THE AYURVEDIC PHARMACOPOEIA OF INDIA

PART - I
VOLUME - IV
First Edition

सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF HEALTH AND FAMILY WELFARE
DEPARTMENT OF AYURVEDA, YOGA-NATUROPATHY,
UNANI, SIDDHA & HOMOEOPATHY (AYUSH)
NEW DELHI

PDH 64(E)
5000-2004 (DSK II)

Effective from 1 January 2004

Price : Inland Rs 500
Foreign US $ 100

ISBN : 81-901151-5-4

Printed by : National Institute of Science Communication And Information Resources (NISCAIR), CSIR
Dr. K S Krishnan Marg, New Delhi – 110012

On behalf of : GOVERNMENT OF INDIA
DEPARTMENT OF AYURVEDA, YOGA-NATUROPATHY,
UNANI, SIDDHA & HOMOEOPATHY(AYUSH)
INDIAN RED CROSS SOCIETY BUILDING,
SANSAD MARG, NEW DELHI

WEBSITE : www.indianmedicine.nic.in

Published by : THE CONTROLLER OF PUBLICATIONS
CIVIL LINES, DELHI-110054

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MEDICINAL PLANTS
FOR HEALTHY
LIVING

सचिव भारत सरकार
स्वास्थ्य एवं परिवार कल्याण मंत्रालय
भारतीय चिकित्सा पद्धति एवं होमियोपैथिक विभाग
रेड क्रोस भवन, नई दिल्ली-110001
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FOREWORD

There is a global demand for natural plant based products including Ayurvedic medicines for various health problems. Therefore, the associated issues of quality and standards of Ayurvedic drugs are very important. It is equally important to ensure the efficacy of the drugs to increase the faith of the users. For the implementation of the provisions relating to Ayurvedic medicines in the Drugs and Cosmetics Act, 1940 and the Rules thereunder, it was considered necessary to work out scientific quality standards of drugs of these systems. The Pharmacopoeial Laboratory for Indian Medicine (PLIM), Ghaziabad has been constantly working since 1970 to develop standards of quality, purity and strengths of Ayurvedic drugs. This Laboratory is guided by the Ayurvedic Pharmacopoeia Committee (APC) having experts of Ayurveda, Pharmacognosy, Phytochemistry, Inorganic Chemistry and Pharmacy. On the advice of APC and scientific data generated by PLIM, the work on developing pharmacopoeial standards of Ayurvedic drugs has resulted in the publication of Ayurvedic Pharmacopoeia of India containing monographs of Ayurvedic drugs on scientific parameters.

Three Volumes of Ayurvedic Pharmacopoeia of India (API) containing 258 monographs on single drugs and two Volumes of Ayurvedic Formulary of India (AFI) containing 636 formulations of Ayurvedic medicines have been published. Now the fourth volume of Ayurvedic Pharmacopoeia of India (API) containing 68 monographs on single drugs has been brought out and is in our hands. With the addition of the fourth volume, we now have 326 monographs on quality standards of Ayurvedic drugs available for the user industry to follow. Ayurvedic Pharmacopoeia of India is a legal document and every licensed manufacturer of Ayurvedic medicines will have to comply with the standards prescribed in the Ayurvedic Pharmacopoeia.

This fourth volume of Ayurvedic Pharmacopoeia of India is the result of the hard work put in by the Director, Scientists and staff of Pharmacopoeial Laboratory for Indian Medicine (PLIM), Ghaziabad, the Chairman and Members and Technical staff of Ayurvedic Pharmacopoeia Committee and Adviser(Ayurveda), Department of Indian Systems of Medicine & Homoeopathy. I want to place on record my appreciation of their efforts.

With the scientific and technological developments in this area, there is a scope for adding more scientific parameters to assess the quality, purity and strength of drugs. Suggestions and comments from experts and user industry are welcome for improving future editions.

I am hopeful that the fourth volume of Ayurvedic Pharmacopoeia of India will meet the needs of Industry and help to improve the quality of Ayurvedic products.

(Malti S. Sinha)

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 provisions of the law are being complied with.

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

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

GENERAL NOTICES

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

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

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

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

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

Odour and Taste - Wherever a specific odour has been found it has been mentioned but the description as 'odourless' or 'no odour' has in many cases been avoided in the description as large 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. IV, 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 and Part-II.

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

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

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

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

Abbreviations used for languages

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

PREFACE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

24. The Committee hopes that with the publication of Ayurvedic Pharmacopoeia of India Part I, Vol. IV comprising of 68 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 68 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, 2003, Part-I, Vol IV may also be notified by Government as a book of reference for implementation of the Drugs and Cosmetics Act, 1940 all over India as Ayurvedic Pharmacopoeia of India Part-I, Vol. I, II & III 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 are also due to Km. Savita Satakopan, 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) who deserve my special thanks for this endeavour. The technical staff of Ayurvedic Pharmacopoeia Committee for preparing the Ayurvedic portion of the Pharmacopoeia, viz.; Dr. Chote Lal, Dr. A.K. S. Bhadoria, Dr. M.N. Rangne, Mr. Ashok Kumar, Mr N Padam Kumar and

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.

Dr. S. K. Sharma
Member Secretary
Ayurvedic Pharmacopoeia Committee

New Delhi
Dated: 5th Oct. 2003

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

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

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

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

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

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

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

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

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

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

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

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

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

ĀDHAKĪ (Seed)

Ādhakī consists of dried seed of *Cajanus cajan* Linn. (Fam. Fabaceae), an erect shrub 1.5 to 3 m high, cultivated nearly throughout the country as a pulse crop.

SYNONYMS -

Sansk. : Tuvari
Assam. : Ruharmah
Beng. : Arhar
Eng. : Pigeon Pea
Guj. : Tuver
Hindi. : Arhar
Kan. : Togari
Mal. : Thuvara
Mar. : Toor
Ori. : Harada, Kandulagachha
Punj. : Arhar
Tam. : Adagi Tuvari, Thuvarai, Tuvarai
Tel. : Kandulu
Urdu. : Arhar

DESCRIPTION –

a) Macroscopic :

Seed rounded to oval, 0.4 to 0.7 cm dia., having a white hilum; varying in colour from yellow and red to brown; odour and taste not distinct.

b) Microscopic :

Seed coat shows single layered, radially elongated, palisade-like, thin-walled cells, covered externally by striated cuticle and internally supported by a single layered bearer cells, followed by 8 to 10 layers of tangentially elongated, elliptical, thin-walled, parenchymatous cells; cotyledon composed of oval to polygonal, thin-walled, parenchymatous cells most of them containing groups of simple, rounded to oval starch grains, measuring 5 to 36 μ in dia.

Powder – Light brown; seed coat in surface view shows polygonal, thin-walled cells with intercellular spaces; groups of oval to polygonal, parenchymatous cells, and rounded to oval starch grains measuring 5 to 36 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 0.5 per cent, Appendix 2.2.4.
Protein content	-	Not less than 20 per cent, (as determined by following method)

Method :

Determination of Total Nitrogen :-

Place an appropriate amount of the substance, accurately weighed, in a 500 ml Kjeldahl's flask of hard glass. The material to be tested, if solid or semi-solid, may be wrapped in a sheet of nitrogen free filter paper for convenience in transferring it into the flask. Add 10 g of powdered potassium sulphate, 0.5 g of powdered copper sulphate and 30 ml of nitrogen free sulphuric acid. Incline the flask at an angle of about 45° and gently heat the mixture, keeping the temperature below the boiling point of the mixture until frothing has ceased. Increase the heat until the acid boils and continue the heating for four hrs until the solution acquires a clear greenish colour. Allow the mixture to cool, add 150 ml of water, thoroughly mix the contents of the flask and cool again. Add cautiously, so as to cause the solution to flow down inside the flask to form a layer under the acid solution, 100 ml of a 30 % w/v solution of sodium hydroxide in water. Add a few pieces of granulated zinc, and connect the flask by means of kjeldahl connecting bulb with a condenser, the delivery tube from which dips beneath the surface of a mixture of 30 ml of 0.5 N HCl or 0.5 N H_2SO_4 and 25 ml of water contained in an Erlenmeyer flask or a wide mouthed bottle of about 500 ml capacity. Mix the contents of the flask by gentle rotation, and distil until about two thirds of the contents of the flask have distilled over. Add about 3 drops of solution of methyl red to the contents of the receiving vessel and determine the excess of acid by titration with 0.5 N sodium hydroxide. Repeat the experiment with the same quantities of reagents and in the same manner, but omitting the substance under test. The difference between the two titrations represent the acid required to neutralize the ammonia. Each ml of 0.5 N hydrochloric acid or 0.5 N Sulphuric acid is equivalent to 0.007004 g of N.

When the nitrogen content of the substance under test is known to be low, 0.5 N hydrochloric or 0.5 N sulphuric acid may be replaced by 0.1N hydrochloric acid or 0.1 N sulphuric acid and 0.1 N sodium hydroxide should then be used in titrating the excess acid. Each ml of 0.1 N hydrochloric acid or 0.1 N sulphuric acid is equivalent to 0.001401 g of N.

Total Protein =Total Nitrogen X 6.25.

T.L.C. –

T.L.C. of alcoholic extract of the drug on Silica gel 'G' using Toluene : Ethyl acetate (90 : 10) shows under U.V. (366 nm) four fluorescent zones at Rf. 0.11, 0.23, 0.30 and 0.40 (all blue). On exposure to Iodine vapour three spots appear at Rf. 0.23, 0.30 and 0.96 (all yellow).

PROPERTIES AND ACTION -

Rasa : Kasaya, Madhura
Guna : Ruksa, Laghu
Virya : Sita
Vipaka : Katu
Karma : Vatakara, Kaphahara, Pittakara, Medohara, Sangrahi, Varnya, Visapaha, Stanyavrddhi

IMPORTANT FORMULATIONS – Kankayana Gutika

THERAPEUTIC USES – Atisthaulya, Raktavikara; Raktapitta; Visaroga, Sthaulya, Medoroga, Arsa

DOSE - As directed by the physician.

AGARU (Heart Wood)

Agaru consists of dried heart wood of *Aquilaria agallocha* Roxb. (Fam. Thymelacaceae), a large evergreen tree, distributed in North East part of the country.

SYNONYMS -

Sansk. : Aguru, Lauha, Krmija
Assam. : Agaru
Beng. : Agaru, Agarkashtha, Agar Chandan
Eng. : Eagle Wood
Guj. : Agar
Hindi. : Agar
Kan. : Krishna Agaru
Mar. : Agar
Mal. : Akil
Ori. : --
Punj. : Ooda, Ooda Pharsi
Tam. : Akil Kattai
Tel. : Agaru
Urdu. : Ood Hindi, Agar

DESCRIPTION –

a) Macroscopic :

Drug available in cut pieces, dark brown to nearly black; fracture, hard; no characteristic smell and taste.

b) Microscopic :

Shows mostly uniseriate sometimes biseriate xylem rays; vessels isolated having simple pitted thickening and filled with dark brown contents; xylem fibres short having narrow lumen occupying a major portion of wood; xylem parenchyma less in number and simple pitted; included phloem tissues in pockets partially disorganised, leaving large circular or oval holes, containing collapsed and broken tissues.

Powder – Dark brown; shows numerous aseptate fibres, simple pitted vessels with dark brown contents.

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 0.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 1 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 2 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows in visible light two spots at Rf. 0.17 and 0.27 (both light brown). Under U.V. (366 nm) five fluorescent zones appear at Rf. 0.17, 0.27, 0.36, 0.57 and 0.80 (all blue). On exposure to Iodine vapour eight spots appear at Rf. 0.05, 0.11, 0.15, 0.24, 0.33, 0.57, 0.73 and 0.80 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and after heating the plate for ten minutes at 105°C five spots appear at Rf. 0.13, 0.18, 0.25, 0.37 and 0.59 (all violet).

CONSTITUENTS – Essential Oil.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta
Guna : Snigdha, Tiksna, Laghu
Virya : Usna
Vipaka : Katu
Karma : Tvacya, Pittalam, Vatahara, Kaphahara, Sirovirecana

IMPORTANT FORMULATIONS – Madhukasava, Mrdvikasava, Karpuradyarka, Cyavanaprasa Avahela Anu Taila, Candanadi Taila, Khadiradi Gutika, Svasahara Kasaya Curna, Guducyadi Taila

THERAPEUTIC USES – Kustha, Karna Roga, Aksi Roga, Visa, Swasa

DOSE - 1-3 gm.

AKLĀRI (Endosperm)

Aklāri consists of dried endosperm of *Lodoicea maldivica* Pers. Syn. *L. seychellarum* Labill. (Fam. Arecaceae), a tall, dioecious palm with straight, smooth, annulated trunk, 18 to 30 m high and 0.3 m dia, growing on all types of soils from the sandy shore to the arid mountain top and also cultivated in India.

SYNONYMS -

Sansk. : Samudra Nārikela
Assam. : --
Beng. : Narikel, Jora Narikel
Eng. : Double coconut
Guj. : Dorai Nareal
Hindi. : Dariyai Nariyal
Kan. : Joditengu
Mal. : Aklari
Mar. : Dariyacha Naral
Ori. : Samudra Narikela
Punj. : Dariyai Nariyal
Tam. : Thunga, Kadal Thengai
Tel. : Samudra Tenkaya Kohari
Urdu. : Narjeel Daryaee

DESCRIPTION –

a) Macroscopic :

Drug occurs in varying sizes, about 2.0 cm thick; very hard having much the appearance and texture of vegetable ivory; outer surface moderately rough to smooth, dark brown in colour; inner surface rough, dirty white in colour with number of small tooth-like projections, when soaked in water it softens a little and can be split into thin fibrous bundles; fracture, very hard; odour and taste not characteristic.

b) Microscopic :

Testa shows 4 to 6 layers of polygonal, tangentially elongated, lignified, thick-walled cells filled with reddish-brown contents, followed by a wide zone of oval to polygonal, thick-walled cells; endosperm consists of spindle-shaped cells with thick walls having a central lumen with club-shaped canals extending to the cell wall; a few simple starch grains present in endosperm measuring 13 to 18 μ in dia., and small minute aleurone grains; oil globules present throughout the region.

Powder – Dirty brown; shows thick-walled, elongated, spindle-shaped endosperm cells, moderately thick-walled, polygonal, slightly wavy cells of testa in surface view, a few of

them containing oil globules and small minute aleurone grains and simple starch grains measuring 13 to18 μ in dia.

IDENTITY, PURITY AND STRENGTH -

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 0.4 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 0.3 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 alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) v/v shows under UV (366 nm) one fluorescent zone at Rf. 0.94 (blue). On exposure to Iodine vapour four spots appear at Rf. 0.40, 0.60, 0.77 and 0.94 (all yellow). On spraying with 60% Methanolic-Sulphuric acid reagent and heating the plate at 120°C for ten minutes two spots appear at Rf. 0.31 (brown) and 0.94 (dark brown).

CONSTITUENTS – Sugars and Sterols.

PROPERTIES AND ACTION -

Rasa : Madhura, Katu
Guna : Laghu
Virya : Usna
Vipaka : Katu
Karma : Vatahara, Kaphahara, Hrdya, Visaghna, Trsnanigrahana, Sitaprasamana, Agnidiptikara

IMPORTANT FORMULATIONS – Gorocanadi Vati, Mrtasanjivani Gutika, Javahara Mohara

THERAPEUTIC USES – Visucika, Hrdroga, Sita Jvara

DOSE - 5-10 gm of the drugs in powder form.

APARĀJITĀ (Leaf)

Aparājitā consists of dried leaf of *Clitoria ternatea* Linn. (Fam. Fabaceae), a perennial twining climber common all over the tropical parts of country being cultivated and also found wild, growing over hedges and thickets.

SYNONYMS -

Sansk. : Girikarnika
Assam. : --
Beng. : Aparajita
Eng. : Winged-leaved clitoria
Guj. : Garnee
Hindi. : Aparajita, Koyal
Kan. : Girikarnike
Mal. : Shankhpushpam
Mar. : Gokarnee
Ori. : Aparajita
Punj. : Aparajita
Tam. : Kakkanam
Tel. : Dintena, Sankupushpam
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Drug generally occurs in the form of leaves and leaflets, rachis broken with or without intact leaflets; leaflet with small petiolule, ovate or elliptic oblong, rarely roundish, obtuse, entire, glabrous or with a few short appressed hairs, subcoriaceous, base obtuse or acute; 2.5 to 5.0 cm long, 1.8 to 3.0 cm wide, yellowish-green; no odour or taste.

b) Microscopic :

Rachis– shows single layered epidermis externally covered with thick, smooth cuticle; uni to tricellular, hooked hair with warty cuticle, found on epidermis of either side; vascular bundle crescent shaped consisting of xylem and phloem; pericycle present in the form of broken ring; rest of the tissues between epidermis and pericycle composed of oval to polygonal, thin-walled, 3 to 5 layered, parenchymatous cells.

Leaflet – shows dorsiventral structure; both upper and lower epidermis consists of single-layered cells, covered externally with thick cuticle; some epidermal cells of both surfaces elongate outwards forming uni to tri-cellular warty hairs, basal cells smaller and apical cells longer; palisade single layered; palisade ratio 3 or 4; spongy parenchyma 4 or 5 layered with intercellular spaces and containing a few prismatic crystals of calcium oxalate; stomata paracytic, present on both surfaces; stomatal index 58 to 64 on lower surface, 31

to 42 on upper surface; vein islet number 22 to 24; veinlet terminal number 34 to 37 per sq. mm.

Powder – Yellowish-green; shows groups of spongy parenchyma, palisade cells, fibres, xylem vessels with spiral thickenings, fragments of hairs with or without warty cuticle, wavy thin-walled, epidermal cells with paracytic 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 15 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 4 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 7 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 15 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract of the drug on Silica gel "G" plate using n-Butanol : Acetic Acid : Water (4:1:5) shows under UV (366 nm) three spots at Rf. 0.34 (violet), 0.59 (blue) 0.93 (red). On exposure to Iodine vapour three spots appear at Rf. 0.29, 0.54 and 0.93 (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. 0.25 (brown), 0.35 (grey), and 0.59 (yellow).

CONSTITUENTS – Glycosides – Flavonal glycosides and Resin glycosides.

PROPERTIES AND ACTION -

Rasa : Tikta, Katu, Kasaya
Guna : Laghu
Virya : Sita
Vipaka : Katu
Karma : Medhya, Kanthya, Caksusya, Pittopadravanasini, Tridosa Samaka, Visapaha, Grahaghni

IMPORTANT FORMULATIONS – Vata Raktantaka Rasa

THERAPEUTIC USES – Kustha, Mutradosa, Sotha, Vrana, Visa, Unmada, Ardhava Bhedaka, Sula, Graha badha, Amadosa, Raktatisara, Bhrama, Swasa, Kasa, Jwara, Daha, Vamana

DOSE -

Root Powder	1-3 gm
Seed Powder	1-3 gm
Leaf Powder	2-5 gm

ĀTMAGUPTA (Root)

Ātmagupta consists of dried root of *Mucuna prurita* Hook. Syn. *M. pruriens* (L.) DC. (Fam. Fabaceae), a herbaceous twining annual found wild almost all over the country and in Andaman and Nicobar Islands.

SYNONYMS -

Sansk. : Kapikacchu, Markati, Kandura, Sukasimbi, Kapiprabha
Assam. : --
Beng. : Aalkushee, Alkusa
Eng. : Cowhage, Cowitch
Guj. : Kaucha, Kavach
Hindi : Kevanch, Kaunch, Khujanee
Kan. : Nasukunnee, Nasuganni, Nayisonanguballi
Kash. : --
Mal. : Shoriyanam, Naykkorana, Naykkuran
Mar. : Khajkuhilee
Ori. : Baikhujnee
Punj. : Aalkushee, Kavanch
Tam. : Punaik-Kalee, Punaikkalee, Punaippidukkam
Tel. : Piliyadugu, Pillee adugu
Urdu. : Kaunch

DESCRIPTION –

a) Macroscopic :

Root long, 7 mm or more in thickness, hard, having lateral roots, dark brown to black; fracture, fibrous; odour and taste not distinct.

b) Microscopic :

Root shows a narrow cork consisting of 4 or 5 rows of tangentially elongated cells; secondary cortex narrow consisting of 2 to 5 rows of thin-walled, parenchymatous cells, a few containing brownish contents; secondary phloem wide, forming bulk of the bark in the form of long, radial strips that are conical due to the medullary rays funneling out in the phloem region; phloem fibres are arranged in groups or occasionally single; phloem rays uni to biseriate; cambium distinct 1 or 2 layered; secondary xylem very wide composed of usual elements, vessels large as well as small, surrounded by xylem parenchyma and fibres; medullary rays in the xylem also mostly uniseriate, somewhat wavy, consisting of radially elongated thin-walled cells.

Powder – Grey to dark brown; shows fragments of cork, fibres singly or groups and xylem vessels.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more then 1 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 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 under UV (366 nm) four fluorescent zones at Rf. 0.33, 0.51, 0.66 and 0.86 (all blue). On exposure to Iodine vapour seven spots appear at Rf. 0.10, 0.20, 0.38, 0.48, 0.59, 0.77 and 0.86 (all yellow). On spraying with Ninhydrin and on heating the plate at 110°C for ten minutes four conspicuous spots appear at Rf. 0.38, 0.48, 0.59 and 0.86 (all light pink).

CONSTITUENTS – Choline.

PROPERTIES AND ACTION –

Rasa : Tikta, Kasaya
Guna : Guru, Srigdha
Virya : Sita
Vipaka : Katu
Karma : Pittahara, Kaphahara, Vrsya, Brhana, Balya, Yonisamkirnikara, Vajikarana

IMPORTANT FORMULATIONS –

THERAPEUTIC USES – Dusta Vrana, Pakwatisara, Raktapitta, Kustha, Krsata, Sitapitta, Vatavyadhi, Yoni Sithilata

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

BILVA (Stem Bark)

Bilva consists of dried stem bark 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. : Sriphala
Assam. : Bael, Vacl
Beng. : Bela, Bilva
Eng. : Bengal Quince, Bael
Guj. : Bill, Bilum
Hindi. : Bela, Sriphal, Bel
Kan. : Bilva
Mal. : Koovalam
Mar. : Bel, Baela
Ori. : Bela
Punj. : Bil
Tam. : Vilvam
Tel. : Maredu
Urdu. : Belgiri (Bael)

DESCRIPTION –

a) Macroscopic :

Bark occurs as pieces of about 0.5 to 1 cm thick, flat or channelled; surface rough and warty due to a number of lenticels, ridges and furrows; fracture tough, gritty in outer and fibrous in inner region; odour and taste, not characteristic.

b) Microscopic :

Cork stratified, tangentially elongated, lignified, with four to eight bands alternating with smaller cells of 2 to 16 layers and larger cells of 2 to 20 layers; secondary cortex wide, consisting of parenchyma, and a large number of groups of, or some times single, thick walled, lignified, stone cells showing transverse striations due to radiating canals; smaller ones 16 to 64 μ wide and 48 to 160 μ long and larger ones 32 to 110 μ wide and 160 to 640 μ long; secondary phloem consisting of fibres, sieve elements and crystal fibre, traversed by phloem rays; phloem fibres long, tapering, sharply pointed to blunt; fibre groups arranged in rings; phloem rays uni to triseriate, biseriate rays being more common, uniseriate rays 3 to 6 cells high, while biseriate rays 6 to 25 cells high.

Powder – Yellowish; fragments of rectangular elongated, lignified cork cells; pieces of fibres with pointed or blunt ends; sieve elements and crystals fibre pieces; uni to biseriate phloem rays; lignified, thick-walled stone cells in groups or singly, with narrow lumen showing striations and measuring 16 to 640 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 10 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 1 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 4 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 alcoholic extract on Silica gel 'G' plate using Toluene : Ethyl acetate (95:5) shows under U.V. (366 nm) five fluorescent spots at Rf. 0.07 (greenish blue), 0.14 (greenish blue), 0.25, 0.39 and 0.67 (all blue). On exposure to Iodine vapour three spots appear at Rf. 0.14, 0.25 and 0.97 (all yellow). On spraying with Dragendorff reagent one spot appears at Rf. 0.25 (orange).

CONSTITUENTS – Coumarins and Sterols.

PROPERTIES AND ACTION -

Rasa : Kasaya, Tikta, Madhura
Guna : Tiksna, Ruksa, Laghu
Virya : Usna
Vipaka : Katu
Karma : Dipaniya, Kaphahara, Vatahara, Samgrahi, Pittakara, Visaghna

IMPORTANT FORMULATIONS – Pusyanuga Curna, Grahani Mihira Taila, Sudarsana Curna, Candanadi Taila, Anu Taila

THERAPEUTIC USES – Chardi, Vatavyadhi, Sula, Sotha, Atisara, Raktatisara, Kuksisula Amasula, Arsa, Medoroga, Grahaniroga, Madhumeha, Pravahika

DOSE – 15 - 30 ml.

CAMPAKA (Flower)

Campaka consists of dried buds and flowers, including calyx, of *Michelia champaca* Linn. (Fam. Magnoliaceae), a tall, ever green tree, usually upto 30 m in height and 3.5 m in girth with a straight trunk, found in eastern Himalayas, North-East India and Western Ghats; it is planted throughout India in gardens and near temples.

SYNONYMS -

Sansk. : Campeya, Hamapuspa
Assam. : --
Beng. : Champa, Champaka
Eng. : Golden Champa
Guj. : Raichampo, Pilo Champo
Hindi. : Champa
Kan. : Sampige
Mal. : Campakappuv
Mar. : Sonachanpha
Ori. : --
Punj. : Champa
Tam. : Sampagi
Tel. : Chattu Sampangi
Urdu. : Champa

DESCRIPTION –

a) Macroscopic :

Drug consists of broken pieces of pedicel, sepal, petal, anthers, gynophore (torus), flowers solitary, fragrant, crumbled, blackish-brown in colour; sepal brown, linear, acute; petal dark brown, oblong; stamens numerous; anther linear, adnate, introrse; gynophore, 2.5-4 cm long; curved style with beak-shaped simple stigma.

b) Microscopic :

Pedicel –Shows ridges and furrows in outline with a single layered epidermis having a few unicellular hairs; cortex composed of a wide zone of collapsed, thin-walled, parenchymatous cells having a few oil globules; collateral vascular bundle and secretory cells are present; pith consisting of thin-walled, oval to polygonal, parenchymatous cells; irregular, elongated, lignified stone cells isolated or in groups, having narrow lumen and pits, found in cortex and pith.

Sepal – Single layered epidermis, slightly sinuous in surface view, present on both surfaces, a few unicellular hairs are in outer surface; ground tissue composed of thin-walled, oval to polygonal, parenchymatous cells having a few prismatic crystals of calcium oxalate; a few vascular bundles present in ground tissue.

Petal –Epidermis single layered of rectangular cells, slightly sinuous in surface view, present on both surfaces; a few fibro-vascular bundles present in ground tissue along with a few cluster crystals of calcium oxalate.

Powder – Dark-brown; shows fragments of parenchymatous cells, broken unicellular hairs, vessels with spiral thickening, a few prismatic and cluster crystals of calcium oxalate; a few irregular shaped, elongated, lignified, stone cells with narrow lumen in singles or groups; fairly large circular to spherical, brown coloured, numerous smooth pollen grains measuring 67-82 μ in diam. having clear exine and intine and a few oil globules.

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 1.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 9 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 alcoholic extract on Silica gel 'G' using Toluene : Ethylacetate (9:1) shows under UV (366 nm) one fluorescent spot at Rf. 0.92 (blue). On exposure to Iodine vapour nine spots appear at Rf. 0.20, 0.25, 0.35, 0.40, 0.51, 0.57, 0.77, 0.88 and 0.92 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and on heating the plate for ten minutes at 105°C seven spots appear at Rf. 0.20, 0.25, 0.40, 0.51, 0.57, 0.77 and 0.92 (light violet).

CONSTITUENTS – Volatile Oil.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta, Kasaya, Madhura
Guna : Laghu, Ruksa
Virya : Sita
Vipaka : Katu
Karma : Pittagit, Kaphapittasra nasaka, Visaghna, Hrdya

IMPORTANT FORMULATIONS – Candanabalalaksadi Taila, Baladhatryadi Taila

THERAPEUTIC USES – Krmi, Mutrakrcchra, Vatarakta, Kustha, Kandu, Vrana

DOSE - Puspa Curna 1-3 gm

CIṄCĀ (Fruit Pulp)

Cinca consists of fruit pulp without seeds of *Tamarindus indica* Linn. (Fam. Fabaceae), a moderate sized to large evergreen tree upto 24 m in height and 7 m in girth, cultivated throughout India, or self sown in waste places and in forest lands; also planted as avenue trees.

SYNONYMS –

Sansk. : Amlika, Tintidika
Assam. : Tamar, Teteli
Beng. : Tetula, Tentul, Ambli
Eng. : Tamarind Tree
Guj. : Anvali
Hindi : Imli
Kan. : Hunisemale
Kash. : --
Mal. : Puli, Amlam
Mar. : Chinch
Ori. : Koina, Omlika
Punj. : Imli, Amli
Tam. : Puli, Aanvilam
Tel. : Chint, Chinta
Urdu. : Imli

DESCRIPTION –

a) **Macroscopic :** Fruit pulp occurs as a reddish-brown, moist, sticky mass, in which yellowish-brown fibres are readily seen; odour, pleasant; taste, sweetish and acidic.

b) **Microscopic :** Fruit pulp consists of thin-walled, elongated to polygonal, parenchymatous cells of considerable size, traversed by a number of long fibro-vascular bundles and having a very few small starch granules, and numerous 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 4 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 46 per cent, Appendix 2.2.6.
Water-soluble extractives	-	Not less than 59 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica Gel 'G' using n-Butanol : Acetic acid : Water (5:1:4) shows under U.V. (366 nm) two spots at Rf. 0.27 and 0.46 (both yellowish blue). On exposure to Iodine vapour five spots appear at Rf. 0.27, 0.46, 0.57, 0.65 and 0.87 (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. 0.46, 0.57, 0.65, 0.71 and 0.87 (all grey).

CONSTITUENTS – Inorganic acids, Sugars, Saponin and bitter principle – Tamarindinca.

PROPERTIES AND ACTION -

Rasa : Amla, Madhura, Kasaya
Guna : Guru, Ruksa, Sara
Virya : Usna
Vipaka : Amla
Karma : Kaphavatanut; Dipana, Bastisuddhikara, Bhedi, Vistambhi, Dipana, Hrdya

IMPORTANT FORMULATIONS - Sankha Dravak, Sankhavati

THERAPEUTIC USES – Udararoga, Agnimandya, Arocaka, Paktisula, Trsna, Klama, Srama, Bhranti, Krmi, Karnasula, Nadivrana

DOSE – 4-10 g. of the drug.

DADIMA (Fresh Fruit)

Dadima consists of fresh fruit of *Punica granatum* Linn. (Fam. Punicaceae), a large deciduous shrub or a small tree; found growing wild in the valley and outer hills of Himalayas, between 900 and 1800 m and cultivated in many parts of the country.

SYNONYMS -

Sansk. : Dantabija, Lohitapuspa
Assam. : Dalim
Beng. : Dadima, Dalimgach, Dalim
Eng. : Pomenagrate
Guj. : Dadam, Dadam phala
Hindi. : Anar, Anar-ke-per
Kan. : Dalimba, Dalimbe haonu
Mal. : Mathalam
Mar. : Dalimba
Ori. : Dalimba
Punj. : Anar
Tam. : Madulam Pazham
Tel. : Dadimbakaya, Dadimma
Urdu. : Anar

DESCRIPTION –

a) Macroscopic :

Fruit a balausta, globose, 4 to 8 cm diam; depressed, bluntly 5 to 8 angled and tipped with persistent calyx alongwith withered stamens; coriaceous, smooth; yellowish-brown or red; odour, not distinct; carpel four to five, with papery, thin walled, fused in 2 whorls, seeds numerous, compressed with a whitish-pink or bright red, transparent, fleshy testa; taste, sour to sweet; seed appears hard, angular, white to buff with an astringent taste.

PROPERTIES AND ACTION -

Rasa : Amla; Madhura; Kasaya
Guna : Laghu, Snigdha
Virya : Usna
Vipaka : Madhura
Karma : Vatahara, Pittahara, Kaphahara, Dipana, Pacana, Rucya, Grathi, Mukhagandhahara, Hrdya, Medhya, Sramahara, Sukrala, Tarpaka, Varcovibadhaniya, Balya, Medhya

IMPORTANT FORMULATIONS – Dadhika Ghrta, Dadimastaka Curna, Bhaskaralavana Curna, Brhacchagaladya Ghrta

THERAPEUTIC USES – Daha, Jvara, Trsna, Kasa, Amavata, Atisara, Raktapitta, Arocaka

DOSE – 15- 30 ml.

DADIMA (Fruit Rind)

Dadima consists of dried fruit rind (pericarp) of *Punica granatum* Linn. (Fam. Punicaceae), a large deciduous shrub or a small tree, found wild in the warm valleys of the outer hills of Himalayas between 900 to 1800 m and also cultivated in many parts of the country.

SYNONYMS -

Sansk. : Dantabija, Lohitapuspa
Assam. : Dalim
Beng. : Dadima, Dalimgach, Dalim
Eng. : Pomenagrate
Guj. : Dadam, Dadam phala
Hindi. : Anar, Anar-ke-per
Kan. : Dalimba, Dalimbe haonu
Mal. : Mathalam
Mar. : Dalimba
Ori. : Dalimba
Punj. : Anar
Tam. : Madulam Pazham
Tel. : Dadimbakaya, Dadimma
Urdu. : Anar

DESCRIPTION –

a) Macroscopic :

Drug occurs in 0.1 to 0.5 cm thick, more or less concave, salver- shaped pieces, some pieces showing residual carpel walls and some having persistent toothed calyx tube alongwith withered stamens, styles and a few seeds; coriaceous, tough and nearly smooth; brown to reddish-brown externally and brownish-yellow internally; bearing impressions left by seeds; fracture, short; odour not distinct; taste, astringent.

b) Microscopic :

Epicarp single layered covered with thick cuticle; mesocarp consists of a wide zone of oval to polygonal thin walled parenchymatous cells; a few fibro-vascular bundles, tanniniferous vessels, secretory canals, oil globules, single and a number of groups of round or oval to elongated stone cells, simple and compound starch grains having 2 or 3 components with concentric striations and central hilum, and rosette crystals of calcium oxalate present in mesocarp.

Powder – Yellowish-brown; shows single or groups of stone cells; oval to polygonal, parenchymatous cells in surface view; vessels with scalariform thickening, tanniniferous vessels and a few rosette crystals of calcium oxalate and rounded to oval starch grains, measuring 3 to 5 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 0.4 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 9 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 alcoholic extract on Silica gel 'G' plate using Chloroform : Ethylacetate : Formic acid (5:4:1) shows in visible light one spot at Rf. 0.74 (bluish grey). Under U.V. (366 nm) one fluorescent zone is visible at Rf. 0.74 (dark blue). On exposure to Iodine vapour two spots appear at 0.74 (dirty yellow) and 0.95 (yellow). On spraying with 10% aqueous Ferric chloride reagent one spot appears at Rf. 0.74 (blue). On spraying with 5% Mathanolic-Sulphuric Acid and heating the plate for ten minutes at 110°C two spots appear at Rf. 0.74 (brownish grey) and 0.95 (violet).

CONSTITUENTS – Tannic acid, Sugar and Gum.

PROPERTIES AND ACTION -

Rasa : Kasaya, Amla
Guna : Laghu, Snigdha
Virya : Anusna
Vipaka : Katu
Karma : Vata kaphahara, Vranaropaka, Grahi

IMPORTANT FORMULATIONS – Khadiradi Gutika, Mrtsanjivani Sura, Kalyanaka Ghrta, Maricadi Gutika, Nilikadya Taila

THERAPEUTIC USES – Daha, Jvara, Kantharoga, Mukhadaurgandha, Aruci, Amlapitta, Atisara, Pravahika, Raktapitta, Raktavikara, Kasa

DOSE – Powder 3 – 6 g.

DADIMA (Leaf)

Dadima consists of dried leaf of *Punica granatum* Linn. (Fam. Punicaceae), a small deciduous shrub or small tree, found wild in the warm valleys of the outer hills of Himalayas between 900 to 1800 m and also cultivated in many parts of the country.

SYNONYMS -

Sansk. : Dantabija, Lohitapuspa
Assam. : Dalim
Beng. : Dadima, Dalimgach, Dalim
Eng. : Pomenagrate
Guj. : Dadam, Dadam phala
Hindi. : Anar, Anar-ke-per
Kan. : Dalimba, Dalimbe haonu
Mal. : Mathalam
Mar. : Dalimba
Ori. : Dalimba
Punj. : Anar
Tam. : Madulam Pazham
Tel. : Dadimbakaya, Dadimma
Urdu. : Anar

DESCRIPTION –

a) Macroscopic : Leaves 2 to 8 cm long, 0.7 to 2.0 cm broad, oblong, lanceolate, acute, entire, glabrous, greyish-green to yellowish-green.

b) Microscopic :

Leaf –

Petiole – shows single layered epidermis covered by thin cuticle, epidermis followed by 2 or 3 layered collenchymatous hyodermis; single, bicollateral, crescent-shaped, vascular bundle situated in centre; rest of the tissues between vascular bundle and hypodermis consists of 3 layers or more, oval to polygonal, thin-walled, parenchymatous cells, some having rosette and a few prismatic crystals of calcium oxalate.

Midrib –shows single layered epidermis covered by a thin cuticle, epidermis followed by 2 or 3 layers of round to angular collenchymatous cells; beneath collenchyma 3 or 4 layers of parenchyma present, some containing a few rosette and prismatic crystals of calcium oxalate, simple and compound starch grains, consisting of 2 or 3 components, round to oval shaped, measuring 5.5 to 8.5 μ in dia.; vascular bundle situated centrally, similar to that of petiole.

Lamina –shows epidermis on both surfaces, single layered; palisade single layered; spongy parenchyma 3 or 4 layered; idioblast containing very large solitary crystal of calcium oxalate; a few small solitary calcium oxalate crystals also present in spongy paren-

chyma; palisade ratio 4 to 6; stomatal index 12 to 25; anomocytic stomata, present only on lower surface.

Powder – Greyish-green; shows spiral vessels, palisade and spongy parenchyma cells, rosette and prismatic crystals of calcium oxalate; fragments of upper and lower epidermis with beaded straight walled and sinuous walled respectively in surface view, simple, round to oval, starch grain measuring 5.5 to 8.5 μ in dia., and compound starch grains having 2 or 3 components.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 10.5 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 12 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 alcoholic extract of the drug on Silica gel 'G' plate using Benzene : Ethylacetate (9:1) v/v shows in visible light four spots at Rf. 0.06 (light green), 0.48 (light green), 0.68 (light green) and 0.79 (green). Under U.V. (366 nm) four fluorescent zones visible at Rf. 0.06, 0.14, 0.54 and 0.94 (all blue). On exposure to Iodine vapour nine spots appear at Rf. 0.02, 0.09, 0.38, 0.62, 0.66, 0.76, 0.87, 0.91 and 0.97 (all yellow). On spraying with 5% Methanolic-Phosphomolybdic acid reagent and heating the plate at 105°C for ten minutes nine spots appear at Rf. 0.06, 0.10, 0.33, 0.41, 0.54, 0.62, 0.79, 0.89 and 0.97 (all grey).

CONSTITUENTS – Tannins and β– Sitosterol.

PROPERTIES AND ACTION -

Rasa : Kasaya, Tikta
Guna : Laghu
Virya : Sita
Vipaka : Kasaya
Karma : Kaphahara, Dipana, Rucya

IMPORTANT FORMULATIONS –

THERAPEUTIC USES – Aruci, Agnimandya, Atisara, Pravahika, Krmi, Raktapitta, Kasa, Jvara, Mukhapaka.

DOSE - Patra Svarasa : 5-10 ml.
Patra Kalka : 5-10 g.

DEVADĀRU (Heart Wood)

Devadāru consists of dried heart wood of *Cedrus deodara* (Roxb.) Loud. (Fam. Pinaceae), a very large and tall ever green tree, upto 75m in height and ranging from 2.4 to 3.6 m in girth, occasionally even upto 13.5 m in girth, found in North Western Himalayas from Kashmir to Garhwal, between 1200 to 3000 m and also cultivated in Kumaon.

SYNONYMS -

Sansk. : Bhadradaru, Surabhuruha, Amaradaru, Devakastha, Daru, Suradaru, Amarataru
Assam. : Shajar Tuljeen
Beng. : Devdaroo
Eng. : Deodar, Himalan Cedar
Guj. : Devdar, Teliyo Devdar
Hindi. : Devdar, Devdaroo
Kan. : Deevdar
Kash. : --
Mal. : Devtaram
Mar. : Devdar, Telya Dedaroo
Ori. : --
Punj. : Diyar, Dewdar
Tam. : Devdaroo
Tel. : Devdaree, Devdari Chettu
Urdu. : Deodar

DESCRIPTION –

a) Macroscopic :

Wood moderately hard, light yellowish-brown to brown; wood splits readily longitudinally; annual rings well marked; medullary rays appear as whitish lines; resin canals, if present, arranged in long tangential rows, showing up as dark, narrow line on the radial surface of the wood pieces; odour, aromatic; taste, not distinct.

b) Microscopic :

Mature wood almost entirely of narrow, quadrangular or rarely five or six sided tracheids, having very thick-wall with pits and a narrow lumen; xylem rays very fine, numerous and run straight throughout the region, uniseriate and 2 to 16 cells high in tangential section; vessels absent.

Powder – Brownish-yellow in colour and oily, shows entire or fragments of tracheids and xylem ray 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 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 1.5	per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' using Toluene : Ethylacetate (9:1) shows under UV (366 nm) six fluorescent zones at Rf. 0.11, 0.18, 0.32, 0.46, 0.65 and 0.75 (all blue). On exposure to Iodine vapour seven spots appear at Rf. 0.14, 0.42, 0.51, 0.67, 0.78, 0.84 and 0.92 (all yellow). On spraying with Methanolic-Sulphuric acid reagent and on heating the plate for ten minutes at 105°C eight spots appear at Rf. 0.10 (violet), 0.18 (violet), 0.52 (grey), 0.64 (violet), 0.71 (violet), 0.78 (violet), 0.89 (violet), 0.92 (green).

CONSTITUENTS – Terpenoids, Flavonoids and Glycosides.

PROPERTIES AND ACTION -

Rasa : Tikta
Guna : Laghu, Snigdha
Virya : Usna
Vipaka : Katu
Karma : Vatahara, Kaphahara, Dustavrana Sodhaka

IMPORTANT FORMULATIONS – Khadirarista, Dasamularista, Devadarvarista, Mrtasanjivani Sura, Karpuradyarka, Pramehamihira Taila, Candanadi Curna, Sudarsana Curna, Narayana Taila, Pradarantaka Lauha, Vataraktanaka Lauha, Mahavisagarbha Taila

THERAPEUTIC USES – Vibandha, Adhamana, Sotha, Tandra, Kikka, Jvara, Prameha, Pinasa, Kasa, Kandu, Krmi, Kustha, Amavata, Raktavikara, Sutikaroga,

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

DHATTURA (Whole Plant)

Dhattura consists of dried whole plant of *Datura metel* Linn. Syn. *D. fastuosa* L.; (Fam. Solanaceae), occurring wild throughout the country.

SYNONYMS -

Sansk. : Kanaka, Unmatta, Dhustura
Assam. : Dhatura
Beng. : Dhatura
Eng. : White Thorn Apple
Guj. : Dhanturo
Hindi. : --
Kan. : Ummatti, Madagunaki, Dathura
Mal. : Umman, Ummatt, Ummattu
Mar. : Dhotra
Ori. : Dudura
Punj. : Dhatura
Tam. : Umattai
Tel. : Tella-ummettha
Urdu. : Dhatura

DESCRIPTION –

a) Macroscopic :

Root - Cylindrical with lateral branches, brown coloured, rough due to fissures and root scars; fracture, splintery; odour, not characteristic; taste, bitter.

Stem - Dichotomously branched, cylindrical, blackish-dark to purple colour, internode very short; fracture, short; odour, not characteristic; taste, bitter.

Leaf – Petiolate, pubescent; 6 to 11 cm long, 2 to 8 cm broad; ovate, acute, repand and dentate, but sometimes entire, base unequal, odour, not characteristic; taste, bitter.

Flower – Stalked, stalk finely pubescent, calyx upto 10 cm long, tubular, lobes acuminate; corolla purple or purple tinged outside, upto 15 cm long, usually double, sometime triple (3 whorls), funnel-shaped, lobes 5 for each whorl; stamen -5, epipetalous with connivent anthers, anther 10 to 12 mm long; gynoecium-bicarpellary, carpels placed obliquely in relation to mother axis, placentation axile, placenta swollen, ovule numerous.

Fruit - Capsule, ovate to obovate with persistent reflexed calyx; about 4 cm long, 3 cm wide, covered with short, stout, spines; taste, bitter and acrid.

Seed – Light brown, reniform, compressed, flattened, 0.4 to 0.5 cm long, and 0.4 cm wide, foveate, surface finely pitted; taste, bitter and acrid (**warning –poisonous**).

b) Microscopic :

Root - Shows 4 to 7 layers of thin-walled, rectangular cork cells; secondary cortex composed of 3 to 4 layers, thin-walled, parenchymatous, tangentially elongated cells; secondary phloem composed of usual elements, traversed by phloem rays; secondary xylem composed of usual elements; vessels two types with spiral thickening or with bordered pits; xylem rays 1 to 4 cells wide; sandy microsphenoidal crystal of calcium oxalate scattered in the secondary cortex and phloem parenchyma.

Stem - Shows a single layered, epidermis covered by striated, thick cuticle having a few unicellular trichomes, followed by 2 or 3 layered, ruptured, rectangular cork cells; secondary cortex consisting of 4 to 7 layered, collenchymatous and 2 to 5 layered parenchymatous cells; endodermis distinct, containing starch grains; pericycle consists of 1 or 2 layers of parenchyma and pericyclic fibres in singles or groups of 2 or 3 or more; secondary phloem composed of sieve elements and parenchyma but no fibres; secondary xylem composed of vessels, tracheids, fibres and parenchyma; vessels with spiral thickening and pits; sandy crystals of calcium oxalate are found scattered in secondary cortex and phloem parenchyma; starch grains oval to rounded, simple, measuring 3 to 7 μ in dia., present in secondary cortex and phloem parenchyma.

Leaf -

Petiole - shows plano-convex outline, cuticularised single layered epidermis, followed by cortex composed of 7 or 8 rows of round to polygonal, thick-walled, collenchyma cells and 2 or 3 rows of thin-walled, round to polygonal, parenchyma cells; vascular bundles bicollateral in a discontinuous ring, number of sandy microsphenoidal, a few rosette and prismatic crystals of calcium oxalate present in cortex and pith region.

Midrib – shows similar structure to that of petiole; collenchyma well developed in basal region and poorly in middle and upper region; cortex and endodermal cells containing simple and compound, oval to round, mostly eccentric starch grains measuring 2 to 4 μ in dia. with 2 or 3 components; cortical cells large hexagonal to round, without any crystals.

Lamina - shows cuticularised single layered epidermal cells bearing both glandular and non-glandular trichomes on both surfaces; non-glandular trichomes uniseriate, mostly multicellular; a few unicellular trichomes with warty surface; glandular trichomes short, stalked with multicellular, globose head; mesophyll differentiated into palisade parenchyma of single layer and spongy parenchyma of 6 to 8 layers, having numerous rosette and a few microsphenoidal crystals of calcium oxalate; stomata anisocytic, present on both surfaces; stomatal index 16 to 17 on upper surface, 17 to 23 on lower surface; palisade ratio 5 to 6; vein islet number 19 to 22 per sq. mm.

Seed – Shows an outline with bulges at 3 places, single layered epidermis with elongated cells; seed coat consists of thick-walled, lignified, sclerenchymatous cells, forming club-shaped structure, followed by 3 to 5 layered, more or less tangentially elongated, parenchymatous cells; endosperm composed of polygonal, thin-walled, parenchymatous cells filled with aleurone grains and abundant oil gloubles, embryo more or less curved.

Powder - Greyish-brown; shows fragments of both glandular and non-glandular trichomes; glandular trichomes short stalked with multicellular globose heads; non-glandular trichomes unbranched, long, mostly multicellular, a few unicellular trichomes with warty surfaces; anisocytic stomata, vessels with spiral thickening, a few sandy microsphenoidal and rosette crystals of calcium oxalate; simple, oval to round starch grains measuring 2 to 7 μ in dia., and compound starch grains with 2 or 3 components.

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 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 alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (80:20) shows under U.V. (366 nm) three fluorescent zones at Rf. 065 (blue), 0.67 (pink) and 0.98 (pink). On exposure to Iodine vapour nine spots appear at Rf. 0.07, 0.15, 0.37, 0.48, 0.61, 0.67, 0.83, 0.89 and 0.98 (all yellow). On spraying with Dragendorff reagent followed by sodium nitrite solution, two spots appear at Rf. 0.11 and 0.98 (both orange yellow).

