86।।
उशीरं पाचनं शीतं स्तम्भनं लघु तिक्तकम् ।।87।।
मधुरं ज्वरहृद्वान्तिमदनुत्कफपित्तहृत् ।
तृष्णाऽस्रविषवीसर्प दाहकृच्छ्रव्रणापहम् ।188।।
(भा.प्र., कर्पूरादि वर्ग, 86-88)

उत्पल (पुष्प)

1. कुमुदं पिच्छिलं स्निग्धं मधुरं हलादि शीतलम्।।15।।
(भा.प्र.पुष्पवर्ग 15)

2. कुमुदं पिच्छिलं स्निग्धं मधुरं हल्लादि शीतलम्।।1453।।
(कै.दे.नि. औषधिवर्ग 1453)

3. उत्पलानि कषायाणि रक्तपित्त हराणि च।।115।।
कुमुदोत्पल- नालास्तु सपुष्पाः सफलाः स्मृताः।
शीताः स्वादुकषायास्तु कफमारूतकोपनाः।।117।।
कषायमीषाद्विगष्टम्भि रक्तपित्तहरं स्मृतम्।।118।।
पौष्करन्तु भवद् बीजं मधुरं रस पाकयोः।(चरक)।।119।।
(च.सू.27/115-119)

4. नीलाब्जं शीतलं स्वादु सुगन्धि पित्तनाशनम्
रूच्यं रसायने श्रेष्ठं देह दाढर्यदकेशदम्।।113।।
(ध.नि.करवीरादिवर्ग 113)

5. नीलाब्जं शीतलं स्वादु सुगंधि पित्तनाशकृत
रूच्यं रसायने श्रेष्ठं कैश्यञ्च देहदाढर्यदम्।।181।।
(रा.नि.करवीरादिवर्ग 181)

6. ईषत् श्वेतं पद्मं नलिनं च तदुक्तमीषदारक्तम्
उत्पलं मीषान्नीलं त्रिविधमितीद भवेत् कमलम्।।182।।
उत्पलादिस्यं दाहरक्तपित्त प्रसादनः
पिपासादाहहृद्रोग- च्छर्दिमूर्च्छाहरो गणः।।183।।
(रा.नि.करवीरादिवर्ग 182- 183)

7. सतिक्तं मधुरं शीतं पद्मं पित्तकफापहम्
मधुरं पिच्छिलं स्निग्धं कुमुदं हलादि शीतलम्।
तस्यादल्पान्तरगुणे विद्यात् कुवलयोत्पले।।
(सु.सू. 46)

उशीर (मूल)

उशीर दाहत्वग्दोषस्वेदापनयन प्रलेपानाम्।
(च.सू.25/40)

उशीर चामृणालं स्यादभयं समगन्धिकम्।
रणप्रियं वीरतरू वीरं वीरणमूलकम्।।13।।
उशीरं शीतलं तिक्तं दाहक्लान्तिहरं च तत्।।
वातघ्नं ज्वरतृण्मेहनुद्ररक्त हन्ति योगतः ।।
उशीरं स्वेददौर्गन्ध्य पित्तघ्नं स्निग्धतिक्तकम्।
(ध. नि. चन्दनादि वर्ग.13-14)

वीरणस्य तु मूलं स्यादुशीरं नलदं च तत्।
अमृणालंच सेव्यंच समगन्धिक मित्यपि।।86।।

उशीरं पाचनं शीतं स्तम्भनं लघु तिक्तकम्।।
मधुरं ज्वर हृद्वान्ति मदनुत्कफपित्तहृत्।
तृष्णाऽस्रविषवीसर्प दाह कृच्छ्व्रणापहम्।।
(भा. प्र. कर्पूरादि वर्ग 86-88)

उत्पल (पुष्प)

कुमुदं पिच्छिलं स्निग्धं मधुरं ह्लादि शीतलम्।।15।।
(भा.प्र.पुष्पवर्ग 15)

कुमुदं पिच्छिलं स्निग्धं मधुरं हलादि शीतलम्।।1453।।
(कै.दे.नि. औषधिवर्ग 1453)

उत्पलानि कषायाणि रक्तपित्त हराणि च।115।
कुमुदोत्पल-नालास्तु सपुष्पाः सफलाः स्मृताः।।
शीताः स्वादुकषायास्तु कफमारूतकोपनाः।।117।।
कषायमीषद्विष्टम्भि रक्तपित्तहरं स्मृतम्।118।
पोष्करन्तु भवेद् बीजं मधुरं रस पाकयोः ।। 119 ।।
(च.सं., सू. 27/115-119)

नीलाब्जं शीतलं स्वादु सुगन्धि पित्तनाशनम्।
रूच्यं रसायने श्रेष्ठ देहदाढर्यदकेशदम।। 113।।
(ध.नि.करवीरादि वर्ग,113)

नीलाब्जं शीतलं स्वादु सुगन्धि पित्तनाशकृत्।।
रूच्यं रसायने श्रेष्ठं केश्यच देहदार्ढ्यदम्।।
(रा.नि.करवीरादिवर्ग, 181)

ईषत्श्वेतं पद्मं नलिनं च तदुक्तमीषदारक्तम्।
उत्पलं मीषान्नीलं त्रिविधमितीदं भवेत् कमलम्।।182।।

उत्पलादिरयं दाहरक्तपित्त प्रसादनः।
पिपासादाह हृदोगच्छद्रिमूर्च्छाहरो गणः ।।183।।
(रा.नि.करवीरादिवर्ग 182-183)

सतिक्तं मधुरं शीतं पद्मं पित्तकफापहम्।।
मधुरं पिच्छिलं स्निग्धं कुमुदं ह्लदि शीतलम्।।
तस्मादल्पान्तरगुणे विद्यात् कुवलयोत्पले ।। 285।।
(सु. सं. सूं. 46/285)

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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- Lightness
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).

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1.	Ajagandha (Sd.)	*Cleome gynandra* Linn.
2.	Ajamoda (Frt.)	*Apium leptophyllum* (Pers.) F.V.M. ex Benth.
3.	Amalaki (Frt. Frt. Pulp)	*Emblica officinalis* Gaertn.
4.	Amalaki (Drd. Frt.)	*Emblica officinalis* Gaertn.
5.	Aragvadha (Rt.)	*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.)
16.	Bakuci (Frt.)	*Psoralea corylifolia* Linn.
17.	Bibhitaka (Frt.)	*Termtinalia 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.)
41.	Karavira (Lf.)	*Nerium indicum* Mill.
42.	Karkatasrngi (Lf.)	*Pistacia lentiscus* Linn.

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.	Kulatha (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. & L.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.	Pasana Bheda (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 (Stn. & 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.