CONSTITUENTS – Alkaloids (Hyoscine) and two withanolide Glucosides (Dhaturametelin A & B).

PROPERTIES AND ACTION -

Rasa : Katu, Kasaya, Madhura, Tikta
Guna : Tiksna, Guru
Virya : Usna
Vipaka : Katu
Karma : Madakari, Kaphahara, Agni, Vrddhikara, Varnya, Jangama Vishahara

IMPORTANT FORMULATIONS – Kanakasawa, Ekangaviara Rasa, Puspadhanwa Rasa, Tribhuvana Kirti Rasa, Sri Jayamangala Rasa, Laghu Visagarbha Taila, Visatinduka Taila, Dhattura Taila

THERAPEUTIC USES – Kasa, Swasa, Jwara, Kustha, Vrana, Mutrakrecchra, Twak Dosa, Yika liksa, Krmi, Alarka, Visa, Karma, Nadi, Kandu, Indralupta, Padadaha, Stanuthita pida, Unmada

DOSE – 100-200 mg.

DURVA (Whole Plant)

Durva consists of dried whole plant of *Cynodon dactylon* (Linn.) Pers. (Fam. Poaceae), an elegant, tenacious, perennial, creeping grass growing throughout the country and ascending to 2440 m.

SYNONYMS -

Sansk. : Sataparva, Satavalli, Niladurva
Assam. : Ushb
Beng. : Doorva, Neel Doorva
Eng. : Creeping Cynodon, Dhub Grass
Guj. : Dhro, Khaddhro, Leelodhro, Neeladhro
Hindi. : Doob, Neelee Doob
Kan. : Garikai-Hallu, Garike, Garik Hallu
Mal. : Karuk, Karukappullu
Mar. : Harlee, Neel durva, Haryali
Ori. : --
Punj. : Dubea
Tam. : Arukampillu
Tel. : Doolu, Harvali, Garichgaddi
Urdu. : Doob Ghas

DESCRIPTION –

a) Macroscopic :

Root –Fibrous, cylindrical, upto 4 mm thick, minute hair-like roots arise from the main roots; cream coloured.

Stem –Slender, prostrate, upto 1.0 mm thick, jointed, leafy, very smooth, yellowish-green in colour.

Leaf – 2 to 10 cm long and 1.25 to 3 mm wide, narrowly linear or lanceolate, finely acute more or less glaucous, soft, smooth, usually conspicuously distichous in the barren shoots and at the base of the stems; sheath light, glabrous or sometimes bearded, ligule a very fine ciliate rim.

b) Microscopic :

Root – Mature root shows epiblema or piliferous layer composed of a single layer of thin-walled, radially elongated to cubical cells; hypodermis composed of 1 or 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 to 6 layers of larger thin-walled, elongated parenchymatous cells; endodermis quite distinct, single layered, thick-walled, tangentially elongated cells; pericycle 1 or 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 to 16 μ in dia., and compound starch grains having 2 to 4 components.

Stem – Oval in outline with a little depression on one side, shows a cuticularised epidermis single layered, having lignified walls; hypodermis 1 or 2 layers, sclerenchymatous; cortex composed of 3 to 5 layers of round to oval thin walled parenchymatous cells; endodermis not distinct; pericycle present in the form of continuous ring of 2 to 5 layers of sclerenchymatous fibres; vascular bundle collateral, closed and scattered throughout the ground mass of parenchyma, each surrounded by sclerenchymatous sheath; vessels simple, spiral, scalariform, and annular; medullary rays not distinct; fibres short, thick walled, having narrow lumen and pointed tips; starch grains simple and compound having 2 to 4 components, present in cortex and ground tissue, simple grains measuring 4 to 16 μ in dia.

Leaf – Lamina shows nearly square to oval epidermis having irregularly cutinised outer wall, bulliform cells present on the dorsal side which are grouped together and lie at the bottom of a well defined groove in between the veins; these are thin walled and lack chlorophyll, extend deep into the mesophyll; mesophyll not differentiated into palisade and spongy parenchyma; row of vascular bundles nearly alike, except that the median bundle is larger; bundle sheath single, and consists of thin-walled more or less isodiametric parenchyma cells containing chloroplast; mesophyll tissue broken by 1 or 2 thin-walled colourless cells which extend from bundle sheath to the thin walled parenchymatous band of stereome near upper and lower epidermis.

Powder – Yellowish-green; simple pitted, scalariform, annular and spiral, vessels; short lignified, thick walled, pointed fibres, paracytic stomata; epidermis in surface view, of elongated, rectangular long cells and nearly square small cells having sinuous walls; simple and compound starch grains, measuring 4 to 16 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 4.5 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 9.5 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Toluene : Ethylacetate (90 : 10) shows in visible light five spots at Rf. 0.1 (green), 0.40 (yellow), 0.45 (green), 0.51 (yellow) and 0.57 (green). On exposure to Iodine vapour six spots appear at Rf. 0.22, 0.40, 0.45, 0.51, 0.57 and 0.64 (all yellow in colour). 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, 0.40, 0.45, 0.51 (all grey), 0.57 (green) and 0.64 (grey).

CONSTITUENTS – Phenolic Phytotoxins (Ferulic, Syringic, P-coumaric, Vanillic, P-Hydroxybenzoic and O-Hydroxyphenil acetic acid).

PROPERTIES AND ACTION -

Rasa : Kasaya, Madhura, Tikta
Guna : Laghu
Virya : Sita
Vipaka : Madhura
Karma : Pittahara, Kaphahara, Sramahara, Rucya

IMPORTANT FORMULATIONS –

THERAPEUTIC USES – Raktapitta, Trsna, Chardi, Daha, Murccha, Visarpa, Raktavikara, Tvak Roga, Atisara, Kaphaja Jvara, Vataja Jvara, Jvara, Nasagata Raktapitta.

DOSE – Svarasa : 10-20 ml.p

GAMBHĀRĪ (Stem Bark)

Gambhārī consists of dried stem bark of *Gmelina arborea* Linn. (Fam. Verbenaceae), a large deciduous tree, mostly found in southern peninsula and upto Kashmir.

SYNONYMS -

Sansk. : Kasmari, Kasmarya, Sriparni
Assam. : Gamari
Beng. : Gamar
Eng. : Candhar Tree
Guj. : Shivani hannu, Shewan
Hindi. : Gambhar Khambhari
Kan. : Shivani, Shivanigida
Mal. : Kumizhu, Kumbil, Kumpil, Kumizhin
Mar. : Shivan
Ori. : Gambhari,
Punj. : Gumhar, Kumhar
Tam. : Nilakumizh
Tel. : Peggumudu, Peggumaddi
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Mature stem bark 0.2 to 0.7 cm thick, channelled pieces, ribbed, quilled at some places; outer surface yellowish-brown in colour and rough due to some longitudinal and horizontal cracks, inner surface fairly smooth and reddish-brown to black in colour; fracture, short; odour and taste not distinct.

b) Microscopic :

Shows a wide zone of cork consisting of rectangular, thick-walled, lignified cells; cork cambium 1 or 2 layers, filled with reddish-brown contents; secondary cortex consists of 2 or 3 layers, tangentially elongated, elliptical, thin-walled, parenchymatous cells; secondary phloem composed of sieve elements, parenchyma and phloem rays; parenchyma rectangular to polygonal, phloem rays 1 to 7 cells wide, 3 to 16 cells high; rays 4 or 5 cells wide and 8 to 10 cells high more common; stone cells oval to elliptical, lignified, pitted, with wide lumen; stone cells and lysigenous cavities present throughout phloem .

Powder – Reddish-brown; shows fragments of cork cells, thick-walled, elliptical, lignified, pitted stone cells with wide lumen.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more then 1 per cent, Appendix 2.2.2.
Total ash	-	Not more then 11 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 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 alcoholic extract of the drug on Silica gel 'G' plate using Chloroform : Methanol (95:5) shows under U.V. (366 nm) no fluorescent spot. On exposure to Iodine vapour two spots appear at Rf. 0.20 and 0.60 (both yellow).

CONSTITUENTS – Alkaloids, in traces.

PROPERTIES AND ACTION -

Rasa : Tikta, Katu, Madhura
Guna : Guru
Virya : Usna
Vipaka : Katu
Karma : Kaphahara, Sothahara, Dipana, Pacana, Medhya, Bhedana, Visahara, Daha Prasamana

IMPORTANT FORMULATIONS – Candanasava

THERAPEUTIC USES – Sula, Arsa, Jvara, Raktapitta, Trsna, Bhrama, Sotha

DOSE – 3-5 gm.

IKSU (Root Stock)

Iksu consists of root stock of *Saccharum officinarum* Linn. (Fam. Poaceae), a plant generally cultivated in all hotter parts of the country for extraction of sugar.

SYNONYMS -

Sansk. : Dirghcchada, Bhurirasa, Gudamula, Asipatra, Trnarasa
Assam. : Kuhiyare
Beng. : Ganna, Akh
Eng. : Sugar-cane
Guj. : Sheradi
Hindi : Ganna, Ikh
Kan. : Ikshu, Kabbu
Mal. : Karimpu
Mar. : Us
Ori. :--
Punj. : Ganna
Tam. : Karumbu Ver
Tel. : Cheraku, Cheruku
Urdu. : Ganna, Naishkar

DESCRIPTION –

a) Macroscopic :

Drug-occurs in form of root stock with attached yellowish-brown stem portion, having 10 to 15 cm long, numerous grey to blackish-brown fibrous roots; solid, jointed, more or less cylindrical, 2 to 2.5 cm thick and varying in length, rough; fracture, splintery; odour and taste, not distinct.

b) Microscopic :

Root Stock – Shows single layered epidermis followed by 3 to 4 layers of oval to elliptical, lignified, thick-walled more or less radially elongated, sclerenchymatous cells; cortex consists of upper 12 to 15 layers oval to polygonal, thin-walled and lower 5 layers, elliptical, parenchymatous cells; endodermis single layered; pericycle 3 or 4 layers, sclerenchymatous; fibro-vascular bundle, covered with sclerenchymatous sheath, scattered throughout the ground mass of parenchymatous cells.

Root – Shows single layered epidermis of thin-walled, rectangular cells, followed by a layer of hypodermis of thin-walled, rectangular cells, outer cortex composed of 2 or 3 layers of thick-walled, polygonal to circular, sclerenchymatous cells filled with dark brown or blackish pigment, inner cortex composed of large aerenchymatous cells; endodermis composed of barrel-shaped, thin-walled cells, enclosing a layer of pericycle consisting of rectangular cells having inner wall thickened, and vascular tissue; xylem and

phloem form an equal number of separate bundles, arranged in a ring; centre occupied by a large pith, composed of circular to oval, parenchymatous, thin-walled cells.

Powder – Blackish in colour; shows sclerenchymatous cells of cortex, xylem vessels and fibres, groups of spindle-shaped, elongated, epidermal cells in surface view.

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	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	7 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica Gel 'G' using n-Butanol : Acetic acid : Water (4:1:5) shows under visible light two spots at Rf. 0.80 and 0.96 (both grey). Under U.V. (366 nm) four fluorescent zones are visible at Rf. 0.67 (light blue), 0.80 (dark blue), 0.86 (light blue) and 0.96 (dark blue). On exposure to Iodine vapour several spots appear out of which three spots are conspicuous at Rf. 0.30, 0.80 and 0.96 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 110°C several spots appear out of which three are conspicuous at Rf. 0.10, 0.86 and 0.96 (all grey).

PROPERTIES AND ACTION -

Rasa : Madhura
Guna : Sara, Guru, Snigdha
Virya : Sita
Vipaka : Madhura
Karma : Bramhana, Vrsya, Vatasamaka, Kaphakara, Pittahara, Mutrala, Balya

IMPORTANT FORMULATIONS - Trnapancamula Kvatha, Sukumara Ghrta, Brahma Rasayana

THERAPEUTIC USES – Raktapitta, Mutrakrcchra, Ojoksaya, Nasa rakta srava, Grahani, Pandu, Ksataja Kasa, Visarpa

DOSE – 15-30 gm in decoction form.

KADALĪ (Flower)

Kadalī consists of dried flower of *Musa paradisiaca* Linn. (Fam. Musaceae), a monoecious herb, cultivated widely in the country in most of the states.

SYNONYMS -

Sansk. : Mouca, Varana, Ambusara
Assam.: Kal, Talha
Beng. : Kela, Kala, Kanch Kala
Eng. : Banana
Guj. : Kela
Hindi. : Kela
Kan. : Bale gadde, Kadubale, Kattebale, Kadali
Mal. : Kadali, Ksetrak
Mar. : Kel, Kela
Ori. : Kadali, Kadila
Punj. : Kela
Tam. : Vazhai, Pazham
Tel. : Arati chettu
Urdu. : Kela (Mouz)

DESCRIPTION –

a) Macroscopic :

Flower –Inflorescence spike, drug occurs in cut and crumpled pieces, 2.5 to 4.0 cm long sessile, unisexual; calyx and corolla present; calyx 2.5 to 4 cm long crumpled, tubular spathaceous, dark brown having ridges and furrows; corolla 1.5 to 2.5 cm long, connate, crumpled, boat-shaped creamish-yellow, membranous, toothed at apex; stamens 5 + 1 rudimentary, 0.8 to 1.2 cm long dark brown; filament erect, strongly filiform; anthers linear, bithecous; carpels 3, syncarpous, ovary inferior, trilocular, each with several ovules; axile placentation; style 3.0 to 4.5 cm long light brown, filiform; stigma capitate or subglobose, 3 or 4 lobed, greyish-brown; taste and odour not characteristic.

b) Microscopic :

Calyx –Shows thin-walled, single layered, upper and lower epidermis, followed by thin-walled, parenchymatous mesophyll, embedding vascular bundle, having usual elements surrounded by some large, thin-walled, specialised cells containing oleo-resin ducts, tannin cells and a few oil globules.

Corolla –Shows thin-walled, striated single layered epidermis on either surface and oval to polygonal in surface view; mesophyll 2 or 3 layered consisting of thin-walled, parenchymatous cells; numerous prismatic crystals of calcium oxalate present in mesophyll.

Androecium – Filament shows single layered epidermis, followed by ground tissues consisting of oval to polygonal, thin-walled, parenchymatous cells having crescent shaped vascular bundles and oleo-resin cells; anther lobe shows two layered wall, 4 to 6

celled tapetum; pollen grains spherical measuring 26 to 47 μ in diam., smooth, yellowish-brown, having clear, thick-walled, pigmented exine, thin-walled, colourless intine.

Gynoecium–Ovary shows single layered, cuticularised epidermis followed by ground tissue consisting of oval, polygonal, thin-walled, parenchymatous cells embedding a few thickened pitted cells; stigma consists of 6 chambers having single layered epidermis.

Powder – Brown, shows fragments of straight walled, polygonal, thin walled epidermal, cells, simple pitted cells, vessels with spiral thickening, anisocytic stomata, a few prismatic crystals of calcium oxalate, spherical, smooth, yellowish-brown pollen grains, having clear exine and intine and measuring 26 to 47 μ in dia., a few oil globules, and oleoresin cells; a few simple, oval or irregular starch grains measuring upto 65 μ in length and 35 μ in width.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 per cent, Appendix 2.2.2.
Total ash	-	Not more than 15 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 18 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract of the drug on Silica Gel 'G' using Toluene : Ethylacetate (9 : 1) shows under U.V. (366 nm) six fluorescent zones at Rf. 0.09 (blue), 0.23 (grey), 0.31 (blue), 0.36 (violet), 0.66 (blue) and 0.97 (violet). On exposure to Iodine vapour five spots appear at Rf. 0.23, 0.31, 0.33, 0.66 and 0.97 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate at 105°C for ten minutes four spots appear at Rf. 0.09, 0.23, 0.66 and 0.97 (all blue).

CONSTITUENTS – Saponins, Tannins, reducing and non-reducing Sugars, Sterols and Triterpenes.

PROPERTIES AND ACTION -

Rasa : Kasaya, Madhura, Tikta
Guna : Mrdu, Grahi, Dipana
Virya : Usna
Vipaka : Madhura
Karma : Pittanasaka, Ruca, Kaphaghna, Balya, Vrsya, Stambhaka

IMPORTANT FORMULATIONS - Hemanatha Rasa

THERAPEUTIC USES - Krmi, Swasa, Roga, Raktapitta, Pradara

DOSE - 10-20 gm.

KARCŪRA (Rhizome)

Karcūra consists of dried pieces of rhizome of *Curcuma zedoaria* Rosc. (Fam. Zingiberaceae), a large perennial herb with underground tuberous root-stock, growing wildly in eastern Himalayas and in moist deciduous forests of the central region of Karnataka; also cultivated throughout the country.

SYNONYMS -

Sansk. : Kaccura, Dravida
Assam. : Katuri
Beng. : Sali, Ekangi, Sari, Kachura
Eng. : Zedoary
Guj. : Kachuro, Shatakachuro
Hindi. : Kacura
Kan. : Kachora
Mal. : Kachalam
Mar. : Kachora
Ori. : Kachoramu, Gandha Sunthi, Karchura
Punj. : Kachur
Tam. : Kichili, Kizhangu, Kitchiliki Zhangu, Padam Kizhangu
Tel. : Kachoramu, Kichili Gadda
Urdu. : Zarambad

DESCRIPTION –

a) Macroscopic :

Drug occurs as whole or longitudinally and tangentially cut pieces; the whole drug 2 to 6 cm long, cylindrical; transversely cut pieces 2 to 3.5 cm in dia., surface rough due to longitudinal wrinkles and occasional protuberances; nodes and internodes distinct, a few pieces bear thin root and root scars at places; colour externally greyish-buff and internally cream; odour, camphoraceous; taste, slightly bitter.

b) Microscopic :

Shows a thin zone of cork composed of 4 to 7 layers of thin-walled, tangentially elongated, rectangular cells, sometimes epidermis intact with cork having uniseriate covering trichomes; ground tissue consist of thin-walled, circular, oval or polygonal, parenchymatous cells, mostly filled with simple starch grains but some cells also contain yellow oleo-resin; stelar region demarked from cortex by somewhat collapsed cells of endodermis and consists of rounded and oval to polygonal cells mostly filled with starch grains but some having yellow masses of oleo-resin; vascular bundles closed and collateral, distributed throughout cortical and stelar region, consisting of a few xylem and

ph'oem elements; vascular bundles found in the form of a ring in the cortical region and in the stelar region, just below endodermis; most of the vascular bundles in rest of the stelar region smaller in size and scattered; number of vessels in each bundle varies from 2 to 10, bundle with single vessels being very rare; starch grains round to oval, a few with slight projection at one end, striations distinct, numerous; hilum cleft, indistinct at the narrow end, 20 to 70 μ in length and 15 to 35 μ in width.

Powder – Greyish-yellow; aromatic; shows fragments of cork, oleo-resin cells, simple circular to oval, abundant starch grains measuring 20 to 70 μ in length and 15 to 35 μ in width.

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 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 10 per cent, Appendix 2.2.7.
Volatile oil	-	Not less than 2 per cent, Appendix 2.2.10.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (93 : 7) v/v shows under U.V. (366 nm) five fluorescent zones at Rf. 0.25, 0.47, 0.76 (all light blue), 0.83 (blue) and 0.97 (light blue). On exposure to Iodine vapour eight spots appear at Rf. 0.25, 0.34, 0.47, 0.58, 0.67, 0.76, 0.83 and 0.97 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C eight spots appear at Rf. 0.25 (violet), 0.34 (light violet), 0.47 (violet), 0.58 (violet), 0.67 (light brown), 0.76 (bluish grey), 0.83 (violet) and 0.97 (light brown).

CONSTITUENTS –Essential Oil and Resin.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta
Guna : Laghu, Tiksna
Virya : Usna
Vipaka : Katu
Karma : Vatahara, Kaphara, Rucya, Dipana Mukhavisadyakara

IMPORTANT FORMULATIONS – Karcuradi Curna (Karcuradi Lepa), Karpuradyarka, Sutasekhara Rasa

THERAPEUTIC USES – Hikka, Swasa, Kasa, Kustha, Arsa, Gulma, Jvara, Vrana, Pliha, Galganda, Krmi

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

KASTŪRĪLATIKĀ (Seed)

Kasturilatika consists of seed of *Hibiscus abelmoschus* Linn. Syn. *Abelmoschus moschatus* Medik (Fam. Malvaceae), an evergreen shrub about 1.22 m in height cultivated in hotter parts of India.

SYNONYMS -

Sansk. : --
Assam.: --
Beng. : Latakasturi
Eng. : --
Guj. : Bhindo, Bhinda
Hindi : --
Kan. : Kasturi Kande, Kadu Kastuar
Mal. : Kattu Kasthuri, Kasturi Kanda
Mar. : Kasturbhendi
Ori. : --
Punj. : Mushak Dana, Lata Kasturi
Tam. : Kasturi-vendai
Tel. : Kasturi Benda
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Seeds greyish-brown and blackish, not velvety to touch, kidney-shaped, slightly compressed with shallow depressions on both sides, marked with minute parallel ridges and furrows; hilum small and distinct; odour, musk-like; no taste.

b) Microscopic :

Shows two integuments, outer integument forms ridges and furrows; epidermis consists of single layered tangentially elongated cells, followed by 1 to 3 layers of thin-walled tangentially elongated cells in the region of furrows; 1 to 4 rows of rounded, thick-walled cells containing yellowish-brown masses with 1 or 2 of the upper most rows thin-walled, tangentially elongated and pointed cells present in the region of ridges; inner integument represented by palisade like cells, containing some granular masses followed by thin and thick-walled parenchyma; the thick-walled being 4 to 8 layered, compactly arranged, tangentially elongated, having reddish-brown contents, followed by the thin-walled and colourless cells; 8 to 12 layers of cells large, isodiametric to oval; a single layer of tangentially elongated cells present; cotyledons two, consisting of single layered cubical to irregular cells of epidermis covered

by cuticle and followed by a single layered palisade like cells; the rest of the cotyledons consists of 4 to 6 rows of thin-walled, isodiametric cells filled with granular masses; lower epidermis composed of a single layer of cells covered with cuticle.

Powder – Greyish-brown; shows brown coloured parenchyma cells, rounded, thick-walled cells, a few palisade cells and polygonal and straight walls epidermal cells in surface view.

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 0.3 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 9 per cent, Appendix 2.2.7.
Fixed oil	-	Not less than 10 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) under UV (366 nm) shows two fluorescent zones at Rf. 0.36 and 0.93 (both blue). On exposure to Iodine vapour five spots appear at Rf. 0.19, 0.31, 0.53, 0.71 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. 0.19, 0.31, 0.53, 0.71 and 0.93 (all grey). On spraying with 5% Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C five spots appear at Rf. 0.19, 0.31, 0.53, 0.71 and 0.93 (all grey).

CONSTITUENTS – Fixed Oil and Volatile Oils.

PROPERTIES AND ACTION –

Rasa : Katu, Tikta, Madhura
Guna : Laghu
Virya : Sita
Vipaka : Madhura
Karma : Caksusya, Chedini, Vrsya, Kaphahara, Mukhadaurgandhyanasaka, Vasti Visodhani

IMPORTANT FORMULATIONS - Karpuradyarka

THERAPEUTIC USES – Trsna, Vasti Roga, Mukha Roga

DOSE – 2-4 gm of the drug in powder form.

KATAKA (Seed)

Kataka consists of dried seed of *Strychnos potatorum* Linn. f.(Fam. Loganiaceae), a tall tree occurring plentifully in deciduous forests in most of the parts of the country upto 400 m.

SYNONYMS -

Sansk. : Nirmali, Payah Prasadi
Assam.: --
Beng. : Nirmali
Eng. : Clearing nut
Guj. : Nirmali
Hindi. : Chillikavi
Kan. : Katakam, Tetramabaral
Mal. : Katakam
Mar. : Nirmal
Ori. : --
Punj. : Nirmali
Tam. : Kottai
Tel. : Chilla
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Seed upto 8 mm dia., circular, bluntly lenticular, shiny with short, appressed silky hairs; cream-white in colour with a slightly prominent ridge round the border, no bitterness, (Seeds of *Strychnos nux-vomica* bitter).

b) Microscopic :

Shows testa, consisting of 2 or 3 layers, thick-walled, elongated, lignified sclerenchymatous cells covered with numerous, cylindrical, unicellular, lignified, trichomes having basal portion ramified; outer endosperm composed of 3 to 8 layers of thick-walled, elongated palisade-like cells arranged in rows, an inner endosperm composed of thin-walled, oval to polygonal, parenchymatous cells having numerous small aleurone grains and oil globules.

(In seed of *Strychnos nux-vomica* base of trichome is pitted, bulbous, ramified with a projection normally elongated and thick-walled).

Powder - Creamish-yellow and oily; shows fragments of testa, trichomes, endosperm cells and oil globules.

IDENTITY, PURITY AND STRENGTH -

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 0.5 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 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 : Diethylamine (70:20:10). On spraying with Dragendorff reagent with tartaric acid two spots appear at Rf. 0.38 (orange and corresponding to that of Brucine) and at Rf. 0.55 (faint orange and corresponding to that of Strychnine).

CONSTITUENTS – Alkaloids.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta, Kasaya
Guna : Guru, Sita
Virya : Usna
Vipaka : Katu
Karma : Caksusya, Vatahara, Slesmahara, Visaghna, Pittala, Asu-drstiprasadakrt, (Kasyapa) Jala prasada kara

IMPORTANT FORMULATIONS – Dasamularista, Niruryari Gutika

THERAPEUTIC USES - Mutrakrcchra, Mutrasmari, Krmi, Aruci, Trsna, Sula, Netra Roga, Sarkara meha, Rakta abhisyanda, Prameha, Vrscika Visa, Apasmara

DOSE - 3-6 gm.

KHARJURA (Dried Fruit)

Kharjura consists of dried fruit, with seeds removed, of *Phoenix dactylifera* Linn. (Fam. Araceae), a tall tree upto 36 m high, cultivated or occasionally self-sown in arid parts of the country.

SYNONYMS -

Sansk. : Pinda Kharjura
Assam.: Tamar
Beng. : Sohara
Eng. : Dried Dates
Guj. : Kharek, Kharika
Hindi. : Chuhara, Chohara
Kan. : Karinchula, Khajura
Mal. : Intappazham, Inthappana
Mar. : Kharika, Kharik Phala, Khajur, Kharik
Ori. : Kharjjuri, Khajur
Punj. : Khajur
Tam. : Pericham, Karchuram, Perichehantay
Tel. : Kharjura, Kharjuramu
Urdu. : Khurma (Khajoor)

DESCRIPTION –

a) Macroscopic :

Fruit an oblong berry, 2.5 to 7.5 cm long, wrinkled, hard, reddish-brown, and sweet.

b) Microscopic :

Shows a wide pericarp consisting of a single layered epidermis covered with striated cuticle; below epidermis 3 to 5 layers of tangentially elongated, tabular, thin-walled cells followed by a layer of stone cells with narrow lumen, thick walled, 28 to 55 μ in dia., with clear striations; below this a wide zone of oval to elongated, thin-walled parenchymatous cells present; cells of outer 10 layers more elongated than the inner ones; some vascular bundles, groups of tanniniferous idioblasts and oil globules present scattered in this region.

Powder – Reddish-brown; shows groups of thin-walled parenchyma; stone cells, oil globules and tanniniferous idioblasts.

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 20 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 74 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica Gel 'G' using n-Butanol : Acetic acid : Water (5:1:4) shows in visible light one spot at Rf. 0.12 (grey). On exposure to Iodine vapour two spots appear at Rf. 0.12 and 0.25 (both yellow). On spraying with 5% Methanolic-Sulphuric acid reagent four spots appear at Rf. 0.12, 0.25 (both black), 0.33 and 0.62 (both grey).

CONSTITUENTS – Sugars, Tannins and Vitamins.

PROPERTIES AND ACTION -

Rasa : Madhura, Kasaya
Guna : Guru, Snigdha
Virya : Sita
Vipaka : Madhura
Karma : Vatahara, Pittahara, Kaphahara, Hrdya, Tarpana, Balya, Brmhana, Vrsya, Sukrala

IMPORTANT FORMULATIONS - Draksadi Curna, Eladya Modaka, Eladi Gutika, Siva Gutika (Laghu)

THERAPEUTIC USES - Ksaya, Ksata Ksaya, Daha, Raktapitta, Murccha, Trsna, Madatyaya, Abhighata, Kasa, Svasa, Srama, Gulma, Jvara, Mukha, Vairasya, Hikka, Prameha, Pittasula

DOSE - 10-15 gm.

KHARJURA (Fresh Fruit)

Kharjura consists of ripe and mature fruit with seed removed, of *Phoenix dactylifera* Linn. (Fam. Araceae), a tall palm tree upto 36 m high, cultivated or occasionally self-sown in arid parts of the country.

SYNONYMS –

Sansk. : Aharjura, Pinda Kharjura
Assam. : --
Beng. : Khejur
Eng. : Date
Guj. : Khajur
Hindi : Khajur, Pinda, Khajur
Kan. : Kharjura, Pinda Kharajura
Mal. : Prantha Puzam
Mar. : Khajur
Ori. : Khejuri
Punj. : Pinda Khajur
Tam. : Pericham Pazham
Tel. : Khajur pupandu
Urdu. : Khurma (Khajoor)

DESCRIPTION –

a) Macroscopic :

Fruit a berry, oval to oblong, compressed, of varying shapes; 2 to 3 cm long, smooth or slightly wrinkled, reddish-brown to yellowish-brown; pulp fleshy, sticky, soft, viscous; odour, not distinct; taste, sweet.

b) Microscopic :

Fruit shows single layered epidermis with striated cuticle, containing heavily cutinized cells and having stomata; below epidermis, 4 or 5 layered tangentially elongated, thin-walled, parenchymatous hypodermis present, followed by a row of stone cells with narrow lumen, thick walled, 28 to 55 μ in dia., with clear striations; mesocarp differentiated into two zones, outer consisting of thin-walled parenchyma cells with scattered tannin, and oil globules, inner consisting of collapsed, crushed and disorganized cells appearing as loose, shining, 'fibrous' mass, representing the so called "rag." scattered sclerosed cells also occur in this region; endocarp composed of single layered inner epidermis together with underlying compact tissues.

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 extractives	-	Not less than 20 per cent, Appendix 2.2.6.
Water-soluble extractives	-	Not less than 65 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica Gel 'G' using n-Butanol : Acetic acid : Water (5:1:4) shows in visible light one spot at Rf. 0.12 (grey). On exposure to Iodine vapour two spots appear at Rf. 0.12 and 0.25 (both yellow). On spraying with 5% Methanolic-Sulphuric acid reagent four spots appear at Rf. 0.12, 0.25 (both black), 0.33 and 0.62 (both grey).

CONSTITUENTS – Sugars, Protein and Vitamins.

PROPERTIES AND ACTION –

Rasa : Madhura, Kasaya
Guna : Guru Snigdha
Virya : Sita
Vipaka : Madhura
Karma : Vatahara, Pittahara, Kaphahara, Mansavardhaka, Sukrakara, Rucikara, Hrdya, Balya, Tarpaka, Kosthagata vayunasaka, Vamaka, Ksudha Sramahara

IMPORTANT FORMULATIONS – Draksadi Curna, Eladya Modaka, Eladi Gutika, Siva Gutika (Laghu)

THERAPEUTIC USES – Ksata Ksaya, Raktapitta, Jvaratisara, Trsna, Kasa, Swasa, Murccha, Madatya, Daha, Abhighat

DOSE – 10 – 50 gm.

KRSNĀSARIVĀ (Root)

Krsnāsariva consists of dried roots of *Cryptolepis buchanani* Roem. & Schult. (Fam. Asclepiadaceae), a perennial, much branched climber with milky juice, found throughout the country from Western Kashmir to Assam, ascending to 1200 m in the Himalayas and in south upto Kerala.

SYNONYMS -

Sansk. : Jambu Patra, Syama, Krsnavalli, Krsnamuli
Assam. : --
Beng. : Shyamalata, Krishna Saarivaa
Eng. : --
Guj. : --
Hindi. : Kaleesar, Kalee Anantmoòl
Kan. : Karccumbu
Mal. : Kalipalvalli
Mar. : Mothi Kawalee, Kallee Kawalee
Ori. : --
Punj. : --
Tam. : --
Tel. : Naltig, Adavipalatige, Rokallipala
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Roots vary in length and are 1 to 1.5 cm thick; slender, cylindrical, dark brown or blackish; rough due to fine longitudinal ridges and wrinkles running sinuously lengthwise; thicker roots show a few transverse cracks, fissures and longitudinal wrinkles with remnants of rootlets and a few lenticels; cork easily peelable; fracture, short and fibrous; odour, slightly aromatic; taste, sweet and astringent.

b) Microscopic :

Shows thin cork consisting of 4 to 14 layers of thin-walled, rectangular to tangentially elongated cells, arranged radially; cork cambium single layered, followed by a wide zone of secondary cortex composed of polyhedral, oval to tangentially elongated cells having fibres in single or in groups of two to ten; fibres long, thick-walled but very occasionally appear also as elongated stone cells; secondary phloem wide consisting of sieve elements, phloem parenchyma, fibres and a few crystal fibres, and traversed by phloem rays; phloem fibres occur in small groups or rarely in singles, somewhat similar in shape to those of secondary cortex with comparatively thicker walls; crystal fibres elongated, thick-walled and divided into chambers, usually 7 to 17 in number, each chamber containing a prismatic crystal of calcium oxalate; medullary rays uni-to triseriate; cambium 2 to 4 layered; secondary xylem composed of vessels, tracheids,

fibre-tracheids, fibres and parenchyma and traversed by xylem rays; vessels with bordered pits, and filled with tyloses; tracheids long and narrow having bordered pits, and moderately thick-walls; xylem parenchyma usually rectangular in shape with pitted walls but some of the pits become T or Y shaped with reticulate thickening; xylem elements thick-walled and lignified; simple and compound starch grains found in abundance in all parenchymatous cells simple being elliptical to oval, measuring 3 to 19 μ in dia., with central hilum and compound with 2 or 3 components.

Powder – Light grey; shows fragments of cork cells, vessels having bordered pits, tracheids, fibres, prismatic crystals of calcium oxalate, starch grains numerous, simple and compound, elliptical to oval, measuring 3 to 19 μ in dia., with central hilum and compound with 2 or 3 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 1.5 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 7 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (90 : 10) shows under U.V. (366 nm) ten fluorescent zones at Rf. 0.05, 0.10, 0.22, 0.30 (all blue), 0.39 (yellow), 0.49, 0.60, 0.72, 0.80 (all blue) and 0.88 (violet). On exposure to Iodine vapour nine spots appear at Rf. 0.09, 0.17, 0.26, 0.35, 0.43, 0.61, 0.74, 0.88 and 0.96 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C eight spots appear at Rf. 0.09, 0.17 (both gery), 0.26 (blue), 0.35, 0.43, 0.49, 0.61 and 0.96 (all violet).

CONSTITUENTS – Alkaloids.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta
Guna : Guru, Snigdha
Virya : Sita
Vipaka : Madhura
Karma : Sukrakara, Kaphanasaka, Visaghna Rucya, Sangrahi, Rakta Vikara Nasaka, Ama Visaghna, Tridosahara, Trsnahara

IMPORTANT FORMULATIONS – Satavari Guda, Kalyanaka Ghrta, Triphala Ghrta, Brhat Phala Ghrta, Maha Kalyanaka Ghrta, Maha Tiktaka Ghrta, Maha Pancagavya Ghrta, Vatsyamayantaka Ghrta, Candanadi Taila, Brhacchagaladya Ghrta

THERAPEUTIC USES – Agnimandya, Aruci, Svasa, Kasa, Jvara, Prameha, Mukha Daurgandhya, Atisara, Kustha, Kandu, Pradara, Vata Rakta, Dehadurgandha, Raktapitta

DOSE - 5-10 gm.

KUNDURU (Exudate)

Kunduru consists of exudate of *Boswellia serrata* Roxb. (Fam. Burseraceae), a moderate sized, deciduous tree, upto 18 m in height and upto 2.4 m in girth, commonly found in the dry forests from Punjab to West Bengal and in peninsular India.

SYNONYMS –

Sansk. : Sallaki
Assam. : Sallaki
Beng. : Luban, Salai, Salgai
Eng. : --
Guj. : Shaledum, Saleda, Saladi, Gugal, Saledhi
Hindi : Salai, Labana
Kan. : Madimar, Chilakdupa, Tallaki, Maddi
Mal. : Kunturukkam, Samprani
Mar. : Salai cha dink
Ori. : --
Punj. : Salai Gonda
Tam. : Parangi Sambrani
Tel. : Parangi sambrani, Anduga, Kondagugi tamu
Urdu. : Kundur

DESCRIPTION –

a) Macroscopic :

Drug occurs in stalactitic, transparent, tears forming agglomerates of various shapes and sizes, brownish-yellow, upto 5 cm long, 2 cm thick, fragrant, fracture brittle; fractured surface waxy and translucent; burns readily and emanates an agreeable characteristic, balsamic resinous odour; taste, aromatic and agreeable.

b) Microscopic :

Debris of fibres, rectangular cork cells, very few yellowish oil globules and numerous, small or large, oval to round or rhomboidal crystalline fragments present.

Identification - Trituration with water forms an emulsion; when immersed in alcohol (90%) a tear of Kunduru is not altered much in form but becomes almost opaque and white; when a drop of con. H_2SO_4 is added on a freshly fractured surface, it becomes cherry red which, when washed with water changes to a white emulsion, then turn to a buff colour.

Fluorescence Test – Browinsh-yellow colour in day light; aqueous extract under U.V. light (366 nm) light green and in (254 nm) shows dark blue colour; alcoholic extract under U.V. light (366 nm) is colourless and in (254 nm) shows light green colour.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 5 per cent, Appendix 2.2.2.
Total ash	-	Not more than 10 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 8 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 45 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 28 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica Gel 'G' using Toluene : Ethylacetate (9:1) shows under UV (366nm) four fluorescent zones at Rf. 0.23 (light blue), 0.79 (light blue), 0.91 (blue) and 0.96 (blue). On exposure to Iodine vapour nine spots appear at Rf. 0.08, 0.23, 0.29, 0.41, 0.47, 0.55, 0.82, 0.91 and 0.96 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C tailing with four conspicuous spots appear at Rf. 0.23, 0.55, 0.79 and 0.91 (all violet).

CONSTITUENTS – Oleo-gum-resins.

PROPERTIES AND ACTION -

Rasa : Madhura, Katu, Tikta
Guna : Guru, Tiksna, Snigdha
Virya : Usna
Vipaka : Madhura
Karma : Kaphapittahara, Kaphahara, Vatahara, Rakta Stambhara, Balya, Swedahara

IMPORTANT FORMULATIONS -Karpuradyarka, Jirakadi Modaka, Bala Tila, Bala Guducyadi Taila

THERAPEUTIC USES – Swasa, Pittabhisyanda, Pradara, Jwara, Sarkarameha, Vrsana Sula, Mukha roga, Uka

DOSE – 1-3 gm.

KUNKUMA (Style and Stigma)

Kunkuma consists of dried style and stigma from the flowers of *Crocus sativus* Linn. (Fam. Iridaceae), a small bulbous perennial, 15 to 25 cm high and cultivated by corms in the Kashmir valley, specially in the Pampor plateau, at about 1600 m.

SYNONYMS -

Sansk. : Kesara, Ghusina, Kasamira, Rakta
Assam.: Kumkum
Beng. : Jafran
Eng. : Saffron
Guj. : Keshar, Kesar
Hindi. : Keshar, Keshara
Kan. : Kunkuma, Kesari
Mal. : Kunkuma PPuvu
Mar. : Keshar
Ori. : --
Punj. : Kesar, Keshar
Tam. : Kungumapuvu
Tel. : Kunkuma Puvvu
Urdu. : Zafran

DESCRIPTION –

a) Macroscopic :

Yellowish style, broken or intact along with trifid stigma; stigma is dark red or reddish-brown, cornucopia shaped, with fimbriate margin, and about 25 mm long; broken style are very thin, upto about 10 mm long; odour, strongly aromatic; taste, slightly bitter.

b) Microscopic :

Stigma composed mostly of elongated, thin-walled, parenchyma cells containing colouring matter; at the upper end numerous cylindrical papillae or trichomes up to 150 microns long present; pollen grains, a few, spherical, nearly smooth, from 40 to 120 microns in dia; occasionally germinated and exhibiting pollen tubes.

Powder - Pale reddish-brown; aromatic, shows elongated, thin-walled, parenchymatous cells, unicellular trichomes, a few spherical, smooth, pollen grains measuring 40 to 120 μ in dia. and xylem vessels with annular and spiral thickenings.

IDENTITY, PURITY AND STRENGTH -

Identification

i. When sprinked on sulphuric acid, the stigmas turn blue immediately, gradually changing to purple and finally purplish red.

ii. Stamens of safflower and florets of marigold should be absent; should be free from artificially dyed corn silk or fibres.

Organic dyes :

i. Digest about 0.1 g in 10 ml of water for 15 minutes with frequent shaking, filter and add 1 g of decolorising charcoal to the filtrate; shake and allow to stand for 10 minutes; filter; the fitrate is colourless.

ii. Macerate 10 mg in 5 ml of alcohol (95 per cent) or methanol; a distinct greenish yellow colour is imparted to the liquid; with corresponding quantities of Kunkuma in ether or chloroform the solvents remain almost colourless; so also with xylene, benzene or carbon tetrachloride.

Absence of Fixed oil or glycerin : Press between clear filter paper, the paper does not display translucent oily spots.

Foreign organic matter – Not more than 2 per cent. Styles not more than 10 per cent.

Loss on drying : Loses not more than 14 per cent of its weight, when dried at 100°C.

Ash : Not more than 7.5 per cent.

Acid-insoluble ash : Not more than 1 per cent

Assay : Weigh accurately 0.1 g in moderately fine powder and maccrate at room temperature in 100 ml of water for 3 hours with frequent shaking. Filter immediately, adding sufficient water through the filter to make 100 ml. Dilute 10 ml of this filtrate, accurately measured, to 100 ml with water. Immediately compare the colour of this solution in Nessler tubes or in a colorimeter, with the colour of N/100 potassium dichromate. The colour of the solution approximates that of the N/100 potassium dichromate, and the strength of the colour is not less that of an equal depth in mm of the N/100 potassium dichromate.

Constituents : Essential Oils, Bitter Glycoside, Picrocrocin and Crocin.

PROPERTIES AND ACTION –

Rasa : Katu, Tikta
Guna : Snigdha
Virya : Usna
Vipaka : Katu
Karma : Varnya, Slesmahara, Vatahara, Rasayana, Visaghna, Jantuhara

IMPORTANT FORMULATIONS – Karpuradyarka, Balarka Rasa, Yakuti, Kunkumandya Taila, Mahanarayana Taila, Pusyanuga Curna

THERAPEUTIC USES – Vyanga, Vrana, Siroroga, Drasti Roga, Chardi, Kasa, Kantha Roga, Sidhma, Mutrasotha, Udavartta, Mutraghata, Suryavartta, Ardhava bhedaka

DOSE - 25 – 50 mg.

KŪSMĀNDA (Fruit)

Kusmanda consists of the dried piece of fruits of *Benincasa hispida* (Thunb.) Cogn. (Fam. Cucurbitaceae), an extensive trailing or climbing herb cultivated throughout the plains of India and on the hills upto 1200 m altitude, as a vegetable.

SYNONYMS -

Sansk. : Pushpaphalam, Brihatphalam
Assam. : Kumra
Beng. : Chal Kumra
Eng. : White guard melon
Guj. : Safed Kohalu, Bhuru, Kohalu, Bhuru Kolu
Hindi. : Kushmand, Petha
Kan. : Boodi Humbala
Mal. : Kumbalanga
Mar. : Kohala
Ori. : Kakharu, Panikakharu
Punj. : Petha
Tam. : Pooshanikkai
Tel. : Boodida Gummadi
Urdu. : Petha

DESCRIPTION –

a) Macroscopic :

Drug occurs in deformed, compressed, cut pieces of various sizes; epicarp cream coloured with light yellowish to brownish mesocarp; taste, slightly acidic.

b) Microscopic :

Mature fruit shows cuticularised epicarp consisting of single layered, squarish or slightly tangentially elongated cells of epidermis, outer tangential walls of epidermis thickened and cuticularised; a few epidermal cells divide periclinally and become 2 or 3 layered; mesocarp has a heterogenous structure consisting of multilayered hypodermis composed of tangentially elongated, thin-walled, parenchymatous cells; immediately within this is a zone of thick-walled, multilayered, lignified sclereids with the outer one to three layers thicker than the inner 2 to 6 or more layers; beneath this zone, thin-walled tangentially elongated, parenchymatous cells present, their size gradually increasing from those at periphery to those inside of mesocarp, the latter becoming circular having conspicuous intercellular spaces; vascular bundles poorly developed, bicollateral, found scattered throughout mesocarp.

Powder – Dirty brown; shows numerous fragments of thin-walled, tangentially elongated and circular parenchymatous cells, numerous sclereids in groups and singles and a few fragments of xylem vessels having spiral thickenings.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 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 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 24 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' plate using Benzene : Ethylacetate (9:1) shows under U.V. (366nm) two fluorescent zones at Rf. 0.71 and 0.79 (both violet). On exposure to Iodine vapour eight spots appear at Rf. 0.07, 0.18, 0.28, 0.40, 0.50, 0.59, 0.71 and 0.79 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate at 105°C for ten minute six spots appear at Rf. 0.07, 0.18, 0.40, 0.50, 071 and 0.79 (all violet).

CONSTITUENTS – Fatty Oil.

PROPERTIES AND ACTION -

Rasa : Madhura, Amla
Guna : Laghu
Virya : Sita
Vipaka : Madhura
Karma : Dipana, Hrdya, Bastisodhaka, Vrsya, Balya, mhana, Tridosahara, Jirnanga Pusti Pradama, Bastisodhaka, Sramsana, Arocakahara, Vatapittajit

IMPORTANT FORMULATIONS – Kusmandaka Rasayana , Dhatryadi Ghrta, Vastyamayantaka Ghrta

THERAPEUTIC USES – Mutraghata, Prameha, Mutrakrcchra, Asmari, Trsa, Manasa Vikara, Malabandh

DOSE - 5-10 gm.

MADAYANTĪ (Leaf)

Madayantī consists of dried leaves of *Lawsonia inermis* Linn. (Fam. Lythraceae); a small, elegant bush with fragrant flowers, cultivated and naturalised all over the country.

SYNONYMS -

Sansk. : Nil Madayantika
Assam. : --
Beng. : Mehadi
Eng. : Henna
Guj. : Mendi
Hindi : Mehandi
Kan. : Goranta, Korate, Madarangi
Mal. : Mailanelu
Mar. : Mendi
Ori. : --
Punj. : Mehndi
Tam. : Marudum
Tel. : Gorinta
Urdu. : Mehendi, Hina

DESCRIPTION -

a) Macroscopic :

Leaves simple, 2 to 3 cm in length, 1 to 1.5 cm in width, greenish-brown to dull green; entire, lanceolate; apex mucronate, base tapering, petiole short and glabrous; odour, aromatic when crushed; taste, sweet, mucilaginous and slightly astringent.

b) Microscopic :

Petiole –shows concavo-convex outline; epidermis consisting of single layered cells covered by thick, striated cuticle; below epidermis 2 to 4 layered collenchyma and 3 to 4 layered parenchyma having intercellular spaces; pericycle 2 to 4 layered, stele bicollateral; cambium a thin strip present between xylem and phloem; phloem consisting of usual elements; xylem mostly composed of tracheids and vessels.

Midrib –shows upper and lower epidermis covered externally by thick and striated cuticle; epidermis followed by 2 to 4 layers of collenchymatous cells, circular in shape with angular thickening; beneath which are 3 or 4 layers of parenchymatous cells, isodiametric with intercellular spaces; stele crescent-shaped, consisting of usual elements traversed by medullary rays; phloem fibres seen in the phloem region; a few parenchymatous cells contain rosette and prismatic crystals of calcium oxalate.

Lamina – shows upper and lower epidermis composed of tangentially elongated cells covered externally by a thick striated cuticle; some large epidermal cells form mucilage sacs projecting into adjacent palisade zone; anomocytic stomata distributed on both surfaces; mesophyll composed of 1 to 3 layers of palisade tissue and 2 to 4 layers of spongy parenchyma; palisade cells filled with chloroplasts, spongy parenchyma oval to

circular in shape, oil globules present in palisade and spongy parenchyma; rosette and prismatic crystals of calcium oxalate also present in spongy parenchyma; mesophyll traversed by vascular strands composed of xylem surrounded by phloem with a patch of sclerenchymatous fibres on abaxial side; average stomatal index 10 to 15 and 15 to 18 in upper and lower surface the respectively; palisade ratio 5 to 8 on both surfaces; vein islet number 30 to 45.

Powder – Dark brown; shows fragments of thin-walled, parenchyma cells, wavy thin-walled epidermal cells in surface view, anomocytic stomata, rosette and prismatic crystals of calcium oxalate, a few oil globules, and vessels showing spiral thickenings.

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 extractive	-	Not less than 18 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 alcoholic extract of the drug on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows in the visible light three spots at Rf. 0.35, 0.60 and 0.63 (all grey). Under U.V. (366 nm) seven spots appear at Rf. 0.18, 0.26, 0.35, (all violet), 0.39, 0.61, 0.68 (all reddish violet) and 0.73 (violet). On spraying with 5% Methanolic Sulphuric acid regent and heating the plate at 105°C for ten minutes five grey colour spots appear at Rf. 0.09, 0.41, 0.61, 0.70 and 0.95.

CONSTITUENTS– Glycosides, colouring matter (Lawsone), Hennotannic acid, Essential Oil containing β–Ionone.

PROPERTIES AND ACTION –

Rasa : Tikta, Kasaya
Guna : Laghu, Ruksa
Virya : Sita
Vipaka : Katu
Karma : Kaphasamaka,, Pittasamaka

IMPORTANT FORMULATIONS - Madayantyadi Curna

THERAPEUTIC USES – Jwara, Kandu, Raktapitta, Kamala, Raktapittahara, Kustha, Mutrakrcchra, Bhrama, Vrana

DOSE – 5-10 ml. (Swarasa)

MAHĀNIMBA (Stem Bark)

Mahānimba consists of dried stem bark of *Melia azedarach* Linn. (Fam. Meliaceae), a moderate sized deciduous tree, 9 to 12 m high with a cylindrical bole, naturalized throughout the country and occurring wild in the sub-Himalayan tracts upto 1800 m.

SYNONYMS -

Sansk. : Ramyaka, Dreka
Assam. : Khammaga
Beng. : Ghoranim
Eng. : Persian Lilac
Guj. : Bakan Limado, Bakai Nimbu
Hindi. : Bakain, Drek
Kan. : Kadu bevu
Mal. : Malaveppu
Mar. : Bakana Nimb
Ori. : --
Punj. : Dharek, Bakain, Drek
Tam. : Malaivembu
Tel. : Turakavepa
Urdu. : Neem

DESCRIPTION –

a) Macroscopic :

Bark comparatively thin, about 0.2 to 0.6 cm thick; outer surface black and rough being slightly fissured and exfoliating in small slightly woody pieces light and dark-grey to greyish-black in colour; inner bark made up of creamy layer alternating with whitish ones; fracture, fibrous; taste, extremely bitter.

b) Microscopic :

Mature bark shows outer zone of rhytidoma, formed of alternating strips of dark-brown cork cells and dead secondary phloem; cork cells compressed, almost rectangular and many layered; secondary phloem multilayered and compressed; cork cambium and secondary cortex almost absent; beneath rhytidoma a wide zone of secondary phloem present, with sieve tubes with compound sieve plates, and with groups of fibres; phloem parenchyma oval to irregular, thin-walled, colourless with intercellular spaces; phloem rays 2 to 5 cells wide; rosette and prismatic crystals of calcium oxalate present in phloem parenchyma and ray cells; a few very small, simple, round to oval, starch grains measuring 5 to 11 μ in dia., having 2 or 3 components.

Powder – Greyish-yellow; shows fragment of cork cells, phloem fibres, rosette and prismatic crystals of calcium oxalate and small, simple round to oval, starch grains measuring 5 to 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 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 7 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (9:1) under UV (366 nm) shows eight fluorescent zones at Rf. 0.10, 0.26, 0.34, 0.50, 0.68, 0.76, 0.86 (all blue) and 0.95 (bluish green). On exposure to Iodine vapour nine spots appear at Rf. 0.10, 0.18, 0.26, 0.34, 0.50, 0.64, 0.76, 0.86 and 0.95 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent two spots appear at Rf. 0.26 and 0.95 (both orange).

CONSTITUENTS – Tannins and Alkaloids.

PROPERTIES AND ACTION -

Rasa : Tikta, Kasaya, Katu
Guna : Ruksa
Virya : Sita
Vipaka : Katu
Karma : Grahi, Kaphajit, Pittajjit, Rakta Vikarajit, Dahanasaka, Pittakaphahara, Raktadahahara

IMPORTANT FORMULATIONS – Brhanmanjsthadikvatha Curna, Maha visagarbha Taila

THERAPEUTIC USES – Prameha, Kustha, Hrllasa, Svasa, Gulma, Arsa, Musika Visa, Visuci, Bhrama, Chardi, Visama jvara

DOSE - 5- 10 gm.

MANDŪKAPARNĪ (Whole Plant)

Mandūkaparnī consists of dried whole plant of *Centella asiatica* (Linn.) Urban.Syn. *Hydrocotyle asiatica* Linn. (Fam. Apiaceae), a prostrate, faintly aromatic, stoloniferous perennial herb, commonly found as a weed in crop fields and other waste places throughout India upto an altitude of 600 m.

SYNONYMS -

Sansk. : Manduki, Darduracchada
Assam. : Manimuni
Beng. : Jholkhuri, Thalkuri, Thankuni
Eng. : Indian Pennywort
Guj. : Khodabrahmi, Khadbhrammi
Hindi : Brahma Manduki, Brahmi
Kan. : Ondelaga, Brahmi soppu
Mal. : Kodangal
Mar. : Karivana
Ori. : --
Punj. : Brahmi
Tam. : Vallarai
Tel. : Saraswati Aku, Vauari
Urdu. : Brahmi

DESCRIPTION –

a) Macroscopic :

Small creeping herb with slender stem, rooting at nodes giving rise to thin, brownish-grey, roots of about 2.5 to 6.0 cm in length; leaves 1 to 3 from each node, orbicular-reniform, crenate, base cordate, petioles channelled with adnate stipules; flowers fascicled umbels each carrying 3 or 4 flowers, short stalked; fruits cremocarp, ovoid, with laterally compressed seeds.

b) Microscopic :

Root – Shows wavy outline, consisting of 3 to 5 layered, rectangular, cork cells having exfoliated cells, followed by 3 or 4 layers of parenchyma cells containing oval to round, simple, starch grains measuring 8 to 16 μ in dia., having centric hilum and microsphenoidal crystals of calcium oxalate; secondary cortex composed of thin-walled, oval to polygonal, parenchymatous cells; secretory cells present, scattered towards periphery region; secondary phloem and secondary xylem consisting of usual elements; vessels lignified with reticulate and spiral thickening; pith nearly obliterated.

Stem – More or less concave-convex outline, shows single layered epidermis composed of round to cubical cells covered by striated cuticle; below this 2 or 3 layers of collenchymatous cells, followed by 6 to 8 layers of thin-walled, isodiametric, parenchymatous cells with intercellular spaces present; vascular bundles collateral, open, arranged in a

ring, capped by patches of sclerenchyma and traversed by wide medullary rays; vessels with spiral thickening present, resin duct present in parenchymatous cells of cortex and generally one in between vascular bundles; pith of isodiametric, parenchyma with intercellular spaces.

Leaf –

Petiole – shows a characteristic outline due to two projections adjacent to ventral groove; epidermis single layered, cells cubical covered by a thick cuticle; inner walls of epidermal cells adjoining the cortex much thickened; hairs absent; collenchyma 2 or 3 layered, absent on the projections, a broad zone of more or less rounded parenchyma cells present with intercellular spaces, and a few containing rosette crystals of calcium oxalate; resin canal present on dorsal side of each vascular bundle except in the vascular bundles occurring projecting arms; vascular bundles seven in number, two of which less developed and present in projections.

Midrib – show a single layered epidermis, 2 or 3 layered collenchyma on both surfaces, 4 or 5 layered parenchyma, mostly devoid of chloroplasts; central zone occupied by vascular bundles differentiated into xylem towards ventral side and phloem towards dorsal side; phloem consisting of sieve tubes, companion cells and phloem parenchyma; xylem consisting of radial rows of vessels with xylem parenchyma in between.

Lamina –shows an epidermis of tangentially elongated cells on both surfaces, larger on the upper surface, covered by striated cuticle; mesophyll differentiated into 2 or 3 layers of palisade cells, 5 to 7 layers of loosely arranged, somewhat isodiametric spongy parenchyma; rosette crystals of calcium oxalate present in a few cells; stomata more on the lower surface, anisocytic in general, but anomocytic type also occurs on both surfaces, palisade ratio 3 to 5, stomatal index on upper surface, 9 to 12, and lower surface 11 to 17.

Fruit – Shows several ridges in outline; epicarp consists of single layered epidermis covered externally with thick cuticle; mesocarp consists of polygonal, thin walled parenchymatous cells having patches of sclerenchymatous cells on both lateral side; each ridge having a vittae and patch of sclerenchyma; endocarp consists of columnar shaped sclereids arranged in wavy layers; endosperm and embryo composed of oval to polygonal, thin-walled parenchymatous cells.

Powder – Green to greenish-brown, shows fragments of epidermal cells polygonal in surface view with stomata, palisade cells, vessels with spiral, reticulate and annular thickening; microsphenoidal and rosette crystals of calcium oxalate; simple, oval to round starch grains measuring 8 to 16 μ in dia.

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 5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 9 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 20 per cent, Appendix 2.2.7.

T.L.C. of alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (80 :20) shows under UV (366 nm) two fluorescent zones at Rf. 0.72 and 0.85 (both blue). On exposure to Iodine vapour six spots appear at Rf. 0.08, 0.16, 0.32, 0.72, 0.85 and 0.96 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate at 105°C for ten minutes seven spots appear at Rf. 0.08 (grey), 0.16 (blue), 0.23 (grey), 0.32 (violet), 0.72, 0.85 (both violet) and 0.96 (violet).

CONSTITUENTS– Glycosides - Saponin Glycosides.

PROPERTIES AND ACTION –

Rasa : Tikta, Kasaya, Madhura, Katu
Guna : Laghu, Sara
Virya : Sita
Vipaka: Madhura
Karma: Kaphapittahara, Hrdya, Medhya, Swarya, Rasayana, Dipana, Varnya, Visaghna, Ayusya, Balya, Smratiprada

IMPORTANT FORMULATIONS - Brahama Rasayana

THERAPEUTIC USES – Raktapitta, Kustha, Meha, Jwara, Swasa, Kasa, Aruci, Pandu, Sotha, Kandu, Raktadosa

DOSE – 3 - 6 gm.

MĀYĀKKU (Gall)

Māyakku consists of dried galls found on *Quercus infectoria* Oliv. (Fam. Fagaceae), a small tree or shrub, 2 to 5 m high, native of Greece, Asia Minor, Syria and Iran. The galls are excrescences on the twigs, resulting from insect attack of the growing, rudimentary leaves; they are imported into India.

SYNONYMS -

Sansk. : Mayaphala
Assam.: Aphsa
Beng. : Majoophal, Majuphal
Eng. : Oak-Gall
Guj. : Muajoophal, Mayfal
Hindi. : Maajoophal, Majuphal
Kan. : Machikaai, Mapalakam
Mal. : Majakaanee, Mashikkay
Mar. : Maayaphal
Ori. : Mayakku
Punj. : Maju
Tam. : Machakaai, Masikki, Mussikki
Tel. : Machikaaya
Urdu. : Mazu, Mazuphal

DESCRIPTION –

a) Macroscopic :

Galls spherical or pear-shaped, hard and brittle 1.2 to 2.5 cm in diameter having a short basal stalk and numerous rounded projections on the upper part of the gall; they usually sink in water; surface, smooth, rather shining, bluish-green, olive green or white - brown, a few galls show the escape route of insect, in the form of a small rounded hole leading to a cylindrical canal which passes to the centre of the gall; taste, astringent, followed by sweetness; average weight of ten galls picked at random should not be less than 2.5 g.

b) Microscopic :

Gall shows outer most zone of small thin-walled parenchymatous cells, irregular in shape; a ring of large, oval-shaped sclerenchymatous cells and a small inner zone of thick-walled parenchymatous cells present near the central cavity; outer zone of the parenchyma differentiated into three type of cells; uppermost small, irregular, thin-walled, middle large, oval, and inner long parenchymatous cells, all having intercellular spaces; vascular bundles irregularly distributed in this region, consisting of small patches of xylem and phloem; vessels with spiral and reticulate thickening; arround the central

cavity, a ring of sclerenchyma of great variation in shape and size, present, with rectangular, ovoid, elongated, small sclereids, having heavily thickened striated walls with numerous pits, lumen large, usually filled with dense brown material, large sclereids are much elongated; a few rosette crystals of calcium oxalate in outer and middle regin and prismatic crystals in inner parenchymatous cells present; starch grains simple and compound with central hilum, compound grains consisting of 2 to 5 or sometimes more components, simple grains round to oval, measuring upto 25 μ in dia, present abundantly in innermost zone of parenchyma.

Powder - Cream colour; shows fragments of palisade-like thin-walled and oval to polygonal, thin-walled parenchymatous cells; sclereids with thickened and striated walls with numerous pits and vessels with reticulate and spiral thickening; simple, round to oval starch grains, measuring upto 25 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Nil, Appendix 2.2.2.
Total ash	-	Not more than 2 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 60 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 55 per cent, Appendix 2.2.7.
Total Tannin Content	-	Not less than 50 per cent, when determined by the following method :

Approximately 2 gms. of powdered fruit, accurately weighed, was refluxed twice for two hrs. with alcohol (95%) on a water bath and filtered. The extract was concentrated almost to dryness, the residue was taken up in 50 ml of water in a separating funnel and extracted four times with 20 ml of solvent ether, collecting the upper etheral layer in each case in a separating funnel. The combined etheral layer was extracted twice with 10 ml of water and aqueous extract was combined with original aqueous extract. The combined aqueous extract was saturated with sodium chloride and shaken with successive quantities of 25, 20, 20, 15 ml of ethyl acetate until complete extraction of the tannins was effected (tested by Ferric chloride reagent).

The combined ethylacetate layer containing the tannins was filtered through a cotton plug (previously soaked with ethylacetate). The filter was washed with 5 ml of ethylacetate and mixed with the original filtrate. The solvent was then distilled on a water bath and when the volume was reduced to about 10 ml, it was quantitatively transferred to a tared glass dish, the solvent removed on a boiling water bath and residue dried to constant weight at 90°C. The residue gives the weight of the tannins present in the drug.

T.L.C. –

T.L.C. of the alcoholic extract on Silica gel 'G' using Chloroform : Ethylacetate : Formic acid (5:4:1) shows in visible light three spots at Rf. 0.60, 0.69 & 0.78 (all grey). Under UV (366 nm) three fluorescent zones are visible at Rf. 0.60, 0.69 & 0.78 (all grey).

On exposure to Iodine vapour five spots appear at Rf. 0.60, 0.69, 0.78, 0.84 & 0.96 (all yellow). On spraying with Ferric chloride reagent four spots appear at Rf. 0.13, 0.60, 0.69 & 0.78 (all greyish blue).

CONSTITUENTS – Tannic Acid, Starch and Sugars.

PROPERTIES AND ACTION -

Rasa : Kasaya
Guna : Laghu, Ruksa
Virya : Sita
Vipaka : Katu
Karma : Pittahara, Kaphahara, Dipana, Grahi

IMPORTANT FORMULATIONS – Gorocanadi Vati, Asthisandhanaka Lepa

THERAPEUTIC USES – Atisara, Grahani, Pravahika, Sveta Pradara, Arsa, Danta Roga, Mukha Roga, Yoni Kanda

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

MUDGAPARNI (Whole Plant)

Mudgaparni consists of dried whole plant of *Vigna trilobata* (L.) Verdc. Syn. *Phaseolus trilobus* Ait. (Fam. Fabaceae), a prostrate or twining perennial herb, found wild, but also occasionally cultivated throughout the country as a forage crop.

SYNONYMS -

Sansk. : Suryaparni, Saha
Assam. : --
Beng. : Muganee
Eng. : --
Guj. : Janglee Maga
Hindi. : Janglee Mung
Kan. : Abaregid
Mal. : Kattuppayaru
Mar. : Ranmug
Ori. : --
Punj. : Mugvan
Tam. : Kattuppayaru, Panippayavu
Tel. : Pilla Pesara
Urdu. : --

DESCRIPTION -

a) Macroscopic :

Root - Occurs in 2.5 to 15.0 cm long, 0.1 or 0.2 cm thick; cylindrical pieces, external surface brownish-grey, rough due to secondary roots; fracture, fibrous.

Stem - Occurs in 12.0 to 55.0 cm long, 0.1 or 0.2 cm thick pieces, more or less cylindrical, grooved, slender, glabrous, pale green; fracture, fibrous.

Leaf - Leaves alternate, pinnately trifoliate, petioled; leaflets palmately 3-lobed; 1.3 to 2.5 cm long; mid lobe large, obovate spathulate, lateral lobe oblique and small, margin ciliate, apiculate, pale green in colour.

Flower - Sessile or very shortly pedicelled; small, yellow with conspicuous persistent bracts and bracteole; calyx, gamosepalous, campanulate, 1 or 2 mm long, pale yellow, five toothed; corolla papilionaceous.

Fruit – A pod; 2.5 to 6 or 7 cm long, 3 mm thick; greyish-black; linear or rarely oblong, torose, subcylindrical, smooth glabrous, recurved or reflexed, 6 to 12 seeded.

Seed – Grey, smooth, with 2 punctate, shortly linear hilum and without strophiole.

b) Microscopic :

Root - Shows a wavy outline, having single layered epidermis, consisting of thick-walled, parenchymatous cells, covered by thick cuticle; secondary cortex composed of 3 to 6 layered, thin-walled, oval to polygonal, parenchymatous cells; pericyclic fibres are present in a discontinuous ring; vascular bundles arranged in a ring; secondary phloem composed of thin-walled cells with brownish contents; secondary xylem consisting of usual elements; radially arranged, lignified, vessels with pitted or reticulate thickening, followed by pith consisting of thin-walled, oval to polygonal, parenchymatous cells.

Stem - Shows a more or less wavy outline; epidermis single layered consisting of thin-walled, parenchymatous cells; secondary cortex consisting of 2 to 5 layers collenchymatous and 1 or 2 layers of parenchymatous thin walled cells; pericycle present in form of a discontinuous ring; vascular bundles arranged in a ring; secondary phloem consisting of compactly arranged, thick-walled cells, having usual elements traversed by phloem rays; secondary xylem composed of usual elements; lignified vessels radially arranged, showing pitted and spiral thickenings; crystal fibres absent; xylem fibres moderately thick walled with narrow lumen and blunt tips, central region occupied by pith consisting of thin-walled, circular, parenchymatous cells.

Leaf -

Midrib - shows single layered epidermis having a few unicellular, pointed hairs on both surfaces, 6 or 7 layers, polygonal collenchyma cells on upper and 5 or 6 layers, thick-walled, collenchyma on lower surface; a single layered thick-walled, lignified polygonal, sclerenchymatous cells present on either side of 'C' shaped vascular bundle having usual elements.

Lamina – isobilateral, shows single layered, elongated, baloon-shaped, thin-walled, epidermis cells on both surfaces, a few unicellular hairs similar as in midrib present on both surfaces; stomata paracytic, present on both surfaces; palisade 2 or 3 layered on upper epidermis, 1 or 2 layered on lower epidermis; palisade ratio 6 or 7 on lower surface, 7 or 8 on upper surface; vein islet number 34 to 45; veinlet termination number 20 to 33; stomatal index, 30 to 36 per sq. mm on lower surfaces, 20 to 27 per sq. mm on upper surface.

Seed - Shows testa consisting of 2 or 3 layered, thick-walled, elongated, lignified stone cells having striations and narrow lumen; cotyledon composed of oval to polygonal, thin-walled, parenchymatous cells.

Powder – Light greyish-green; shows fragments of parenchyma, unicellular pointed broken hairs; lignified, simple pitted, reticulate or spiral vessels; paracytic stomata, epidermal cells in surface view with wavy outline.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Not more than 2	per cent, Appendix 2.2.2.
Total ash	-	Not more than 11.5	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 3	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 alcoholic extract on Silica Gel 'G' using n-Butanol : Acetic acid : Water (4:1:5) shows under UV (366 nm) five fluorescent zones at Rf. 0.35, 0.42, 0.58, 0.70 and 0.82 (all blue). On exposure to Iodine vapour six spots appear at Rf. 0.30, 0.42, 0.50, 0.58, 0.70 and 0.82 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and on heating the plate for ten munutes at 105° five spots appear at Rf. 0.30, 0.42, 0.58, 0.70 and 0.82 (all yellow).

CONSTITUENTS – Sterols.

PROPERTIES AND ACTION -

Rasa : Tikta, Madhura
Guna : Ruksa, Laghu
Virya : Sita
Vipaka : Madhura
Karma : Sukradosahara, Kaphahara, Pittahara, Caksusya, Sukrala, Visaghna, Rasayana, Garbhasthapana

IMPORTANT FORMULATIONS – Amrtaprasa Ghrta, Asoka Ghrta, Vidaryadi Ghrta, Dhanvantra Taila, Brahma Rasayana, Bala Taila Mahanarayana Taila, Ratnagiri Rasa

THERAPEUTIC USES – Daha, Jwara, Vatarakta, Pitta daha, Kasa, Musika visa, Ksaya, Krmi, Ksat Sotha, Kustha, Pradara, Madya Trsna

DOSE – 3-5 gm.

MUNDITIKĀ (Whole Plant)

Munditikā consists of dried whole plant of *Sphaeranthus indicus* Linn. (Fam. Asteraceae), an aromatic, much branched herb, 30 to 60 cm high found abundantly in damp places throughout the country, ascending to an altitude of 1,500 m.

SYNONYMS –

Sansk. : Mundi, Sravani, Bhumikadamba
Assam.: Kamadarus
Beng. : Surmuriya, Mudmudiya
Eng. : --
Guj. : Gorakhmundi
Hindi. : Mundi, Gorakhmundi
Kan. : Mudukattanagida, Karande
Mal. : Manni
Mar. : Mundi, Gorakhmundi
Ori. : Bhuikadam
Punj. : Gorakhmunda
Tam. : Karandai
Tel. : Bodasarumu Badataramu
Urdu. : Mundi

DESCRIPTION –

a) Macroscopic :

Root – Pieces 5 to 15 cm long and 0.3 to 0.5 cm thick, a few branching; smooth, slender, somewhat laterally flattened, greyish-brown; fracture, short; odour not characteristic; taste, slightly bitter.

Stem – Pieces 10 to 30 cm long, 0.2 to 0.4 cm thick, branched, cylindrical or somewhat flattened with toothed wings, rough due to longitudinal wrinkles, externally brownish-black to brownish-green, internally creamish-grey; fracture, fibrous; odour nil, taste, bitter.

Leaf – Sessile, decurrent, 2 to 7 cm long, 1 to 1.5 cm wide, obovate-oblong, narrowed at the base, dentate or serrate, hairy, greenish-brown; odourless; taste, bitter.

Flower – Globose, head about 1.5 cm long and about one cm in diameter; purplish-brown with linear involucral bracts which are shorter than the head and ciliate at apex; peduncle with toothed wings; outer female flowers 12 to 16, inner bisexual 2 or 3, corolla of female 2-toothed, ovary, inferior, carpels 2, style – arms connate.

Fruit – Achene, smooth, stalked.

b) Microscopic :

Root – Epidermis single layered, rectangular; secondary cortex composed of oval to tangentially elongated, thin-walled, parenchymatous cells having aerenchyma; secondary phloem composed of thin-walled, oval to polygonal cells, a large number of groups of lignified phloem fibres found scattered in this zone; central portion occupied by lignified, secondary xylem having usual elements; vessels simple pitted; starch grains simple, round to oval with concentric striations and distinct hilum; measuring 13 to 27 μ in dia., present in secondary cortex.

Stem – Epidermis single layered covered with thick cuticle; cortex consisting of 4 to 6 layers of oval to polygonal, thin-walled, parenchymatous cells; endodermis single layers of barrel-shaped cells; pericyclic fibres, lignified arranged in discontinuous ring; secondary phloem narrow, having usual elements; groups of cellulosic fibres found scattered in this zone; secondary xylem composed of usual elements; vessels with spiral thickening or simple pitted; pith very wide composed of oval to polygonal, thin-walled, parenchymatous cells.

Leaf –

Midrib – epidermis single layered, followed by 4 to 6 layered collenchyma and 3 or 4 layered parenchyma cells present on both surfaces; trichomes both non-glandular and glandular, present on both surfaces, glandular trichomes 2 or 3 cells high, uni or biseriate stalk, having a multicellular head; non-glandular trichomes uniseriate with 2 to 5 cells, vascular bundle 3 or 4, situated centrally having usual elements.

Lamina – epidermis single layered having numerous non-glandular and glandular trichomes similar to those present in midrib; mesophyll composed of oval to polygonal thin walled parenchymatous cells and not differentiated into palisade and spongy parenchyma cells, anisocytic stomata present on both surfaces; stomatal index 32 to 38 on lower surfaces, 20 to 29 on upper surfaces; stomatal number 47 to 54 per sq. mm on lower surfaces, 15 to 22 per sq. mm on upper surfaces; vein islet number 20 to 26.

Powder – Greyish-yellow; shows fragments of thin-walled, oval to polygonal aerenchyma cells; thin-walled, sinuous, elongated epidermal cells; small pieces of glandular trichomes; a few anisocytic stomata; vessels with spiral and pitted thickening; fibres short, thick walled, lignified with wide lumen and blunt tips having simple pits; oval to round, elliptic, simple starch grains with centric hilum and striations, measuring 13 to 27 μ in diameter.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 23 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 2 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 6 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract of the drug on Silica gel 'G' using Toluene ; Ethylacetate (9:1) shows under UV (366 nm) two fluorescent spots at Rf. 0.54 and 0.76 both green). On exposure to Iodine vapour one spot appears at Rf. 0.44 (brown). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for 10 minutes at 105°C five spots appear at Rf. 0.20 (violet), 0.25 (blue), 0.44, 0.54 and 0.59 (all violet).

CONSTITUENTS – Essential Oil, Sterols and Alkaloids.

PROPERTIES AND ACTION -

Rasa : Katu, Madhura, Tikta, Kasaya
Guna : Laghu
Virya : Usna
Vipaka : Katu
Karma : Vatahara, Medhya, Kaphapittanut, Rucya, Swarya, Rasayana, Visaghna

IMPORTANT FORMULATIONS - Mundi Arka, Vata gajankusa Rasa, Ratnagiri Rasa, Nava ratnaraya Mrganka Rasa

THERAPEUTIC USES - Apau, Mutrakrcichra, Krmi roga, Vatarakta, Pandu, Yoni roga, Amatisara, Kasa, Slipada, Apasmara, Pliharoga, Medoroga, Guda roga, Prameha, Chardi

DOSE –10-20 ml. swarasa

NYAGRODHA JATA (Aerial Root)

Nyagrodha jata consists of dried aerial roots of *Ficus bengalensis* Linn. (Fam. Moraceae), a very large tree with spreading branches, occurring throughout the country, and also planted on road sides and in gardens.

SYNONYMS -

Sansk. : Vata jata, Bahu Pada
Assam. : --
Beng. : Bar, Bot
Eng. : Banyan Tree
Guj. : Vad Vadavai
Hindi : Baragada jata, Valajatta
Kan. : Alada Chirugu
Mal. : Peralveru
Mar. : Vada Paranika
Ori. : Bara gachha
Punj. : Barda jattu
Tam. : Alamvizhuthu
Tel. : Peddamatti, Marri Udalu
Urdu. : Bargad

DESCRIPTION –

a) Macroscopic :

Drug occurs in cut pieces, 4 to 8 cm long, 0.1 to 1.2 cm thick, cylindrical, unbranched or branched; rough due to longitudinal and transverse cracks and transverse rows of lenticels; external surface grey; cut surface reddish-brown; fracture, fibrous in bark portion and tough and short in wood portion.

b) Microscopic :

Aerial root shows cork consisting of 4 to 6 or more rows of narrow, tangentially elongated cells; secondary cortex consisting of a zone of 4 or 5 rows of stone cells , followed by wide zone of thin-walled parenchymatous cells, filled with reddish-brown contents; a number of large groups of stone cells, oval to elliptical, elongated, thick-walled, with wide lumen and clear pit canals found scattered throughout secondary cortex; secondary phloem a wide zone consisting of sieve tubes, phloem fibres and phloem parenchyma, traversed by phloem rays; phloem fibres numerous, arranged in tangential bands alternating with sieve elements; secondary xylem very wide consisting of pitted xylem vessels, fibres and xylem parenchyma, all elements being lignified; vessels single or in groups, xylem parenchyma numerous, xylem fibres numerous, thick-walled with blunt tips and wide lumen; xylem rays numerous, uni to tetraseriate.

Powder – Reddish-brown; shows oval to elliptical, elongated, thick-walled stone cells with wide lumen and clear pit canals; fibres, thick-walled with blunt tips and wide lumen; xylem vessels showing pitted thickening.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more then 2 per cent, Appendix 2.2.2.
Total ash	-	Not more then 7 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 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 alcoholic extract on Silica gel 'G' using Toluene : Ethyl acetate (7:3) shows under U.V. (366 nm) three fluorescent zones at Rf 0.34 (sky blue), 0.63 (sky blue) and 0.78 (blue). On spraying with 10% Methanolic-Sulphuric acid regent and on heating the plate for about ten minute at 105°C three spots appear at Rf. 0.63 (grey), 0.78 (brownish grey) and 0.96 (brown).

CONSTITUENTS – Tannins.

PROPERTIES AND ACTION –

Rasa : Kasaya, Madhura
Guna : Ruksa, Guru
Virya : Sita
Vipaka : Madhura
Karma : Pittahara, Kaphahara, Grahi, Stambhaka, Varna, Bhagnasandhanakara, Sodhana, Ropana, Kesyam

IMPORTANT FORMULATIONS – Kumkumadi Taila, Rasa Sindura, Abhraka Bhasma (marana), Svarna Sindura, Naga Bhasma/Vanga Bhasma (Jaranartha), Taila Moorchana

THERAPEUTIC USES – Raktapitta, Trsna, Daha, Yoniroga, Medoroga, Bhagandara, Visarpa

DOSE – 2-5 gm of the drug in powder form.

NIMBŪ (Fresh Fruit)

Nimbū consists of fresh fruit of *Citrus limon* (Linn.) Burm. f. Syn. *C. medica* var. *limonum* (Fam. Rutaceae); a straggling bush or small tree, 3 to 4 m high with thorny branches, cultivated in many parts of the country in orchards.

SYNONYMS -

Sansk. : Jambira, Maha nimbu
Assam. : --
Beng. : Patinebu, Kagghinebu, Baranebu
Eng. : The lemon of India, Lemon
Guj. : Limbu
Hindi. : Nimbu, Bara Nimbu, Pakari Nimbu
Kan. : Nimbe, Lime hannu, Nimbe hannu
Mal. : Cherunakaram, Vadukappulinarakam
Mar. : Nimbu
Ori. : --
Punj. : Nimbu
Tam. : Elumichai, Elumichangai, Elumicchai, Cherunaranka
Tel. : Pedda Nimma, Jambira, Nimmu, Bijapuram
Urdu. : Limu, Neebu

DESCRIPTION –

Macroscopic :

Fruit a berry, hesperidium, yellow when ripe, ovoid or globose, 5 to 10 cm long; external surface even or rugged showing openings of oil glands; usually with 9 mammillate extremity and thin rind; transversely cut surface shows thin rind and an inwardly grown endocarp forming 10 to 12 segments, each containing 2 or 3 seeds with pulp formed by succulent hairs; juice acidic.

PROPERTIES AND ACTION -

Rasa : Amla
Guna : Laghu
Virya : Usna
Vipaka : Amla
Karma : Vatahara, Pittakara, Kaphahara, Dipana, Pacana

IMPORTANT FORMULATIONS - Varisosana Rasa, Vasanta Malati Rasa, Vamga Bhasma, Kasisa Bhasma, Gandhaka Vati, Samkha Vati, Ajirnkantaka Rasa, Kalakuta Rasa, Mahasamkha Vati, Nasika Curna

THERAPEUTIC USES - Trsna, Vatika sula, Chardi, Vibandha, Krmi, Aruci, Agnimandya, Udara roga, Visucika

DOSE - 6-12 gm of the drug in juice form.

NIRGUNDI (Root)

Nirgundi consists of dried root of *Vitex negundo* Linn. (Fam. Verbenaceae), a large aromatic shrub or sometimes a small tree, upto 4.5 m in height, common throughout the country ascending to an altitude of 1500 m in the lower Himalayas.It is common in waste places around village, river bank, moist localities and deciduous forests.

SYNONYMS -

Sansk. : --
Assam. : Aslak
Beng. : Nirgundi, Nishinda
Eng. : Five leaved chaste, Indian Privet
Guj. : Nagod
Hindi. : Nirgundi
Kan. : Lakkigida, Nekkigida, Lakkimara
Mal. : Indranee
Mar. : Lingad, Nigad
Ori. : --
Punj. : Sambhalu
Tam. : Karuno chchil
Tel. : Nallavavilli
Urdu. : Sambhalu

DESCRIPTION –

a) Macroscopic :

Roots cylindrical, hard, tough with irregular fractures; external surface rough due to longitudinal, narrow, cracks and small rootlets; cut surface shows cork region greyish-brown, middle region greyish-white, and xylem region cream coloured; bark thin, easily separates from wood; wood hard, forming major part of root.

b) Microscopic :

Root shows 10 to 18 or more tangential rows of rectangular to cubicular, moderately thick-walled cork cells with a few rows of radially arranged cork cells also being present, inner 3 to 5 rows of cork cells thin-walled; cork cambium consists of single row of squarish to transversely elongated cells; secondary cortex composed of 4 to 12 rows of rectangular to elongated cells, some contain starch grains; numerous, small groups of stone cells found scattered in this zone; stone cells vary in shape and size; secondary phloem consists of sieve tubes with companion cells, fibres and phloem parenchyma traversed by phloem rays; distal portion of phloem conical, due to dilating phloem rays; each band of phloem composed of thin-walled, phloem tissues alternating with transverse strips of thick-walled phloem fibres; a few tangential strips of obliterated phloem tissues also present in outer-phloem region; each fibre group composed of 6 to 60 or more thick-walled, long and short fibres, short fibres comparatively thick-walled, a few fibres show forked tips; inner zone of phloem composed of intact, thin-walled,

phloem tissues mainly sieve tubes, companion cells and phloem parenchyma; cambium composed of one, or sometimes two, rows of cells; central major part of root consists of xylem; vessels varying in size, scattered throughout xylem region, either in small groups of 2 to 4 or singly; a few xylem vessels show tail on one or both the ends; xylem fibres long, having thick-walls and pointed tips; xylem parenchyma contains starch grains similar to those found in cortical region; medullary rays are uni-to triseriate, almost straight, extend from pith to cork, medullary rays in xylem region radial while in phloem region they dilate; cells contain starch grain, simple and compound, oval to circular, having 4 components and measuring 8 to 12 μ in dia.

Powder – Pale yellow; shows parenchymatous cells containing simple oval to round and compound starch grains with 4 components, measuring 8 to 12 μ in dia; stone cells elongated, rectangular and squarish in shape with wide and narrow lumen, radiating canals and conspicuous striations; xylem vessels with pitted thickening, xylem and phloem fibres with thick walls.

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 0.2 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 9 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' using Chloroform : Methanol (8:2) shows in visible light two spots at Rf. 0.14 and 0.95 (both yellow). Under UV (366 nm) six fluorescent zones are visible at Rf. 0.14 (dirty yellow), 0.40 (blue), 0.66 (blue), 0.82 (light blue), 0.90 (blue) and 0.95 (bluish green). On exposure to Iodine vapour five spots appear at Rf. 0.14, 0.40, 0.66, 0.82 and 0.95 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent two spots appear at Rf. 0.03 and 0.95 (both orange).

CONSTITUENTS – Alkaloid (Nishindine).

PROPERTIES AND ACTION -

Rasa : Tikta, Kasaya, Katu
Guna : Laghu, Ruksa
Virya : Sita/Usna (Nila)
Vipaka : Katu
Karma : Pittavinasana, Kesya, Netrya, Slesmaha, Vatahara, Pidahara

IMPORTANT FORMULATIONS – Maha Visagrabha Taila, Manasa mitra Vataka

THERAPEUTIC USES – Sula Roga, Kasa, Kustha, Kandu, Pradara, Adhmana, Krmi Roga, Slesmaja Jvara

DOSE - 10-20 ml.

PALASA (Flower)

Palasa consists of dried flower of *Butea monosperma* (Lam.) Kuntze, Syn. *B. frondosa* Koeing ex Roxb. (Fam. Fabaceae), an erect deciduous tree 12 to 15 m high with crooked trunk and irregular branches, commonly found throughout the greater part of the country upto about 915 m altitude.

SYNONYMS -

Sansk. : Kimsuka, Brihma Vriksha
Assam. : Palash
Beng. : Palas, Palash Gaccha
Eng. : Flame of the Forest
Guj. : Khakharo, Kesuda
Hindi : Dhak, Tesu, Paras
Kan. : Muttug, Muttulu
Mal. : Palashinsamatha
Mar. : Kakracha, Palas
Ori. : Porasu, Kijuko
Punj. : Tesh
Tam. : Purasu
Tel. : Modyga Puvvu
Urdu. : Dhak (Tesu)

DESCRIPTION -

a) Macroscopic :

Drug available in about 3.0 to 4.5 cm long racemes of orange to yellow coloured flowers; bracts and bracteoles small, pedicels about twice as long as the calyx, densely brown-velvety; calyx 0.8 to 1.2 cm long, sepals 5, campanulate, densely velvety outside, clothed with silky hairs within; corolla about 2.0 to 7.0 cm long, petals 5, polypetalous, unequal keel, clothed outside with silky silvery hairs, orange or salmon coloured, keel semicircular, beaked, veined; stamens 10, diadelphous, anthers 2 celled; carpel superior unilocular; style one and stigma one.

b) Microscopic :

Pedicel - Shows more or less wavy outline, single layered epidermis covered with thick cuticle, unicellular, 2 or 3 celled trichomes, followed by ground tissue consisting of 6 to 8 celled, thin-walled, oval to polygonal parenchymatous cells; endodermis single layered; vascular bundle radially arranged, collateral, consisting of usual elements.

Sepal - Shows single layered epidermal cells; uniseriate, multicellular trichomes and club shaped secretory ducts present on lower surface; epidermis followed by 3 or 4 layered, thin-walled, loosely arranged parenchymatous cells on both surfaces; thin walled, wavy epidermal cells showing on the surface view.

Petal - Shows single layered, thin-walled, epidermal cells, covered with numerous, unicellular, pointed trichomes and a few glandular hairs; thin-walled, capitate or cone-shaped papillae present on both surface; mesophyll consisting of thin-walled, loosely arranged, parenchymatous cells; a large number of larger and smaller vein found scattered in this region, some of the cells contain a few of oil globules.

Powder - Yellowish-brown; shows fragments of parenchyma, epidermis with stomatal cells; numerous, pointed, multicellular trichomes and a few oil globules.

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 7 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 alcoholic extract of the drug on Silica gel 'G' plate using n-Butanol Acetic Acid : Water (4:1:5) shows in visible light six spots at Rf. 0.42 (light brown), 0.48 (brown), 0.58 (yellow), 0.82 (brown), 0.88 (yellow) and 0.96 (light brown). On spraying with phosphomolybdic acid reagent and heating the plate at 105°C for about ten minutes nine spots appear at Rf 0. 08 (blue), 0.19 (blue), 0.32 (blue), 0.42 (blue), 0.48 (yellow), 0.58 (blue), 0.82 (yellow), 0.88 (blue) and 0.96 (blue). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for about fifteen minutes seven spots appear at Rf. 0.19 (light red), 0.32 (light red), 0.42 (light red), 0.58 (red), 0.82 (red), 0.88 (red) and 0.96 (grey).

CONSTITUENTS - Glycosides and Flavonoids.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta, Kasaya, Madhura
Guna : Laghu, Ruksa, Sara
Virya : Sita
Vipaka : Madhura
Karma : Pittahara, Kaphahara, Dipana, Vatahara, Trsnasamaka, Rakta Stambhana, Mutrala, Kusthaghna, Sandhaniya, Dahaprasamana Grahi

IMPORTANT FORMULATIONS – Kunkumadi Taila, Vanga Bhasma (Jarana (b))

THERAPEUTIC USES – Raktavikara, Mutrakrcchra, Grahi, Krmi, Meha, Daha, Vata Rakta, Kustha, Trsna, Raktapitta, Pliharoga, Gulma, Grahani, Netrasula, Krmi, Kandu, Arsa

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

PALASA (Gum)

Palasa consists of dried gum exuding from natural cracks and artificial incisions in the stem bark of *Butea monosperma* (Lam.) Kuntze Syn. *B. frondosa* Koen. ex Roxb. (Fam. Fabaceae), a medium sized tree with somewhat crooked trunk, 12 to 15 m high with irregular branches commonly found throughout greater parts of the country upto 915 m altitude.

SYNONYMS -

Sansk. : Kimsuka, Triparna
Assam. : Palash
Beng. : Palas
Eng. : Flame of forest, Bengal Kino
Guj. : Khakharo, Kesudo
Hindi : Dhak, Palas, Teshu
Kan. : Mattuga, Muthuga
Mal. : Palashu
Mar. : Palas
Ori. : --
Punj. : Dhak
Tam. : Purasu
Tel. : Moduga, Modugu
Urdu. : Dhak (Tesu)

DESCRIPTION –

a) Macroscopic :

Drug occurs in pieces, flattish, brittle, perfectly transparent, smooth and shining, ruby red to dark brown; buff coloured pieces of bark attached; no peculiar odour; taste, astringent.

b) Microscopic :

Angular fragments, opaque in transmitted light; shows plants debris form thick-walled rectangular cork and polygonal, thin-walled cortex, and phloem parenchymatous cells, derived from the parent plant.

Identification : It dissolves partially in boiling alcohol and freely, almost completely, in cold water, forming a milky solution; when treated with 5% aqueous solution of perchloride of iron (Ferric chloride) it gives greyish-green precipitate and with lead acetate gives white precipitate.

Fluorescence : Colour of 5% aqueous solution light brown in day light and greyish green in UV light (366 nm); colour of 5% alcoholic solution reddish-brown in daylight, and light green in UV light (366 nm).

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 69 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 63 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 (5:1:4) shows in visible light six spots at Rf. 0.30, 0.42, 0.67, 0.74, 0.84 and 0.92 (all yellowish brown). Under UV (366 nm) three blue fluorescent zones are visible at Rf. 0.74, 0.84 and 0.92. On exposure to Iodine vapour eight spots appear at Rf. 0.07, 0.23, 0.30, 0.42, 0.67, 0.74, 0.84 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. 0.07, 0.23, 0.30, 0.42, 0.67, 0.74, 0.84 and 0.92 (all violet).

CONSTITUENTS – Anthocyanins and Tannins.

PROPERTIES AND ACTION –

Rasa : Kasaya, Katu, Tikta
Guna : Sara, Snigdha
Virya : Usna
Vipaka : Katu
Karma : Dipana, Vrsya, Bhagnasandhanakrt, Vatahara, Slesmahara

IMPORTANT FORMULATIONS – Bala Taila

THERAPEUTIC USES – Grahani, Gulma, Arsa, Krmi Roga, Gudaroga, Asthibhaga, Vrana, Pliha Roga

DOSE – 0.5 to 1.5 gm.

PALASA (Seed)

Palasa consists of dried seed of *Butea monosperma* (Lam.) Kuntze, Syn. *B. frondosa* Koen. ex Roxb. (Fam. Fabaceae), a medium sized tree with a somewhat crooked trunk, 12 to 15 m high with irregular branches, commonly found throughout the greater part of the country upto about 915 m altitude.

SYNONYMS -

Sansk. : Kinsuka, Raktapuspaka, Ksara srestha, Brahma Vrksa
Assam. : --
Beng. : Palash Gachha
Eng. : Bengal Kinotree
Guj. : Khakharo, Kesudo
Hindi. : Dhak, Palash
Kan. : Muttuga
Mal. : Palashu
Mar. : Palash
Ori. : --
Punj. : Palash, Dhak, Tesoo, Kesoo
Tam. : Purashu
Tel. : Moduga mada
Urdu. : Dhak (Tesu)

DESCRIPTION –

a) Macroscopic :

Seed flat, kidney-shaped, 2.5 to 4 cm long, 1 to 3 cm wide, dark reddish-brown, thin, glossy; hilum clear, situated near middle of concave edge of seed; odour, faint; taste, slightly acrid and bitter.

b) Microscopic :

Shows a wide zone of testa, consisting of a layer of palisade cells, a row of bearer cells and many layers of parenchymatous cells; palisade cells compactly arranged, columnar-shaped and covered with thick cuticle, followed by a single row of bearer cells; parenchymatous layers consisting of many rows of cells, filled with reddish-brown contents; a number of vascular bundles occur in a row, in middle region of parenchymatous zone; cotyledons consists of a single layered epidermis, composed of square to oval cells, covered with cuticle; mesophyll cells bear hyaline walls, oval to irregular shaped with small intercellular spaces; simple, oval to round, starch grains with concentric striations, and centric hilum, compound grains having 2 to 4 components measuring 8 to 16 μ in dia., present in cotyledons.

Powder – Cream or grey; shows fragments of testa, bearer cells, numerous simple oval to round starch grains with concentric striations and a centric hilum, and also compound starch grains having 2 to 4 components, measuring 8 to 16 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 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 9 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 25 per cent, Appendix 2.2.7.
Hexane-soluble extractive (By soxhlet extraction)	-	Not less than 15 per cent.

T.L.C. –

T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) shows under U.V. light (366 nm) three fluorescent at Rf. 0.41, 0.49 to 0.65 (elongated and light blue) and 0.91 (blue). On exposure to Iodine vapour six spots appear at Rf. 0.04, 0.19, 0.28, 0.41, 0.49 to 0.65 (elongated) and 0.91 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C six spots appear at Rf. 0.04, 0.19, 0.28, 0.41, elongated spot (0.49-0.65) and 0.91 (all violet). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent three sots appear at Rf. 0.41, 0.49 to 0.65 (elongated) and 0.91 (all light orange).

CONSTITUENTS – Fixed Oil, Enzymes and small quantities of Resins and Alkaloids.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta, Kasaya
Guna : Sara, Snigdha
Virya : Usna
Vipaka : Katu
Karma : Vatahara, Pittahara, Kaphahara, Dipana, Vrsya, Asthisandhanaka, Sangrahi

IMPORTANT FORMULATIONS– Ayaskrti, Krmimudgara Rasa, Krmikuthara Rasa, Palasa bijadi Curna, Palasa Arka

THERAPEUTIC USES – Vrana, Gulma, Grahani, Arsa, Krmi Roga, Basti Roga, Pliha Roga, Dadru, Kandu, Tvaka Roga, Prameha, Timira Roga, Netrabhisyanda, Garbhadhananivaranartha

DOSE - 3 gm of the drug in powder form.

PARPATA (Whole Plant)

Parpata consists of dried whole plant of *Fumaria parviflora* Lam. (Fam. Fumaraceae), a pale green, branched, annual, diffuse herb, about 60 cm high, distributed as a weed of cultivated fields over the greater parts of the country, and also commonly growing on road sides during cold season.

SYNONYMS -

Sansk. : Varatikta, Suksmapatra
Assam. : Shahtaraj
Beng. : Vanshulpha, Bansulpha
Eng. : --
Guj. : Pittapapada, Pitpapado, Pittapapado
Hindi. : Pittapapada, Dhamgajra, Pittapapara
Kan. : Kallu Sabbasige, Parpatu, Chaturasigide
Mal. : --
Mar. : Pittapapada, Shatara, Parpat
Ori. : --
Punj. : Shahtara, Pittapapara
Tam. : Tura, Tusa
Tel. : Parpatakamu
Urdu. : Parpata

DESCRIPTION –

a) Macroscopic :

Root - Buff or cream coloured, branched, about 3 mm thick, cylindrical; taste, bitter.

Stem - Light green, smooth, diffused, hollow, about 2 to 4 mm thick; taste, bitter and slightly acrid.

Leaf – Compound, pinnatifid, 5 to 7 cm long, divided into narrow segments; segments 5 mm long and about I mm broad, linear or oblong, more or less glaucous, acute or subacute; petiole, very thin, 2.5 to 4.0 cm long; taste, bitter.

Flower - Racemes with 10 to 15 flowers, peduncle upto 3 mm, pedicels about 2 mm, flowers about 7 mm long, bract much longer than the pedicels; sepals 2, white, minute, about 0.5 mm long, triangular ovate, acuminate; corolla in 2 whorls with very small 4 petals, each about 4 mm long; inner petals with a purple or green tip; outer petals with narrow spur, without purple spots stamens 3+3 , staminal sheath subulate above, about 4 mm long, stigma 2 lipped.

Fruit - Capsule, 2 mm long and slightly broader, subrotund, obovate, obtuse or subtruncate, obscurely apiculate, rugose when dry; nutlets globose, upto 2 mm long, single seeded.

b) Microscopic :

Root - Root shows single layered epidermis, followed by 5 or 6 layers of cortex consisting of thin-walled, rectangular, parenchymatous cells, outer I or 2 layers irregular and brown in colour; endodermis not distinct; secondary phloem very narrow and consisting of 2 or 3 rows with usual elements; central core shows a wide zone of xylem and consists of usual elements; vessels mostly solitary having reticulate and spiral thickening, medullary ray less developed and mostly uniseriate; fibres moderately long, thick-walled, having narrow lumen and blunt tips.

Stem - Stem shows a pentagonal outline, having prominent angles composed of collenchymatous cells; epidermis single layered of thin-walled, oblong, rectangular cells, covered with thin cuticle; cortex narrow, composed of 2 to 4 layers of chlorenchymatous cells endodermis not distinct; vascular bundles collateral, 5 or 6 arranged in a ring; each vascular bundle capped by a group of sclerenchymatous cells; phloem consists of usual elements; xylem consists of vessels, tracheids, fibres and xylem parenchyma; vessels much elongated, having reticulate, annular or spiral thickening or simple pits; xylem fibres narrow elongated with pointed ends having a few simple pits; centre either hollow or occupied by narrow pith consisting of thin-walled, parenchymatous cells.

Leaf -

Petiole - V-shaped outline; single layer epidermis consisting of thin-walled, parenchymatous cells followed by ground tissue composed of thick-walled round, oval or polygonal, parenchymatous cells, outer cells smaller than inner; collenchymatous cells present at corners; three vascular bundle scattered in ground tissue, one central and two in wings; vascular bundle consists of phloem and xylem, phloem capped with fibrous sheath, lower epidermis single layered.

Lamina - Shows single layer epidermis on either side, consisting of thin-walled, rectangular, oval-shaped, parenchymatous cells; mesophyll composed of oval to polygonal thin-walled parenchymatous cells, filled with green pigment and not differentiated into palisade and spongy parenchyma; vascular bundles scattered throughout the mesophyll; stomata anomocytic, present on both surfaces.

Powder - Light greenish-brown; shows fragments of parenchyma; tracheids, fibres, and vessels having simple pits and spiral thickenings; anomocytic stomata and wavy walled epidermal cells in surface view.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 30 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 7 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 29 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 visible light one spot at Rf. 0.93 (green). Under UV (366 nm) eight fluorescent zones are visible at Rf. 0.07 (blue), 0.13 (blue), 0.29 (light blue), 0.50 (light pink), 0.60 (light yellow), 0.67 (yellow), 0.79 (blue) and 0.93 pink). On exposure to Iodine vapour twelve spots appear at Rf. 0.07, 0.10, 0.13, 0.19, 0.29, 0.50, 0.60, 0.67, 0.74, 0.79, 0.86 and 0.93 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent one spot appears at Rf. 0.07 (orange).

CONSTITUENTS - Alkaloids, Tannins, Sugars and salt of Potassium.

PROPERTIES AND ACTION -

Rasa : Tikta
Guna : Laghu
Virya : Sita
Vipaka : Katu
Karma : Samgrahi, Pittahara, Kaphahara, Raktadosahara, Rocaka

IMPORTANT FORMULATIONS – Pacanamrt Kwatha Curna, Tiktaka Ghrta, Mahatiktaka Ghrta, Nalpamaradi Taila, Brhat Manjisthadi Kwatha Curna, Patoladi Ghrta, Parpatadi Kwatha, Sadangapaniya, Brhat Garbha, Cintamani Rasa

THERAPEUTIC USES – Chardi, Raktapitta, Mada, Bhrama, Jvara, Trsna, Daha, Raktavikara, Glani

DOSE –1-3 gm.

PATALAI (Stem Bark)

Patalai consists of dried stem bark of *Stereospermum chelonoides* (L. f.) DC. (Fam. Bignoniaceae), a large deciduous tree upto 18 m high and about 1.8 m in girth with a clear bole of about 9 m, found throughout the moist parts of the country.

SYNONYMS -

Sansk. : Patala, Krsnvrnta, Madhuduti, Tamrapuspi
Assam.: --
Beng. : Paarul
Eng. : Trumpet Flower Tree, Yellow Snake Tree
Guj. : Paadal
Hindi. : Paraal, Paatar, Paadree, Paadhal
Kan. : Hude, Kalludi, Kaala-adri
Mal. : Puppaatiri, Paatiri
Mar. : Paadal
Ori. : Patudi
Punj. : Paadal
Tam. : Paadiri, Pumpaadiri, Paadari
Tel. : Kokkosa, Kaligottu
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Drug occurs in cut pieces of varying sizes, upto 0.8 cm thick, slightly recurved and very slightly channelled; external surface rough due to ridges, fissures and lenticels; dull brown; when cut across it shows lamellations due to presence of concentric bands of phloem fibres; fracture, tough and short with inner lamellae occasionally peeling off; taste, not characteristic.

b) Microscopic :

Cork consisting of about 8 to 22 layers of tangentially elongated, thin-walled, lignified, rectangular cells; cork cambium single layered of narrow cells; secondary cortex very wide, composed of tangentially elongated, thick-walled, polyhedral, isodiametric, parenchymatous cells with intercellular spaces having numerous, mostly groups of stone cells of various sizes, fairly large, thick-walled, lignified, oval to polygonal upto 180 μ long and upto 90 μ wide, pitted with clear striations and with wide lumen; secondary phloem composed of ceratenchyma, phloem parenchyma, fibres and rays cells; ceratenchyma present in the form of thick-walled tangential strips between two obliquely running rays; phloem fibres mostly in groups arranged in concentric manner; phloem rays mostly multiseriate, fairly large, 2 to 4 cells wide, a few

uniseriate rays also occur; microsphenoidal crystals of calcium oxalate present in phloem parenchyma and ray cells.

Powder – Brown; fragments of thin-walled, rectangular cork cells; single or groups of lignifed, thick-walled, oval to polygonal stone cells upto 180 μ long and upto 90 μ wide, having clear striations with wide lumen and pits; fibres with small tapering and pointed ends; pieces of phloem parenchyma cells and a few microsphenoidal 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 1	per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 12.5	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 n-Butanol : Glacial Acetic acid : Water (4:1:5) shows under UV (366 nm) two fluorescent spots at Rf. 048 and 0.81 (both blue). On exposure to Iodine vapour four spots appear at Rf. 0.36, 0.48, 0.60 and 0.81 (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. 0.16, 0.36, 0.54, 0.64, 0.81 and 0.89 (all black).

CONSTITUENTS – Gum and a bitter substance.

PROPERTIES AND ACTION -

Rasa : Tikta, Katu, Kasaya, Madhura
Guna : Guru, Visada
Virya : Usna
Vipaka : Katu
Karma : Tridosahara, Dipana, Raktadosahara, Visaghna, Trsaghna, Hrdya, Rasayana, Adhodhagadosahara

IMPORTANT FORMULATIONS - Amrtarista, Dantyadhyarista, Dasamularista, Indukanta Ghrta

THERAPEUTIC USES - Svayathu, Sannipata, Hikka, Vami, Arocaka, Svasa, Adhman, Dagdhavrana, Vrana, Mutraghata, Sotha

DOSE – 3-6 gm in powder form.
10-30 gm for decoction in dividing dose.

Pattanga consists of dried heart wood of *Caesalpinia sappan* Linn. (Fam. Caesalpiniaceae), a shrub or small tree, about 6 to 9 m in height, found in South India and Bengal; usually cultivated as a hedge plant.

SYNONYMS -

Sansk. : Patranga, Pattanga
Assam. : Baggam, Bakam
Beng. : Bokom
Eng. : Sappan Wood
Guj. : Patang
Hindi. : Pagang, Bakam
Kan. : Patang
Mal. : --
Mar. : Patang
Ori. : --
Punj. : --
Tam. : Anaikuntrumani
Tel. : Bukkapuchettu
Urdu. : Pattang

DESCRIPTION –

a) Macroscopic :

Drug occurs in pieces, moderately hard, about 2.5 cm thick, smooth, dark brown on one surface and creamish-white on the other, and yellowish-orange in between; fracture, fibrous; odour and taste not characteristic.

b) Microscopic :

Shows vessels, tracheids, fibres and xylem parenchyma, traversed by numerous xylem rays; vessels numerous, barrel-shaped with bordered pits, scattered throughout xylem in single or in groups of 2 to 5, a few vessels filled with yellowish pigment; fibres spindle-shaped, pointed at both ends; xylem rays numerous uni to biseriate found more common, 3 to 30 cells high, ray cells round or oval; calcium oxalate crystals and starch grains absent.

Powder - Creamish-white; shows group of fibres and vessels; crystals of calcium oxalate and starch grains absent.

Identification

a) Colour test – i) 5 gram of sample extracted in 100 ml of water, filtered and seen in daylight is saffron in colour; ii) 5 gram of sample extracted in 100 ml of 95% of alcohol, filtered and seen in daylight is reddish, which becomes carmine on addition of 5% aqueous solution of sodium hydroxide; iii) small fragments of wood impart crimson colour in lime water.

b) Fluorescence - Extract obtained in the test for water soluble extractive greenish brown under U.V. light (254 nm) and brownish-green under (366 nm); extract obtained in the test for alcoholic soluble extractive greenish yellow under U.V. light (254 nm) and dark-brown, under (366nm).

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 2 per cent. Appendix 2.2.6.
Water-soluble extractive	-	Not less than 8 per cent. Appendix 2.2.7.

T.L.C.-

T.L.C. of alcoholic extract on Silica gel 'G' using n-Butanol : Acetic acid : Water (4:1:5) shows in visible light three spots at Rf. 0.75 (pink), 0.89 (grey), and 0.94 (dirty yellow). Under U.V. (366 nm) four fluorescent zones are visible at Rf. 0.66 (blue), 0.75 (pink), 0.89 (grey) and 0.94 (dirty yellow). On exposure to Iodine vapour four spots appear at Rf. 0.66, 0.75, 0.89 and 0.94 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C four spots appear at Rf. 0.66. 0.75 (both light pink), 0.89 (grey) and 0.94 (orange).

CONSTITUENTS - Brasilin, Essential oils, Saponin Glycoside, Amino Acids and Sugars.

PROPERTIES AND ACTION -

Rasa : Modhura, Tikta
Guna : Ruksa
Virya : Sita
Vipaka : Katu
Karma : Varnya, Pittahara, Dosahara

IMPORTANT FORMULATIONS – Arimedadi Taila, Karpuradyarka, Kunkumadi Taila,

THERAPEUTIC USES – Vrana, Daha, Rakta dosa, Pradara, Mukharoga

DOSE- 5-10 gm.

PIPPALI (Fruit)

Pippali consists of the dried, immature, catkin-like fruits with bracts of *Piper longum* Linn. (Fam. Piperaceae), a slender, aromatic climber with perennial woody roots, occurring in hotter parts of India from central Himalayas to Assam upto lower hills of West Bengal and ever green forests of Western ghats as wild, and also cultivated in North East and many parts of the South.

SYNONYMS -

Sansk. : Kana, Magadhi, Magadha, Krsna, Saundi
Assam. : Pipali
Beng. : Pipul
Eng. : Long Pepper
Guj. : Lindi Peeper, Pipali
Hindi. : Pipar
Kan. : Hippali
Mal. : Pippali
Mar. : Pimpali, Lendi Pimpali
Ori. : Pipali, Pippali
Punj. : magh, Magh Pipali
Tam. : Arisi Tippali, Thippili
Tel. : Pippalu
Urdu. : Filfil Daraz

DESCRIPTION –

a) Macroscopic :

Fruit greenish-black to black, cylindrical, 2.5 to 5 cm long and 0.4 to 1 cm thick, consisting of minute sessile fruits, arranged around an axis; surface rough and composite; broken surface shows a central axis and 6 to 12 fruitlets arranged around an axis; taste, pungent producing numbness on the tongue; odour, aromatic.

b) Microscopic :

Catkin shows 6 to 12 fruits, arranged in circle on a central axis, each having an outer epidermal layer of irregular cells filled with deep brown content and covered externally with a thick cuticle; mesocarp consists of larger cells, usually collapsed, irregular in shape and thin-walled; a number of stone cells in singles or in groups present; endocarp and seed coat fused to form a deep zone, outer layer of this zone composed of thin-walled cells and colourless, inner layer composed of tangentially elongated cells, having reddish-brown content; most of endocarp filled with starch grains, round to oval measuring 3 to 8 μ in dia.

Powder – Deep moss green, shows fragments of parenchyma, oval to elongated stone cells, oil globules and round to oval, starch grains, measuring 3 to 8 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 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 alcoholic extract of the drug on Silica gel 'G' plate using Toluene : Ethylacetate (90:10) as mobile phase. Under U.V. (366 nm) six fluorescent zones are visible at Rf. 0.15, 0.26, 0.34, 0.39, 0.50 and 0.80. On exposure to Iodine vapour seven spots appear at Rf. 0.04, 0.15, 0.26, 0.34, 0.39, 0.50 and 0.93 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate at 105° for ten minutes five spots appear at Rf. 0.04, 0.22, 0.35, 0.43 and 0.82. On spraying with Dragendorff reagent three spots appear at Rf. 0.15, 0.26 and 0.34 (all orange).

CONSTITUENTS – Essential Oil and Alkaloids.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta, Madhura
Guna : Snigdha & Laghu
Virya : Anusna
Vipaka : Madhura
Karma : Vatahara, Kaphahara, Dipana, Rucya, Rasayana, Hrdya, Vrsya, Tridosahara, Recana

IMPORTANT FORMULATIONS – Gudapippali, Amrtarista, Ayasakrti, Asvagandhadyarista, Kumaryasava, Candanasava, Cayavanaprasa avaleha, Siva Gutika, Kaisora Guggulu

THERAPEUTIC USES – Svasa, Kasa, Pliha Roga, Gulma, Jvara, Prameha, Arsa, Ksaya, Udara Roga, Hikka, Trsna, Krmi, Kustha, Sula, Ama Vata, Amadosa

DOSE - 1-3 gm.

PLAKSA (Fruit)

Plaksa consists of dried fruit of *Ficus lacor* Buch. –Ham. Syn. F. *lucescens* Blume., *F. infectoria* Roxb. (Fam. Moraceae), a large spreading tree, with a few occasional aerial roots, found nearly throughout the country and commonly planted as an avenue and ornamental tree.

SYNONYMS –

Sansk. : Jati
Assam.: Pakar
Beng. : Pakar
Eng. : --
Guj. : Peep, Pakadee
Hindi : Pakhar, Pilkhin
Kan. : Karibasari, Kadubasari, Jeevibsari Basa
Mal. : Itthy, Kallal
Mar. : Pimpari, Paicta
Ori. : Pakali, Pakal
Punj. : Pilkhan
Tam. : Kallal, Itthi
Tel. : Juvvi, Erra-Juvvi
Urdu. : Pakhar

DESCRIPTION –

a) Macroscopic :

Fruit a syconus, 0.5 to 1.0 cm in dia., attached with pedicel; sub-globose, wrinkled, glabrous, having three basal bracts; greyish-brown to yellowish-brown; taste, astringent.

b) Microscopic :

Fruit shows single layered, thin-walled epidermis followed by a narrow zone of 2 to 5 layers, of round, oval, rectangular, lignified stone cells with wide lumen; rest of mesocarp very wide consisting of oval to polygonal, collenchymatous cells containing brownish contents; a few vascular traces found scattered in this zone; inner zone consisting of stone cells similar in shape and size to those found scattered in outer zone; male and female flower attached to inner layer of mesocarp.

Powder –Dark greyish-brown; shows fragments of epidermal cells; single, or groups of lignified stone cells; collenchymatous cells; a few debris of male and female flowers present.

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 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 alcoholic extract on Silica Gel 'G' using n-Butanol : Acetic Acid : Water (4:1:5) shows in visible light three spots at Rf. 0.27, 0.63 (both grey) and 0.97 (yellowish green). Under UV (366 nm) six fluorescent zones are visible at Rf. 0.53, 0.63, 0.84, 0.91 0.94 (all blue) and 0.97 (pink). On exposure to Iodine vapour twelve spots appear at Rf. 0.12, 0.16, 0.22, 0.27, 0.38, 0.50, 0.63, 0.73, 0.84, 0.91, 0.94 and 0.97 (all yellow). On spraying with Ninhydrin reagent a single spot appears at Rf. 0.97 (brick red).

CONSTITUENTS – Amino Acids.

PROPERTIES AND ACTION -

Rasa : Kasaya, Madhura
Guna : Sita
Virya : Sita
Vipaka : Katu
Karma : Pittahara, Kaphahara

IMPORTANT FORMULATIONS -

THERAPEUTIC USES – Daha, Raktapitta, Murccha, Srama, Pralapa, Bhrama, Sotha

DOSE – 5-10 gm.

PRIYALA (Stem Bark)

Priyala consists of dried stem bark of *Buchanania lanzan* Spreng. Syn. *B. latifolia* Roxb. (Fam. Anacardiaceae), an evergreen tree upto 15 m high, found throughout the country in dry deciduous forests.

SYNONYMS -

Sansk. : Priyala, Carah, Kharaskandhah
Assam. : --
Beng. : Chironji, Pial
Eng. : Calumpang Nut Tree
Guj. : Chaaroli
Hindi. : Chiraunji, Piyaar, Chironji
Kan. : Kolatmavu, Chalaali
Mal. : Priyaalam, Mural maram
Ma. : Chaaroli Jhaada
Ori. : Char, Charakoli, Priyal
Punj. : Chironji
Tam. : Saarapparuppu
Tel. : Sarapappu Chettu, Chinna morilli Mori, Saara
Urdu. : Habb-us-Samena

DESCRIPTION –

(a) Macroscopic :

Bark occurs in 3 to 11 cm long, and about 1. 0 cm thick pieces; external surface greyish-brown, rough due to formation of fissures; internal surface reddish-brown and fibrous; recurved, flat or more or less channelled; fracture, fibrous.

(b) Microscopic :

Shows a wide zone of rhytidoma, consisting of oval thick-walled cork cells, hardened dead cortical cells, having a few oil globules, groups of lignified phloem fibres, stone cells and a large number of lysigenous cavities with yellow contents; secondary phloem a wide zone composed of oval to polygonal, parenchymatous cells containing prismatic crystals of calcium oxalate and a few oil globules; groups of round to oval stone cells having distinct striations with both narrow and wide lumen; phloem rays usually biseriate, composed of round to oval, slightly thick-walled cells.

Powder -Greyish-brown; shows fragments of parenchymatous cells, phloem fibres, stone cells and a few prismatic 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 18 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 14 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 alcoholic extract on Silica gel 'G' plate using n-Butanol ; Acetic acid Water (4:1:5) shows in visible light two spots at Rf. 0.14 and 0.91 (both grey). Under UV (366nm) two fluorescent zones appear at Rf. 0.70 and 0.78 (both blue). On exposure to Iodine vapour two spots appear at Rf. 0.14 and 0.91 (both yellow). On spraying with Ferric chloride solution two spots appear at Rf. 0.14 and 0.91 (both dirty blue).

CONSTITUENTS - Alkaloids, Tannins, Saponins, reducing Sugars, Triterpenoids and Flavonoids.

PROPERTIES AND ACTION -

Rasa	:	Madhura
Guna	:	Guru, Snigdha, Sara
Virya	:	Sita
Vipaka	:	Madhura
Karma	:	Vaitahara, Pittahara, Dahahara, Raktaprasadana, Hrdya, Vrsya, Virecanopaga

IMPORTANT FORMULATIONS – Nyagrodhadi Kvatha Curna, Asoka Ghrta

THERAPEUTIC USES – Jvara, Trsa, Raktatisara, Raktapitta

DOSE – 5- 10 gm

PRIYANGU (Fruit)

Priyangu consists of dried fruit of *Callicarpa macrophylla* Vahl. (Fam. Verbenaceae), a stout shrub, about 1.2 to 1.8 m high, occurring in the sub-Himalayan tracts from Hazara eastwards to Assam upto 1800 m. and in Upper Gangetic and West Bengal plains;

SYNONYMS -

Sansk. : Phalini, Vanita
Beng. : Priyangu
Guj. : Ghaunla, Priyango
Hindi. : Priyangu
Kan. : Kadu-edi, Sannanathdagida, Proyangu, Navane
Mal. : Nazhal, Kadurohini, Njazhal, Jnazhal
Mar. : Gauhala, Gahula, Priyangu
Ori. : Priyangu
Punj. : Priyangu
Tam. : Gnazalpoo
Tel. : Prenkhanamu
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Fruit globose, 1 to 3 mm in dia., yellowish-brown with or without fruit stalk; 4-toothed, bell-shaped calyx sometimes attached; fruit contains four one seeded pyrenes; taste, astringent; no characteristic odour.

b) Microscopic :

Fruit shows pericarp differentiated into an epicarp, a mesocarp and an endocarp; epicarp thin, forms skin of fruit consisting of outer epidermal cells; a few epidermal cells elongate to form short stalked, disc-shaped, 2 to 4 celled glandular hairs; some other epidermal cells form stellate hairs; mesocarp composed of 5 to 8 layered, thin-walled, parenchymatous cells; endocarp hard and stony, consisting of sclerenchymatous cells, which are larger towards inner side and smaller towards outer side; seeds four in each fruit; yellowish coloured; endosperm 2 to 6 layered consisting of isodiametric cells; cotyledons 2, consisting of isodiametric cells.

Powder – Brown; shows fragments of straight walled, lignified cells of seed coat; oval to elongated, elliptical endocarp cells in surface view; single and groups of elongated, oval

to rectangular, lignified stone cells having concentric striations, radial canal, with narrow lumen; a few glandular and stellate hairs and pieces of polygonal endosperm cells.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 2 per cent, Appendix 2.2.2.
Total ash	-	Not more than 6.5 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 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 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 light (366 nm) one conspicuous fluorescent spot at Rf. 0.82 (sky blue). On exposure to Iodine vapour two spots appear at Rf. 0.82 & 0.92 (both yellowish brown). On spraying with Ferric Chloride (10% aqueous solution) two spots appear at Rf. 0.82 & 0.92 (both greyish brown).

CONSTITUENTS – Fixed Oil.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta, Kasaya
Guna : Ruksa, Sitala, Guru
Virya : Sita
Vipaka : Katu
Karma : Pittahara, Kaphahara, Sangrahi, Balakrta, Udrikta raktaprasadana

IMPORTANT FORMULATIONS - Jirakadi Modaka, Brhatphala Ghrta, Brhacchagaladya Ghrta, Vyaghri Taila

THERAPEUTIC USES - Jvara, Daha, Chardi, Raktadosa, Bhrama, Vataroga, Vaktrajadya

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

PRSNIPARNĪ (Whole Plant)

Prsniparni consists of dried whole plant of *Uraria picta* Desv. (Fam. Fabaceae), an erect, under shrub upto 90 cm high, distributed throughout the country.

SYNONYMS -

Sansk. : Citraparni, Kalasi, Dhavani, Prthakparni, Srgalavinna
Assam. : --
Beng. : Salpani, Chhalani, Chakule
Eng. : --
Guj. : Pithavan
Hindi. : Pithavan, Dabra
Kan. : Murele Honne, Ondele honne, Prushniparni
Mal. : Orila
Mar. : Pithvan, Prushniparnee
Ori. : Prushniparnee, Shankarjata
Punj. : Detedarnee
Tam. : Oripai
Tel. : Kolakuponna
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Root - Occur in pieces of varying size, thickness of 1 to 2 cm, gradually tapering, tough,woody,cylindrical; externally light yellow to buff, internally pale yellow; surface bearing fine longitudinal striations; fracture, splintery or fibrous; taste, slightly acrid.

Stem - About 8.0 to 16.0 cm long, 0.2 to 0.4 cm in diameter, in cut pieces; cylindrical, branched, pubescent, external surface light yellow to brown; transversely cut and smoothened surface shows buff-white colour, mature stem longitudinally wrinkled, leaf scar present at nodes; fracture, fibrous.

Leaf - Very variable, imparipinnate, upto 20 cm or more long, upto 2 cm wide; leaflets on the upper part of the stem 5 to 7, rigidly sub-coriaceous, linear-oblong, acute, blotched with white; glabrous above, finely reticulately veined and minutely pubescent beneath, base rounded; leaflets on the lower part of the stem 1 to 3, sub-orbicular or oblong.

b) Microscopic :

Root - Shows 5 or 6 layers of thin-walled, tabular, regularly arranged cork cells; cork cambium single layered; secondary cortex composed of 4 to 6 layers of oval, tangentially arranged, thin-walled, parenchymatous cells, a few fibres present singly or in groups;

secondary phloem composed of sieve elements, parenchyma and fibres traversed by phloem rays; sieve elements somewhat collapsed towards periphery but intact in inner phloem region; phloem parenchyma composed of rounded to somewhat oval cells, larger towards periphery; fibres thick-walled,lignified with narrow lumen and tapering ends;phloem rays 1 to 5 cells wide, their cells being oval or rectangular in the portion nearer the wood but broader towards their distal ends; secondary xylem composed of vessels, tracheids, fibres, crystal fibres and parenchyma traversed by xylem rays; vessel very few, mostly confined to inner and outer part of xylem; fibres similar to those of phloem fibres and arranged in close set concentric bands; in isolated preparation vessels are cylindrical,pitted with transverse to oblique perforation; tracheids possess bordered pits; xylem parenchyma mostly rectangular with simple pits; xylem ray cells isodiametric showing simple pits; starch grains simple, round to oval, measuring 6 to 17 μ in dia., distributed throughout parenchymatous cells of secondary cortex, phloem and xylem; prismatic crystals of calcium oxalate present in crystal fibres, as well as in many parenchymatous cells of secondary cortex, phloem and ray cells.

Stem - Shows single layered epidermis covered with cuticle, a few epidermal cells elongate outwards forming papillae; cortex 8 to 10 cells wide, consisting of oval to circular, thin-walled, parenchymatous cells; groups of pericyclic fibres present in the form of discontinuous ring; phloem consisting of usual elements except phloem fibres; phloem rays 2 to 4 cells wide; xylem consisting of usual elements; vessels mostly simple pitted; fibres simple with blunt tips; xylem rays 1 to 4 cells wide and 2 to 8 cells in height; pith wide, consisting of thin-walled, round to oval parenchymatous cells.

Leaf -

Midrib - single layered epidermis on either surfaces covered with striated cuticle having a few unicellular or bicellular, hooked or straight and pointed tipped hairs present on both-surfaces but more on lower surface ; collenchyma 2 or 3 layered, followed by 2 layers of parenchyma cells; single row of pericyclic fibers present on both sides; vascular bundle located centrally.

Lamina – shows single layered epidermis on either surfaces, a few unicellular or bicellular, hooked or straight, pointed tipped hairs present on lower surface; mesophyll differentiated into single layered palisade and spongy parenchyma; spongy parenchyma cells oval to rounded having small intercellular spaces; numerous paracytic stomata present on lower surface; stomatal index 27 to 36 on lower surface; palisade ratio 4 or 5; vein-islet number 29 to 32 per sq. mm.; vascular bundle present centrally.

Powder – Greenish-yellow; shows simple pitted vessels; fragments of fibres, tracheids, parenchyma cells; pieces of hairs; palisade cells; a few prismatic crystals of calcium oxalate; epidermal cells wavy walled in surface view showing paracyic stomata and starch grains simple, round to oval, measuring 6 to 17 μ in dia.

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 then 4 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 7 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 8 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica gel 'G' plate using Toluene : Ethyl acetate (9:1) shows under UV (366 nm) three fluorescent zones at Rf. 0.13 (Red), 0.26 (light blue) and 0.30 (Red). On exposure to Iodine vapour nine spots appear at Rf. 0.07, 0.18, 0.26, 0.30, 0.44, 0.63, 0.86, 0.91 and 0.97 (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. 0.18, 0.26, 0.30, 0.39, 0.44, 0.86, 0.91 and 0.97 (all grey).

CONSTITUENTS – Alkaloids, reducing sugars and Sterols.

PROPERTIES AND ACTION -

Rasa : Madhura, Katu, Amla, Tikta
Guna : Laghu, Sara
Virya : Usna
Vipaka : Madhura
Karma : Tridosahara, Vrsya, Dipana, Sangrahi Vatahara, Sothahara, Angamardapra Samana, Sandhaniya, Jivanu-nasaka, Balavardhaka

IMPORTANT FORMULATIONS – Angamardaprasamana Kasaya Curna, Amrtarista, Dasamula Taila, Vyaghritaila, Madhyama Narayana Taila, Sirah Suladi Vajra Rasa, Dasamularista

THERAPEUTIC USES – Daha, Jvara, Svasa, Raktavikara, Vataroga, Unmada, Chardi, Kasa, Raktatisara, Atisara, Vrana, Raktarsa, Kaphaja-madatyayaja, Trsna, nataprabala, Vatarakta, Ekahika Jwara, Pilla (Netra Roga), Asthibhagna

DOSE – 20-50 gm powder for decoction.

PUSKARA (Root)

Puskara consists of dried root of *Inula racemosa* Hook. f. (Fam. Asteraceae), a stout herb, 0.5 to 1.5 m high, mostly found in Western Himalayas upto 2600 m.

SYNONYMS -

Sansk. : Poushkara, Kashmira
Assam. : Pohakarmul, Puskar
Beng. : Pushkara, Pushkaramula
Eng. : Orris Root
Guj. : Pushkarmula
Hindi. : Pohakar Mul
Kan. : Pushkara Moola
Mal. : Puskara
Mar. : Pokhar Mool
Ori. : Puskara
Punj. : Pokhar Mool
Tam. : Pushkarmulam
Tel. : Pushkara Mulamu
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Root available in cut pieces, upto about 15 cm long and 0.5 to 2.0 cm in dia.; cylindrical, straight or somewhat curved; surface rough due to longitudinal striations and cracks, scars of lateral rootlets and rhytidoma present, externally brownish-grey and internally yellowish-brown; fracture, short and smooth; odour, camphoraceous and aromatic; taste, bitter and camphoraceous.

b) Microscopic :

Mature root shows a wavy outline due to development of rhytidoma; cork composed of 8 to 12 layers of thick-walled, tangentially elongated, rectangular cells, some filled with reddish-brown contents; secondary cortex 1 or 2 layers or absent; secondary phloem consists of sieve elements and parenchyma having secretory cavities and traversed by medullary rays; cambium not distinct; wood occupies bulk of root consisting of vessels, tracheids, fibres, parenchyma, secretory cavities and medullary rays; vessel have reticulate thickenings, a few fibres occur in small patches adjacent to vessels and abundant in xylem parenchyma, thin-walled; a few small tracheids; parenchyma in general contain granular, slightly yellowish or colourless inulin granules and also a few yellowish oil globules; starch grains either absent or very rarely seen in cortical and ray cells; yellowish resinous masses present in secretory canals.

Powder - Reddish-brown; under microscope shows fragments of cork cells, vessels, fibres and parenchyma cells containing tannin and inulin.

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 0.6 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 alcoholic extract on Silica gel 'G' plate using Benzene : Ethylacetate (9:1) shows on exposure to Iodine vapour nine spots at Rf. 0.23, 0.28, 0.34, 0.39, 0.48, 0.51, 0.64, 0.73 and 0.94 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for about ten minutes at 105°C eight spots appear at Rf. 0.11, 0.28, 0.34, 0.39, 0.48, 0.64, 0.73 and 0.94 (all violet).

CONSTITUENTS – Essential oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Katu
Guna : Laghu
Virya : Usna
Vipaka : Katu
Karma : Kaphavatjit

IMPORTANT FORMULATIONS – Mahanarayana Taila, Kankayana Gutika, Manasamitravataka, Dasmularista, Kumaryasava, Lodhrasava, Rasnadi Kvatha Curna

THERAPEUTIC USES – Hikka, Kasa, Svasa, Parsvasula, Sopha, Ardita, Pandu, Aruci, Jvara, Adhmana

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

RUDRĀKSA (Seed)

Rudrāksa consists of seeds of *Elaeocarpus sphaericus* Gaertn. K. Schum (Fam. Elaeocarpaceae), a medium sized, ornamental tree, found in the lower Himalayas and in the Western ghats at higher elevation.

SYNONYMS -

Sansk. : --
Assam. : --
Beng. : Rudrakya
Eng. : --
Guj. : Rudraksh, Rudraksha
Hindi : Rudraki
Kan. : Rudrakshi mara, Rudrakshi
Mal. : Rudraksha
Mar. : Rudraksha
Ori. : --
Punj. : Rudraksh
Tam. : Rudraksha
Tel. : Rudraksha
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Seed stony, very hard, spherical, obovoid or oval, variable in size, about 1 or 2 cm in dia.; longitudinally grooved, tubercled, brown, divided into five segments.

b) Microscopic :

Seed coat consists of multilayered, oval to polygonal stone cells and internally followed by 8 to 10 layers of tangentially elongated, oval-shaped, thin-walled, parenchymatous cells, filled with reddish-brown contents, excepting the middle 2 or 3 layers; endosperm consists of oval to polygonal, thin-walled, parenchymatous cells; rosette crystals of calcium oxalate and oil globules present in this region; embryo slightly curved and consists of oval to polygonal, thin-walled, parenchymatous cells, a few having oil globules.

Powder - Reddish-brown; shows polygonal lignified with narrow lumened stone cells, thin-walled, parenchymatous cells with reddish-brown contents, rosette crystals of calcium oxalate and oil globules.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than Nil per cent, Appendix 2.2.2.
Total ash	-	Not more than 1.2 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more than 0.4 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 1 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 (4:1:5) under U.V. (366 nm) shows one fluorescent zone at Rf. 0.91 (violet). On exposure to Iodine vapour three spots appear at Rf. 0.19, 0.31 and 0.52 (all yellow). On spraying with 5% Methnaolic-Sulphuric acid reagent and heating the plate at 105°C for ten minutes a single spot appears at Rf. 0.91(grey).

CONSTITUENTS – Fixed Oil and Fatty Acids.

PROPERTIES AND ACTION –

Rasa : Madhura
Guna : Snigdha, Sthula
Virya : Usna
Karma : Raksoghna, Arogyaprda, Medya, Hrdyam (Somnasya Karah)

IMPORTANT FORMULATIONS – Gorocanadi Vat, Cukkumtippalyadi Gutika, Dhanwantara Gutika, Svarnamukladi Gutika, Mrtasanjivani Gutika

THERAPEUTIC USES – Matisudhikar, Uccaraktacapa, Prgyaparadha, Hrdyaroga, Romantika, Manasroga, Anidra

DOSE - 1-2 gm internally.

SARJA (Exudate)

Sarja consists of resinous exudate of *Vateria indica* Linn. (Fam. Dipterocarpaceae), a large, evergreen tree, upto 30 m high with a cylindrical bole, indigenous to the evergreen forests of the Western Ghats from North Kanara to Kerala and also extensively planted as an avenue tree in Karnataka; resinous exudate is obtained by making semicircular incisions on the stem through the cork cambium up to the surface of sapwood.

SYNONYMS -

Sansk. : Karsya, Sasyasumbara, Ajakarna, Devdhupa
Assam. : --
Beng. : Shakgachha, Chandras
Eng. : White Damar tree, India Cop tree
Guj. : Chandras
Hindi. : Sandras, Safed Damar
Kan. : Rala
Mal. : Payin
Mar. : Raal
Ori. : Sava
Punj : --
Tam. : Kungiliyam, Vellai Kuntarakam, Vellai Kundarakam
Tel. : Tellaguggilamu, Telladamaramu
Urdu : Sandaras, Raal

DESCRIPTION –

Macroscopic :

Rough, irregular, solid, brittle masses, breaking into angular pieces, upto 1.5 cm thick, light-yellow to pale yellow in colour; odour fragrant; tasteless.

SOLUBILITY –

Slightly soluble in alcohol in which it forms a jelly-like mass; insoluble in petroleum ether (40°C-60°C), forming white precipitate; insoluble in carbon-disulphide but yields jelly-like mass, dissolves entirely and gives a dense red colour with concentrated sulphuric acid; dissolves mostly in chloroform giving white or milky solution; (Sal resin dissolves almost entirely in petroleum ether forming a pale cream solution and also dissolves entirely in carbon-disulphide).

Test for presence of Colophony – (Distinction from Sala and Shallaki resin)

1. Dissolve 0.1 g in 10 ml of acetic anhydride by gentle heat, cool, and add 1 drop of sulphuric acid; a bright purplish-red colour, rapidly changing to violet, is produced.

2. Shake 0.1 g of powder with 10 ml of light petroleum (b.p. 50°-60°), and filter; shake 5 ml of the filtrate with 10 ml of dilute solution of copper acetate; the petroleum layer assumes a bright bluish-green colour.

IDENTITY, PURITY AND STRENGTH –

Foreign matter	-	Nil Appendix 2.2.2.
Total ash	-	Not more than 0.1 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Negligible
Alcohol-soluble extractive	-	Not less than 60 per cent, Appendix 2.2.6.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' using Benzene : Methanol (95:5) shows under UV (366 nm) three fluorescent spots at Rf. 0.04, 0.28 and 0.93 (all blue). On exposure to Iodine vapour seven spots appear at Rf. 0.04, 0.28, 0.48, 0.65, 0.76, 0.85 and 0.93 (all yellow). On spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate for ten minutes at 110°C seven spots appear at Rf. 0.04, 0.28, 0.48, 0.65, 0.76, 0.85 and 0.93 (all violet).

CONSTITUENTS – Resins.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta, Kasaya
Guna : Snigdha
Virya : Usna
Vipaka : Katu
Karma : Varnya, Vatahara, Kaphaghna, Krmighna, Visaghna, Svedahara

IMPORTANT FORMULATIONS – Kaccuradi Curna Lepa, Pinda Taila, Lavangadi Curna

THERAPEUTIC USES – Pandu, Karna Roga, Prameha, Kustha, Badhirya, Vrana, Atisara, Kandu, Visphota, Medoroga, Grahani, Vata Rakta, Ksudraroga, Lippa, Manasa Roga, Musika Visa, Vidradhi, Dagdhaka, Yoni Roga, Rakta Dosa, Krmi Roga

DOSE - 1-2 gm Internal, External.

SATAVARI (Root)

Satavari consists of tuberous roots of *Asparagus recemosus* Willd. (Fam. Liliaceae), an ascending, spinous much branched, perennial climber found throughout the country.

SYNONYMS -

Sansk. : Narayani, Vari, Abhiru, Atirasa,
Assam. : Satmull
Beng. : Satamuli, Satmuli, Shatamuli
Eng. : Asparagus
Guj. : Satavari
Hindi : Satavar, Satamul
Kan. : Ashadi poeru, Halavu Bau, Narayani, Makkala
Mal. : Satavari Kizhangu
Mar. : Shatavari
Ori. : --
Punj. : Satavar
Tam. : Shimai-Shadvari, Nilichedi Kishangu
Tel. : Sima-Shatawari (Dry Root), Pippipichara, Pilliteegalu (Fresh Root)
Urdu. : Satawari

DESCRIPTION –

a) Macroscopic :

Root tuberous, 10 to 30 cm in length and 0.1 to 0.5 cm thick, tapering at both ends with longitudinal wrinkles; colour cream; taste, sweetish.

b) Microscopic :

Shows an outer layer of piliferous cells, ruptured at places, composed of small, thin-walled, rectangular asymetrical cells, a number of cells elongated to form unicellular root hairs; cortex comprises of 25 to 29 layers, distinct in two zones, outer and inner cortex; outer cortex consists of 6 or 7 layers, compactly arranged, irregular to polygonal, thick walled, lignified cells; inner cortex comprise of 21 to 23 layers, oval to polygonal, thin-walled, tangentially elongated cells with intercellular spaces; stone cells, either singly or in groups, form a discontinuous to continuous ring in the upper part of this region; raphides of calcium oxalate also present in this region; 2 or 3 layers of stone cells encirle the endodermis; endodermis composed of thin-walled parenchymatous cells; pericycle present below endodermis; stele exarch and radial in position; xylem consist of vessels, tracheids and parenchyma; xylem vessels have

pitted thickening; phloem patches consists of usual element; pith composed of circular to oval parenchymatous cells, a few cells slightly lignified.

Powder – Yellowish-cream; fragments of lignified, thick-walled cells; vessels with simple pits, pieces of raphides, numerous, lignified, rectangular elongated stone cells having clear striations with wide as well as narrow lumen and groups of parenchyma.

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 10 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 alcoholic extract on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) v/v shows on exposure to Iodine vapour three spots at Rf. 0.07, 0.50 and 0.67 (all yellow). On spraying with 5% methanolic sulphuric acid reagent and heating the plate for ten minutes at 110°C four spots appear at Rf. 0.07 (black), 0.41 (grey), 0.50 and 0.83 (both brownish yellow).

CONSTITUENTS– Sugar, Glycosides, Saponin and Sitosterol.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta
Guna : Snigdha, Guru
Virya : Sita
Vipaka : Madhura
Karma : Vrsya, Sukraja, Balya, Medhya, Rasayana, Kaphavataghna, Pittahara, Vatahara, Stanyakara, Hrdya, Netrya, Sukrala, Agnipustikara

IMPORTANT FORMULATIONS – Satavari Guda, Brahma Rasayana, Puga Khanda, Saubhagyasunthi, Mahanarayana Taila, Brhaechagaeadya Ghrta, Satavari Ghrta, Satavari Kalpa, Asvagandharista, Narasimiha Curna

THERAPEUTIC USES – Sotha, Ksaya, Parinama Sula, Gulma, Atisara, Raktatisara, Raktavikara, Mutrarakta, Amlapitta, Arsa, Vatajvara, svara bheda, Naktandhya, Vatarakta, Raktapitta, Visarpa, Sutika Roga, Stanya Dosa, Stanya Ksaya

DOSE – 3-6 gm of the drug.

SIGRU (Root Bark)

Sigru consists of dried root bark of *Moringa oleifera* Lam. Syn. *Moringa pterygosperma* Gaertn. (Fam. Moringaceae), a small or medium sized tree, found wild in sub-Himalayan tract, and also commonly cultivated throughout the country for its leaves and fruits used as vegetable.

SYNONYMS -

Sansk. : Sobhanjana, Bahala, Tiksnagandha, Aksiva, Mocaka
Assam. : Saijna, Sohjna
Beng. : Sajina, Sajna
Eng. : Horse Radish Tree, Drum-stick Tree
Guj. : Saragavo
Hindi : Sahajan
Kan. : Neegge, Nugge Kand Chakke
Mal. : Muringa
Mar. : Sevaga, Segat Sala
Ori. : Sajina
Punj. : Sohanjana
Tam. : Murungai
Tel. : Munaga, Mulaga
Urdu. : Sohanjana, Sahajan

DESCRIPTION –

a) Macroscopic :

Drug occurs in pieces of variable sizes, external surface, light greyish-brown, rough, reticulated, marked with transverse row of lenticels; outer bark, thin, peeling off in small bits, internal surface, white.

b) Microscopic :

Mature bark shows a very wide zone of cork, consisting of 25 or more rows of rectangular cells, arranged radially, a few inner layers, larger and cubicular in shape; secondary cortex composed of rectangular, thin-walled cells, a few containing starch grains and rosette crystals of calcium oxalate and a few others containing oil globules and coloured resinous matter; starch grains mostly simple and rarely compound, composed of 2 or 3 components, round to oval in shape, measuring 6 to 28 μ in dia., groups of stone cells, round to rectangular, of various sizes, present in secondary cortex; mucilagenous cavities found scattered towards inner secondary cortical region; secondary phloem appreciably wide, consisting mainly of phloem fibres and phloem parenchyma; phloem fibres in large patches, alternating with phloem parenchyma; numerous starch grains and cell contents as described above also present in phloem cells; phloem rays numerous, long, 2 to 4 seri-

ate, consisting of radially elongated, thin-walled cells containing numerous starch grains, similar to those present in secondary cortex.

Powder – Pinkish-brown; shows stone cells, phloem fibres, starch grains, measuring 6 to 28 μ in dia., rosette crystals of calcium oxalate and oil globules.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more then 2 per cent, Appendix 2.2.2.
Total ash	-	Not more then 18 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more then 10 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 11 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of the alcoholic extract on Silica gel 'G' using Toluene : Ethylacetate (9:1) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.06 and 0.52 (both green). On exposure to Iodine vapour seven spots appear at Rf. 0.06, 0.33, 0.43, 0.54, 0.70, 0.78 and 0.87 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate at 105°C for ten minutes six spots appear at Rf. 0.33, 0.43, 0.54, 0.70, 0.78 and 0.87 (all violet).

CONSTITUENTS – Alkaloids and Essential Oil.

PROPERTIES AND ACTION –

Rasa : Katu, Tikta, Madhura
Guna : Laghu, Ruksa, Tiksna, Sara
Virya : Usna
Vipaka : Katu
Karma : Vatahara, Kaphara, Pittakara, Medohara, Sukral, Dipana, Pacana, Hrdya, Sophaghna, Caksusya, Samgrahi, Hrdya, Rocana, Visaghna

IMPORTANT FORMULATIONS – Prabhanjana Vimardana Taila, Sarasvata Ghrta, Vastyamayantaka Ghrta, Kasara Taila Manikya Rasa

THERAPEUTIC USES – Sopha; Krmiroga, Medoroga, Pliha Roga, Vidradhi, Gulma, Galaganda, Mukhajadya, Grathi, Visarpa, Asmari Vrana vikara, Mutra Sarkara, Kustha, Ksata, Karnasula, Antarvidradhi

DOSE – 25-50 gm of the drug in powder form.

SIGRU (Seed)

Sigru consists of dried seed of *Moringa oleifera* Lam. Syn. *M. pterygosperma* Gaertn. (Fam. Moringaceae), a small or medium sized tree, found wild in sub-Himalayan tract, and also commonly cultivated all over the plains of the country, for its leaves and fruits used as vegetable.

SYNONYMS -

Sansk. : Sobhaniana, Aksiva, Mocaka
Assam.: Saijna, Sohjna
Beng. : Sajina, Sajna
Eng. : Horse Radish Tree, Drum-stick Tree
Guj. : Sargavo, Sekato
Hindi. : Sahajana, Munga, Sahiiana
Kan. : Neegge, Nugge Beeta
Mal. : Muringa, Tiksnggandha
Mar. : Shevaga, Shegatabeeja
Ori. : Sajana, Munga, Munika
Punj. : Sohaniana
Tam. : Muringai, Muringai Virai
Tel. : Munaga
Urdu. : Sohanjana, Sahajan

DESCRIPTION –

a) Macroscopic :

Seeds hard, trigonous, having short wings; size 0.5 to 1.0 cm long and 0.3 to 0.5 cm wide; colour greyish-cream; odour, not characteristic; taste, slightly bitter.

b) Microscopic :

Seed shows 10 to 15 layered, tangentially elongated, thin-walled cells of the testa, followed by a wide zone of cells of cotyledons consisting of round to oval, thin-walled, parenchymatous cells with intercellular spaces and containing mucilage and oil globules.

Powder – Cream coloured; shows groups of elongated, round to oval, parenchymatous cells; oval to elongated, thin-walled cells of testa showing striations in surface view 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 0.8 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 24 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica Gel 'G' plate using Chloroform : Toluene (75 : 25) as mobile phase shows under UV (366 nm) three fluorescent zones at Rf. 0.52, 0.59 and 0.94 (all blue). On spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C three spots appear at Rf. 0.52, 0.59 and 0.94 (all violet).

CONSTITUENTS – Fixed Oil.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta
Guna : Laghu, Ruksa, Tiksna
Virya : Usna
Vipaka : Katu
Karma : Vatahara, Kaphahara, Hrdya, Caksusya, Sangrahi, Dipana

IMPORTANT FORMULATIONS - Sudarsana Curna, Sothaghna Lepa, Sarsapadi Pralepa, Sarvajvarahara Lauha

THERAPEUTIC USES – Krmiroga, Netraroga, Sotha, Vidradhi, Apaci, Medoroga, Gulma, Pliharoga, Galaganda, Vrana, Mukhajadya, Siroroga, Vataroga, Atinidra

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

SIGRU (Stem Bark)

Sigru consists of dried stem bark of *Moringa oleifera* Lam. Syn. *M. pterygosperma* Gaertn. (Fam. Moringaceae), a small or medium sized tree, indigenous to the sub-Himalayan tract, found wild in lower Himalayas and cultivated all over the plains of India, for its leaves and fruits used as vegetables.

SYNONYMS –

Sansk. : Sobhanjana, Bahola, Sakapatra
Assam. : --
Beng. : Sajina, Sajne
Eng. : Horse Radish Tree, Drum-stick Tree,
Guj. : Saragave
Hindi : Sahijana
Kan. : Nugge, Nuggemara, Nuggekoyimara
Mal. : Muringya, Murinna
Mar. : Shewga
Ori. : Sajana, Munga, Munika
Punj. : Sohajana
Tam. : Murungai
Tel. : Munaga chettu, Mulaya Chetta
Urdu. : Sohanjana, Sahajan

DESCRIPTION –

a) Macroscopic :

Mature bark, rough, deeply cracked, grey or dark green; young bark, greenish to greenish-brown, 1 to 3 cm thick or more, depending upon the age of plant; taste, bitter and pungent.

b) Microscopic :

Cork region very wide, composed of 15 to 20 layers, thin-walled, radially arranged, rectangular cells with coloured contents; cork cambium consists of a single row of thin-walled, rectangular or tangentially elongated cells; secondary cortex very wide, composed of nearly cubical to rectangular, thin-walled parenchymatous cells containing a few rosette and cubical, rhomboidal or hexagonal crystals of calcium oxalate; several groups of thick-walled, lignified, elongated to polygonal stone cells with striations and wide as well as narrow lumen present; a few small, simple, round to oval, starch grains measuring 5 to 14 μ in dia., with concentric striations and hilum, and a few oil globules scattered in cortical region; secondary phloem consists of thin-walled, oval to polygonal parenchyma, fibres, and phloem rays; phloem parenchyma cells adjoining the sclerenchyma cells containing small rhomboidal or cubical crystals of calcium oxalate and many large lysigenous mucilage cavities filled with mucilage; groups of lignified fibres form nearly concentric, discontinuous zones, separated by phloem rays; rays many, 2 or 3 seriate, occasionally

uniseriate; towards the inner phloem regions they are radially elongated but, become tangentially elongated in the outer phloem; most of the cells loaded with simple, starch grains and crystals of calcium oxalate.

Powder – Light brown, fragments of thin-walled, polygonal, sometimes rectangular cork cells; groups or single, thick-walled, lignified, elongated to polygonal stone cells with striations and lumen; a few rhomboidal, rosette crystals of calcium oxalate; a few oil globules; a very small, numerous, simple, oval to round, starch grains measuring 5 to 14 μ in dia., with concentric striations and narrow hilum; pieces of phloem parenchyma, lignified phloem fibres and ray cells.

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 extractives	-	Not less than 1 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 alcoholic extract on Silica gel 'G' using Chloroform : Methanol (85:15) shows under U.V. (366nm) a fluorescent zone at Rf. 0.97 (blue). On exposure to Iodine vapour five spots appear at Rf. 0.15, 0.22, 0.49, 0.81 and 0.97 (all yellow). On spraying with 5% Methanolic-Phosphomolybdic acid reagent six spots appear on heating the plate at 105°C for about fifteen minutes at Rf. 0.15, 0.22, 0.49, 0.66, 0.81 and 0.97 (all grey).

CONSTITUENTS – Sterols and Terpenes.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta, Madhura
Guna : Laghu, Tiksna, Ruksa, Picchila, Sara
Virya : Usna
Vipaka : Katu
Karma : Dipana, Hrdya, Vidahkrt, Samgrahi, Visaghna, Sukrala, Rocana, Caksusya, Kaphaghna, Vataghna, Sophaghna, Sirovirecanopaga, Pittotklesaka

IMPORTANT FORMULATIONS - Karpasasthyadi Taila, Ksara Taila, Visatimduka Taila, Kanda Lawana Sarasvata Ghrta, Sarsapadi Pralepa Vastyamayantaka Ghrta, Sveta Karvira pallavadya Taila

THERAPEUTIC USES - Krmi, Vidradhi, Pliha Roga, Gulma, Hrdaya Roga, Aksi Roga, Medoroga, Apaci, Galaganda, Vrana Sotha, Arsa, Bhagandara, Drsti Roga, Sarvapida Nivarani

DOSE – Stem Bark juice 10-20 ml , Stem Bark Powder 2-5 gm.

SRNGĀTAKA (Dried Seed)

Srngataka consists of dried seeds of *Trapa natans* Linn. var. *bispinosa* (Roxb.) Makino. Syn. *T. bispinosa* Roxb. *T. quadrispinosa* Wall. (Fam. Trapaceae), a very variable, rooted, aquatic herb occurring throughout the greater part of the country in lakes, tanks and ponds and also extensively grown.

SYNONYMS -

Sansk. : Srngata, Jalaphala, Trikonaphala
Assam. : --
Beng. : Paniphal, Singade, Jalfal
Eng. : Water Chestnut
Guj. : Shingoda, Singoda
Hindi. : Singhara, Singhada
Kan. : Singade, Gara, Simgara, Simgoda
Mal. : Karimpolam, Vankotta, Jalaphalam, Karimpolam
Mar. : Shingoda
Ori. : Paniphala, Singada
Punj. : Singhade, Gaunaree
Tam. : Singhara
Tel. : Kubyakam, Singada
Urdu. : Singhara

DESCRIPTION –

a) Macroscopic :

Seeds somewhat triangular to 4-angled in shape, with or without shallow groove on both surfaces, 2 to 3.0 cm long and 2.5 to 3.5 cm wide; externally reddish-brown; mostly one surface mottled, smooth in texture.

b) Microscopic :

Shows testa of three zones, outer zone consisting of tangentially elongated or somewhat crushed, 3 to 6 layered parenchymatous cells, middle zone of lignified cells, inner zone of rectangular and tangentially elongated thin-walled cells having reddish-brown contents; tegmen 2 or 3 layered, comprising of tangentially elongated cells, rest of the seed consisting of thin-walled, parenchymatous cells; starch grains simple, or in groups, oval to round having distinct striations and hilum, measuring 6 to 45 μ in dia, a few vascular strands with vessels showing spiral thickening, found scattered in this region.

Distinction from Arrow root (a possible substitute)- Arrow root (*Maranta arundinacea* Linn.) starch is more irregular in shape, being ellipsoid, pear-shaped or even almost trigonal, occasionally showing small tuberosities; hilum stellar or cleft, slightly eccentric, being situated near the broader end; fine concentric striations are visible in most granules.

Powder - White; numerous simple, solitary and groups of circular to oval starch grains, having concentric striations and distinct hilum in centre, measuring upto 45 μ in dia; a few fragments of testa consisting of oval to polygonal, thin-walled, parenchyma cells in surface view.

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 0.3 per cent, Appendix 2.2.4.
Water-soluble extractive	-	Not less than 8 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) v/v shows under U.V. (366 nm) one fluorescent zone at Rf. 0.60 (blue). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at Rf. 105°C three spots appear at Rf. 0.30 (grey), 0.43 (grey), and 0.93 (violet).

CONSTITUENTS – Starch and Protein.

PROPERTIES AND ACTION -

Rasa : Madhura, Kasaya
Guna : Guru
Virya : Sita
Vipaka : Madhura
Karma : Pittahara, Vrsya, Sramahara, Sukrakara, Grahi, Stanyajanan, Rakta Stambhaka, Garbhasdhapana

IMPORTANT FORMULATIONS – Saubhagya Sunthi, Amrtaprasa Ghrta, Pugakhanda

THERAPEUTIC USES – Raktapitta, Daha, Garbha Srava, Sopha (external), Mutrakrchra, Asthibhagna Vatavyadhi, Prameha, Visarpa, Trsna

DOSE - 5-10 mg of the dry in powder form.

SRUVAVRKSA (Leaf)

Sruvavrksa consists of dried leaf of *Flacourtia indica* Merr. Syn. *F. ramontchi* L' Herit. (Fam. Flacourtiaceae), a small deciduous, usually thorny tree or shrub, found in the sub-Himalayan tracts and outer Himalayas upto 1220 m and also common throughout Chota Nagpur, Deccan and South India.

SYNONYMS -

Sansk. : Vikankata, Gopakanta
Beng. : Bincha, Bainchi, Bewich
Eng. : Governors Plum, Madaraskara Plum
Guj. : Kankata
Hindi. : Bilangra
Kan. : Ilumanika, Dodda Gejjalakai
Mal. : Vavankataku, Vikamkath, Yaliya Nzerinigal, Loloikka
Mar. : Kaker
Ori. : Kantheikoli, Vaincha, Uincha
Punj. : Kakoa, Kukoya
Tam. : Sottaikala, Kat Ukala
Tel. : Putregu, Kanavegu Chettu, Vikankata
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Leaves simple, sessile, 3 to 5 cm long and 1 to 3 cm wide, ovate to obovate, glabrous above, more or less pubescent beneath, serrate towards apex, and crenate in basal region, greenish-grey.

b) Microscopic :

Leaf –

Midrib – Epidermis, single layered, covered externally with thin cuticle; followed by 1 or 2 layers of collenchyma and 3 to 5 layers parenchyma; lower epidermis with 2 or 3 layers of adjacent collenchyma and 2 or 3 layers of parenchyma; vascular bundle single, situated in the centre, covered by fibre sheath on both sides; a few unicellular, hooked, trichomes present on lower surface; a few rosette and prismatic crystals of calcium oxalate scattered in parenchyma cells.

Lamina – Epidermis single layered on both surfaces, covered with thin cuticle; a few simple, unicellular hairs with blunt tips present on lower surface; 2 layers of palisade cells and 2 or 3 layers of spongy parenchyma cells present; rosette and a few prismatic crystals

crystals of calcium oxalate present in epidermis, palisade and spongy parenchyma cells; a few veinlets present in between palisade and spongy parenchyma; stomata anisocytic, present on lower surface; palisade ratio 2 or 3; vein islet number 8 to 10 per sq. mm; veinlet termination number 10 to 12 per sq. mm; stomatal index 24 to 26.

Powder – Greenish-grey, shows fragments of collenchymatous, and parenchymatous cells; elongated, thick-walled pointed fibres; sinuous walled epidermal cells in surface view, containing rosette and a few prismatic crystals of calcium oxalate; palisade cells, a few anisocytic stomata, and pieces of unicellular hairs present.

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 0.6 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 12 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using n-Butanol : Acetic acid : Water (4:1:5) shows under UV (366 nm) four fluorescent zones at Rf. 0.26, 0.76, 0.88 (all blue) and 0.98 (red). On exposure to Iodine vapour four spots appear at Rf. 0.26, 0.48, 0.61 and 0.88 (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. 0.34, 0.48, 0.61, 0.76 0.88 and 0.98 (all grey).

CONSTITUENTS – Tannin and Sugar.

PROPERTIES AND ACTION -

Rasa : Madhura, Amla, Tikta
Guna : Laghu
Virya : Sita
Vipaka : Madhura
Karma : Pittahara, Kaphahara, Dipana, Pacana

IMPORTANT FORMULATIONS – Aragvadhadi Kvatha Curna

THERAPEUTIC USES – Raktavikara, Sopha, Kamala

DOSE - 50-100 gm for decoction.

SRUVAVRKSA (Stem Bark)

Sruvavrksa consists of dried stem bark of *Flacourtia indica* Merr. Syn. *F. ramontchi* L' Herit. (Fam. Flacourtiaceae), a small deciduous, usually thorny tree or shrub, found in the sub-Himalayan tract and outer Himalayas upto 1220 m and also common throughout Indian deciduous forests.

SYNONYMS -

Sansk. : Vikankata, Gopakanta
Assam. : --
Beng. : Bincha, Bainchi, Bewich
Eng. : Governors Plum, Madaraskara
Guj. : Kankata
Hindi. : Bilangra
Kan. : Ilumanika, Dodda Gejjala Kai
Mal. : Vayankataku, Vikamkath, Yali Nzerinigal, Lik
Mar. : Kaker
Ori. : Kantheikoli, Vaincha, Vinch
Punj. : Kakoa, Kukoya
Tam. : Sottaikala, Kat Ukala
Tel. : Putregu, Kanavegu Chettu, Vika
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Drug occurs in 2 to 5 cm long and 1 to 3 mm thick, curved, quilled or flat pieces; external surface smooth, reddish-grey, having lenticels, internal surface reddish-brown; fracture, short.

b) Microscopic :

Mature bark shows 4 to 13 layers of exfoliated cork consisting of tangentially elongated and radially arranged, thin-walled cells, a few containing reddish-brown contents; secondary cortex consisting of oval to elliptical, tangentially elongated, parenchymatous cells, followed by a zone of compactly arranged fibre and groups of stone cells; secondary phloem composed of sieve elements, parenchyma, phloem rays and phloem fibres; lignified phloem fibres oval to polygonal mostly in groups; phloem rays 1 or 2 cells wide and 3 to 10 cells deep, slightly thick-walled; prismatic crystals of calcium oxalate present in secondary cortex and phloem parenchyma; starch grains simple, round to oval measuring 3 to 11 μ in dia.

Powder – Creamish-brown; shows cork cells, lignified phloem fibres, prismatic crystals of calcium oxalate, numerous, round to oval starch grains measuring 3 to 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 16 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 6 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 alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (9:1) shows under U.V. (366nm) one fluorescent spot at Rf. 0.27 (Sky blue). On exposure to Iodine vapour four spots appear at Rf. 0.13, 0.20, 0.27 and 0.64 (all brownish yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 105°C five spots appear at Rf. 0.06, 0.13, 0.20, 0.27 and 0.64 (all greyish brown).

CONSTITUENTS – Tannin and Flacourtin, a phenolic glucoside ester.

PROPERTIES AND ACTION -

Rasa : Tikta
Guna : Laghu, Tiksna
Virya : Sita
Vipaka : Katu
Karma : Pittahara, Kaphahara, Dipana

IMPORTANT FORMULATIONS – Aragvadhadi Kvatha Curna

THERAPEUTIC USES – Raktavikara, Sopha (Sotha), Dusta Vrana

DOSE - 50-100 gms of the drug for decoction.

TALAMULI (Rhizome)

Talamuli consists of dried rhizome of *Curculigo orchioides* Gaertn. (Fam. Amaryllidaceae), a small herb, upto 30 cm high with tuberous root stock, occurring wild in sub-tropical Himalayas from Kumaon eastwards, ascending upto 1830 m in Khasi hills, Manipur and the Eastern Ghats, also from Konkan southwards; drug is collected from two year old plants, washed well and cleared of rootlets, sliced and dried in shade.

SYNONYMS -

Sansk. : Bhumitala
Assam. : Talmuli, Tailmuli
Beng. : Talmalu, Tallur
Guj. : Kalimusali
Hindi. : Syahmusali, Kalimusli
Kan. : Neltal, Neltathigodde, Nelatale, Nelatelegadde
Mal. : Nilappenea
Mar. : Kali musali, Bhuimaddi
Ori. : Talamuli
Punj. : Syah musali, Musali safed,
Tam. : Nilappanai
Tel. : Nel tadigadda
Urdu : Musali Siyah, Kali Musali

DESCRIPTION –

a) Macroscopic :

Drug occurs in transversely cut pieces of 2.5 to 5 cm long, cylindrical, straight to slightly curved, cut surface 1.0 to 4.5 cm in dia.; external surface blackish-brown, cut surface cream coloured; surface with numerous shallow wrinkles and transverse cracks; with a few rootlets and root scars; nodes and internodes prominent; taste, mucilaginous and slightly bitter.

b) Microscopic :

Shows a narrow strip of cork, consisting of 5 to 7 rows of light brown cubical to rectangular cells; secondary cortex consists of thin-walled, parenchymatous cells, densely filled with starch grains and acicular crystals of calcium oxalate, either isolated or in bundles, in a few cells; a few small, round to tangentially elongated, lysigenous cavities also found scattered in this region; a few vascular bundles found embedded in cortical region with phloem towards outer side, and consisting of a few xylem elements; ground tissue consists of parenchymatous cells, some of which contain acicular crystals of calcium oxalate; numerous fibro-vascular bundles found scattered throughout the region, mostly towards peripheral region having phloem, almost encircled by xylem vessels having annular and spiral thickenings; starch grains simple, rounded to oval and also compound of 2 to 4 components, measuring 4 to 21 μ in dia., present in cortical and

central region, a number of deep red, resin canals found throughout the region, mucilage in the form of colourless mass found in a few cortical parenchymatous cells.

Powder – Greyish; vessels with annular and spiral thickenings; simple, round to oval, starch grains measuring 4 to 21 μ in dia., and compound starch grains having 2 to 4 components and a few acicular crystals of calcium oxalate; mucilage in the form of colourless mass found in a few cortical parenchymatous 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 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 17 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of 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) four fluorescent zones at Rf. 0.39, 0.77, 0.90 and 0.97 (all yellow). On exposure to Iodine vapour twelve spots appear at Rf. 0.06, 0.13, 0.17, 0.25, 0.39, 0.50, 0.62, 0.70, 0.77, 0.88, 0.90 and 0.97 (all yellow). On spraying with Dragendorff reagent followed by sodium nitrite three spots appear at Rf. 0.39, 0.70 and 0.88 (all light purple).

CONSTITUENTS – Tannin, Resin, Sapogenin and Alkaloid.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta
Guna : Guru, Picchila
Virya : Usna
Vipaka : Madhura
Karma : Vrsya, Bramhana, Rasayana, Pustiprada, Balaprada, Sramahara, Pitta hara Daha hara.

IMPORTANT FORMULATIONS – Gandharvahastadi Kvatha Curna, Candanadi Curna.

THERAPEUTIC USES – Arsa, Vataroga, Karsya, Kstaksina

DOSE - 3-6 gm of the drug in powder form.

TALISA (Leaves)

Talisa consist of dried needle like leaves of *Abies webbiana* Lindl. (Fam. Pinaceae), plant is a tall, evergreen tree with thick, spreading, horizontal branches attaining a height of 60 m found in Himalayas at an altitude of 2800-10000 m.

SYNONYMS :

Sansk. : Patradhyam
Assam. : Talish
Beng. : Talish Pala, Taleesh Patra
Eng. : Himalayan Siver
Guj. : Talish Patra
Hindi : Talish Patra
Kan. : Tales Patra, Talisapathra, Shukodara
Mal. : Talisapatram, Taleesapatri
Mar. : Laghu Taleespatra
Ori. : Talis
Punj. : --
Tam. : Talispatra, Taleesapatri
Tel. : Taleesapatri
Urdu. : Zarnab

DESCRIPTION –

a) Macroscopic :

Leaves flat, 1 to 5.5 cm long, about 2 mm broad; shining, midrib in the upper surface channelled down the middle but raised beneath; with two faint white lines on either side of the midrib beneath, petiole very short, greyish-brown; odour, terebinthine-like; taste, astringent.

b) Microscopic :

Mature leaf shows single layered epidermis on either side covered with thick cuticle; upper epidermis followed by single layered sclerenchymatous hypodermis, lower epidermis shows papillate projections at some places followed by 1 or 2 layers sclerenchymatous hypodermis; palisade 2 layered; spongy parenchyma 4-6 layered; vascular bundle single, situated centrally, consisting of xylem and phloem, enclosed by a single layered endodermis; xylem on upper side and phloem on lower side; cambium inconspicuous; secretory cavities two in numbers, located on either side of vascular bundle, stomata sunken type, present only on the lower surface.

Powder – Greenish-brown; shows sclerenchymatous cells, palisade, spongy parenchyma and a few epidermal cells.

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 14 per cent, Appendix 2.2.6.
Water-soluble extractives	- Not less than 15 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica Gel 'G' using Toluene : Ethylacetate (9:1) shows in visible light five spots at Rf. 0.09, 0.41, 0.59, 0.67 (all green) and 0.92 (light green). Under UV (366 nm) eight fluorescent zones visible at Rf. 0.05 (orange), 0.09 (blackish) 0.14 (orange), 0.43 (red), 0.54 (blue), 0.62 (blackish red), 0.67 and 0.92 (both red). On exposure to iodine vapour eleven spots appear at Rf. 0.04, 0.08, 0.12, 0.17, 0.39, 0.50, 0.57, 0.65, 0.73, 0.85 and 0.92 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate at 105°C for ten minutes eleven spots appear at Rf. 0.04, 0.08, 0.12, 0.17, 0.39, 0.50, 0.57, 0.65, 0.73, 0.85 and 0.92 (all violet).

CONSTITUENTS – Essential Oil & Alkaloid.

PROPERTIES AND ACTION -

Rasa : Tikta, Katu, Madhura
Guna : Laghu, Tiksna
Virya : Usna
Vipaka : Katu
Karma : Vatakaphapaham, Slesmapittajit, Dipana, Hrdya

IMPORTANT FORMULATIONS - Talisadi Curna, Bhaskara Lavana, Pranada Gutika, Jatiphaladi Curna, Puga Khanda, Draksadi Curna, Talisadi Modaka

THERAPEUTIC USES – Swasa, Kasa, Gulma, Agnimandya, Amadosa, Ksaya, Hikka, Chardi, Krmi, Mukharoga, Aruci

DOSE – 2-3 gm of the drug in powder form.

TILA (Seed)

Tila consists of dried seeds of *Sesamum indicum* Linn. (Fam. Pedaliaceae), a herb extensively cultivated throughout the plains of India upto 1200 m for its seeds.

SYNONYMS -

Sansk. : Tila
Assam. : Simmasim
Beng. : Tilagachh
Eng. : Sesame, Gingelly-oil Seeds
Guj. : Tall
Hindi. : Tila, Teel, Tili
Kan. : Accheellu, Ellu
Mal. : Ellu
Mar. : Tila
Ori. : Til
Punj. : Til
Tam. : Ellu
Tel. : Nuvvulu
Urdu. : Kunjad

DESCRIPTION –

a) Macroscopic :

Seed white, brown, grey or black, flattened ovate in shape, smooth or reticulate, 2.5 to 3 mm long and 1.5 mm broad, one side slightly concave with faint marginal lines and an equally faint central line; taste, pleasant and oily.

b) Microscopic :

Testa of seed shows single layered palisade-like, thin-walled, yellowish coloured cells, and the rest of the testa composed of collapsed cells; endosperm 3 layered, rarely 2 layered, consisting of cellulosic polygonal cells of parenchyma containing fixed oils and small aleurone grains; cotyledons two, externally covered with thin cuticle; single layered epidermal cell, followed by a single row of palisade- like cells; rest of the tissues consist of polygonal, parenchyma cells containing fixed oil and aleurone grains.

Powder – Blackish coloured; shows palisade-like cells in surface view, parenchyma cells, 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 9 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 20 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 4 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 alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) shows under UV (366 nm) three fluorescent zones at Rf. 0.57, 0.64 (both light blue) and 0.72 (blue). On exposure to Iodine vapour five spots appear at Rf. 0.08, 0.57, 0.64, 0.72 and 0.94 (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, 0.57, 0.64, 0.72 (all violet), 0.76, 0.84 (both light violet) and 0.94 (violet).

CONSTITUENTS – Fixed Oil.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta, Kasaya, Katu
Guna : Guru, Snigdha, Suksma, Vyavai
Virya : Usna
Vipaka : Madhura
Karma : Snehana, Svraka, Saedopaga, Balya, Vataghna, Kusthakara, Pittala, Vitbardhaka, Mutrabandhaka, Medhavardhala Agnivardhaka, Sangrahi, Kesya, Avasadakar, Kesa Krsnakara, Kasa Vardhaka, Karnpalivaidhaka, Kaphakopaka, Mrdurecaka, Vrana Samsodhaka, Vrana pacaka, Vrana dahanasaka, Bhagna prasadhaka, Rasayana, Visaghna, Vajikara, Varnya, Agnibala Vardhaka

IMPORTANT FORMULATIONS – Jatiphaladya Curna, Narsimha Curna, Samangadi Curna, Haridradi Lepa, Vrsya Pupalika Yoga, Nagaradi Yoga, Tiladi Upanaha, Tiladi Yoga, Priyaladi Yoga, Mustadi Upanaha, Sunthyadi Curna, Pathyadi Gutika, Hingavadi Yoga, Paniya Ksara, Bhallatakadi Modaka

THERAPEUTIC USES – Udavarta, Yonisula, Gulma, Udara Anaha, Sirah Sula, Parsva Sula, Amasula, Raktarsa, Guda bhramsa, Kasa, Svasa, Pravahika, Visarpa, Hikka, Pinasa, Vatarakta, Pradara, Asmarai, Nadi vrana, Kustha, Svitra, Granthi, Upadamsa, Vidaraka, Alasa, Khalitya, Palitya, Aksi Roga, Pratisyaya, Sankhaka, Sakuni, Graha, Kumara, Pitrmesagraha, Atisara, Raktatisara, Ksaya, Krmi, Mutraghata, Dantaroga, Dantaharasa, Vatika Mukharoga, Atidagdha, Trsna, Pliharoga, Galganda, Musika Dansa, Karnapali Sora

DOSE - Powder 5-10 gm/day.

TULASI (Seed)

Tulasi consists of seeds of *Ocimum sanctum* Linn. (Fam. Lamiaceae), an erect, branched, annual herb, found throughout the country, and also cultivated.

SYNONYMS -

Sansk. : Surasa, Surasa, Bahumaniari, Bhutaghni
Assam. : Tulasi
Beng. : Tulasi
Eng. : Holi Basil, Sacred Basil
Guj. : Tulasi, Tulsi
Hindi. : Tulasi
Kan. : Tulasi, Sritulasi
Mal. : Tulasi
Mar. : Tulasi
Ori. : --
Punj. : Tulasi
Tam. : Tulasi, Thulasi, Thiruthazai
Tel. : Tulasi, Manchi Tuasi, Nalla Tuasi
Urdu. : Tulsi

DESCRIPTION –

Macroscopic :

Seeds round to oval, about 0.1 cm long, brown with mucilaginous outer covering, slightly notched at the tip and broadly rounded at the base; no odour; taste, pungent, and slightly mucilaginous.

Powder – Brown; shows groups of polygonal, thick-walled, epidermal cells, 28 to 55 μ in size; oval to polygonal, parenchymatous cells containing oil globules and starch grains simple as well as compound, having 2 to 5 components, single grains measuring 3 to 17 μ in dia.

Swelling Index –Not less than 5, when determined as follows :

Introduce the accurately weighed seeds into a 25 ml glass stoppered measuring cylinder. The length of the graduated portion of the cylinder should be 125 mm; the internal diameter 16 mm subdivided in 0.2 ml and marked from 0 to 25 ml in up wards direction. Add 25 ml of water, and shake the mixture thoroughly at intervals of every 10 minutes for 1 hour. Allow to stand for 3 hours at room temperature. Measure the volume in ml occupied by the seeds, including any sticky mucilage. Carry out simultaneously not less than 3 determination and calculate the mean value of the individual determinations, related to 1 g of seeds.

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 2 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 4 per cent, Appendix 2.2.6.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9:1) as mobile phase shows under U.V. (366 nm) three fluorescent zones at Rf. 0.36, 0.56 (both red) and 0.93 (blue). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C five spots appear at Rf. 0.04, 0.23, 0.36, 0.70 and 0.93 (all violet).

CONSTITUENTS – Fixed Oil and Mucilage.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta, Kasaya
Guna : Laghu, Ruksa, Tiksna
Virya : Usna
Vipaka : Katu
Karma : Vatahara, Kaphahara, Pittahara, Rucikrt, Dipana, Dahakrt, Krmighna, Visahara, Vranasodhaka, Hrdya

IMPORTANT FORMULATIONS – Muktadi mahanjana

THERAPEUTIC USES – Swasa, Kasa, Hikka, Parsvasula, Kustha, Mutarakrchra, Pratisyaya, Aruci, Puthigandha, Gara Visa, Sopha, Krmi, Rakta Vikara, Jantuvisa, Bhuta Roga

DOSE - 1-2 gm of the seed in powder form.

TUMBURU (Fruit)

Tumburu consists of dried fruit of *Zanthoxylum armatum* DC. Syn. *Z. alatum* Roxb. (Fam. Rutaceae), an armed or erect shrub or small tree, found in the valleys of the Himalayas at an altitude of 1000 to 2100 m, in Khasi hills at 600 to 1800 m, and in the Ghats in peninsular India.

SYNONYMS -

Sansk. : Tejovati, Tejovali, Tejohva
Assam. : Tejovati
Beng. : Tejovati, Nepali Dhania
Eng. : --
Guj. : Tejbal
Hindi. : Tejbal, Nepali dhaniya
Kan. : Tejapatri, Tumburu, Tejovanti
Mal. : Thumboonal, Thumbooni
Mar. : Tejbal, Tejobalee
Ori. : Tejbal
Punj. : Tirmira
Tam. : Thejyovathi
Tel. : Tumburl
Urdu. : Kabab-e-Khanda (Miswak)

DESCRIPTION –

a) Macroscopic :

Reddish-brown, sub-globose, mostly dehisced, follicles, containing a single seed in each follicle; seeds, globose, glabrous, shiny black; upto 0.5 cm long, and about 0.3 cm wide; taste, pungent; odour, aromatic.

b) Microscopic :

Fruit - Pericarp shows large oil cavities and vascular tissues surrounded by parenchymatous cells containing irregular masses of hesperidin and followed by 2 to 5 layered palisade-like cells, hesperidin insoluble in organic solvents but soluble in potassium hydroxide.

Seed – Testa shows wide, very thick-walled, irregular, non-lignified cells having blackish-brown contents and numerous oil globules; tegmen shows 3 or 4 oval to polygonal tangentially elongated thin-walled parenchymatous cells, followed by 8 to 10 layers tangentially elongated tabular cells filled with reddish-brown contents; endosperm consists of thin-walled, polygonal, parenchymatous cells.

Powder – Dark brown to black; shows groups of thin-walled, parenchymatous cells, some filled with oil globules, and a few with hesperidin; polygonal cells of seed coat and separate globules of oil.

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 1 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 10 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' plate using Toluene : Ethylacetate (9 : 1) v/v shows in visible light two spots at Rf. 0.18, 0.35 (both grey). Under U.V. (366 nm) five spots appear at Rf. 0.10, 0.18, (both blue), 0.38 (violet) 0.55 (violet) and 0.93 (violet). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for ten minutes seven spots appear at Rf. 0.18, 0.26, 0.35, 0.48, 0.66, 0.76 and 0.96 (all grey).

CONSTITUENTS – Essential Oil.

PROPERTIES AND ACTION -

Rasa : Katu, Tikta
Guna : Laghu, Ruksa, Tiksna
Virya : Usna
Vipaka : Katu
Karma : Rucya, Dipana, Pacana, Vatahara, Kaphahara, Lalapraseka, Cimicimayanam, Rasana Samvedaka

IMPORTANT FORMULATIONS – Saptavimsati Guggulu, Dadhika Ghrta, Maha Visagarbha Taila, Hingavadi Taila

THERAPEUTIC USES – Swasa, Kasa, Ardita, Kaphaja Roga, hrdroga, Kantha Roga, Arsa, Hikka, Agnimandya, Asya Roga, Danta Roga

DOSE – 2- 4 gm.

UTINGANA (Seed)

Utingana consists of dried mature seeds of *Blepharis persica* (Burm. f.) O. Kuntze. Syn. *B. edulis* Pers. (Fam. Acanthaceae), a shrub, occurring in Punjab.

SYNONYMS -

Sansk. : Uttingana
Assam. : --
Beng. : Ucchata
Eng. : --
Guj. : Utingun, Chopunivel
Hindi. : Utangan
Kan. : Utangana
Mal. : Utigana, Utungana
Mar. : Utangan
Ori. : Utingana
Punj. : Uttangan
Tam. : Uttanjana
Tel. : Uttangan
Urdu. : Utangan

DESCRIPTION –

a) Macroscopic :

Seed occurs as entire or broken, 0.4 to 0.6 cm long, 0.3 to 0.4 cm broad; heart-shaped, rough due to network of coarse hairs; cream to light yellow, flat; when soaked in water, hairs swell and produce viscid mucilage; mucilagenous on chewing.

b) Microscopic :

Seed shows 4 to 6 layers of tangentially elongated, hyaline, thin-walled, parenchymatous seed coat, multicellular, multiseriate columnar, elongated hairs with twisted tips present towards outer side of the seed coat; embryo having two cotyledons with upper and lower epidermis; upper epidermis followed by 4 to 5 layers of oval to polygonal, thin-walled, parenchymatous cells and 2 or 3 layers more or less radially 2elongated, thin-walled, parenchymatous cells respectively; beneath this a single layer of palisade-like cells present; lower epidermis covered with thick cuticle and consisting of rounded, isodiametric cells that are larger than those of the upper epidermis.

Powder – Yellowish-brown; shows fragments of hairs with mucilage, palisade-like oval to polygonal, thin-walled, parenchyma cells isolated or in larger or smaller groups.

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 1.5 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 16 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 alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (80:20) shows in visible light four spots at Rf. 0.17 (grey), 0.25 (light grey), 0.79 (light yellow), 0.87 (yellow). Under U.V. (366 nm) six fluorescent zones are visible at Rf. 0.09, 0.17 (both black), 0.23 (light black) 0.33, 0.69 (both light blue) and 0.90 (dark blue). On exposure to Iodine vapour seven spots appear at Rf. 0.13, 0.18, 0.26, 0.36, 0.64, 0.75 and 0.90 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid one spot appear at Rf. 0.87 (orange). On spraying with 5% methanolic sulphuric acid eight spots appear at Rf. 0.14, 0.22, 0.33 (grey), 0.64 (violet), 0.71 (yellowish), 0.75 (brownish), 0.81 (yellow), and 0.90 (brown).

CONSTITUENTS – Glycosides and Tannin.

PROPERTIES AND ACTION -

Rasa : Madhura, Tikta
Guna : Guru, Snigdha, Picchila
Virya : Usna
Vipaka : Madhura
Karma : Vrsya, Mutrala

IMPORTANT FORMULATIONS – Kumaryasava

THERAPEUTIC USES – Mutrakrcchra, Klaibya

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

VĀRĀHI (Rhizome)

Vārāhi consists of dried cut pieces of rhizome of *Dioscorea bulbifera* Linn. (Fam. Dioscoreaceae), a large unarmed climber found throughout India ascending upto 1800 m in the Himalayas.

SYNONYMS -

Sansk. : Varahi Kanda
Assam. : --
Beng. : Ratalu
Eng. : --
Guj. : Dukkarkanda
Hindi : Varahi Kanda, Genthi
Kan. : Kunta Genusu, Heggenusu
Mal. : Varahi
Mar. : Dukarkanda
Ori. : --
Punj. : --
Tam. : --
Tel. : Kaya Pendazam
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Drug occurs in cut pieces, 0.5 to 0.7 cm thick, 2 to 3 cm in dia.; a few root and root scars present; outer surface dark brown, inner yellow to light brown; odour, indistinct; taste, bitter.

b) Microscopic :

Rhizome shows a cork composed of 10 to 15 layers of thick-walled, tangentially elongated rectangular cells; outer few cells filled with reddish-brown contents; cortex consists of oval to elliptical, thin-walled parenchymatous cells; ground tissue, forming major portion of drug composed of oval to polygonal cells having a few scattered closed vascular bundles; starch grains found both in cortex and ground tissues, but abundant in ground tissue, rounded to oval, three sided with rounded angles or rod-shaped, simple, solitary or in groups, 11 to 28 μ in diameter; hilum present at the narrower extremity.

Powder - Slightly yellowish-brown; shows parenchymatous cells; varying sizes of cone and rod-shaped starch grains measuring 11 to 28 μ in dia.

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 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' using n-Butanol : Acetic acid : Water (4:1:5) shows three spots at Rf. 0.79 (light yellow), 0.85 (light yellow) and 0.92 (grey) in visible light. Under UV (366 nm) six fluorescent zones are visible at Rf. 0.48, 0.59, 0.73 (all light blue), 0.78 (grey), 0.85 (blue) and 0.92 (grey). On exposure to Iodine vapour seven spots appear at Rf. 0.12, 0.34, 0.59, 0.73, 0.78, 0.85 and 0.92 (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. 0.34, 0.59, 0.66 (all light grey), 0.73, 0.85 and 0.92 (all grey).

CONSTITUENTS – Saponins–Steroidal Saponins.

PROPERTIES AND ACTION –

Rasa : Madhura, Tikta, Katu
Guna : Laghu
Virya : Usna
Vipaka : Katu
Karma : Rasayana, Slesmaghna, Balya, Vrsya, Svarya, Varnya, Ayvardhana, Agnivrd-dhi kara, Pittakara

IMPORTANT FORMULATIONS – Vastyamayantaka Ghrta, Narasimha Curna, Pan-canimba Curna

THERAPEUTIC USES – Kustha; Kandu; Prameha; Krmi

DOSE – 3-6 gm.

VARSĀBHU (Root)

Varsābhu consists of dried root of *Trianthema portulacastrum* Linn. Syn. *T. monogyna* Linn., *T. obcordata* Roxb. (Fam. Aizoaceae), a prostrate, glabrous, typically post monsoon annual herb, found almost throughout the country as a weed in cultivated and waste lands.

SYNONYMS -

Sansk. : Sweta Mula, Sothaghni, Vrshoheev
Assam. :--
Beng. : Sabuni
Eng. : Hoase Purslane
Guj. : --
Hindi : Saphed Punarnava, Bish Kharpra, Pathar
Kan. : Muchchugane, Sihi Punarnava
Mal. : Thazhuthama, Jamizhama
Mar. : Sweta Punarnava
Ori. : Sweta Puruni, Gothapurni
Punj. : Sanaya
Tam. : Saranai, Mukuruttai
Tel. : Galijeru
Urdu. : Bish Khapra

DESCRIPTION –

a) Macroscopic :

Root mostly twisted, consisting of tap root, 8 to 21 cm long, about 0.5 cm thick, with several lateral rootlets, external surface light greyish-yellow; fracture, short; no characteristic odour and taste.

b) Microscopic :

Mature root shows anamolous secondary growth; cork 5 to 8 layered; secondary cortex narrow zone consisting of round to polygonal, tangentially elongated, thin-walled, parenchymatous cells, a few cells containing groups of prismatic crystals of calcium oxalate; below secondary cortex five concentric bands of vascular tissue; vessels of varying sizes occurring alongwith xylem fibres and phloem; phloem composed of thin-walled cells having intercellular spaces a few cells containing prismatic crystals of calcium oxalate; a few rows of polygonal, thin walled, parenchymatous cells occur in rings; medullary rays prominent in middle of the cortical region and in the second or third vascular bundle ring; centre mostly occupied by a single vascular bundle strand with two isolated groups of phloem.

Differences with Boerhaavia diffusa Linn. :- Boerhaavia diffusa Linn. root contains raphides of calcium oxalate, simple and compound starch grains in secondary cortex, vessels arranged in radial groups while Trianthema protulacastrum L. contains prismatic crystals of calcium oxalate, starch grains absent and vessels scattered in thick-walled, xylem fibres.

Powder - Light yellow; shows groups of xylem vessels with pitted thickening, thick-walled xylem fibres and cells with a few prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more then 2 per cent, Appendix 2.2.2.
Total ash	-	Not more then11 per cent, Appendix 2.2.3.
Acid-insoluble ash	-	Not more then 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 11 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica gel 'G' plate using Acetone : Water : Conc. Ammonia (90 : 78 : 3) shows under UV (366 mm) three conspicuous fluorescent zones at Rf. 0.20, 0.33 and 0.91 (all sky blue). On exposure to Iodine vapour one conspicuous spot appears at Rf. 0.11 (yellow). On spraying with Dragendorff reagent one spot appears at Rf. 0.11 (yellow).

CONSTITUENTS – Glycoside.

PROPERTIES AND ACTION –

Rasa : Tikta, Kasaya, Katu, Madhura
Guna : Ruksa, Laghu
Virya : Usna
Vipaka : Katu
Karma : Vatahara, Kaphahara, Dipana, Mutrala, Bhedana, Rucya, Hrdya

IMPORTANT FORMULATIONS – Suskamulaka Taila, Kumaryasava, Dhanvantara Ghrta, Sukumara, Ghrta, Punarnavadyarista

THERAPEUTIC USES – Sopha, Pandu, Arsa, Udara Roga, Gulma, Jvara, Garvisa, Vasti Sula, Hrdroga, Urahksatad, Agnimandya, Ykrt avam Pliha Roga

DOSE – 2-5 gm of the drug in powder form.

VĀSĀ (Root)

Vāsā consists of dried root of *Adhatoda zeylanica* Medic. Syn. *A. vasica* Nees (Fam. Acanthaceae); a sub-herbaceous bush, found throughout the year in plains and sub-Himalayan tracts of the country ascending upto 1200 m.

SYNONYMS -

Sansk. : Vrsa, Atarusa, Vasaka, Simhasya, Vajidnta
Assam.: Titabahak, Bahak, Vachaka
Beng. : Bakas, Basak
Eng. : Vasaka, Malabar Nuttree
Guj. : Ardusi, Aradusi, Araduso
Hindi. : Adoosa, Arusa, Aduss
Kan. : Adusoye
Mal. : Adalodakam, Adarooshaka
Mar. : Adulsa, Vasa
Ori. : Vasanga, Basanga
Punj. : Vishuti, Bhekar, Vansa, Arusa
Tam. : Adatodai
Tel. : Adda, Saramu
Urdu. : Adusa (Arusa)

DESCRIPTION –

a) Macroscopic :

Drug occurs in cut pieces of 8 to 13 cm long, 1.5 to 3.0 cm in dia.; hard, woody, almost cylindrical, tap root having lateral branches, rough due to longitudinal cracks or fissures; greyish-brown to dark brown externally; creamish-white internally; fracture, hard; taste, bitter.

b) Microscopic :

Shows 6 to 15 layers of rectangular to slightly tangentially elongated, thin-walled cork cells; secondary cortex wide consisting of rectangular to polygonal, thin-walled parenchymatous cells a few containing oil globules, followed by more or less discontinuous, annular band of mostly rectangular groups of stone cells having distinct pits and striations; secondary phloem composed of 15 to 20 layered, rectangular, elongated, thin-walled cells having usual elements; secondary xylem composed of vessels, fibres, parenchyma and rays; vessel simple pitted; xylem rays mostly uniseriate, a few four seriate rays are also present; starch grains simple and compound, with 2 to 3 components, round to oval, 3 to 6 μ in dia., having concentric striations and hilum, present in secondary cortex and secondary phoem.

Powder – Brownish-grey; shows fragments of cork cells; simple pitted vessels; stone cells mostly in groups; starch grains simple and compound having 2 to 3 components, round to oval, 3 to 6 μ in dia. having concentric striations and hilum.

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 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 alcoholic extract on Silica gel 'G' plate using Chloroform : Methanol (80 : 20) shows under U.V. (366 nm) four fluorescent zones at Rf. 0.57, 0.63 (both red), 0.83 (sky blue) and 0.87 (yellow). On exposure to Iodine vapour six spots appear at Rf. 0.07, 0.27, 0.52, 0.72, 0.87 and 0.93 (all yellow). On spraying with Dragendorff reagent two spots appear at Rf. 0.27 and 0.52 (both orange).

CONSTITUENTS – Alkaloids (Vasicine and Vasicinol) and Oil.

PROPERTIES AND ACTION -

Rasa : Tikta, Kasaya
Guna : Laghu, Snigdha
Virya : Sita
Vipaka : Katu
Karma : Raktasodhaka, Pittahara, Kaphahara, Svara, vivardhaka, Vatakrt, Hrdya

IMPORTANT FORMULATIONS - Brhat Manjisthadi Kvatha Curna, Panca tikta Ghrta, Cyavanaprasa Avaleha, Kanakasava

THERAPEUTIC USES - Kustha, Vata Roga, Krmi, Svasa, Kasa, Jvara, Chardi, Meha, Ksaya, Raktapitta, Trsna

DOSE - 3-6 gm.

VISAMUSTI (Seed)

Visamusti consists of dried seed of *Strychnos nux-vomica* Linn. (Fam. Fabaceae), a tree, upto a height of 9 to 15 m found throughout tropical parts of the country upto 360 m altitude in the moist deciduous forest. **Seed is poisonous and can produce ill effects.**

SYNONYMS -

Sansk. : Karaskara; Visatindu, Kakatinduka
Assam. : Ajraki, Habbul gurab, Kucila
Beng. : Kuchila
Eng. : Poison-nut tree, Nux vomica
Guj. : Konchala, Jher Kochla, Kuchla, Zer Kochalu
Hindi. : Kuchala, Kuchila, Bish tendu
Kan. : Kanjihemushti, Manjira, Hemmushti, Ittongi, Kasarkayi
Mal. : Kajjl, Kanniram
Mar. : Kajra, Kuchla
Ori. : --
Punj. : Kuchla
Tam. : Yettimaram, Kakotee, Ettikottai, Ettikkai
Tel. : Mushti, Mushini
Urdu. : Azaraqi, Kuchla

DESCRIPTION –

a) Macroscopic :

Seeds greenish-grey to grey, extremely hard, silky to touch with a satiny sheen; disc-shaped, almost flat, umbonate but a few seeds somewhat irregularly bent, 10 to 30 mm in diameter, 4 to 6 mm thick, margin rounded or depressed; when cut open, endosperm found to be horny, having a central cavity in which the embryo is situated with two small, thin, cordate, leafy cotyledons with 5 to 7 veins and a terete radicle; odourless.

b) Microscopic :

Seed shows single layered epidermis, each epidermal cell elongated externally to form closely appresed trichomes, lignified, comprising of pitted bulbous base and a thick-walled narrowly elongated, projection; trichome slightly bent beyond the base, with about ten strongly lignified ribs of thickenings; inner testa composed of collapsed parenchymatous cells with yellowish-brown contents; outermost layer of endosperm consists of palisade-like cells while the inner layers have thick-walled, cellulosic polyhedral cells, showing plasmodesmata; endosperm cells also contain oil, and aleurone grains.

Powder – Greenish-grey; shows narrowly elongated and slightly bent thick-walled, lignified trichomes with bulbous base without ramification, thin-walled, parenchymatous cells filled with yellowish-brown content, 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 2 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 4 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 12 per cent, Appendix 2.2.7.
Assay –		Not less than 1.2 per cent of strychnine.

Weigh accurately about 10 g in fine powder, add 100 ml of a 33 per cent v/v mixture of chloroform in solvent ether and set aside for ten minutes. Add 5 ml of dilute ammonia solution and shake continuously for six hours. Transfer to a continuous extraction apparatus with more of the same solvent mixture and extract for two hours. Filter the solvent extract, washing the filter with solvent ether and extract with successive quantities of 20 ml, 20 ml , 10 ml and 10 ml of 1N sulphuric acid, until complete extraction of the alkaloids is effected. Combine the acid extracts and make alkaline with dilute ammonia solution. Extract with successive quantities of 20 ml , 20 ml 10 ml and 10 ml of chloroform until complete extraction of the alkaloids is effected. Evaporate the chloroform, add 5 ml of alcohol and evaporate to dryness. Dissolve the residue in a mixture of 15 ml of a 3 per cent w/v solution of sulphuric acid and 2 ml of nitric acid, add a few crystals of sodium nitrite and set aside at 18°C for thirty minutes. Transfer to a separator containing 20 ml of solution of sodium hydroxide, shake for two minutes and then shake with 20 ml of chloroform, separate the chloroform solution, wash it with 5 ml of solution of sodium hydroxide and then with two quantities each of 10 ml of water. Continue the extraction with successive quantities of 10 ml of chloroform, until complete extraction of the alkaloids is effected, washing each chloroform solution separately with the 5 ml of solution of sodium hydroxide and with the two quantities of water, which were used for washing the first chloroform solution. Titrate the second wash with 0.1 N sulphuric acid using solution of methly orange as indicator if more than 0.1 ml is required, wash the combined chloroform solutions with further quantities, each of 10 ml of water until on titration not more than 0.1 ml of 0.1 N sulphuric acid is required. Remove the chloroform, add 5 ml of alcohol, evaporate, and dry for thirty minutes, at 100°C. Dissolve the residue in 10 ml of 0.1N sulphuric acid and titrate the excess of acid with 0.1 N sodium hydroxide, using solution of methlyl orange as indicator. Each ml of 0.1 N sulphuric acid is equivalent to 0.03344 g of strychinine, multiply the result by 1.02 to correct for loss of strychinine.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' using Toluene : Ethylacetate : Diethylamine (70:20:10) shows on spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid two orange spots at Rf. 0.44 and 0.65 corresponding to that of brucine and strychnine.

CONSTITUENTS –Alkaloids, Indole Alkaloids, Strychnine & Brucine, Monoterpenoid Glycoside (Loganin), α, β–Colubrine, Vomicine.

PROPERTIES AND ACTION -

Rasa : Tikta, Katu
Guna : Ruksa, Laghu, Tiksna
Virya : Usna
Vipaka : Katu
Karma : Grahi, Madakaraka, Vatalam, Kaphanasaka, Pittanasaka, Raktadosa Nasaka, Vranasodhana, Parama Vedanahara, Agniret, Rujahara, Jantunasana

IMPORTANT FORMULATIONS – Visatinduka Taila, Mahavisagarbha Taila, Agnitundi Vati, Ekangavira Rasa, Visatinduka Vati, Krmimudgara Rasa, Navajivana Rasa

THERAPEUTIC USES – Agnimandya, Ardita, Paksaghata, Visucika, Nadi Daurbahya, Kustha, Arsa, Klaibya, Grdhrasi, Kandu, Vrana

DOSE – 60 –125 mg powder of the sodhita drug.

VRSCIKĀLĪ (Whole Plant)

Vrscikālī consists of dried whole plant of *Tragia involucrata* Linn. (Fam. Euphorbiaceaee), a perennial, evergreen, twiner, more or less hispid with scattered stinging hairs, distributed throughout India from Punjab and Lower Himalayas eastwards to Assam and Meghalaya, ascending upto an altitude of 750 m and southwards to Kerala.

SYNONYMS -

Sansk. : --
Assam. : --
Beng. : Shedha Songi
Eng. : Scorpion Tail Plant
Guj. : Vichaati
Hindi. : Vahanta, Vrishi-Kali
Kan. : Haligilu
Mal. : Terkkada
Mar. : Vrischikali
Ori. : --
Punj. : --
Tam. : Thal Kodu Kkuppoondu
Tel. : --
Urdu. : --

DESCRIPTION –

a) Macroscopic :

Root – Occurs in pieces of 2 to 10 cm long and 0.3 to 1.3 cm in dia., woody, hard, cylindrical, ribbed at some places, more or less rough due to presence of secondary roots and root scars; light brown; no characteristic odour and taste.

Stem – Cylindrical, slender, twining 0.2 to 0.6 cm in diameter, elongated, stinging to touch, and having fine ridges and furrows; light grey; moderately hard; internal surface whitish, composed of loosely arranged tissues; fracture, fibrous; no characteristic odour and taste.

Leaf – Simple, petiolate, stipulate, stinging to touch, linear-oblong to broadly ovate, cordate or oblong-lanceolate, acute or acuminate at apex, margin serrate; 1.5 to 5.5 cm long, 1 to 3 cm broad, slightly yellowish-green; no characteristic odour and taste.

b) Microscopic :

Root – Root shows nearly circular outline; cork consisting of 3 to 10 layered, tangentially elongated, thin-walled cells; secondary cortex narrow consisting of fairly large, polygonal, thin-walled, parenchymatous cells; rosette crystals of calcium oxalate and some fibres present in the region; secondary phloem appears in form of conical caps,

composed of sieve tubes, companion cells, parenchyma, fibres and phloem rays; fibres present in small groups of 2 to 4 cells arranged in tangential rows alternating with phloem elements; rosette crystals of calcium oxalate present in phloem parenchyma ; secondary xylem forms major part of root composed of vessels, tracheids, parenchyma, fibres and xylem rays; vessels solitary or 2 or 3 to a group, having simple pits; fibres and tracheids having thick-walled and blunt ends; medullary rays 1 or 2 cells wide, rectangular to radially elongated and thick-walled; some cells contain starch grains and rosettes of calcium oxalate present in those towards periphery; starch grains rounded to oval in shape, measuring 4 to 9 μ in diameter.

Stem – Mature stem shows cork composed of 3 to 8 layered, thin-walled cells; at a few places epidermis shows the presence of glandular and stinging hairs; secondary cortex a wide zone, consisting of tangentially elongated, thin-walled, parenchymatous cells; some cells contain rosette crystals of calcium oxalate; some laticifers present scattered in this region; secondary cortex followed by zone of pericycle fibres with highly thickened walls, arranged in groups; secondary phloem composed of sieve elements, phloem fibres and phloem parenchyma; phloem fibres thick-walled, some phloem parenchyma cells contain rosette crystals of calcium oxalate; laticifers scattered in the secondary phloem similar to those found in secondary cortex; cambium narrow consisting of thin-walled, tangentially elongated cells; secondary xylem in form of continuous cylinder traversed by narrow xylem rays; xylem consists of vessels, tracheids, xylem fibres and xylem parenchyma; vessels numerous distributed uniformly in groups or singles; in macerated material vessels vary in shape and size, with transverse to oblique perforation, lignified with pitted walls; xylem parenchyma usually rectangular having simple pits, xylem rays uni to triseriate, uniseriate being more common and usually 2 to 15 cells high, having pitted walls; pits consists of large, thin-walled parenchymatous cells, some cells with rosette crystals of calcium oxalate.

Leaf –

Petiole – shows irregular outline due to fine ridges and furrows; epidermis single layered having some unicellular glandular and stinging hairs; collenchyma 4 to 7 layered, followed by polygonal, thin-walled parenchymatous cells containing rosette crystals of calcium oxalate; vascular bundles collateral, five in number corresponding to ridges; centre occupied by oval to angular, thin-walled parenchymatous cells containing rosette crystals of calcium oxalate.

Midrib – nearly biconvex in outline; epidermis consists of single layered, oval, parenchymatous cells covered externally by a thin cuticle; some unicellular glandular and stinging hairs present on both surfaces; epidermis followed by 3 or 4 layers of collenchymatous cells; stele composed of single, collateral vascular bundle; ground tissue composed of 3 or 4 layers of thin-walled, polygonal, parenchymatous cells; rosette crystals of calcium oxalate present in parenchyma and phloem parenchyma.

Lamina – shows dorsiventral structure; epidermis on either side; upper epidermal cells radially elongated and larger in size; lower ones oval-shaped, tangentially elongated both covered externally by thick cuticle; glandular and stinging hairs present on both surfaces similar to those present in midrib; palisade 1 or 2 layered; spongy parenchyma 5 to 7

layered of loosely arranged cells, some contain rosette crystals of calcium oxalate; small veins found traversing spongy tissue at certain places.

Powder –Light greenish-yellow; shows groups of fibres, vessels with simple pits and spiral thickening, rosette crystals of calcium oxalate, simple rounded starch grains, fragments of lamina showing palisade and groups of spongy parenchyma, unicellular stinging hairs.

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 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 11 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract on Silica gel 'G' plate using Chloroform : Ethyl acetate : Formic acid (5:4:1) shows under visible light two spots at Rf. 0.92 (light grey) and 0.95 (yellowish green). Under UV (366 nm) two fluorescent zones are visible at Rf. 0.92 (blue) and 0.95 (pink). On exposure to Iodine vapur six spots appear at Rf. 0.08, 0.27, 0.40, 0.50, 0.92 and 0.95 (all yellow). On spraying with 5% Ferric chloride solution and heating the plate for ten minutes a 110°C two spots appear a Rf. 0.92 and 0.95 (both bluish grey).

PROPERTIES AND ACTION -

Rasa : Katu
Guna : Usna
Virya : Usna
Vipaka : Katu
Karma : Vatakara, Suddhikrt, Balya, Hrtsuddhikrt

IMPORTANT FORMULATIONS – Vidaryadi Kvatha Curna, Vidaryadi Ghrta

THERAPEUTIC USES - Raktapitta, Vibandha, Arocaka

DOSE - 3-6 gm.

YAVA (Whole Plant)

Yava consists of dried whole plant of *Hordeum vulgare* Linn. Syn. *H. sativum* Pers. (Fam. Poaceae), an annual, erect, herb, 50 to 100 cm high, cultivated chiefly in North India, for its dehusked fruits known as Barley in trade.

SYNONYMS -

Sansk. : Divya
Assam. : --
Beng. : Jab, Jau, Yava
Eng. : Barley
Guj. : Jau, Java, Jau
Hindi. : Yav, Jav, Jau8
Kan. : Jave godi, Barli Akki
Mal. : Yavam, Baarli, Barley
Mar. : Jav
Ori. : Jav, Javadhana, Yava, Bansa
Punj. : Jav, Jau
Tam. : Barliarisi, Yavam
Tel. : Yavalu, Barlibiyam, Tella Tumma, Barley
Urdu. : Jau

DESCRIPTION –

a) Macroscopic :

Root - Fibrous, 0.5 to 1 cm thick; cylindrical, glabrous, greyish-brown.

Stem - Cylindrical, 0.4 to 0.6 cm thick; hollow, slightly flattened, smooth; internode long, shining yellow; node short, bearing sheath; fracture, fibrous.

Leaf - Linear-lanceolate, 15 to 25 cm long, upper one close to the spike; sheath smooth, striate; yellowish-grey.

Inflorescence - Spike, terminal, linear-oblong, compressed spikelet sessile, 6 to 8 cm long, 6-rowed type; dark cream.

Fruit - A caryopsis, elliptic, oblong, ovoid and tapering at both ends; smooth, about I cm long and 0.2 to 0.3 cm wide; dorsally compressed and flattened on the sides with a shallow longitudinal furrow; 3 to 5 ridged having shallow depression between them; grains tightly enclosed and adhering to the lemma and palea; a long awn present on the palea; pale greenish-yellow; taste, sweetish acrid.

b) Microscopic :

Root - Shows single layered epidermis, covered by striated cuticle; cortex composed of about 4 to 6 layers of round to polygonal, thin-walled, parenchymatous cells having intercellular spaces; vascular bundles arranged in discontinuous ring, each having

usual elements; pith very wide composed of round to polygonal thin-walled, parenchymatous cells having intercellular spaces.

Stem - Shows single layered epidermis, covered by thick cuticle; hypodermis composed of 5 to 6 layered, round to polygonal, lignified, sclerenchymatous cells; ground tissue consisting of 5 to 7 layered, round to polygonal, thin-walled, parenchymatous cells having intercellular spaces; vascular bundles containing of usual elements found scattered in ground tissues.

Leaf - Shows single layered epidermis covered by thick cuticle on either surface; a few big or bulliform cells are present in upper and lower epidermis, mesophyll not differentiated into palisade and spongy parenchyma; vascular bundles conjoint, collateral, closed, each covered by bundle sheath; stomata paracytic, present on both surfaces; stomatal number 9 to 17 per sq. mm on lower surface, 5 to 8 per sq. mm on upper surface; stomatal index 15 to 23 on lower surface, 9 to 15 upper surface.

Fruit -shows single layered epidermis consisting of crescent-shaped, round to oval wavy walled cells, followed by 2 or 3 layers of thick-walled, sclerenchymatous fibres; below the sclerenchyma are present irregular, square or quadrilateral, spongy parenchymatous cells, a few cell walls having silica bodies through which run the fibro-vascular bundles of the ribs, followed by more or less, polygonal inner epidermal cells, a few inner epidermal cells having unicellular claw-shaped hair and stomata; pericarp composed of cells with more or less compressed parenchymatous cells; seed coat appears as a colourless line; perisperm composed of cells with more or less wavy walls having narrow lumens; endosperm divided into two zones, 2 to 4 cells deep aleurone layers, and the rest starch layers; starch grains simple, round to oval, measuring 3 to 30 μ, in dia.

Powder – Light creamish-yellow; shows fragments of epidermal cells, parenchyma, groups of tubular, elongated lignified cells, polygonal, thin-walled parenchymatous epidermal cells of palea with intercellular spaces, in surface view, thin-walled, conical trichomes with large lumen, measuring 30 to 180 μ in length and upto 20 μ in width and stomata, sclerenchymatous fibres, scalariform vessels, abundant round to oval, simple starch grains having concentric striations, measuring 3 to 30 μ in dia.

IDENTITY, PURITY AND STRENGTH -

Foreign matter	-	Not more than 1 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 4 per cent, Appendix 2.2.4.
Alcohol-soluble extractive	-	Not less than 7 per cent, Appendix 2.2.6.
Water-soluble extractive	-	Not less than 8 per cent, Appendix 2.2.7.

T.L.C. -

T.L.C. of alcoholic extract on Silica gel 'G' using n-Butanol : Acetic acid: Water (4:1:5) shows under UV (366nm) nine fluorescent zones at Rf. 0.15, 0.28, 0.42, 0.52, 0.59, 0.67, 0.85, 0.93 and 0.96 (all blue). On exposure to Iodine vapour nine spots appear at Rf. 0.10, 0.15, 0.39, 0.48, 0.56, 0.67, 0.85, 0.93 and 0.96 (all yellow). On spraying with 5% Phosphomolybdic acid reagent and heating the plate for fifteen minutes at 105°C nine spots appear at Rf. 0.10, 0.24, 0.39, 0.48, 0.56, 0.67, 0.85, 0.93 and 0.96 (all blue).

CONSTITUENTS - Proteins, Carbohydrate, free Amino-acids, Vitamins, Tannins and Flavonoid glycosides-Luteolin and Orientin.

PROPERTIES AND ACTION -

Rasa : Madhura
Guna : Ruksa, Aguru, Mrdu
Virya : Sita
Vipaka : Katu
Karma : Kaphapittahara, Medhavardhaka, Swara vardhaka varna vardhaka, Lekhana, Medohara, Vatahara Vrsaya

IMPORTANT FORMULATIONS -

THERAPEUTIC USES – Pinasa, Swasa, Kasa, Urustambha

DOSE – 10-20 gm.

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 quantity of 10 g is to be weighed to the nearest 10 mg. A balance should be chosen such that the value of three times the standard deviation of the reproducibility of the balance, divided by the amount to be weighed, does not exceed 0.001.

APPENDIX-2

2.1 TESTING OF DRUGS

2.1.1.-Systematic Study of Crude Drugs

In the Indian Systems of Medicine comprising of Ayurveda, Unani and Siddha, drugs of plant, animal and mineral origin, are used in their natural or so called "Crude" forms singly or in their mixture or in combination, to make a compound preparation of formulation. Nearly 90 per cent of the Crude Drugs are obtained from the plant sources while about 10 per cent of the drugs are derived from animal and mineral sources. The drugs of plant origin especially of herbaceous nature are frequently used as whole plant; otherwise their parts such as Root, Stem, Leaf, Flower, Seed, Fruit modifications of Stem and Root, Bark of a Stem or Root, Wood, and their Exudates or Gums etc. constitute single drugs in the Indian Systems of Medicine. These vegetable drugs are either used in dried forms or some times as whole fresh or their juice. The study of these crude drugs made with a view to recognise them is called Pharmacognosy (Pharmakon = Drug; Gignosco = to acquire knowledge of), meaning the knowledge or science of Drugs. In Pharmacognosy a complete and systematic study of a drug is done, which comprises of (I) origin, common names, scientific nomenclature and family, (ii) geographical source (and history), (iii) cultivation, collection, preservation and storage, (iv) Macroscopical, Microscopical and sensory (organoleptic) characters, (v) Chemical composition wherever possible, (vi) Identity, Purity, Strength and Assay, (vii) substitute and adulterants etc. Such systematic study of a drug as complete as possible, is claimed to be the scientific or pharmacognositical evaluation.

As mentioned above each crude drug derived from the vegetable kingdom consists of a definite part of plant e.g., leaf, stem, fruit, seed, wood, bark, root etc. Morphological or Macroscopical details of the respective part are given by observing it with a naked eye or with the aid of a magnifying lens. In this description general conditions of the drug, size, shape, outer surface, inner surface etc are referred to. Drugs can be identified with the aid of the above, only if they are available in entire condition. Sensory or Organoleptic characters describe colour, odour, taste, consistency etc. The microscopic examination of different parts of the drug provides several diagnostic characters. In case of leaves, surface preparation and transverse section, preferably through midrib, are made and nature of epidermis, trichomes, stomata, arrangement of tissues like palisade cells, vascular bundles and nature of cell content are studied. Similarly in case of bark, root, rhizome and wood, transverse and longitudinal sections are made and from characteristic arrangements of tissues of each drug and from diagnostic elements like stone cells, fibres, vessels etc. as also from the study of the cell deposits like crystals, starch etc., the drugs are identified. The studies of diagnostic elements are helpful especially when the drugs are in powdered condition and give clues in the identification of drugs. Linear measurements and other methods of quantitative microscopy give further aid in the identification of the drugs. The sections or the powdered drugs samples are cleared by clearing agents, mostly chloral-hydrate solution, before mounting on the slide.

The basic chemical nature of cell-wall of almost all the plants is cellulosic, However, lignin, suberin, cutin or mucilage are deposited on the cellulose. Cellulose gives blue colour with chlorzinc-iodine solution or with cuoxam. (Copper-oxide-ammonia) reagent. Lignin present in the middle lamella and secondary cell-well of many vessels, fibres and sclerieds gives red colour with phloroglucinol and concentrated hydrochloric acid. Suberin is present in cork and endodermis cells while cutin in the cuticle of leaf. Both are fatty in nature and when heated with Sudan Red-III give red colour.

Mucilage gives red colour with ruthenium red. The chemical constituents present in the drugs can be identified by chemical or microchemical tests e.g., Rhubarb rhizomes give with 5% potassium hydroxide red colour because of anthraquinone derivatives, strychnine present in Nux-vomica gives purplish-red colour with ammonium vanadate and concentrated sulphuric acid.

Paper and Thin Layer Chromotography are now utilised in identification of drugs, their adulterant and their chemical constituents. Methods have been developed for quantitative estimation of the chemical constituents from Paper and Thin Layer Chromatography (TLC).

2.1.2. –Microscopical Methods of Examining Crude Vegetable Drugs

Methods of preparing specimens of crude materials of vegetable drugs for microscopical studies vary, depending on the morphological groups of drugs to be examined and also on the natures of the material i.e., entire, cut or powdered.

I. LEAVES, HERBS AND FLOWERS

For examining leaves, herbs and flowers (entire or cut) under microscope, following methods are employed for clarification :

A. Entire and cut materials

(i) ***Entire materials*** – When examining entire leaves, herbs and flowers, take pieces of leaf (margin and vein of leaves only), herbs (only leaf) and flowers (only calyx and corolla) in test tube. Add a solution of caustic alkali or nitric acid to the test tube and boil for 1-2 minutes, pour the contents into a porcelain dish, drain off the liquid, wash the material with water and leave for sometimes. Remove the pieces of the material from the water with a spatula and put on the slide, add a few drops of the solution of *glycerol or chloral hydrate.* Crush the material with scalpel and cover with cover slip before examining.

(ii) ***Cut materials*** –For examining cut leaves, herbs and flowers, take several pieces in a test tube and employ the same methods as described for entire materials.

Other methods employed for clarification of the material (leaf and stem) are described below :-

(a) Leaf –Boil pieces of leaves in a test tube with chloral hydrate for several minutes until completely clarified and then examine them in chloral hydrate solution. After clarification, leaf pieces are divided into two parts with the help of a scalpel or needle, and carefully turn one part. The leaf can be examined from both the dorsal and ventral surfaces.

(b) Stem –To examine stem material (without leaf) boil pieces in a solution of *caustic alkali* or in *nitric acid.* Remove the epidermis with a scalpel or a needle for examining the surface. For examining pressed specimen of stem, take separate tissue and press them with a scalpel on the slide.

B. Powder

For examining characters of the powder take sufficient amount of powder in Chloral-hydrate solution on a slide and cover it with a cover slip, warm over a low flame for a short time.

II. FRUITS AND SEEDS

A. Entire materials

For microscopical examination of fruit and seed take the specimens or outer coat of seed or fruit and examine as described below :

(i) ***Outer Coat*** –For examining the outer coat boil 3 or 4 seeds or fruits in caustic alkali solution in a test tube for 1-2 minutes (outer coat specimens with intensive pigmentation are boiled for longer period). After boiling, place the pieces on slide, remove the layers of the coat and examine them after mounting in glycerol solution.

(ii) ***Section*** –If fruits or seeds are too hard to cut then boil them for 15-30 minutes or more depending on their hardness or keep them in moistening chamber or absorb in water and chloroform solution or soften them with stem and then cut the specimen for examining purpose. For cutting small, flat seeds (which are difficult to hold) place them in a pith or potato slit for section cutting. Small, round or smooth seeds cannot be cut into section in the pith, then in such cases, they may be embedded in paraffin wax blocks for section cutting. For this, a block of paraffin (0.6 × 0.5 × 1.5 cms. in size) is made and the seed is embedded in the block by making a cavity or a pit in the block with a hot teasing needle. Cut the section with a sharp razor (through the object) together with the paraffin, place them on to the slide, remove paraffin with a needle or wash it with xylene and examine the section in *chloral-hydrate solution.*

B. Powder

For examining the structure of the cells of the seed coat and the cells of the embryo take a small amount of powder of the material on a slide in glycerol and cover it with a cover slip and examine.

1. *Starch* – For examining the presence of starch in the seed, take two specimens, one in iodine solution and the other in water. With iodine solution starch turns blue. Shape and the structure of starch grains can be seen in water and their size is measured.

When examining objects containing starch, prepare specimen by slightly warming in chloral-hydrate solution.

2. *Fixed Oil* – For examining the presence of fixed oil, prepare a specimen in a solution of Sudan III droplets of fixed oil are coloured orange pink. When examining objects containing small amount of fixed oil, prepare a specimen by slightly warming in chloral-hydrate solution, and when examining objects containing large amount of fixed oil, then the powder is de-fatted and clarified as follows :

Place 0.5 g. of the powder in a porcelain dish, add 5-10 ml. of dilute nitric acid and boil for 1 minute, then strain off the liquid through a cloth, wash the residue with hot water and return it to the porcelain dish with a spatula, boil it with 5-10 ml of *caustic alkali solution* for 1 minute and again strain it through the cloth and wash with water. Examine the residue in a glycerol solution, after the treatment the structure of the layers of the coat and their cells can be seen very distinctly.

3. *Mucilage* –Prepare a specimen in Ruthenium Red and examine it under a low power microscope or under dissecting microscope. Mucilage appears as pinkish-red or yellow coloured masses.

III. BARKS

A. Entire material

Prepare transverse or longitudinal section of bark. To soften bark break it into pieces of about 1-2 cm long and 0.5-1 cm wide and boil with in a test tube for 1-3 minutes. Soft pieces are then straightened with a scalpel so as to have a exact transverse or longitudinal direction. Cut the section with razor, moisten the surface of the bark with glycerol solution. Remove the sections with a brush and place them on the slide. Thin pieces of the bark are cut by placing them in the pith (potato or carrot). The sections are treated with various reagents before examining.

1. *Lignified elements* –For testing lignin add several drops of *phloroglucinol* and a drop of *concentrated hydrochloric acid* to the section on a slide then draw off the liquid, immerse the section in *chloral hydrate solution* and cover with a cover slip (the specimen should not be heated); the lignified elements are coloured crimson. *Phloroglucinol* can be substituted by *saffranine*, and the lignified elements are coloured pink. The excessive stain can be washed out with acidified alcohol.

2. *Starch* – Starch is detected by treating with iodine solution.

3. *Tannin* –Tannin is detected by treating with *ferric ammonium sulphate solution* (blue-black or green black colour shows the presence of Tannin) or with *potassium-bi-chromate solution* (brown colour indicates the presence of Tannin).

4. *Anthraquinone derivatives* –Anthraquinone derivatives are detected by treating with alkali solution (blood-red colour shows the presence of anthraquinone derivatives).

B. Cut materials

Prepare small pieces or scraping of bark and boil them for 3-5 minutes in a solution of *caustic alkali* or *potassium hydroxide* or in *nitric acid solution* and then mount in *glycerin* for examination on a slide covered with a cover slip.

C. Powder

Prepare specimen for examination by placing a little amount of powder on a slide, add 1-2 drops of *phloroglucinol* and a drop of concentrated *hydrochloric acid*, cover it with a cover slip, draw off the liquid from one side of the slide with filter paper, and then apply 1-2 drops of *chloral-hydrate solution* from the other side of the slide, lignified elements are stained crimson-red. Specimen may also be prepared with *caustic alkali or ferric ammonium sulphate* for this purpose.

IV. ROOTS AND RHIZOMES

A. Entire materials

For anatomical examination of entire roots and rhizomes cut transverse and longitudinal sections. For this, soften small pieces of roots without heating in *glycerol solution* for 1-3 days, depending on their hardness. The softened roots are straightened with the help of a scalpel in the right direction and then cut a section with the razor. First, cut thicker entire slices and then make thin, smaller sections. Stain the entire slices with *phloroglucinol* and *concentrated hydrochloric acid* or with *safranin* examine the specimen under a dissecting microscope. For micro-chemical test the small and thin sections are examined under microscope, as follows :

1. *Starch* – Starch is detected with iodine solution. For this, prepare specimen with water to measure the granule of starch with an occular micrometer.

2. *Inulin* –Inulin is detected with Molish's reagent. For this place a little powder on a slide and apply 1-2 drops of naphthol and a drop of concentrated sulphuric acid, if inulin is present, the powder will appear reddish-violet coloured. Starch also gives this test, so the test for inulin can be done in the absence of starch.

3. *Lignified elements* –Lignified elements (fibrovascular bundles, mechanical tissue etc.) are detected with *phloroglucinol* and concentrated *hydrochloric acid* or *safranine solution* as mentioned above for barks.

4. *Fixed oil* –For fixed oil detection use Sudan IV, as mentioned above for fruits and seeds.

If required for tannin, anthraquinone derivatives, test as mentioned above.

B. Cut material

Make small pieces or scrapping of roots or rhizomes and boil them for 3-5 minutes in *caustic alkali,* or in *nitric acid* and then make pressed specimen and immerse them in *glycerol.*

Microchemical tests can be performed with scrapings for various chemicals as mentioned above.

C. Powder

Prepare several specimens of the powder on slides in *chloral hydrate solution* and perform the above mentioned standard tests for detection of starch, fixed oil, inulin, lignified elements, anthraquinone derivatives, tannins, mucilage, etc.

2.1.3. –Types of Stomata

There are several types of stomata, distinguished by the form and arrangement of the surrounding cells. The following descriptions apply to mature stomata.

1. Anomocytic (irregular-celled) –Previously known as ranunculaceous. The stoma is surrounded by a varying number of cells in no way differing form those of the epidermis generally.

2. Anisocytic (unequal-celled) –Previously known as cruciferous or solanaceous. The stoma is usually surrounded by three subsidiary cells, of which one is markedly smaller than the others.

3. Diacytic (cross-celled) –previously known as caryophyllaceous. The stoma is accompanied by two subsidiary cells whose common wall is at right angles to the guard cells.

4. Paracytic (parallel-celled) –Previously known as rubiaceous. The stoma has one each side one or more subsidiary cells parallel to the long axis of the pore and guard cells.

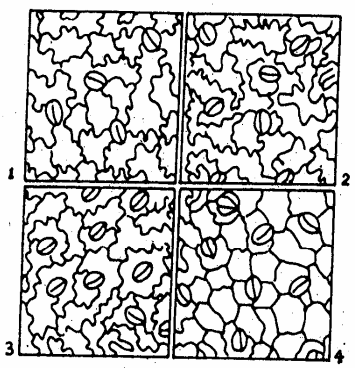

Fig. 1 Various types of stomata

2.1.4 – Determination of Stomatal Index

The stomatal index is the percentage of the number of stomata formed by the total number of epidermal cells, including the stomata, each stoma being counted as one cell.

Place leaf fragments of about 5 × 5 mm in size in a test tube containing about 5 ml of *chloral hydrate solution* and heat in a boiling water-bath for about 15 minutes or until the fragments become transparent. Transfer a fragment to a microscopic slide and prepare the mount, the lower epidermis uppermost, in chloral hydrate solution and put a small drop of glycerol-ethanol solution on one side of the cover-glass to prevent the preparation from drying. Examine with a 40x objective and a 6x eye piece, to which a microscopical drawing apparatus is attached. Mark on the drawing paper a cross (x) for each epidermal cell and a circle (o) for each stoma. Calculate the result as follows :

$$\text{Stomatal index} = \frac{S \times 100}{E + S}$$

Where S = the number of stomata in a given area of leaf ; and
E = the number of epidermal cells (including trichomes) in the same area of leaf.

For each sample of leaf make not fewer than ten determinations and calculate the average index.

2.1.5. – Determination of Palisade Ratio

Palisade ratio is the average number of palisade cells under one epidermal cell.

Place leaf fragments of about 5 × 5 mm in size in a test-tube containing about 5 ml of chloral hydrate solution and heat in a boiling water-bath for about 15 minutes or until the fragments become transparent. Transfer a fragment to a microscopical slide and prepare the mount of the upper epidermis in chloral hydrate solution and put a small drop of glycerol solution on one side of the cover-glass to prevent the preparation from drying. Examine with a 40x objective and a 6x eye piece, to which a microscopical drawing apparatus is attached. Trace four adjacent epidermal cells on paper; focus gently downward to bring the palisade into view and trace sufficient palisade cells to cover the area of the outlines of the four epidermal cells. Count the palisade cells under the four epidermal cells. Where a cell is intersected, include it in the count only when more than half of it is within the area of the epidermal cells. Calculate the average number of palisade cells beneath one epidermal cell, dividing the count by 4; this is the "Palisade ratio" (See Fig. 2).

For each sample of leaf make not fewer than ten determinations and calculate the average number.

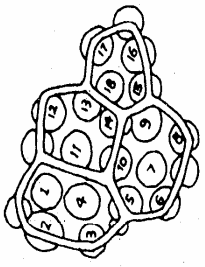

Fig. 2 Palisade ratio $\frac{18.4}{4} = 4.5$

2.1.6 –Determination of Vein-Islet Number

The mesophyll of a leaf is divided into small portions of photosynthetic tissue by anastomosis of the veins and veinlets; such small portions or areas are termed "Vein-Islets". The number of vein-islets per square millimeter is termed the "Vein-Islet number". This value has been shown to be constant for any given species and, for full-grown leaves, to be unaffected by the age of the plant or the size of the leaves. The vein-islet number has proved useful for the critical distinction of certain nearly related species. The determination is carried out as follows :

For Whole or Cut leaves —Take pieces of leaf lamina with an area of not less than 4 square millimeters from the central portion of the lamina and excluding the midrib and the margin of the leaf. Clear the pieces of lamina by heating in a test tube containing *chloral hydrate solution* on a boiling water-bath for 30 to 60 minutes or until clear and prepare a mount in *glycerol-solution* or, if desired, stain with *safranin solution* and prepare the mount in *Canada Balsam.* Place the stage micrometer on the microscope stage and examine with 4x objective and a 6x eye piece. Draw a line representing 2 mm on a sheet of paper by means of a

microscopical drawing apparatus and construct a square on the line representing an area of 4 square millimeters. Move the paper so that the square is seen in the centre of the field of the eyepiece. Place the slide with the cleared leaf piece on the microscope stage and draw in the veins and veinlets included within the square, completing the outlines of those vein-islets which overlap two adjacent sides of the square. Count the number of vein-islets within the square including those overlapping on two adjacent sides and excluding those intersected by the other two sides. The result obtained is the number of vein-islets in 4 square millimeters. For each sample of leaf make not fewer than three determinations and calculate the average number of vein-islets per square millimeter.

For Leaf Fragments having an area less than 4 square millimeters – Take fragments of leaf lamina each with an area of not less than 1 square millimeter, excluding the midrib and the margin of the leaf. Clear and prepare a mount as stated above. Use a 10x objective and a 6x eyepiece and draw a line representing 1 mm on a sheet of paper by means of a microscopial drawing apparatus and construct a square on this line representing an area of 1 square millimetre. Carry out the rest of the procedure as stated above. The result obtained is the number of vein-islets in 1 square millimetre. For each sample of leaf make no less than 12 determinations and calculate the average number.

2.1.7 Determination of Stomatal Number

Place leaf fragments of about 5x5 mm in size in a test tube containing about 5 ml of chloral hydrate solution and heat in a boiling water-bath for about 15 minutes or until the fragments become transparent. Transfer a fragments to a microscopic slide and prepare the mount the lower epidermis uppermost, in chloral hydrate solution and put a small drop of glycerol-ethanol solution on one side of the cover glass to prevent the preparation from drying. Examine with a 40 x objective and a 6x eye piece, to which a microscopical drawing apparatus is attached. Mark on the drawing paper a cross (x) for each stomata and calculate the average number of stomata per square millimetre for each surface of the leaf.

2.2. DETERMINATION OF QUANTITATIVE DATA OF VEGETABLE DRUGS

2.2.1 – Sampling of Vegetable Drugs

Original Samples

(a) Samples of crude vegetable drugs in which the component parts are 1 cm or less in any dimension; and of powdered or ground drugs may be taken by means of sampling device that removes a core from the top to the bottom of the container. Not less than two cores are taken in opposite directions.

When the total weight of the drug to be sampled is less than 100 Kg, at least 250 g are withdrawn to constitute an original sample.

When the total weight of the drug to be sampled is more than 100 Kg, several samples are taken in the manner described, mixed and quartered, two of the diagonal quarters being rejected, and the remaining two quarters being combined and carefully mixed, and again subjected to a quartering process in the same manner until each of the quarters weigh at least 125 g; two such quarters then constitute an original sample.

(b) Samples of crude vegetable drugs in which the component parts are over 1 cm in any dimension may be taken by hand.

When the total weight of the drug to be sampled is less than 100 Kg, samples are taken from different parts of the container or containers. Not less than 500 g of samples so taken constitute an original sample.

When the total weight of the drug to be sampled is more than 100 Kg, several samples are taken in the manner described, mixed and quartered, two of the diagonal quarters being rejected, and the remaining two quarters being combined and carefully mixed, and again subjected to a quartering process in the same

manner until each of the quarters weigh not less than 250 g; two such quarters then constitute an original sample.

NOTE :- Where the total weight of crude drug to be sampled is less than 10 Kg, the preceding methods may be followed but somewhat smaller quantities are to be withdrawn but in no case shall the original samples weight less than 125 g.

Test sample

Withdraw as much as may be necessary of the original sample by quartering, taking care to see that the portion is representative of the gross sample. In the case of unground or unpowdered drugs, grind the sample so that it will pass through a No. 22 sieve. If the sample cannot be ground, it should be reduced to as fine a state as possible. Mix by rolling it in paper or cloth, spread it out in a thin layer, and withdraw the portion for analysis.

2.2.2 –Foreign Matter and Determination of Foreign Matter

A. FOREIGN MATTER

Drugs should be free from moulds, insects, animal faecal matter and other contaminations such as earth, stones and extraneous material.

Foreign matter is material consisting of any or all of the following :-

(1) In particular, parts of the organ or organs from which the drug is derived other than the parts named in the definition or for which a limit is prescribed in the individual monograph.

(2) Any organ or part of organ, other than those named in the definition and description.

The amount of foreign matter shall not be more than the percentage prescribed in the monograph.

B. DETERMINATION OF FOREIGN MATTER

Weigh 100 –500 g of the drug sample to be examined, or the minimum quantity prescribed in the monograph, and spread it out in a thin layer. The foreign matter should be detected by inspection with the unaided eye or by the use of a lens (6x). Separate and weigh it and calculate the percentage present .

2.2.3. –Determination of Total Ash

Incinerate about 2 to 3 g accurately weighed, of the ground drug in a tared platinum or silica dish at a temperature not exceeding 450° until free from carbon, cool and weigh. If a carbon free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the residue on an ashless filter paper, incinerate the residue and filter paper, add the filtrate, evaporate to dryness, and ignite at a temperature not exceeding 450°. Calculate the percentage of ash with reference to the air-dried drug.

2.2.4. –Determination of Acid Insoluble Ash

Boil the ash obtained in (2.2.3) for 5 minutes with 25 ml of *dilute hydrochloric acid;* collect the insoluble matter in a Gooch crucible, or on an ashless filter paper, wash with hot water and ignite to constant weight. Calculate the percentage of acid-insoluble ash with reference to the air dried drug.

2.2.5. –Determination of Water Soluble Ash

Boil the ash for 5 minutes with 25 ml of water; collect insoluble matter in a Gooch crucible, or on an ashless filter paper, wash with hot water, and ignite for 15 minutes at a temprature not exceeding 450°.

Substract the weight of the insoluble matter from the weight of the ash; the difference in weight represents the water-soluble ash. Calculate the percentage of water-soluble ash with reference to the air-dried drug.

2.2.6. –Determination of Alcohol Soluble Extractive

Macerate 5 g of the air dried drug, coarsely powdered, with 100 ml of Alcohol of the specified strength in a closed flask for twenty-four hours, shaking frequently during six hours and allowing to stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105°, to constant weight and weigh. Calculate the percentage of alcohol-soluble extractive with reference to the air-dried drug.

2.2.7. –Determination of Water Soluble Extractive

Proceed as directed for the determination of Alcohol-soluble extractive, using *chloroform water* instead of ethanol.

2.2.8. –Determination of Ether Soluble Extractive (Fixed Oil Content)

Transfer a suitably weighed quantity (depending on the fixed oil content) of the air dried, crushed drug to an extraction thimble, extract with *Solvent ether* (or petroleum *ether,* b.p. 40° to 60°) in a continuous extraction apparatus (Soxhlet extractor) for 6 hours. Filter the extract quantitatively into a tared evaporating dish and evaporate off the solvent on a water bath. Dry the residue at 105° to constant weight. Calculate the percentage of ether-soluble extractive with reference to the air-dried drug.

2.2.9. –Determination of Moisture Content (Loss on Drying)

Procedure set forth here determines the amount of volatile matter (i.e., water drying off from the drug). For substances appearing to contain water as the only volatile constituent, the procedure given below, is appropriately used.

Place about 10 g of drug (without preliminary drying) after accurately weighing (accurately weighed to within 0.01 g) it in a tared evaporating dish. For example, for underground or unpowderdd drug, prepare about 10 g of the sample by cutting shredding so that the parts are about 3 mm in thickness.

Seeds and fruits, smaller than 3 mm should be cracked. Avoid the use of high speed mills in preparing the samples, and exercise care that no appreciable amount of moisture is lost during preparation and that the portion taken is representative of the official sample. After placing the above said amount of the drug in the tared evaporating dish dry at 105° for 5 hours, and weigh. Continue the drying and weighing at one hour interval until difference between two successive weighings corresponds to not more than 0.25 per cent. Constant weight is reached when two consecutive weighings after drying for 30 minutes and cooling for 30 minutes in a desiccator, show not more than 0.01 g difference.

2.2.10. –Determination of Volatile Oil in Drugs

The determination of volatile oil in a drug is made by distilling the drug with a mixture of *water* and *glycerin,* collecting the distillate in a graduated tube in which the aqueous portion of the distillate is automatically separated and returned to the distilling flask, and measuring the volume of the oil. The content of the volatile oil is expressed as a percentage v/w.

The apparatus consists of the following parts (See Fig. 3) . The apparatus described below is recommended but any similar apparatus may be used provided that it permits complete distillation of the volatile oil. All glass parts of the apparatus should be made of good quality resistance glass.

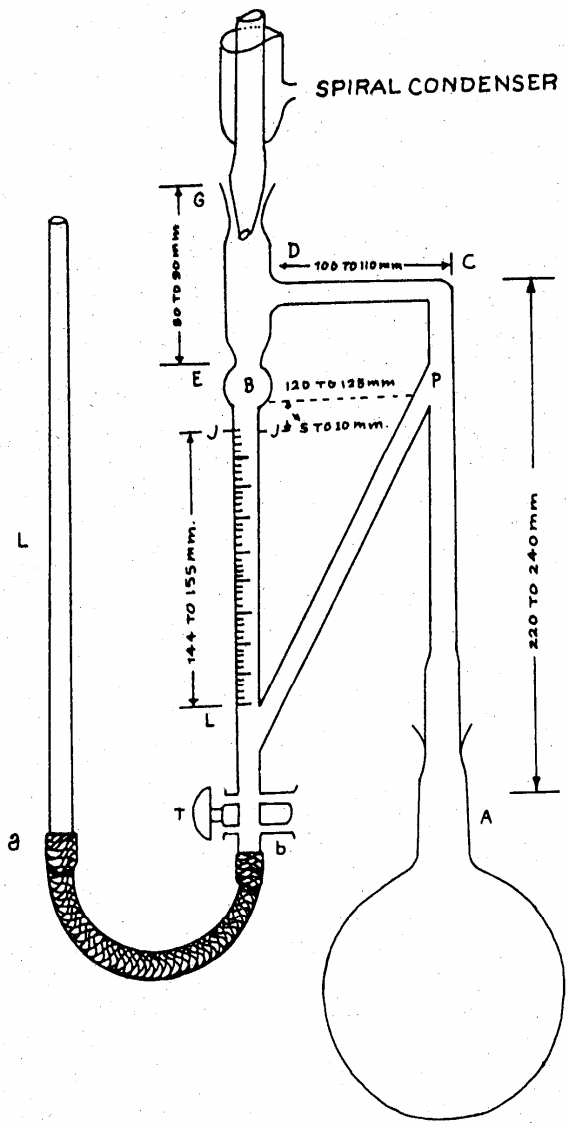

Fig. 3 Apparatus for volatile oil determination

(a) Distilling Flask –A spherical flask, 1,000 ml capacity with ground neck, taper of ground socket 1 in 10, internal diameter of larger end 34.35 to 34.65 mm

(b) Still head –graduated measuring tube, and return flow tube made in one piece, in accordance with the following specifications. External diameter of the smaller end 31.0 to 31.2 mm. Minimum length of the ground zone –34 mm.

Tube AC, length –220 to 240 mm.
Internal diameter –13 to 15 mm.

Bulb CD, length –100 to 110 mm.
Internal diameter –13 to 15 mm.

Spiral condenser –ground joint accurately fitting in the ground neck of the tube EG, taper 1 in 10.

Tube EG, length –80 to 90 mm.
Internal Diameter –30 to 40 mm.
Bulb B –length 20 to 22 mm.
Internal diameter –15 to 20 mm.

The distance between B and P is 120 to 125 mm.

Junction P and the centre of the bulb B must be in the same horizontal plane.

Measuring tube JL –length of the graduated portion 144 to 155 mm capacity 2 millilitres graduated into fifths and fiftieths of a millilitre.

Tube PL –return flow tube –Internal diameter –7 to 8 mm.
Levelling tube I, length –450 to 500 mm. Internal diameter 10 to 12 mm tapering at the lower end with a wide top (20 to 25 mm diameter).
Rubber tubing a—b length 450 to 500 mm. Internal diameter 5 to 8 mm.

(c) **Burner** – A luminous Argand burner with chimney and sensitive regulative tap.

(d) **Stand** –A retort stand with asbestos covered ring and clamp carrying a piece of metal tubing connected by a short length of rubber tubing with the water inlet tube of the condenser jacket.

The Whole of the apparatus is effectively screened from draught.

The apparatus is cleaned before each distillation by washing successively with *acetone* and *water,* then inverting it, filling it with *chromic sulphuric acid* mixture, after closing the open end at G, and allowing to stand, and finally rinsing with water.

Method of determination

A suitable quantity of the coarsely powdered drug together with 75 ml of *glycerin* and 175 ml of *water* in the one litre distilling flask, and a few pieces of porous earthen ware and one filter paper 15 cm cut into small strips, 7 to 12 mm wide, are also put in the distilling flask, which is then connected to the still head. Before attaching the condenser, water is run into the graduated receiver, keeping the tap T open until the water overflows, at P. Any air bubbles in the rubber tubing a—b are carefully removed by pressing the tube. The tap is then closed and the condenser attached. The contents of the flask are now heated and stirred by frequent agitation until ebullition commences. The distillation is continued at a rate which keeps the lower end of the condenser cool. The flask is rotated occasionally to wash down any material that adheres to its sides.

At the end of the specified time (3 to 4 hours) heating is discontinued, the apparatus is allowed to cool for 10 minutes and the tap T is opened and the tube L_1 lowered slowly; as soon as the layer of the oil completely enters into the graduated part of the receiver the tap is closed and the volume is read.

The tube L_1 is then raised till the level of water in it is above the level of B, when the tap T is slowly opened to return the oil to the bulb. The distillation is again continued for another hour and the volume of oil is again read, after cooling the apparatus as before. If necessary, the distillation is again continued until successive readings of the volatile oil do not differ.

The measured yield of volatile oil is taken to be the content of volatile oil in the drug.

The dimensions of the apparatus may be suitably modified in case of necessity.

2.2.11. –Special processes used in Alkaloidal Assays

2.2.11.a –CONTINUOUS EXTRACTION OF DRUG –

Where continuous extraction of a drug of any other substance is recommended in the monograph, the process consists of percolating it with a suitable solvents at a temperature approximately that of the boiling point of the solvent. Any apparatus that permits the uniform percolation of the drug and the continuous flow of the vapour of the solvent around the percolator may be used. The type commonly known as the Soxhlet apparatus is suitable for this purpose.

A simple apparatus is shown in the accompanying illustraion. A is an outer tube of stout glass; the wider part is about 18 cm in length and has an internal diameter of 4.8 to 5 cm; the lower end C is about 5 cm in length and has an external diameter of about 1.6 cm . B is a straight glass tube open at both ends, about 9 cm in length and having an external diameter of about 3.8 cm; over its lower flanged end is tied firmly with a piece of calico or other suitable material. D is a glass coil, which supports the margin of the tube B and prevents it from resting in contact with the outer tube A. The lower end C of the outer tube A is fitted by a cork to the distilling flask E, in which a suitable quantity of the solvent has been placed. The substance to be extracted, previously moistened with the solvent or subjected to any preliminary treatment required, is introduced into the inner tube B, which is supported so that the percolate drops into the outer tube. A pad of cotton wool G is placed on the top of the drug, the inner tube is lowered into position and the outer tube connected by means of a suitable cork with the tube of a reflux condenser F. The flask is heated and the extraction continued as directed (See Fig. 4).

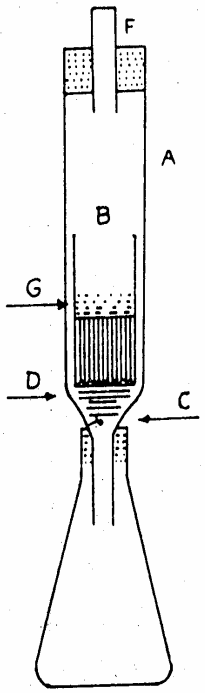

Fig. 4 Apparatus for the continuous extraction of Drugs

2.2.11.b –TESTS FOR COMPLETE EXTRACTION OF ALKALOIDS–Complete extraction is indicated by the following tests :

When extracting with an aqueous or alcoholic liquid –After extracting at least three times with the liquid, add to a few drops of the next portion, after acidifying with 2 *N hydrochloric acid* if necessary, 0.05 ml of potassium mercuri-iodide solution or for solanaceous alkaloids 0.05 ml of *potassium iodobismuthate solution;* no precipitate or turbidity, is produced.

When extracting with an immiscible solvent –After extracting at least three times with the solvent, add to 1 to 2 ml of the next portion 1 to 2 ml of 0.1 *N hydrochloric acid,* remove the organic solvent by evaporation, transfer the aqueous residue to a test tube, and add 0.05 ml of *potassium mercuri-iodide solution* for solanaceous alkaloids 0.05 ml of *potassium iodobismuthate solution* or for emetine, 0.05 ml of *iodine solution;* not more than a very faint opalescenece is produced.

2.2.12 Thin-Layer Chromatography (TLC)

Thin-layer chromatography is a technique in which a solute undergoes distribution between two phases, a stationary phase acting through adsorption and a mobile phase in the form of a liquid. The adsorbent is a relatively thin, uniform layer of dry finely powdered material applied to a glass, plastic or metal sheet or plate. Glass plates are most commonly used. Separation may also be achieved on the basis of partition or a combination of partition and adsorption, depending on the particular type of support, its preparation and its use with different solvent.

Identification can be effected by observation of spots of identical R_f value and about equal magnitude obtained, respectively, with an unknown and a reference sample chromatographed on the same plate. A visual comparison of the size and intensity of the spots usually serves for semi-quantitative estimation.

Apparatus

(a) Flat glass plates of appropriate dimensions which allow the application at specified points of the necessary quantities of the solution being examined and appropriate reference solutions and which allow accommodation of the specified migration path-length. The plates are prepared as described below; alternatively, commercially prepared plates may be used.

(b) An aligning tray or a flat surface on which the plates can be aligned and rested when the coating substance is applied.

(c) The adsorbent or coating substance consisting of finely divided adsorbent materials, normally 5 μm to 40 μm in diameter, is suitable for chromatography. It can be applied directly to the plate or can be bonded to the plate by means of Plaster of Paris (Hydrated Calcium Sulphate) or with any other suitable binders. The adsorbent may contain fluorescing material to help in visualising spots that absorb ultra-violet light.

(d) A spreader which, when moved over the glass plate, will apply a uniform layer of adsorbent of desired thickness over the entire surface of the plate.

(e) A storage rack to support the plates during drying and transportation.

(f) A developing chamber that can accommodate one or more plates and can be properly closed and sealed. The chamber is fitted with a plate support rack that supports the plates, back to back, with lid of the chamber in place.

(g) Graduated micro-pipettes capable of delivering microlitre quantities say 10 µl and less.

(h) A reagent sprayer that will emit a fine spray and will not itself be attacked by the reagent.

(i) An ultra-violet light, suitable for observation at short (254 nm) and long (365 nm) ultra-violet wavelengths.

Preparation of plates –Unless otherwise specified in the monograph, the plates are prepared in the following manner. Prepare a suspension of the coating substance in accordance with the instructions of the supplier and, using the spreading device designed for the purpose, spread a uniform layer of the suspension, 0.25 to 0.30 mm thick, on a flat glass plate 20 cm long. Allow the coated plates to dry in air, heat at 100° to 105° for at least 1 hour (except in the case of plates prepared with cellulose when heating for 10 minutes is normally sufficient) and allow to cool, protected from moisture. Store the plates protected from moisture and use within 3 days of preparation. At the time of use, dry the plates again, if necessary, as prescribed in the monographs.

Method

Unless unsaturated conditions are prescribed, prepare the tank by lining the walls with sheets of filter paper; pour into the tank, saturating the filter paper in the process, sufficient of the mobile phase to form a layer of solvent 5 to 10 mm deep, close the tank and allow to stand for 1 hour at room temperature. Remove a narrow strip of the coating substance, about 5 mm wide, from the vertical sides of the plate. Apply the solutions being examined in the form of circular spots about 2 to 6 mm in diameter, or in the form of bands (10 to 20 mm x 2 to 6 mm unless otherwise specified) on a line parallel with, and 20 mm from, one end of the plate, and not nearer than 20 mm to the sides; the spots should be 15 mm apart. If necessary, the solutions may be applied in portions, drying between applications. Mark the sides of the plate 15 cm, or the distance specified in the monograph, from the starting line. Allow the solvent to evaporate and place the plate in the tank, ensuring that it is as nearly vertical as possible and that the spots or bands are above the level of the mobile phase. Close the tank and allow to stand at room temperature, until the mobile phase has ascended to the marked line. Remove the plate and dry and visualise as directed in the monograph; where a spraying technique is prescribed it is essential that the reagent be evenly applied as a fine spray.

For two-dimensional chromatography dry the plate after the first development and carry out the second development in a direction perpendicular to the first.

When the method prescribed in the monograph specified 'protected from light' or 'in subdued light' it is intended that the entire procedure is carried out under these conditions.

Visualisation

The phrases *ultra-violet light (254 nm)* and *ultra-violet light (365 nm)* indicate that the plate should be examined under an ultra-violet light having a maximum output at about 254 or at about 365 nm, as the case may be.

The term *secondary spot* means any spot other than the principal spot. Similarly, a *secondary band* is any band other than the principal band.

Rf. Value

Measure and record the distance of each spot from the point of its application and calculate the Rf. value by dividing the distance travelled by the spots by the distance travelled by the front of the mobile phase.

2.3. LIMIT TESTS

2.3.1 Limit Test for Arsenic

In the limit test for arsenic, the amount of arsenic present is expressed as arsenic, As

Apparatus –

A wide-mouthed bottle capable of holding about 120 ml is fitted with a rubber bung through which passes a glass tube. The latter, made from ordinary glass tubing, has a total length of 200 mm and an internal diameter of exactly 6.5 mm (external diameter about 8 mm). It is drawn out at one end to a diameter of about 1 mm and a hole not less than 2 mm in diameter is blown in the side of the tube, near the constricted part. When the bung is inserted in the bottle containing 70 ml of liquid, the constricted end of the tube is above the surface of the liquid, and the hole in the side is below the bottom of the bung. The upper end of the tube is cut off square, and is either slightly rounded or ground smooth.

Two rubber bungs (about 25 mm X 25 mm), each with a hole bored centrally and true, exactly 6.5 mm in diameter, are fitted with a rubber band or spring clip for holding them tightly together. Alternatively the two bungs may be replaced by any suitable contrivance satisfying the conditions described under *the General Test.*

Reagents –

Ammonium oxalate AsT : *Ammonium oxalate* which complies with the following additional test :

Heat 5 g with 15 ml of *water,* 5 ml of *nitric acid AsT,* and 10 ml of *Sulphuric acid AsT* in narrow necked, round-bottomed flask until frothing ceases, cool, and apply the General Test; no visible stain is produced.

Arsenic solution, dilute, AsT :

Strong Arsenic solution AsT		1 ml
Water	sufficient to produce	100 ml

Dilute arsenic solution AsT must be freshly prepared.
1 ml contains 0.01 mg of arsenic, As.

Arsenic solution, strong, AsT :

Arsenic trioxide		0.132 g
Hydrochloric acid		50 ml
Water	sufficient to produce	100 ml

Brominated hydrochloric acid AsT :

Bromine solution AsT	1 ml
Hydrochloric acid AsT	100 ml

Bromine solution AsT :

Bromine		30 g
Potassium bromide		30 g
Water	sufficient to produce	100 ml

It complies with the following test :

Evaporate 10 ml on a water-bath nearly to dryness, add 50 ml of water, 10 ml of *hydrochloric acid AsT* and sufficient *stannous chloride solution AsT* to reduce the remaining bromine and apply the General Test; the stain produced is not deeper than 1 ml *standard stain,* showing that the proportion of arsenic present does not exceed 1 part per million.

Citric acid AsT : *Citric acid* which complies with the following additional tests : Dissolve 10 g in 50 ml of water add 10 ml of *stannated hydrochloric acid AsT* and apply the General Test; no visible stain is produced.

Hydrochloric acid AsT : *Hydrochloric acid* diluted with *water* to contain about 32 per cent w/w of HCI and complying with the following additional tests :

(i) Dilute 10 ml with sufficient water to produce 50 ml, add 5 ml of *ammonium thiocyanate solution* and stir immediately; no colour is produced.

(ii) To 50 ml add 0.2 ml of *bromine solution AsT,* evaporate on a water-bath until reduced to 16 ml adding more *bromine solution AsT,* if necessary, in order that an excess, as indicated by the colour, may be present throughout the evaporation; add 50 ml of *water* and 5 drops of *stannons chloride solution AsT,* and apply the General Test; the stain producted is not deeper than a 0.2 ml *standard stain* prepared with the same acid, showing that the proportion of arsenic present does not exceed 0.05 part per million.

Hydrochloric acid (constant-boiling composition) AsT : Boil *hydrochloric acid AsT to constant boiling Composition* in the presence of *hydrazine hydrate,* using 1 ml of 10 per cent w/v solution in *water* per litre of the acid.

Mercuric chloride paper – Smooth white filter paper, not less than 25 mm in width, soaked in a saturated solution of *mercuric chloride,* pressed to remove superfluous solution, and dried at about 60°, in the dark. The grade of the filter paper is such that the weight is between 65 and 120 g per sq. mm; the thickness in mm of 400 papers is approximately equal numerically, to the weight in g per sq. mm.

Nitric acid AsT : *Nitric acid* which complies with the following additional test :

Heat 20 ml in a porcelain dish with 2 ml of *sulphuric acid AsT,* until white fumes are given off. Cool, add 2 ml of water, and again heat until white fumes are given off; cool, add 50 ml of water and 10 ml of *stannated hydrochloric acid AsT,* and apply the General Test; no visible stain is produced.

Potassium chlorate AsT : *Potassium chlorate* which complies with the following additional test :

Mix 5 g in the cold with 20 ml of *water* and 22 ml of *hydrochloric acid AsT;* when the first reaction has subsided, heat gently to expel chlorine, remove the last traces with a few drops of *stannous chloride solution AsT,* add 20 ml of water, and apply the General Test; no visible stain is produced.

NOTE –Murcuric chloride paper should be stored in a stoppered bottle in the dark. Paper which has been exposed to sunlight or to the vapour of ammonia affords a lighter stain or no stain at all when empolyed in the limit test for arsenic.

Potassium iodide AsT : *Potassium iodide* which complies with the following additional test :

Dissolve 10 g in 25 ml of *hydrochloric acid AsT* and 35 ml of *water,* add 2 drops of *stannous chloride solution AsT* and apply the General Test; no visible stain is produced.

Sodium carbonate, anhydrous AsT : *Anhydrous sodium carbonate* which complies with the following additional test :

Dissolve 5 g in 50 ml of *water,* add 20 ml of *brominated hydrochloric acid AsT,* remove the excess of bromine with a few drops of *stannous chloride solution AsT,* and apply the General Test; no visible stain is produced.

Stannated hydrochloric acid AsT :

Stannous chloride solution AsT	1ml
Hydrochloric Acid AsT	100 ml

Stannous chloride solution AsT : Prepared from *stannous chloride solution* by adding an equal volume of *hydrochloric acid,* boiling down to the original volume, and filtering through a fine-grain filter paper.

It complies with the following test :

To 10 ml add 6 ml of water and 10 ml of *hydrochloric acid AsT,* distil and collect 16 ml. To the distillate and 50 ml of *water* and 2 drops of *stannuous chloride solution AsT* and apply the General Test; the stain produced is not deeper than a 1-ml *standard stain,* showing that the proportion of arsenic present does not exceed 1 part per million.

Sulphuric acid AsT : *Sulphuric acid* which complies with the following additional test :

Dilute 10 g with 50 ml of water, add 0.2 ml of *stannous chloride solution AsT,* and apply the General Test; no visible stain is produced.

Zinc AsT : *Granulated zinc* which complies with following additional test :

Add 10 ml of *stannated hydrochloric acid AsT* to 50 ml of *water,* and apply the General Test, using 10 of the zinc and allowing the action to continue for one hour; no visible stain is produced (limit of arsenic). Repeat the test with the addition of 0.1 ml of *dilute arsenic solution AsT;* a faint but distinct yellow stain is produced (test for sensitivity).

General Method of Testing – By a variable method of procedure suitable to the particular needs of each substance, a solution is prepared from the substance being examined which may or may not contain that substance, but contains the whole of the arsenic (if any) originally present in that substance. This solution, referred to as the 'test solution', is used in the actual test.

General Test – The glass tube is lightly packed with cotton wool, previously moistened with *lead acetate solution* and dried, so that the upper surface of the cotton wool is not less than 25 mm below the top of the tube. The upper end of the tube is then inserted into the narrow end of one of the pair of rubber bungs, either to a depth of about 10 mm when the tube has a rounded-off end, or so that the ground end of the tube is flush with the larger end of the bung. A piece of *mercuric chloride paper* is placed flat on the top of the bung and the other bung placed over it and secured by means of the rubber band or spring clip in such a manner that the borings of the two bungs (or the upper bung and the glass tube) meet to form a true tube 6.5 mm in diameter interrupted by a diaphragm of *mercuric chloride paper.*

Instead of this method of attaching the *mercuric chloride paper,* any other method may be used provided (1) that the whole of the evolved gas passes through the paper; (2) that the portion of the paper in contact with the gas is a circle 6.5 mm in diameter; and (3) that the paper is protected from sunlight during the test. The test solution prepared as specified, is placed in the wide-mouthed bottle, 1 g of *potassium iodide AsT* and 10 g of *zinc AsT* added, and the prepared glass tube is placed quickly in position. The action is allowed to proceed for 40 minutes. The yellow stain which is produced on the *mercuric chloride paper* if arsenic is present is compared by day light with the *standard stains* produced by operating in a similar manner with known quantities of *dilute arsenic solution AsT*. The comparison of the stains is made immediately at the completion of the test. The *standard stains* used for comparison are freshly prepared; they fade on keeping.

By matching the depth of colour with *standard stains*, the proportion of arsenic in the substance may be determined. A stain equivalent to the 1-ml *standard stain*, produced by operating on 10 g of substance indicates that the proportion of arsenic is 1 part per million.

NOTE – (1) The action may be accelerated by placing the apparatus on a warm surface, care being taken that the mercuric chloride paper remains dry throughout the test.

(2) The most suitable temperature for carrying out the test is generally about 40° but because the rate of the evoluion of the gas varies somewhat with different batches zinc AsT, the temperature may be adjusted to obtain a regular, but not violent, evolution of gas.

(3) The tube must be washed with *hydrochloric acid AsT*, rinsed with water and dried between successive tests.

Standard Stains – Solutions are prepared by adding to 50 ml of water, 10 ml of *stannated hydrochloric acid AsT* and quantities of *dilute arsenic solutions AsT* varying from 0.2 ml to 1 ml. The resulting solutions, when treated as described in the General Test, yield stains on the *mercuric chloride paper* referred to as the standard stains.

Preparation of the Test Solution

In the various methods of preparing the test solution given below, the quantities are so arranged unless otherwise stated, that when the stain produced from the solution to be examined is not deeper than the 1-ml *standard stain,* the proportion of arsenic present does not exceed the permitted limit.

Ammonium chloride – Dissolve 2.5 g in 50 ml of *water,* and 10 ml of *stannated hydrochloric acid AsT.*

Boric acid – Dissolve 10 g with 2 g of *citric acid AsT* in 50 ml water, and add 12 ml of *stannated hydrochloric acid AsT.*

Ferrous sulphate – Dissolve 5 g in 10 ml of *water and 15 ml of stannated hydrochloric* acid *AsT and* disitil 20 ml; to the distillate add a few drops of *bromine solution AsT.* Add 2 ml of *stannated hydrochloric acid AsT,* heat under a reflux condenser for one hour, cool, and add 10 ml of *water* and 10 ml of *hydrochloric acid AsT.*

Glycerin – Dissolve 5 g in 50 ml of water, and add 10 ml of *stannated hydrochloric acid AsT.*

Hydrochloric acid – Mix 10 g with 40 ml of water and 1 ml of *stannous chloride solution AsT.*

Magnesium sulphate – Dissolve 5 g in 50 ml of *water* and add 10 ml of *stannated hydrochloric acid AsT.*

Phosphoric acid – Dissolve 5 g in 50 ml of *water* and add 10 ml of *stannated hydrochloric acid AsT*

Potassium iodide – Dissolve 5 g in 50 ml of *water* and add 2 ml of *stannated hydrochloric acid AsT.*

Sodium bicarbonate – Dissolve 5 g in 50 ml of *water* and add 15 ml of *brominated hydrochloric acid AsT,* and remove the excess of bromine with a few drops of *stannous chloride solution AsT.*

Sodium hydroxide – Dissolve 2.5 g in 50 ml of *water,* add 16 ml of *brominated hydrochloric acid AsT,* and remove the excess of *bromine* with a few drops of *stannous chloride solution AsT.*

2.3.2 –Limit Test for Chlorides

Dissolve the specified quantity of the substance in *water* or prepare a solution as directed in the text and transfer to a *Nessler cylinder.* Add 10 ml of *dilute nitric acid,* except when nitric acid is used in the preparation of the solution, dilute to 50 ml with water, and add 1 ml of *silver nitrate solution.* Stir immediately with a glass rod and allow to stand for 5 minutes. The opalescence produced is not greater than the *standard opalescence,* when viewed transversely.

Standard Opalescence

Place 1.0 ml of a 0.05845 percent w/v solution of *sodium chloride* and 10 ml of *dilute nitric acid* in a *Nessler cylinder.* Dilute to 50 ml with water and add 1 ml of *silver nitrate solution.* Stir immediately with a glass rod and allow to stand for five minutes.

2.3.3 –Limit Test For Heavy Metals

The test for heavy metals is designed to determine the content of metallic impurities that are coloured by sulphide ion, under specified conditions. The limit for heavy metals is indicated in the individual monographs in terms of the parts of lead per million parts of the substance (by weight), as determined by visual comparison of the colour produced by the substance with that of a control prepared from a standard lead solution.

Determine the amount of heavy metals by one of the following methods and as directed in the individual monographs. Method A is used for substances that yield clear colourless solutions under the specified test conditions. Method B is used for substances that do not yield clear, colourless solutions under the test conditions specified for method A, or for substances which, by virtue of their complex nature, interfere with the precipitation of metals by sulphide ion. Method C is used for substances that yield clear, colourless solutions with *sodium hydroxide solutions.*

Special Reagents –

Acetic acid Sp. – *Acetic acid* which complies with the following additional test : Make 25 ml alkaline with *dilute ammonia solution Sp.,* add 1 ml of *potassium cyanide solution Sp.,* dilute to 50 ml with *water* and add two drops of *sodium sulphide* solution; no darkening is produced.

Dilute acetic acid Sp. – *Dilute acetic acid* which complies with the following additional test – Evaporate 20 ml in a porcelain dish, nearly to dryness on a water-bath. Add to the residue 2 ml of the acid and dilute with water to 25 ml, add 10 ml of *hydrogen sulphide solution.* Any dark colour produced is not more than that of a control solution consisting of 2 ml of the acid and 4.0 ml of *standard lead solution* diluted to 25 ml with *water.*

Ammonia solution Sp. – *Strong ammonia solution* which complies with the following additional test : Evaporate 10 ml to dryness on a water-bath; to the residue add 1 ml of *dilute hydrochloric acid Sp.* and evaporate to dryness. Dissolve the residue in 2 ml of dilute acetic acid Sp. Add sufficient water to produce 25 ml.

Add 10 ml of *hydrogen sulphide solution.* Any darkening produced is not greater than in a blank solution containing 2 ml of dilute acetic acid Sp. 1.0 ml of *standard lead solution* and sufficient *water* to produce 25 ml.

Dilute ammonia solution Sp. – *Dilute ammonia solution* which complies with the following additional test : To 20 ml add 1 ml of *potassium cyanide solution Sp.*, dilute to 50 ml with *water*, and add two drops of *sodium sulphide solution;* no darkening is produced.

Hydrochloric acid – *Hydrochloric acid* which complies with the following additional test : Evaporate off the acid in a beaker to dryness on a water-bath. Dissolve the residue in 2 ml of *dilute acid Sp.*, dilute to 17 ml with water and add 10 ml of *hydrogen sulphide solution;* any darkening produced is not greater than in a blank solution containing 2.0 ml of *standard lead solution*, 2 ml of *dilute acetic acid Sp.* and dilute to 40 ml with water.

Dilute hydrochloric acid Sp. – *Dilute hydrochloric acid,* which complies with the following additonal test: Treat 10 ml of the acid in the manner described under *Hydrochloric acid Sp.*

Lead nitrate stock solution – Dissolve 0.1598 g of *lead nitrate* in 100 ml of *water* to which has been added 1 ml of *nitric acid,* then dilute with *water* to 1000 ml.

This solution must be prepared and stored in polyethylene or glass containers free from soluble lead salts.

Standard lead solution – On the day of use, dilute 10.0 ml of *lead nitrate stock solution* with *water* to 100.0 ml. Each ml of *standard lead solution* contains the equivalent of 10 µg of lead. A control comparison solution prepared with 2.0 ml of standard lead solution contains, when compared to a solution representing 1.0 g of the substance being tested, the equivalent of 20 parts per million of lead.

Nitric acid Sp. –*Nitric acid* which complies with the following additional test : Dilute 10 ml with 10 ml of *water,* make alkaline with *ammonia solution Sp.*, add 1 ml of *potassium cyanide solution Sp.*, dilute to 50 ml with water, and add two drops of *sodium sulphide solution;* no darkening is produced.

Potassium cyanide solution Sp. – See Appendix 2.3.5.

Sulphuric acid Sp. – Sulphuric acid which complies with following additional test : Add 5 g to 20 ml of *water* make alkaline with *ammonia solution Sp.*, add 1 ml of *potassium cyanide solution Sp.*, dilute to 50 ml with *water* and add two drops of *sodium sulphide solution;* no darkening is produced.

Method A

Standard solution – Into a 50 ml *Nessler cylinder,* pipette 2 ml of *standard lead solution* and dilute with *water* to 25 ml. Adjust with *dilute acetic acid Sp.* or *dilute ammonia solution Sp* to a pH between 3.0 and 4.0, dilute with *water* to about 35 ml, and mix.

Test solution – Into a 50 ml *Nessler cylinder,* place 25 ml of the solution prepared for the test as directed in the individual monogrpah, or using the stated volume of acid when specified in the individual monograph, dissolve and dilute with *water* to 25 ml the specified quantity of the substance being tested. Adjust with *dilute acetic acid Sp.* or *dilute ammonia solution Sp.* to a pH between 3.0 and 4.0, dilute with *water* to about 35 ml and mix.

Procedure – To each of the cylinders containing the *standard solution* and *test* solution respectively add 10 ml of freshly prepared *hydrogen sulphide solution,* mix, dilute with *water* to 50 ml, allow to stand for five minutes, and view downwards over a white surfac; the colour produced in the *test solution* is not darker than that produced in the *standard solution.*

Method B

Standard solution – Proceed as directed under Method A.

Test solution – Weigh in a suitable crucible the quantity of the substance specified in individual monograph, add sufficient *sulphuric acid Sp.* to wet the sample, and ignite carefully at a low temperature until thoroughly charred. Add to the charred mass 2 ml of *nitric acid Sp.* and five drops of *sulphuric acid Sp.* and heat cautiously until white fumes are no longer evolved. Ignite, preferably in a muffle furnace, at 500° to 600° until the carbon is completely burnt off. Cool, add 4 ml of *hydrochloric acid Sp.*, cover, digest on a water bath for 15 minutes, uncover and slowly evaporate to dryness on a water-bath. Moisten the residue with one drop of *hydrochloric acid Sp.*, add 10 ml of hot water and digest for two minutes. Add *ammonia solution Sp.*, dropwise, until the solution is just alkaline to *litmus paper*, dilute with *water* to 25 ml and adjust with dilute acetic acid Sp. to a pH between 3.0 and 4.0. Filter if necessary, rinse the crucible and the filter with 10 ml of water, combine the filtrate and washings in a 50 ml *Nessler cylinder*, dilute with *water*, to about 35 ml, and mix. Procedure : Proceed as directed under Method A.

Method C

Standard solution – Into a 50 ml *Nessler cylinder*, pipette 2 ml of *standard lead solution*, add 5 ml of *dilute sodium hydroxide solution.*, dilute with *water* to 50 ml and mix.

Test solution – Into a 50 ml *Nessler cylinder*, place 25 ml of the solution prepared for the test as directed in the individual monograph; or, if not specified otherwise in the individual monograph, dissolve the specified quantity in a mixture of 20 ml of *water* and 5 ml of *dilute sodium hydroxide solution.* Dilute 50 ml with water and mix.

Procedure –To each of the cylinders containing the *standard solution* and the *test solution*, respectively add 5 drops of *sodium sulphide solution*, mix, allow to stand for five minutes and view downwards over a white surface; the colour produced in the *test solution* is not darker than that produced in the *standard solution.*

2.3.4. Limit Test For Iron

Standard iron solution – Weigh accurately 0.1726 g of *ferric ammonium sulphate* and dissolve in 10 ml of 0.1 *N sulphuric acid* and sufficient *water* to produce 1000.0 ml. Each ml of this solution contains 0.02 mg of Fe.

Method

Dissolve the specified quantity of the substance being examined in 40 ml of *water*, or use 10 ml of the solution precribed in the monograph, and transfer to a *Nessler cylinder.* Add 2 ml of a 20 per cent w/v solution of *iron-free citric acid* and 0.1 ml of *thioglycollic acid*, mix, make alkaline with *iron-free ammonia solution*, dilute to 50 ml with *water* and allow to stand for five minutes. Any colour produced is not more intense than the standard colour.

Standard colour – Dilute 2.0 ml of *standard iron solution* with 40 ml of *water* in a *Nessler cylinder.* Add 2 ml of a 20 per cent w/v solution of *iron-free citric acid* and 0.1 ml of *thioglycollic acid*, mix, make alkaline with *iron-free ammonia solution*, dilute to 50 ml with *water* and allow to stand for five minutes.

2.3.5. Limit Test for Lead

The following method is based on the extraction of lead by solutions of dithizone. All reagents used for the test should have as low a content of lead as practicable. All reagent solutions should be stored in containers of borosilicate glass. Glassware should be rinsed thoroughly with warm *dilute nitric acid*, followed by *water.*

Special Reagents

(1) **Ammonia-cyanide solution Sp.** – Dissolve 2 g of *potassium cyanide* in 15 ml of *strong ammonia solution* and dilute with *water* to 100 ml.

(2) **Ammonium citrate solution Sp.** – Dissolve 40 g of *citric acid* in 90 ml *water.* Add two drops of *phenol red solution* then add slowly *strong ammonia solution* until the solution acquires a reddish colour. Remove any lead present by extracting the solution with 20 ml quantities of *dithizone extraction solution* until the dithizone solution retains its orange-green colour.

(3) **Dilute standard lead solution** – Dilute 10.0 ml of *standard lead solution* with sufficient 1 per cent v/v solution of nitric acid to produce 100.0 ml. Each ml of this solution contains 1 µg of lead per ml.

(4) **Dithizone extraction solution** –Dissolve 30 mg of *diphenylthiocarbazone* in 1000 ml of *chloroform* and add 5 ml of *alcohol.* Store the solution in a refrigerator. Before use, shake a suitable volume of the solution with about half its volume of 1 per cent v/v solution of *nitric acid* and discard the acid.

(5) **Hydroxylamine hydrochloride solution Sp.** – Dissolve 20 g of *hydroxylamine hydrochloride* in sufficient *water* to produce about 65 ml. Transfer to separator, add five drops of *thymol blue solution,* add *strong ammonia solution* until the solution becomes yellow. Add 10 ml of a 4 per cent w/v solution of *sodium diethyldithiocarbamate* and allow to stand for five minutes. Extract with successive quantities, each of 10 ml, of *chloroform* until a 5 ml portion of the extract does not assume a yellow colour when shaken with dilute copper sulphate solution. Add *dilute hydrochloric acid* until the solution is pink and then dilute with sufficient water to produce 100 ml.

(6) **Potassium cyanide solution Sp.** – Dissolve 50 g of potassium cyanide in sufficient *water* to produce 100 ml. Remove the lead from this solution by extraction with successive quantities, each of 20 ml of *dithizone extraction solution* until the dithizone solution retains its orange-green colour. Extract any dithizone remaining in the cyanide solution by shaking with *chloroform.* Dilute this cyanide solution with sufficient *water* to produce a solution containing 10 g of *potassium cyanide* in each 100 ml.

(7) **Standard dithizone solution** – Dissolve 10 ml of *diphenylthiocarbazone* in 1000 ml of *chloroform.* Store the solution in a glass-stoppered, lead-free bottle, protected from light and in a refrigerator.

(8) **Citrate-cyanide wash solution** – To 50 ml of *water* add 50 ml of *ammonium citrate solution Sp.* and 4 ml of *potassium cyanide solution Sp.,* mix, and adjust the pH, if necessary, with strong *ammonia solution* to 9.0.

(9) **Buffer solution pH 2.5** – To 25.0 ml of 0.2 *M potassium hydrogen phthalate add* 37.0 ml of 0.1 N *hydrochloric acid,* and dilute with sufficient *water* to produce 100.0 ml.

(10) **Dithizone-carbon tetrachloride solution** –Dissolve 10 mg of *diphenylthiocarbazone* in 1000 ml of carbon tetrachloride. Prepare this solution fresh for each determination.

(11) **pH 2.5 wash solution** – To 500 ml of a 1 per cent v/v *nitric acid* add *strong ammonia solution* until the pH of the mixture is 2.5, then add 10 ml of *buffer solution* pH 2.5 and mix.

(12) **Ammonia-cyanide wash solution** – To 35 ml of pH 2.5 *wash solution* add 4 ml of *ammonia-cyanide solution Sp.,* and mix.

Method

Transfer the volume of the prepared sample directed in the monograph to a separator, and unless otherwise directed in monograph, add 6 ml of *ammonium citrate solution Sp.,* and 2 ml *hydroxylamine hydrochloride solution Sp.,* (For the determination of lead in iron salts use 10 ml of *ammonium citrate*

solution Sp.). Add two drops of *phenol red solution* and make the solution just alkaline (red in colour) by the addition *of strong ammonnia solution.* Cool the solution if necessary, and add 2 ml of *potassium cyanide solution Sp.* Immediately extract the solution with several quantities each of 5 ml, of *dithizone extraction solution,* draining off each extract into another separating funnel, until the dithizone extraction solution retains its green colour. Shake the combine dithizone solutions for 30 seconds with 30 ml of a 1 per cent w/v solution of *nitric acid* and discrad the chloroform layer. Add to the solution exactly 5 ml of *standard dithizone solution* and 4 ml of *ammonia-cyanide solution Sp.* and shake for 30 seconds; the colour of the chloroform layer is of no deeper shade of violet than that of a control made with a volume of *dilute standard lead solution* equivalent to the amount of lead permitted in the sample under examination.

2.3.6 Sulphated Ash

Heat a silica or platinum crucible to redness for 10 minutes, allow to cool in a desiccator and weigh. Put 1 to 2 g of the substance, accurately weighed, into the crucible, ignite gently at first, until the substance is thoroughly charred. Cool, moisten the residue with 1 ml of *sulphuric acid,* heat gently until white fumes are no longer evolved and ignite at 800° ± 25° until all black particles have disappeared. Conduct the ignition in a place protected from air currents. Allow the crucible to cool, add a few drops of *sulphuric acid* and heat. Ignite as before, allow to cool and weigh. Repeat the operation until two successive weighings do not differ by more than 0.5 mg.

2.3.7 –Limit Test for Sulphates

Reagents --

Barium sulphate reagent – Mix 15 ml of 0.5 *M barium chloride,* 55 ml of *water,* and 20 ml of *sulphate free alcohol,* add 5 ml of a 0.0181 per cent w/v solution of potassium sulphate, dilute to 100 ml with *water,* and mix. Barium sulphate reagent must be freshly prepared.

0.5 M Barium chloride – *Barium chloride d*issolved in *water* to contain in 1000 ml 122.1 g of $BaCl_2$, $2H_2O$.

Method

Dissolve the specified quantity of the substance in *water* , or prepare a solution as directed in the text, transfer to a *Nessler cylinder,* and add 2 ml of *dilute hydrochloric acid,* except where *hydrochloric acid* is used in the preparation of the solution. Dilute to 45 ml with *water,* add 5 ml of barium sulphate reagent. Stir immediately with a glass rod, and allow to stand for five minutes. The turbidity produced is not greater than the *standard turbidity,* when viewed transversely. Standard turbidity : Place 1.0 ml of 0.1089 per cent w/v solution of potassium sulphate and 2 ml of *dilute hydrochloric acid* in a *Nessler cylinder,*dilute to 45 ml with *water,* add 5 ml of barium sulphate reagent, stir immediately with a glass rod and allow to stand for five minutes.

APPENDIX –3

3.1 PHYSICAL TESTS AND DETERMINATIONS

3.1.1 Powder Fineness

The degree of coarseness or fineness of a powder is expressed by reference to the nominal mesh aperture size of the sieves for measuring the size of the powders. For practical reasons, the use of sieves, Appendix 1.2, for measuring powder fineness for most pharmaceutical purposes, is convenient but device other than sieves must be employed for the measurement of particles less than 100 mm in nominal size.

The following terms are used in the description of powders :

Coarse powder – A powder, all the particles ot which pass through a sieve with a nominal mesh aperture of 1.70 mm and not more than 40.0 per cent through a sieve with a nominal mesh aperture of 355 µm.

Moderately coarse powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 710 µm and not more than 40.0 per cent through a sieve with a nominal mesh aperture of 250 µm.

Moderately fine powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 355 µm and not more than 40.0 per cent through a sieve with a nominal mesh aperature of 180 µm.

Fine powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 180 µm.

Very fine powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 125 µm .

When the fineness of a powder is described by means of a number, it is intended that all the particles of the powder shall pass through a *sieve* of which the nominal mesh aperture, in µm, is equal to that number.

When a batch of a vegetable drug is being ground and sifted, no portion of the drug shall be rejected but it is permissible except in the case of assays, to withhold the final tailings, if an approximately equal amount of tailings from a preceding batch of the same drug has been added before grinding.

Sieves – Sieves for testing powder fineness comply with the requirements stated under sieves, Appendix 1.2.

Method

(1) For coarse and moderately coarse powders – Place 25 to 100 g of the powder being examined upon the appropriate sieve having a close fitting receiving pan and cover. Shake the sieve in a rotary horizontal direction and vertically by tapping on a hard surface for not less than twenty minutes or until sifting is practically complete. Weigh accurately the amount remaining on the sieve and in the receiving pan.

(2) For fine and very fine powder – Proceed as described under coarse and moderately coarse powders, except that the test sample should not exceed 25 g and except that the sieve is to be shaken for not less than thirty minutes, or until sifting is practically complete.

NOTE – Avoid prolonged shaking that would result in increasing the fineness of the powder during the testing.

With oily or other powders which tend to clog the openings, carefully brush the screen at interval during siftings. Break up any lumps that may form. A mechanical sieve shaker which reproduces the circular and tapping motion given to sieves in hand sifting but has a uniform mechanical action may be employed.

3.1.2 Refractive Index

The refractive index (n) of a substance with reference to air is the ratio of the sine of the angle of incidence to the sine of the angle of refraction of a beam of light passing from air into the substance. It varies with the wavelength of the light used in its measurement.

Unless otherwise prescribed, the refractive index is measured at 25°(±0.5) with reference to the wavelength of the D line of sodium (ψ =589.3 nm). The temperature should be carefully adjusted and maintained since the refractive index varies significantly with temperature.

The Abbe refractometer is convenient for most measurements of refractive index but other refractometer of equal or greater accuracy may be used. Commercial refractometers are normally constructed for use with white light but are calibrated to give the refractive index in terms of the D line of sodium light.

To achieve accuracy, the apparatus should be calibrated against *distilled water :* which has a refractive index of 1.3325 at 25° or against the reference liquids given in the following table :-

TABLE

Reference Liquid	$n_D^{20°}$	Temperature Co-efficient $\Delta n/\Delta t$
Carbon tetrachloride	1 4603	-0.00057
Toluene	1.4969	-0.00056
a-Methylnaphthalene	1.6176	-0.00048

* Reference index value for the D line of sodium, measured at 20°

The cleanliness of the instrument should be checked frequently by determining the refractive index of distilled water which at 25° is 1.3325.

3.1.3 Weight Per Millilitre and Specific Graveity

Weight per millilitre – The weight per millilitre of a liquid is the weight in g of 1 ml of a liquid when weighed in air at 25°, unless otherwise specified.

Method

Select a thoroughly clean and dry pycnometer. Calibrate the pycnometer by filling it with recently boiled and cooled *Water* at 25° and weighing the contents. Assuming that the weight of 1 ml of *water* at 25° when weighed in air of density 0.0012 g per ml, is 0.99602 g. Calculate the capacity of the pycnometer. (Ordinary deviations in the density of air from the value given do not affect the result of a determination significantly). Adjust the temperature of the substance to be examined, to about 20° and fill the pycnometer

with it. Adjust the temperature of the filled pycnometer to 25°, remove any excess of the substance and weigh. Substract the tare weight of the pycnometer from the filled weight of the pycnometer. Determine the weight per milliliter dividing the weight in air, expressed in g, of the quantity of liquid which fills the pycnometer at the specified temperature, by the capacity expressed in ml, of the pycnometer at the same temperature.

Specific gravity –The specific gravity of a liquid is the weight of a given volume of the liquid at 25° (unless otherwise specified) compared with the weight of an equal volume of water at the same temperature, all weighings being taken in air.

Method

Proceed as described under Wt. Per ml. Obtain the specific gravity of the liquid by dividing the weight of the liquid contained in the pycnometer by the weight of water contained, both determined at 25° unless otherwise directed in the individual monograph.

APPENDIX –4

4.1 REAGENTS AND SOLUTIONS

Acetic Acid – Contains approximately 33 per cent w/v of $C_2H_4O_2$. Dilute 315 ml of glacial acetic acid to 1000 ml with *water*.

Acetic Acid, x N – Solutions of any normality xN may be prepared by diluting 60x ml of glacial acetic acid to 1000 ml with water.

Acetic Acid, Dilute – Contains approximately 6 per cent w/w of $C_2H_4O_2$. Dilute 57 ml of glacial acetic acid to 1000 ml with water.

Acetic Acid, Glacial – CH_3COOH =60.05.

Contains not less than 99.0 per cent w/w of $C_2H_4O_2$. About 17.5 N in strength.

Description – At temperature above its freezing point a clear colourless liquid, odour, pungent and characteristic; crystallises when cooled to about 10° and does not completely re-melt until warmed to about 15°.

Solubility – Miscible with *water,* with *glycerin* and most fixed and volatile oils.

Boiling range –Between 117° and 119°.

Congealing temperature –Not lower than 14.8°.

Wt. per ml –At 25° about 1.047 g.

Heavy metals –Evaporate 5 ml to dryness in a porcelain dish on water-bath, warm the residue with 2 ml of 0.1 *N hydrochloric acid* and water to make 25 ml; the limit of heavy metals is 10 parts per million, Appendix 2.3.3.

Chloride –5 ml complies with the limit test for chlorides, Appendix 2.3.2.

Sulphate –5 ml complies with the limit test for sulphates, Appendix 2.3.7.

Certain aldehydic substances – To 5 ml add 10 ml of *mercuric chloride solution* and make alkaline with *sodium hydroxide solution,* allow to stand for five minutes and acidify with dilute *sulphuric acid*; the solution does not show more than a faint turbidity.

Formic acid and oxidisable impurities – Dilute 5 ml with 10 ml of water, to 5 ml of this solution add 2.0 ml of 0.1 *N* potassium dichromate and 6 ml of sulphuric acid, and allow to stand for one minute, add 25 ml of water, cool to 15°, and add 1 ml of freshly prepared potassium iodide solution and titrate the liberated iodine with 0.1 *N* sodium thiosulphate, using starch solution as indicator. Not less than 1 ml of 0.*N sodium thiosulphate* is required.

Odorous impurities –Neutralise 1.5 ml with *sodium hydroxide solution*; the solution has no odour other than a faint acetous odour.

Readily oxidisable impurities – To 5 ml of the solution prepared for the test for Formic Acid and Oxidisable Impurities, add 20 ml of water and 0.5 ml of 0.1 *N potassium permanganate;* the pink colour does not entirely disappear within half a minute.

Non-volatile matter – Leaves not more than 0.01 per cent w/w of residue when evaporated to dryness and dried to constant weight at 105°.

Assay –Weigh accurately about 1 g into a stoppered flask containing 50 ml of *water* and titrate with *N sodium hydroxide,* using *phenolphthalein solution* as indicator. Each ml of *sodium hydroxide* is equivalent to 0.06005 g of C2H4O2.

Acetic Acid, Lead-Free –Acetic acid which complies with following additional test, boil 25 ml until the volume is reduced to about 15 ml, cool make alkaline with lead-free ammonia solution, add 1 ml of lead free *potassium cyanide solution, dilute* to 50 ml with water, add 2 drops of *sodium sulphide solution;* no darkening is produced.

Acetone – Propan 2-one; $(CH_3)_2CO = 58.08$

Description – Clear, colourless, mobile and volatile liquid; taste, pungent and sweetish; odour characteristic; flammable.

Solubility –Miscible with *water,* with alcohol, with *solvent ether,* and with *chloroform,* forming clear solutions.

Distillation range – Not less than 96.0 per cent distils between 55.5° and 57°.

Acidity– 10 ml diluted with 10 ml of freshly boiled and cooled water; does not require for neutralisation more than 0.2 ml of 0.1 *N sodium hydroxide*, using phenolphthalein solution as indicator.

Alkalinty – 10 ml diluted with 10 ml of freshly boiled and cooled water, is not alkaline to litmus solution.

Methyl alcohol –Dilute 10 ml with water to 100 ml. To 1 ml of the solution add 1 ml of *water* and 2 ml of *potassium permanganate* and *phosphoric acid solution.* Allow to stand for ten minutes and add 2 ml of *oxalic acid* and *sulphuric acid solution;* to the colourless solution add 5 ml of *decolorised magenta solution* and set aside for thirty minutes between 15° and 30°; no colour is produced.

Oxidisable substances –To 20 ml add 0.1 ml of 0.1 *N potassium permanganate,* and allow to stand for fifteen minutes; the solution is not completely decolorised.

Water – Shake 10 ml with 40 ml of *carbon disulphide*; a clear solution is produced.

Non-volatile matter –When evaporated on a water-bath and dried to constant weight at 105°, leaves not more than 0.01 per cent w/v residue.

Acetone Solution, Standard – A 0.05 per cent v/v solution of acetone in water.

Alcohol –

Description –Clear, colourless, mobile, volatile liquid, odour, characteristic and spirituous; taste, burning, readily volatilised even at low temperature, and boils at about 78°, flammable. Alcohol containing not less than 94.85 per cent v/v and not more than 95.2 per cent v/v of C_2H_5OH at 15.56°.

Solubility –Miscible in all proportions with *water,* with *chloroform* and with *solvent ether.*

Acidity or alkalinity – To 20 ml add five drops of *phenolphthalein solution*; the solution remains colourless and requires not more than 2.0 ml of 0.1*N sodium hydroxide* to produce a pink colour.

Specific gravity –Between 0.8084 and 0.8104 at 25°.

Clarity of solution –Dilute 5 ml to 100 ml with *water* in glass cylinder; the solution remains clear when examined against a black background. Cool to 10° for thirty minutes; the solution remains clear.

Methanol – To one drop add one of water, one drop of *dilute phosphoric acid,* and one drop of *potassium permanganate solution.* Mix, allow to stand for one minute and add sodium bisulphite solution dropwise, until the permanganate colour is discharged. If a brown colour remains, add one drop of *dilute phosphoric* acid. To the colourless solution add 5 ml of freshly prepared *chromotropic acid* solution and heat on a water-bath at 60° for ten minutes; no violet colour is produced.

Foreign organic substances – Clean a glass-stoppered cylinder thoroughly with *hydrochloric acid,* rinse with water and finally rinse with the alcohol under examination. Put 20 ml in the cylinder, cool to about 15° and then add from a carefully cleaned pipette 0.1 ml 0.1 *N potassium permanganate.* Mix at once by inverting the stoppered cylinder and allow to stand at 15° for five minutes; the pink colour does not entirely disappear.

Isopropyl alcohol and t-butyl alcohol – To 1 ml add 2 ml of water and 10 ml of *mercuric sulphate solution* and heat in a boiling water-bath; no precipitate is formed within three minutes.

Aldehydes and ketones – Heat 100 ml of *hydroxylamine hydrochloride solution* in a loosely stoppered flask on a water-bath for thirty minutes, cool, and if necessary, add sufficient 0.05 *N sodium hydroxide* to restore the green colour. To 50 ml of this solution add 25 ml of the alcohol and heat on a water bath for ten minutes in a loosely stoppered flask. Cool, transfer to a Nesseler cylinder, and titrate with 0.05 *N sodium hydroxide* until the colour matches that of the remainder of the *hydroxylamine hydrochloride solution* contained in a similar cylinder, both solutions being viewed down the axis of the cylinder. Not more than 0.9 ml of 0.05 *N sodium hydroxide* is required.

Fusel oil constituents – Mix 10 ml with 5 ml of *water* and 1 ml of *glycerin* and allow the mixture to evaporate spontaneously from clean, odourless absorbent paper; no foreign odour is perceptible at any stage of the evaporation.

Non-volatile matter – Evaporate 40 ml in a tared dish on a water-bath and dry the residue at 105° for one hour; the weight of the residue does not exceed 1 mg.

Storage – Store in tightly-closed containers, away from fire.

Labelling – The label on the container states "Flammable".

Dilute Alcohols : Alcohol diluted with water to produce dilute alcohols. They are prepared as described below :

Alcohol (90 per cent)
Dilute 947 ml of alcohol to 1000 ml with water.
Specific Gravity –At 15.56°/15.56°, 0.832 to 0.835.

Alcohol (80 per cent)
Dilute 842 ml of alcohol to 1000 ml with water.
Specific Gravity –At 15.56°/15.56°, 0.863 to 0.865,

Alcohol (60 per cent)
Dilute 623 ml of alcohol to 1000 ml with water.
Specific Gravity –At 15.56°/15.56°, 0.913 to 0.914,

Alcohol (50 per cent)
Dilute 526 ml of alcohol to 1000 ml with water
Specific Gravity –At 15.56°/15.56°, 0.934 to 0.935.

Alcohol (25 per cent)
Dilute 263 ml of alcohol to 1000 ml with water.
Specific Gravity –At 15.56°/15.56°, 0.9705 to 0.9713.

Alcohol (20 per cent)
Dilute 210 ml of alcohol to 1000 ml with water.
Specific Gravity –At 15.56°/15.56°, 0.975 to 0976.

Alcohol, Aldehyde-free. –Alcohol which complies with the following additional test :

Aldehyde – To 25 ml, contained in 300 ml flask, add 75 ml of *dinitrophenyl hydrazine solution,* heat on a water bath under a reflux condenser for twenty four hours, remove the alcohol by distillation, dilute to 200 ml with a 2 per cent v/v solution of sulphuric acid, and set aside for twenty four hours; no crystals are produced.

Alcohol, Sulphate-free. –Shake alcohol with an excess of anion exchange resin for thirty minutes and filter.

Ammonia, xN. –Solutions of any normality xN may be prepared by diluting 75 x ml of strong ammonia solution to 1000 ml with water.

Ammonia-Ammonium Chloride Solution, Strong. –Dissolve 67.5 g of *ammonium chloride* in 710 ml of strong *ammonia solution* and add sufficient *water* to produce 1000 ml.

Ammonia Solution, Dilute. – Contains approximately 10 per cent w/w of NH_3.

Dilute 425 ml of *strong ammonia solution* to 1000 ml with *water.*

Wt. per ml – At 25°, about 0.960 g.

Storage – Dilute ammonia solution should be kept in a well-closed container, in a cool place.

Ammonia Solution 2 per cent –Ammonia solution 2 per cent is the ammonia solution strong diluted with purified water to contain 2 per cent v/v of Ammonia solution strong.

Ammonia Solution, Strong –Contains 25.0 per cent w/w of NH3 (limit, 24.5 to 25.5). About 13.5 N in strength.

Description –Clear, colourless liquid; odour, strongly pungent and characteristic.

Solubility –Miscible with *water* in all proportions.

Wt. per. ml – At 25°, about 0.91g.

Heavy metals –Evaporate 5 ml to dryness on a water-bath. To the residue, add 1 ml of *dilute hydrochloric acid* and evaporate to dryness. Dissolve the residue in 2 ml of *dilute acetic acid* and add *water* to make 25 ml; the limit of heavy metals is 15 parts per million, Appendix 2.3.3.

Iron –Evaporate 40 ml on a water-bath to about 10 ml. The solution complies with the *limit test for iron,* Appendix 2.3.4

Chloride –Evaporate 40 ml on a water-bath to about 5 ml. The solution complies with the *limit test for chlorides,* Appendix 2.3.2.

Sulphate –Evaporate 20 ml on a water-bath to about 5 ml. The solution complies with *the limit test for sulphates*; Appendix 2.3.7.

Tarry matter – Dilute 5 ml with 10 ml of *water*, mix with 6 g of powdered *citric acid* in a small flask, and rotate until dissolved; no tarry or unpleasant odour is perceptible.

Non-volatile residue –Evaporate 50 ml to dryness in a tared porcelain dish and dry to constant weight at 105°, not more than 5 mg of residue remains.

Assay –Weigh accurately about 3 g in flask containing 50 ml of *N sulphuric acid* and titrate the excess of acid with *N sodium hydroxide*, using *methyl red solution* as indicator. Each ml of *N sulphuric acid* is equivalent to 0.01703 g of NH_3.

Storage –Preserve strong Ammonia Solution in a well-closed container, in a cool place.

Ammonia Solution, Iron-free –Dilute ammonia solution which complies with the following additional test :-

Evaporate 5 ml nearly to dryness on a water-bath add 40 ml of water, 2 ml of 20 per cent w/v *solution of iron free citric acid* and 2 drops of *thioglycollic acid*, mix, make alkaline with *iron-free ammonia solution and dilute* to 50 ml with *water*, no pink colour is produced.

Ammonia Buffer pH 10.00 –Ammonia buffer solution. Dissolve 5.4 g of *ammonium chloride* in 70 ml of 5 *N ammonia and dilute* with *water* to 100 ml.

Ammonium Chloride –NH_4Cl = 53.49

Description – Colourless crystals or white crystalline powder; odourless; taste, saline.

Solubility – Freely soluble in *water*, sparingly soluble in alcohol.

Arsenic – Not more than 4 parts per million, Appendix 2.3.1.

Heavy metals –Not more than 10 parts per million, determined by method A, on 2.0 g dissolved in 25 ml of water, Appendix 2.3.3.

Barium – Dissolve 0.5 g in 10 ml of *water* and add 1 ml of *dilute sulphuric acid*; no turbidity is produced within two hours.

Sulphate – 2 g complies with the limit test for sulphates, Appendix 2.3.7

Thiocyanate – Acidify 10 ml of a 10 per cent w/v solution with *hydrochloric acid* and add a few drops of *ferric chloride solution*; no red colour is produced.

Sulphated ash – Not more than 0.1 per cent, Appendix 2.3.6.

Assay – Weigh accurately about 0.1 g, dissolve in 20 ml of water and add a mixture of 5 ml of *formaldehyde solution*, previously neutralised to *dilute phenolphthalein solution* and 20 ml of water. After two minutes, titrate slowly with 0.1 *N sodium hydroxide*, using a further 0.2 ml of *dilute phenolphthalein solution*. Each ml of 0.1N *sodium hydroxide* is equivalent to 0.005349 g of NH_4Cl.

Ammonium Chloride Solution –A 10.0 per cent w/v solution of *ammonium chloride* in water.

Ammonium Citrate Solution –Dissolve with cooling, 500 g *citric acid* in a mixture of 200 ml of *water* and 200 ml of 13.5 M ammonia, filter and dilute with water to 1000 ml.

Ammonium Nitrate – NH_4NO_3 =80.04

Description – Colourless crystals

Solubility – Freely soluble in water

Acidity – A solution in water is slightly acid to litmus *solution.*

Chloride – 3.5 g complies with the limit test for chloride, Appendix 2.3.2.

Sulphate – 5 g complies with the limit test for sulphates, Appendix 2.3.7.

Sulphated ash – Not more than 0.05 per cent, Appendix 2.3.6.

Ammonium Oxalate – $(CO_2NH_4)_2$. H_2O =142.11.

Description –Colourless crystals

Solubility – Soluble in water

Chloride –2 g, with an additional 20 ml of *dilute nitric acid,* complies with the limit test for chlorides, Appendix 2.3.2.

Sulphate –Dissolve 1 g in 50 ml of water, add 2.5 ml of hydrochloric acid and 1ml of *barium chloride solution* and allow to stand for one hour; no turbidity or precipitate is produced.

Sulphated ash – Not more than 0.005 percent, Appendix 2.3.6.

Ammonium Oxalate Solution –A 2.5 per cent w/v solution of *ammonium oxalate* in water.

Ammonium Phosphate – $(NH_4)_2HPO_4$ –

Description –White crystals or granules.

Solubility –Very soluble in wate; insoluble in alcohol.

Reaction – 1 g dissolved in 100 ml of *carbon dioxide-free water* has a reaction of about pH 8.0, using solution of cresol red as indicator.

Iron –2 g complies with the limit test for iron, Appendix 2.3.4.

Chloride – 2 g with an additional 3.5 ml of nitric acid complies with the limit test for chlorides, Appendix 2.3.2.

Sulphate –2.5 g with an additional 4ml of hydrochloric acid, complies with the limit test for sulphate, Appendix 2.3.2.

Ammonium Phosphate, Solution –A 10.0 per cent w/v solution of ammonium phosphate in water.

Ammonium Thiocyanate – NH_4SCN = 76.12.

Description –Colourless crystals.

Solubility – Very soluble in water, forming a clear solution, readily soluble in alcohol.

Chloride –Dissolve 1 g in 30 ml of solution of hydrogen peroxide; add 1 g of *sodium hydroxide*, warm gently, rotate the flask until a vigorous reaction commences and allow to stand until the reaction is complete; add a further 30 ml of *hydrogen peroxide solution* boil for two minutes, cool, and add 10 ml of *dilute nitric acid* and 1 ml of *silver nitrate solution*; any opalescence produced is not greater than that obtained by treating 0.2 ml of 0.01 *N hydrochloric acid* in the same manner.

Sulphated ash –Moisten 1 g with *sulphuric acid* and ignite gently, again moisten with sulphuric acid and ignite; the residue weighs not more than 2.0 mg.

Ammonium Thiocyanate, 0.1N – NH_4SCN = 76.12; 7.612 in 1000 ml. Dissolve about 8 g of *ammonium thiocyanate* in 100o ml of water and standardise the solution as follows :

Pipette 30 ml of standardised 0.1 *N silver nitrate* into a glass-stoppered flask, dilute with 50 ml of *water* then add 2 ml of *nitric acid* and 2 ml of *ferric ammonium sulphate solution* and titrate with the *ammonium thiocyanate solution* to the first appearance of a red brown colour. Each ml of 0.1N silver nitrate is equivalent to 0.007612 g of NH_4SCN.

Ammonium Thiocyanate Solution – A 10.0 per cent w/v solution of *ammonium thiocyanate solution.*

Anisaldehyde-Sulphuric Acid Reagent – 0.5 ml *anisaldehyde* is mixed with 10 ml *glacial acetic acid*, followed by 85 ml methanol and 5 ml concentrated *sulphuric acid* in that order.

The reagent has only limited stability and is no longer usable when the colour has turned to redviolet.

Arsenic Trioxide –As_2O_3 = 197.82. Contains not less than 99.8 per cent of As_2O_3.

Description – Heavy white powder

Solubility –Sparingly soluble in water; more readily soluble in water on the addition of *hydrochloric acid*, or solutions of alkali hydroxides or carbonates.

Arsenious sulphide – Weigh accurately 0.50 g and dissolve in 10 ml of *dilute ammonia sulution;* forms a clear colourless solution which, when diluted with an equal volume of water and acidified with *hydrochloric acid*, does not become yellow.

Non-volatile matter –Leaves not more than 0.1 per cent of residue when volatilised.

Assay –Weigh accurately about 0.2 g and dissolve in 20 ml of boiling water and 5 ml of *N sodium hydroxide*, cool, and 5 ml of *N hydrochloric acid* and 3 g of *sodium bicarbonate,* and titrate with 0.1 *N iodine.* Each ml of 0.1N iodine is equivalent to 0.004946 g of As_2O_3.

Barium Chloride - $BaCl_2$, $2H_2O$ =244.27.

Description – Colourless crystals.

Solubility –Freely soluble in water.

Lead –Dissolve 1 g in 40 ml of recently boiled and cooled water, add 5 ml of *lead free acetic acid.* Render alkaline with *lead-free ammonia solution* and add 2 drops of *lead-free sodium sulphide solution;* not more than a slight colour is produced.

Nitrate –Dissolve 1 g in 10 ml of *water*, add 1 ml of *indigo carmine solution* and 10 ml of *nitrogen free sulphuric acid* and heat to boiling; the blue colour does not entirely disappear.

Barium Chloride Solution –A 10.0 per cent w/v solution of *barium chloride* in *water*.

Bismuth Oxynitrate – Bismuth Oxide Nitrate, Contains 70.0 to 74.0 per cent of Bi.

Description –White, microcrystalline powder.

Solubility –Practically insoluble in water, in alcohol; freely soluble in *dilute nitric acid* and in *dilute hydrochloric acid.*

Assay –Weigh accurately about 1 g and dissolve in a mixture of 20 ml of *glycerin* and 20 ml of water. Add 0.1 g of *sulphamic acid* and titrate with 0.05 M *disodium ethylenediamine tetraacetate*, using *catechol violet solution* as indicator. Each ml of 0.05 M disodium ethylenediamine tetra-acetate is equivalent to 0.01045 g of Bi.

Borax -Sodium Tetraborate , $Na_2B_4O_7.\ 10H_2O$ = 381.37. Contains not less than 99.0 per cent and not more than the equivalent of 103.0 per cent of $Na_2B_4O_7.\ 10H_2O$.

Description –Transparent, colourless crystals, or a white, crystalline powder; odourless, taste, saline and alkaline. Effloreces in dry air, and on ignition, loses all its water of crystallisation.

Solubility –Soluble in water, practically insoluble in alcohol.

Alkalinity –A solution is alkaline to litmus solution.

Heavy metals –Dissolve 1 g in 16 ml of water and 6 ml of *N hydrochloric acid* and add *water* to make 25 ml; the limit of heavy metals is 20 parts per million, Appendix 2.3.3.

Iron –0.5 g complies with the *limit test for iron*, Appendix 2.3.4

Chlorides –1 g complies with the *limit test for chlorides,* Appendix 2.3.2

Sulphates –1g complies with the *limit test for sulphates,* Appendix 2.3.7.

Assay –Weigh accurately about 3 g and dissolve in 75 ml of *water* and titrate with 0.5 *N hydrochloric acid*, using *methyl red solution* as indicator. Each ml of 0.5 *N* hydrochloric acid is equivalent to 0.09534 g of $Na_2B_4O_7.10.H_2O$.

Storage – Preserve Borax in well-closed container.

Boric Acid –H_3BO_3 = 61.83.

Description –Colourless plates or white crystals or white crystalline powder, greasy to touch; odourless; taste, slightly acid and bitter with a sweetish after taste.

Solubility –Soluble in *water* and in *alcohol*; freely soluble in boiling *water*, in boiling *alcohol* and in *glycerin.*

Sulphate –Boil 3 g with 30 ml of *water* and 1 ml of *hydrochloric acid*, cool, and filter; 25 ml of the filtrate complies with the *limit test for sulphates*, Appendix 2.3.7.

Arsenic –Not more than 10 parts per million, Appendix 2.3.1.

Heavy metals –Not more than 20 parts per million, determined by Method A on a solution obtained by dissolving 1.0 g in 2 ml of *dilute acetic acid* and sufficient *water* to produce 25 ml, Appendix 2.3.3.

Assay –Weigh accurately about 2 g, and dissolve in a mixture of 50 ml of *water* and 100 ml of *glycerine*, previously neutralised to *phenolphthalein solution*. Titrate with *N sodium hydroxide*, using *phenolphthalein solution* as indicator. Each ml of *N sodium hydroxide* is equivalent to 0.06183 g of H_3BO_3.

Storage –Store in well-closed containers.

Labelling –The label on the container states "Not for internal use".

Boric Acid Solution –Dissolve 5 g of boric acid in a mixture of 20 ml of *water* and 20 ml of *absolute ethanol* and dilute with *absolute ethanol* to 250 ml.

Bromine – Br2 =159.80.

Description –Reddish-brown, fuming, corrosive liquid.

Solubility –Slightly soluble in *water*, soluble in most organic solvents.

Iodine –Boil 0.2 ml with 20 ml of *water*, 0.2 ml of *N sulphuric acid* and a small piece of marble until the liquid is almost colourless. Cool, add one drop of *liquified phenol*, allow to stand for two minutes, and then add 0.2 g of *potassium iodide* and 1 ml of *starch solution*; no blue colour is produced.

Sulphate –Shake 3 ml with 30 ml of *dilute ammonia solution* and evaporate to dryness on a water bath, the residue complies with the *limit test for sulphates*, Appendix 2.3.7.

Bromine Solution – Dissolve 9.6 ml of *bromine* and 30 g of *potassium bromide* in sufficient *water* to produce 100 ml.

Bromocresol Purple – 4,4' –(3H-2, 1-Benzoxathiol-3-ylidene) bis-(2,6-dibromo-o-cresol) SS-dioxide; $C_{21}H_{14}Br_2O_4S$ =540.2.

Gives a yellow colour in weakly acid solutions and a bluish-violet colour in alkaline, neutral and extremely weakly acid solutions (pH range, 5.2 to 6.8).

Bromocresol Purple Solution –Warm 0.1 g of *bromocresol purple* with 5 ml of *ethanol* (90 per cent) until dissolved, add 100 ml of ethanol (20 per cent), 3.7 ml of 0.05 M *sodium hydroxide*, and sufficient *ethanol (20 per cent)* to produce 250 ml.

Complies with the following test :

Sensitivity –A mixture of 0.2 ml of the solution and 100 ml of *carbon dioxide-free water* to which 0.05 ml of 0.02 M *sodium hydroxide* has been added is bluish-violet. Not more than 0.20 ml of 0.02 M *hydrochloric acid* is required to change the colour to yellow.

Bromophenol Blue –4, 4/, -(3H-2, 1-Benzoxathiol-3-ylidene) bis-(2-6-dibromophenol) SS-dioxide C19H19Br4O5S = 670.

Gives a yellow colour in moderately acid solutions, and a bluish-violet colour in weakly acid and alkaline solutions (pH range, 2.8 to 4.6).

Bromophenol Blue Solution – Warm 0.1 g of *bromophenol blue* with 3.0 ml of 0.05 *N sodium hydroxide* and 5 ml of *alcohol* (90 per cent); after solution is effected, add sufficient *alcohol* (20 per cent) to produce 250 ml.

Complies with the following test :

Sensitivity –A mixture of 0.05 ml of the solution and 20 ml of *carbon dioxide-free water* to which 0.05 ml of 0.1*N hydrochloric acid* has been added is yellow. Not more than 0.10 ml of 0.1 *N sodium hydroxide* is required to change the colour to bluish-violet.

Bromothymol Blue –6, 6′–(3H-2, 1–Benzoxathiol–3–ylidene) bis –(2 –bromothymol) SS–dioxide $C_{27}H_{28}Br_2O_5S$ = 624.

Gives a yellow colour in weakly acid solutions and a blue colour in weakly alkaline solutions. Neutrality is indicated by a green colour (pH range, 6.0 to 7.6).

Bromothymol Blue Solution –Warm 0.1 g of *bromothymol blue* with 3.2 ml of 0.05 *N sodium hydroxide* and 5 ml of alcohol (90 per cent); after solution is effected, add sufficient alcohol (20 per cent) to produce 250 ml.

Complies with the following test :

Sensitivity –A mixture to 0.3 ml of the solution and 100 ml of *carbon dioxide-free water* is yellow. Not more than 0.10 ml of 0.02 *N sodium hydroxide* is required to change the colour to blue.

Cadmium Iodide – CdI_2 = 366.23

Description –Pearly white flakes or a crystalline powder.

Solubility –Freely soluble in water.

Iodate –Dissolve 0.2 g in 10 ml of *water*, and add 0.5 g of *citric acid* and 1 ml of *starch solution*, no blue colour is produced.

Cadmium Iodide Solution – A 5.0 per cent w/v solution of *cadmium iodide* in *water*.

Calcium Carbonate – $CaCO_3$ = 100 .1

Analytical reagent grade of commerce.

Calcium Chloride – $CaCl_2$ H_2O = 147.0.

Analytical reagent grade of commerce.

Calcium Chloride Solution –A 10 per cent w/v solution of calcium chloride in water.

Calcium Hydroxide – $Ca(OH)_2$ = 74.09

Analytical reagent grade of commerce.

Calcium Hydroxide Solution –Shake 10 g of calcium hydroxide repeatedly with 1000 ml of water and allow to stand until clear.

Calcium Sulphate – $CaSO_4$, $2H_2O$ = 172.17.

Description –White powder.

Solubility –Slightly soluble in *water*.

Chloride –Boil 5 g with 50 ml of *water* and filter while hot. The filtrate, after cooling complies with the limit test for chlorides, Appendix 2.3.2.

Acid-insoluble matter –Boil 2 g with 100 ml of *N hydrochloric acid*; and then with *water*, dry, ignite, and weigh; the residue weighs not more than 2 mg.

Alkalinity –Boil 1 g with 50 ml of water, cool, and titrate with 0.*1 N hydrochloric acid, using bromo thymol blue solution* as indicator; not more than 0.3 ml of 0.1 *N hydrochloric acid* is required.

Carbonate –Boil 1 g with 10 ml of *water* and 1 ml of *hydrochloric acid,* no carbon dioxide is evolved.

Residue on ignition –When ignited, leaves not less than 78.5 per cent and not more than 80.0 per cent of residue.

Camphor –C10H16O = 152.23

Camphor is a ketone, obtained from *Cinnamomum camphora* (Linn.) Nees and Eberm. (Fam. Lauraceae) and *Ocimum kilimandscharicum Guerke* (Fam. Labiatae) (Natural Camphor) or produced synthetically (Synthetic Camphor). It contains not less than 96.0 per cent of $C_{10}H_{16}O$.

Description – Colourless or white crystals, granules or crystalline masses or colourless to white, translucent tough masses; odour, penetrating and characteristic; taste, pungent, aromatic, and followed by a sensation of cold. Readily pulverisable in the presence of a little *alcohol, chloroform*, or solvent ether.

Solubility –Slightly soluble in water, very soluble in *alcohol, in chloroform* and in *solvent ether*, freely soluble in fixed oils and in volatile oils.

Melting range –174° to 179°.

Specific optical rotation – + 41° to + 43°, determined in a 10 per cent w/v solution of Natural Camphor in alcohol. Synthetic Camphor is the optically inactive, racemic form.

Water – A 10 per cent w/v solution in light petroleum (boiling range 40° to 60°) is clear.

Non-volatile matter – Leaves not more than 0.05 per cent of residue when volatilised at 105°.

Assay – Weigh accurately about 0.2 g and dissolve in 25 ml of *aldehyde-free alcohol*, in a 300-ml flask. Slowly add while stirring 75 ml of *dinitrophenylhydrazine* solution and heat on a water-bath for four hours under a reflux condenser. Remove the alcohol by distillation, allow to cool, dilute to 200 ml with a 2 per cent v/v solution of *sulphuric acid* in water. Set aside for twenty-four hours, filter in a tared Gooch crucible, and wash the precipitate with successive quantities of 10 ml of cold water until the washings are neutral to *litmus paper*. Dry to constant weight at 80° and weigh. Each g of precipitate is equivalent to 0.458 g of C10H16O.

Storage –Preserve Camphor in a well-closed container in a cool place.

Canada Balsam Reagent –General reagent grade of commerce.

Carbon Dioxide – CO_2 = 44. 01.

Commercially available carbon dioxide.

Carbon Disulphide – CS_2 = 76.14

Description –Clear, almost colourless, flammable liquid.

Distillation range – Not less than 95 per cent distils between 46° and 47°.

Wt. per ml – At 25°, about 1.263 g.

Non-volatile matter –When evaporated to dryness on a water bath, and dried to constant weight at 105°. Leaves not more than 0.005 per cent w/v of residue.

Carbon Tetrachloride – CCl_4 = 153.82

Description –Clear, colourless, volatile, liquid; odour, characteristic.

Solubility –Practically insoluble in water; miscible with ethyl alcohol, and with solvent ether.

Distillation range –Not less than 95 per cent distils between 76° and 77°.

Wt per ml – At 20°, 1.592 to 1.595 g.

Chloride, Free acid –Shake 20 ml with 20 ml of freshly boiled and cooled water for three minutes and allow separation to take place; the aqueous layer complies with the following test :

Chloride – To 10 ml add one drop of nitric acid and 0.2 ml of *silver nitrate solution*; no opalescence is produced.

Free acid –To 10 ml add a few drops of *bromocresol purple solution;* the colour produced does not indicate more acidity than that indicated by the addition of the same quantity of the indicator to 10 ml of freshly boiled and cooled *water.*

Free chlorine –Shake 10 ml with 5 ml of *cadmium iodide solution* and 1 ml *of starch solution*, no blue colour is produced.

Oxidisable impurities –Shake 20 ml for five minutes with a cold mixture of 10 ml of *sulphuric acid* and 10 ml of 0.1 *N potassium dichromate*, dilute with 100 ml of water and add 3 g of *potassium iodide* : the liberated iodine requires for decolourisation not less than 9 ml of 0.1 *N sodium thiosulphate.*

Non-volatile matter –Leaves on evaporation on a water-bath and drying to constant weight at 105° not more than 0.002 per cent w/v of residue.

Caustic Alkali Solution, 5 per cent –

Dissolve 5 g of *potassium or sodium hydroxide* in *water* and dilute to 100 ml.

Charcoal, Decolourising –General purpose grade complying with the following test.

Decolourising powder –Add 0.10 g to 50 ml of 0.006 per cent w/v solution of *bromophenol blue* in ethanol (20 per cent) contained in a 250 ml flask, and mix. Allow to stand for five minutes, and filter; the colour of the filterate is not deeper than that of a solution prepared by diluting 1 ml of the *bromophenol blue solution* with *ethanol* (20 per cent) to 50 ml.

Chloral Hydrate –$CCl_3.CH(OH)_2$ = 165.40.

Description –Colourless, transparent crystals, odour, pungent but not acrid; taste, pungent and slightly bitter, volatilises slowly on exposure to air.

Solubility –Very soluble in *water,* freely soluble in *alcohol*, in chloroform and in *solvent ether.*

Chloral alcoholate – Warm 1 g with 6 ml of *water* and 0.5 ml of *sodium hydroxide solution* : filter, add sufficient 0.*1 N iodine* to impart a deep brown colour, and set aside for one hour; no yellow crystalline precipitate is produced and no smell of iodoform is perceptible.

Chloride – 3 g complies with the limit test for chlorides, Appendix 2.3.2.

Assay – Weigh accurately about 4 g and dissolve in 10 ml of *water* and add 30 ml of *N sodium hydroxide.* Allow the mixture to stand for two minutes, and then titrate with *N sulphuric acid* using *phenolphthalein solution* as indicator. Titrate the neutralised liquid with 0.1 *N silver nitrate* using solution of *potassium chromate* as indicator. Add two-fifteenth of the amount of 0.1 *N silver nitrate* used to the amount of *N sulphuric acid* used in the first titration and deduct the figure so obtained from the amount of *N sodium hydroxide* added. Each ml of *N sodium hydroxide,* obtained as difference; is equivalent to 0.1654 g of $C_2H_3Cl_3O_2$.

Storage – Store in tightly closed, light resistant containers in a cool place.

Chloral Hydrate Solution –Dissolve 20 g of *chloral hydrate* in 5 ml of water with warming and add 5 ml of *glycerin.*

Chloral Iodine Solution –Add an excess of crystalline *iodine* with shaking to the *chloral hydrate solution*, so that crystals of undissolved iodine remain on the bottom of bottle. Shake before use as the iodine dissolves, and crystals of the iodine to the solution. Store in a bottle of amber glass in a place protected from light.

Chlorinated Lime –Bleaching powder. Contains not less than 3.0 per cent of available chlorine.

Description –A dull white powder; odour characteristic. On exposure to air it becomes moist and gradually decomposes.

Solubility –Slightly soluble in water and in alcohol.

Stability –Loses not more than 3.0 per cent of its available chlorine by weight when heated to 100° for two hours (The available chlorine is determined by the Assay described below).

Assay –Weigh accurately about 4 g, triturate in a mortar with successive small quantities of water and transfer to a 1000 ml flask. Add sufficient water to produce 1000 ml and shake thoroughly. To 100 ml to this suspension add 3 g of *potassium iodide* dissolved in 100 ml of *water*, acidify with 5 ml of *acetic acid* and titrate the liberated iodine with 0.1 *N sodium thiosulphate*. Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.003545 g of available chlorine.

Storage –Preserve in a well-closed container.

Chlorinated Lime Solution. –Mix 100 g of *chlorinated lime* with 1000 ml of *water;* transfer the mixture to a stoppered bottle; set aside for three hours, shaking occasionally; filter through calico.

Chlorinated lime solution must be recently prepared.

Chloroform – $CHCl_3$ = 119.38

Description –Colourles, volatile liquid; odour, characteristic. taste, sweet and burning.

Solubility –Slightly soluble in water; freely miscible with ethyl alcohol and with solvent ether.

Wt. Per ml. : Between 1.474 and 1.478 g.

Boiling range – A variable fraction, not exceeding 5 per cent v/v, distils below 60° and the remainder distils between 50° to 62°.

Acidity –Shake 10 ml with 20 ml of freshly boiled and cooled water for three minutes, and allow to separate. To a 5 ml portion of the aqueous layer add 0.1 ml of *litmus solution*; the colour produced is not different from that produced on adding 0.1 ml of *litmus solution* to 5 ml of freshly boiled and cooled water.

Chloride –To another 5 ml portion of the aqueous layer obtained in the test for Acidity, add 5 ml of water and 0.2 ml of *silver nitrate solution*; no opalescence is produced.

Free chlorine –To another 10 ml portion of the aqueous layer, obtained in the test for Acidity, add 1 ml of *cadmium iodide solution* and two drops of starch solution; no blue colour is produced.

Aldehyde –Shake 5 ml with 5 ml of water and 0.2 ml of *alkaline potassium mercuri-iodide solution* in a stoppered bottle and set aside in the dark for fifteen minutes; not more than a pale yellow colour is produced.

Decomposition products – Place 20 ml of the *chloroform* in a glass-stoppered flask, previously rinsed with *sulphuric acid,* add 15 ml of *sulphuric acid* and four drops of *formaldehyde solution*, and shake the mixture frequently during half an hour and set aside for further half an hour, the flask being protected from light during the test; the acid layer is not more than slightly coloured.

Foreign organic matter – Shake 20 ml with 10 ml of *sulphuric* acid in a stoppered vessel previously rinsed with *sulphuric acid* for five minutes and set aside in the dark for thirty minutes, both the acid and chloroform layers remain colourless. To 2 ml of the acid layer add 5 ml of water; the liquid remains colourless and clear, and has no unpleasent odour. Add a further 10 ml of water and 0.2 ml of *silver nitrate solution*; no opalescence is produced.

Foreign odour –Allow 10 ml to evaporate from a large piece of filter paper placed on a warm plate; no foreign odour is detectable at any stage of the evaporation.

Non volatile matter – Not more than 0.004 per cent w/v determined on 25 ml by evaporation and drying at 105°.

Storage : Store in tightly-closed, glass-stoppered, light-resistant bottles.

Note :- Care should be taken not to vaporise Chloroform in the presence of a flame because of the production of harmful gases.

Chloroform Water –

Chloroform	:	2.5 ml
Purified Water	:	sufficient to produce 1000 ml

Dissolve the *Chloroform* in the purified water by shaking.

Chromic-Sulphuric Acid Mixture –A saturated solution of Chromium trioxide in sulphuric acid .

Chromium Trioxide – $CrO_3 = 99.99$

Analytical reagent grade.

Chromotropic Acid – $C_{10}H_8O_8S_2.2H_2O = 356.32$

Description –White to brownish powder. It is usually available as its sodium salt, $C_{10}H_8O_8S_2Na_2$, which is yellow to light brown in colour.

Solubility –Soluble in water; sodium salt is freely soluble in water.

Sensitivity –Dilute exactly 0.5 ml *formaldehyde solution* with water to make 1000 ml. Disslove 5 mg of *chromotropic acid* or its sodium salt, in a 10 ml of a mixture of 9 ml *of sulphuric acid* and 4 ml of water. Add 5 ml of this solution to 0.2 ml of the *formaldehyde solution*, and heat for 10 minutes at 60°; a violet colour is produced.

Chromotropic Acid Solution –Dissolve 5 mg of *chromotropic acid sodium* salt in 10 ml of a mixture of 9 ml of *sulphuric acid* and 4 ml of water.

Citric Acid – $C_6H_8O_7$, H_2O =210.1

Colourless, translucent crystals, or a white, crystalline powder, slightly hygroscopic in moist air and slightly efflorescent in warm dry air; odourless; taste, strongly acid.

Analytical reagent grade.

Citric Acid, Iron-Free –Citric acid which complies following additional test :

Dissolve 0.5 g in 40 ml of water, add 2 drops of thioglycollic acid, mix, make alkaline with iron free ammonia solution and dilute to 50 ml with water; no pink colour is produced.

Copper Acetate –$Cu(C_2H_3O_2)_2$, H_2O =199.65

Contains not less than 98.0 per cent of $C_4H_6O_4Cu$, H_2O

Description –Blue-green crystals or powder, having a faint odour of acetic acid.

Solubility – Soluble in water, yielding a clear solution.

Chloride –3g complies with the *limit test for chlorides*, Appendix 2.3.2.

Sulphate –3g complies with the *limit test for sulphates*, Appendix 2.3.7.

Assay –Weigh accurately about 0.8 g and dissolve in 50 ml of water, add 2 ml of *acetic acid* and 3 g of *potassium iodide*, and titrate the liberated iodine with 0.1 *N sodium thiosulphate*, using starch solution as indicator, until only a faint blue colour remains; add 2 g of *potassium thiocyanate* and continue the titration until the blue colour disappears. Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.01997 g of $C_4H_6O_4Cu$, H_2O

Copper Acetate, Solution –0.5 per cent w/v of copper acetate in water.

Copper Sulphate – $CuSO_4$, $5H_2O$ = 249.68

Contains not less than 98.5 per cent and not more than the equivalent of 101.0 per cent of $CuSO_4$, $5H_2O$.

Description –Blue triclinic prisms or a blue, crystalline powder.

Solubility –Soluble in *water*, very solube in boiling water, almost insoluble in *alcohol*; very slowly soluble in *glycerin.*

Acidity and clarity of solution – 1 g, dissolved in 20 ml of water,forms a clear blue solution, which becomes green on the addition of 0.1 ml of *methyl orange solution.*

Iron – To 5 g, add 25 ml of water, and 2 ml of nitric acid, boil and cool. Add excess of *strong ammonia solution*, filter, and wash the residue with *dilute ammonia solution* mixed with four times its volumes of water. Dissolve the residue, if any, on the filter with 2 ml of *hydrochloric acid*, diluted with 10 ml of water; to the acid solutions add *dilute ammonia solution* till the precipitation is complete; filter and wash; the residue after ignition weighs not more than 7 mg.

Copper Sulphate, Anhydrous –$CuSO_4$ =159.6

Prepared by heating copper sulphate to constant weight at about 230°.

Copper Sulphate Solution –A10.0 per cent w/v solution of *copper sulphate* in *water.*

Catechol Violet – 4,4′ –(3H-2, I-Benzoxathiol-3-ylidene) diphyrocatechol SS-dioxide.

Gives a blue colour with bishmuth ions in moderately acid solution. When metal ions are absent, for example, in the presence of an excess of *disodium ethylenediamine tetra-acetate*, the solution is yellow.

Catechol Violet Solution –Dissolve 0.1 g of catechol violet in 100 ml of water.

Cresol Red – 4,4′, –(3H-2, 1-Benzoxathiol-3 ylidene) di-o-cresol SS-dioxide; $C_{12}H_8O_5S$ = 382.4.

Gives a red colour in very strongly acid solutions, a yellow colour in less strongly acid and neutral solutions, and a red colour in moderately alkaline solutions (pH ranges, 0.2 to 1.8, and 7.2 to 8.8).

Cresol Red Solution –Warm 50 ml of *cresol red* with 2.65 ml of 0.05 M s*odium hydroxide* and 5 ml of *ethanol (90 per cent);* after solution is effected, add sufficient ethanol (20 per cent) to produce 250 ml.

Sensitivity –A mixitue of 0.1 ml of the solution and 100 ml of *carbon dioxide-free water* to which 0.15 ml of 0.02 M s*odium hydroxide* has been added is purplish-red.Not more than 0.15 ml of 0.02 *M hydrochloric acid* is required to change the colour to yellow.

Dimethyl Yellow – 4 –Dimethyl aminoazobenzene ; $C_{14}H_{15}5N_3$ = 225.3

Gives a red colour in moderately acid alcoholic solutions, and a yellow colour in weakly acid and alkaline solution (pH range, 2.8 to 4.0).

Dimethyl Yellow Solution –A 0.2 per cent w/v solution of *dimethyl yellow* in alcohol (90 per cent).

Sensitivity – A solution containing 2 g of ammonium chloride in 25 ml of *carbon dioxide-free water,* to which is added 0.1 ml of the *dimethyl yellow solution*, is yellow. Not more than 0.10 ml of 0.1 *N hydrochloric acid* is required to change the colour to red.

Dinitrophenylhydrazine –2,4–Dinitrophenylhydrazine; $(NO_2)_2C_6H_3$, NH, NH_3 = 198.14.

Description –Orange-red crystals or a crystalline powder.

Solubility –Practically insoluble in *water,* slightly soluble in alcohol.

Clarity and colour of solution – 0.5 g yields a clear yellow solution on heating with a mixture of 25 ml of water and 25 ml of h*ydrochloric acid.*

Melting range –197° to 200°, with decomposition.

Sulphated ash –Not more than 0.5 per cent, Appendix 2.3.6.

Dinitrophenylhydrazine Solution –Dissolve 1.5 gm of *dinitrophenylhydrazine* in 20 ml of sulphuric acid (50 per cent v/v). Dilute to 100 ml with *water* and filter.

Dinitrophenylhydrazine solution must be freshly prepared.

Diphenylbenzidine –$(C_6H_5.\ NH.\ C_6H_4)_2$ = 336.42.

Description – White for faintly grey coloured, crystalline powder.

Melting range –246° to 250°.

Nitrate –Dissolve 8 mg in a cooled mixture of 45 ml of *nitrogen free sulphuric acid* and 5 ml of water; the solution is colourless or not more than very pale blue.

Sulphated ash –Not more than 0.1 per cent, Appendix 2.3.6.

Diphenylcarbazide –1,5-Diphenylcarbazide : $(C_6H_5NH.\ NH)_2\ CO$ = 242.27.

Description –White crystalline powder which gradually acquires a pink tint on exposure to air.

Solubility –Practically insoluble in *water*; soluble in alcohol.

Diphenylcarbazide Solution –A 0.2 per cent w/v solution of *diphenylcarbazide* in a mixture of 10 ml of glacial acetic acid and 90 ml of *alcohol (90 per cent).*

Diphenylthiocarbazone –Dithizone : 1,5–Diphenylthiocarbazone; C_6H_5N : NCS. NH. NH. C_6H_5 = 256.32.

Description –Almost black powder.

Solubility –Practically insoluble in *water*; soluble in *chloroform*, in carbon tetrachloride and in other organic solvents, yielding solutions of an intense green colour.

Lead –Shake 5 ml of 0.1 per cent w/v solution in *chloroform* with a mixture of 5 ml of *water*, 2 ml of *lead free potassium cyanide solution,* and 5 ml of *strong ammonia solution*; the chloroform layer may remain yellow but has no red tint.

Sulphated ash –Not more than 0.5 per cent, Appendix 2.3.6.

Disodium Ethylenediamine tetraacetate –(Disodium Acetate) $C_{10}H_{14}N_2Na_2O_8,\ 2H_2O$ = 372.2

Analytical reagent grade.

Dragendorff Reagent –

Solution 1 –Dissolve 0.85 g of *bismuth oxy nitrate* in 40 ml of water and 10 ml of acetic acid.

Solution 2 –Dissolve 8 g of *potassium iodide* in 20 ml of water.

Mix equal volumes of solution 1 and 2, and to 10 ml of the resultant mixture add 100 ml of water and 20 ml of acetic acid.

Eosin – Acid Red 87; Tetrabromofluorescein disodium salt; $C_{20}H_6O_5Br_4Na_2$ =691.86.

Description – Red powder, dissolves in water to yield a yellow to *purplish-red* solution with a greenish-yellow fluorescence.

Solubility –Soluble in *water* and in alcohol.

Chloride –Dissolve 50 mg in 25 ml of *water*, add 1 ml of *nitric acid*, and filter; the filtrate complies with *the limit test for chlorides*, Appendix 2.3.2.

Sulphated ash –Not more than 24.0 per cent, calculated with reference to the substance dried at 110° for two hours, Appendix 2.3.6.

Eosin Solution –A 0.5 per cent w/v solution of eosin in water.

Eriochrome Black T –Mordant Black 11; Sodium 2(1-hydroxy-2-naphthylazo) 5-nitro-2-naphtol-4-sulphonate; $C_{20}H_{12}N_3NaO_7S$ = 461.38.

Brownish black powder having a faint, metallic sheen, soluble in alcohol, in *methyl alcohol* and in hot water.

Ether, Diethyl Ether – $(C_2H_5)_2O$ = 74.12.

Analytical reagent grade.

A volatile, highly flammable, colourless liquid, boiling point, about 34°; weight per ml about 0.71g .

Warning –It is dangerous to distil or evaporate ether to dryness unless precautions have been taken to remove peroxides.

Ethyl Acetate –CH_3. $CO_2C_2H_5$ = 88.11.

Analytical reagent grade.

A colourless liquid with a fruity odour; boiling point, about 77°; weight per ml about 0.90g.

Ethyl Alcohol –C_2H_5OH = 46.07.

Absolute Alcohol; Dehydrated Alcohol.

Description –Clear, colourless, mobile, volatile liquid; odour, characteristic and spirituous; taste, burning; hygroscopic. Readily volatilisable even at low temperature and boils at 78° and is flammable.

Solubility –Miscible with water, with solvent ether and with chloroform.

Contains not less than 99.5 per cent w/w or 99.7 per cent v/v of C_2H_5OH..

Identification –Acidity or Alkalinity : Clarity of Solution; Methanol; Foreign organic substances; Isopropyl alcohol and butyl alcohol; Aldehydes and ketones; fusel oil constituents; Non-volatile matter; complies with the requirements described under Alcohol.

Specific gravity –Between 0.7871 and 0.7902, at 25°.

Storage –Store in tightly closed containers in a cool place away from fire and protected from moisture.

Labelling –The label on the container states "Flammable".

Ferric Ammonium Sulphate –Ferric Alum, $Fe(NH_4)(SO_4)_2, 12H_2O = 482.18$

Contains not less than 99.0 per cent and not more than the equivalent of 101.0 per cent of $Fe(NH_4)(SO_4)_2, 12H_2O$.

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 (perchloride of iron) –Contains not less than 14.25 per cent and not more than 15.75 per cent w/v of $FeCl_3$.

Description –Clear, Yellowish-brown liquid.

Assay –Dilute 2 ml with 20 ml of water, add 1 ml of *sulphuric acid* and *0.1 N potassium permanganate* drop by drop until a pink colour persists for five seconds. Add 15 ml of *hydrochloric acid* and 2 g of *potassium iodide*, allow to stand for three minutes, and titrate with 0.1 *N sodium thiosulphate*, using starch solu-

tion as indicator added towards the end of titration. Each ml of 0.*1 N sodium thiosulphate* is equivalent to 0.01622 g of FeCl3.

Ferrous Sulphate – FeSO4. 7H2O = 278.0

Description –Transparent, green crystals, or a pale bluish-green, crystalline powder; odourless; taste, metallic and astringent, Efflorescent in dry air. On exposure to moist air, the crystals rapidly oxidise and become coated with brownish yellow basic ferrous sulphate.

Solubility –Freely soluble in water, very soluble in boiling water, practically insoluble in alcohol.

pH-Between 3.0 and 4.0, determined in a 5.0 per cent w/v solution.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Copper – Dissolve 2 g in 50 ml of *water*, acidify with 1 ml of *dilute sulphuric acid,* saturate with *solution of hydrogen sulphide;* no darkening or precipitate is produced.

Ferrous Sulphate Solution –A 2.0 per cent w/v solution *of ferrous sulphate* in freshly boiled and cooled water.

Ferrous sulphate solution must be freshly prepared.

Ferrous Sulphate Solution, Acid –A 0.45 per cent w/v solution of *ferrous sulphate* in freshly boiled and cooled *water containing* 0.5 ml of hydrochloric acid.

Formaldehyde Solution –Formalin; HCHO =30.03

Formaldehyde Solution is a solution of formaldehyde in water with *methyl alcohol* added to prevent polymerisation. It contains not less than 34.0 per cent w/w and not more than 38.0 per cent w/w of CH2O.

Description –Colourless liquid; odour, characteristic, pungent and irritating; taste, burning. A slight white cloudy deposit is formed on long standing, especially in the cold, due to the separation of paraformaldehyde. This white deposit disappears on warming the solution.

Solubility –Miscible with *water*, and with *alcohol.*

Acidity –To 10 ml add 10 ml of *carbon dioxide free water* and titrate with 0.1 *N sodium hydroxide* using *bromothymol blue solution* as indicator; not more than 5 ml of 0.1 *N sodium hydroxide* is required.

Wt. per ml – At 20°, 1.079 to 1.094 g.

Assay –Weigh accurately about 3 g and add to a mixture of 50 ml of *hydrogen peroxide solution* and 50 ml of *N sodium hydroxide*, warm on a water-bath until effervescence ceases and titrate the excess of alkali with *N sulphuric acid* using *phenolphthalein solution* as indicator. Repeat the experiment with the same quantities of the same reagents in the same manner omitting the formaldehyde solution. The difference between the titrations represents the sodium hydroxide required to neutralise the formic acid produced by the oxidation of the formaldehyde. Each ml of N sodium hydroxide is equivalent to 0.03003 g of CH_2O.

Storage–Preserve Formaldehyde Solution in well-closed container preferably at a temperature not below 15°

Formaldehyde Solution, Dilute –

Dilute 34 ml of *formaldehyde solution* with sufficient water to produce 100 ml.

Glycerin –$C_3H_8O_3$ = 82.09.

Description – Clear, colourless liquid of syrupy consistency; odourless, taste sweet followed by a sensation of warmth. It is hygroscopic.

Solubility –Miscible with water and with *alcohol*; practically insoluble in chloroform, in solvent ether and in fixed oils.

Acidity –To 50 ml of a 50 per cent w/v solution add 0.2 ml of *dilute phenolphthalein solution*; not more than 0.2 ml of 0.1 *N sodium hydroxide* is required to produce a pink colour.

Wt. per ml –Between 1.252 g and 1.257 g, corresponding to between 98.0 per cent and 100.0 per cent w/w of $C_3H_8O_3$.

Refractive index –Between 1.470 and 1.475 determined at 20°.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Copper –To 10 ml add 30 ml of *water*, and 1 ml of *dilute hydrochloric acid*, and 10 ml of *hydrogen sulphide solution*; no colour is produced.

Iron – 10 g complies with the *limit test* for iron, Appendix 2.3.4.

Heavy metals – Not more than 5 parts per million, determined by Method A on a solution of 4 g in 2 ml of 0.1 *N hydrochloric acid* and sufficient water to produce 25 ml, Appendix 2.3.3.

Sulphate –1 ml complies with the *limit test* for sulphates, Appendix 2.3.7.

Chloride –1 ml complies with the *limit test* for chloride, Appendix 2.3.2.

Acraldehyde and glucose –Heat strongly; it assumes not more than a faint yellow, and not a pink colour. Heat further; it burns with little or no charring and with no odour of burnt sugar.

Aldehydes and related substances – To 12.5 ml of a 50 per cent w/v solution in a glass-stoppered flask add 2.5 ml of *water* and 1 ml of *decolorised magenta solution*. Close the flask and allow to stand for one hour. Any violet colour produced is not more intense than that produced by mixing 1.6 ml of 0.*1 N potassium permanganate* and 250 ml of *water*.

Sugar –Heat 5 g with 1 ml of *dilute sulphuric acid* for five minutes on a water-bath. Add 2 ml of *dilute sodium hydroxide solution* and 1 ml of *copper sulphate solution*. A clear, blue coloured solution is produced. Continue heating on the water-bath for five minutes. The solution remains blue and no precipitate is formed.

Fatty acids and esters –Mix 50 ml with 50 ml of freshly boiled *water* and 50.0 ml of 0.5N *sodium hydroxide*, boil the mixture for five minutes. Cool, add a few drops of *phenolphthalein solution* and titrate the excess alkali with 0.5 *N hydrochloric acid*. Perform a blank determination , not more than 1 ml of 0.5 *N sodium hydroxide* is consumed.

Sulphated ash –Not more than 0.01 per cent, Appendix 2.3.6.

Storage –Store in tightly-closed containers.

Glycerin Solution –Dilute 33 ml of glycerin to 100 ml with water and add a small piece of camphor or liquid phenol.

Hexamine – $(CH_2)_6N_4 = 140.2$

Analytical reagent grade.

Hydrazine Hydrate –$NH_2.NH_2.H_2O = 50.06$

Analytical reagent grade.

A colourless liquid with an ammonical odour; weight per ml. about 1.03 g.

Hydrochloric Acid –HCl = 36.46

Concentrated Hydrochloric Acid

Description –Clear, colourless, fuming liquid; odour, pungent.

Arsenic –Not more than 1 part per million, Appendix 2.3.1.

Heavy metals –Not more than 5 parts per million, determined by Method A on a solution prepared in the following manner : Evaporate 3.5 ml to dryness on a water-bath, add 2 ml of *dilute acetic acid* to the residue, and add water to make 25 ml, Appendix 2.3.3.

Bromide and iodide –Dilute 5 ml with 10 ml of *water*, add 1 ml of *chloroform*, and add drop by drop, with constant shaking, *chlorinated lime solution*; the chloroform layer does not become brown or violet.

Sulphite –Dilute 1 ml with 10 ml of water, and add 5 drops of *barium chloride solution* and 0.5 ml of 0.001 *N iodine*; the colour of the iodine is not completely discharged.

Sulphate –To 5 ml add 10 mg of sodium bicarbonate and evaporate to dryness on a water bath; the residue, dissolved in *water*; complies with the *limit test for sulphates*, Appendix. 2.3.7.

Free chlorine –Dilute 5 ml with 10 ml of freshly boiled and cooled *water*, add 1 ml of cadmium *iodide solution*, and shake with 1 ml of *chloroform*; the chloroform layer does not become violet within one minute.

Sulphated ash –Not more than 0.01 per cent, Appendix 2.3.6.

Assay –Weigh accurately about 4 g into a stoppered flask containing 40 ml of water, and titrare with *N sodium hydroxide*, using *methyl orange solution* as indicator. Each ml of *N sodium hydroxide* is equivalent to 0.03646 g of HCl.

Storage –Store in glass-stoppered containers at a temperature not exceeding 30°.

Hydrochloric Acid, x N –Solution of any normality x N may be prepared by diluting 84 x ml of *hydrochloric acid* to 1000 ml with *water*.

Hydrochloric Acid –(1 per cent w/v)

Dilute 1 g of *hydrochloric acid* to 100 ml with *water*.

Dilute Hydrochloric Acid –

Description –Colourless liquid.

Arsenic, heavy metals bromoide and iodide, sulphate, free chlorine –Complies with the tests described under Hydrochloric Acid, when three times the quantity is taken for each test.

Assay –Weigh accurately about 10 g and carry out the Assay described under Hydrochloric Acid.

Storage –Store in stoppered containers of glass or other inert material, at temperature below 30°.

Hydrochloric Acid, N – HCl = 36.460

36.46 g in 1000 ml

Dilute 85 ml of hydrochloric acid with water to 1000 ml and standardise the solution as follows :

Weigh accurately about 1.5 g of anhydrous sodium carbonate, previously heated at about 270° for one hour. Dissolve it in 100 ml of *water* and add two drops of *methyl red solution*. Add the acid slowly from a burette with constant stirring, until the solution becomes faintly pink. Heat again to boiling and titrate further as necessary until the faint pink colour no longer affected by continued boiling. Each 0.5299 g of *anhydrous* sodium carbonate is equivalent to 1 ml of N hydrochloric acid.

Hydrochloric Acid, Iron-Free –Hydrochloric acid which complies with the following additonal test. Evaporate 5 ml on a water-bath nearly to dryness, add 40 ml of water, 2 ml of a 20 per cent w/v solution of citric acid and two drops of thioglycollic acid, mix, make alkaline with *dilute ammonia solution*, and dilute to 50 ml with water; no pink colour is produced.

Hydrogen Peroxide Solution – (20 Vol.) H_2O_2 = 34.02

Analytical reagent grade of commerce or *hydrogen peroxide solution* (100 Vol.) diluted with 4 volumes of water.

A colourless liquid containing about 6 per cent w/v of H_2O_2; weight per ml, about 1.02 g.

Hydrogen Sulphide – H_2S =34.08

Use laboratory cylinder grade, or prepare the gas by action of hydrochloric acid, diluted with an equal volume of *water*, on iron sulphide, the resulting gas is washed by passing it through water.

A colourless, poisonous gas, with a characteristic unpleasant odour.

Hydrogen Sulphide Solution –A recently prepared, saturated solution of hydrogen sulphide in water at 20°.

Hydrogen Sulphide solution contains about 0.45 per cent w/v of H_2S.

Hydroxylamine Hydrochloride; Hydroxylammonium Chloride – NH_2OH, HCl = 69.49

Contains not less than 97.0 per cent w/w of NH_2OH, HCl

Description –Colourless crystals, or a white, crystalline powder.

Solubility –Very soluble in water; soluble in alcohol.

Free acid –Dissolve 1.0 g in 50 ml of *alcohol*, add 3 drops of *dimethyl yellow solution* and titrate to the full yellow colour with *N sodium hydroxide*; not more than 0.5 ml of *N sodium hydroxide* is required.

Sulphated ash –Not more than 0.2 per cent, Apendix 2.3.6.

Assay –Weigh accurately about 0.1 g and dissolve in 20 ml of water, add 5 g of ferric ammonium sulphate dissolve in 20 ml of water, and 15 ml of *dilute sulphuric acid*, boil for five minutes, dilute with 200 ml of water, and titrate with 0.1 *N potassium permanganate*. Each ml of 0.1 *N potassium permanganate* is equivalent to 0.003475 g of NH_2OH, HCl.

Hydroxylamine Hydrochloride Solution –Dissolve 1 g of *hydroxylamine hydrochloride* in 50 ml of *water* and add 50 ml of *alcohol*, 1 ml of *bromophenol blue solution* and 0.1 *N sodium hydroxide* until the solution becomes green.

***Indigo Carmine** – $C_{16}H_8N_2Na_2O_8S_2$ =466.4

Analytical reagent grade.

A deep blue powder, or blue granules with a coppery lustre.

Indigo Carmine Solution –To a mixture of 10 ml of *hydrochloric acid* and 990 ml of a 20 per cent w/v solution of sulphuric acid in water, add sufficient indigo carmine to produce a solution which complies with the following test.

Add 10 ml to a solution of 1.0 mg of potassium nitrate in 10 ml of *water*, add, rapidly, 20 ml of sulphuric acid and heat to boiling; the blue colour is just discharged in one minute.

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*Indian ink –General purpose grade.

Iodine – I2 = 253.8

Description – Heavy, bluish-black, brittle, rhombic prisms or plates with a metallic lustre; odour characteristic; volatile at ordinary temperatures.

Solubility – Very slightly soluble in *water*; soluble in *alcohol*, freely soluble in carbon disulphide and in *chloroform*, in *solvent ether*, *in carbon tetrachloride* and in concentrated aqueous solutions of iodides.

Chloride and Bromide –Triturate 3.5 g thoroughly with 35 ml of *water*, filter and decolorise the filtrate by the addition of a little *zinc powder*. To 25 ml of the filtrate so obtained, add 5 ml of *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; $(CH_3CO_2)_2$ Pb, $3H_2O$ = 379.33

Contains not less than 99.5 per cent and not more than the equivalent of 104.5 per cent of C4H6O4Pb, $3H_2O$.

Description –Small, white, transparent, monoclinic prisms, or heavy, crystalline masses; odour, acetous, taste, sweet and astringent. Efflorescent in warm air. Becomes basic when heated.

Solubility –Freely soluble in *water*, and in *glycerin*; sparingly soluble in *alcohol*.

Water-insoluble matter –Dissolve 1 g in 10 ml of recently boiled and cooled *water; a* solution is produced which is, at most, faintly opalescent and becomes clear on the addition of one drop of *acetic acid*.

Chloride –1 g complies with the *limit test* for chlorides, Appendix 2.3.1.

Copper, iron, silver, and zinc – Dissolve 0.5 g in 10 ml of *water*, add 2 ml of dilute *sulphuric acid*, allow to stand for thirty minutes, and filter; to the filtrate add an excess of *potassium ferrocyanide solution;* no precipitate or colour is produced.

Assay –Weigh accurately about 0.8 g and dissolve in a mixture of 100 ml of *water* and 2 ml of *acetic acid*, add 5 g of hexamine, titrate with 0.05 *M disodium ethylenediaminetetraacetate*, using 0.*2 ml of xylenol orange solution* as indicator, until the solution becomes pale bright yellow. Each ml of 0.05 *M disodium ethylenediaminetetraacetate* is equivelent to 0.01897 g of $C_4H_6O_4Pb$, $3H_2O$.

Storage –Preserve Lead Acetate in a well-closed container.

Lead Acetate Solution –A 10.0 per cent w/v solution *of lead acetate in carbon dioxide-free water.*

Lead Nitrate – $Pb(NO_3)_2$ = 331.21

Contains not less than 99.0 per cent of $Pb(NO_3)_2$
Description –Colourless or white crystals, or a white crystalline powder.

Solubility –Soluble in water, forming a clear, colourless solution.

Assay –Weigh accurately about 0.3 g and dissolve in 150 ml of water. Add 5 ml of dilute *acetic acid*, heat to boiling, add a slight excess of *potassium chromate solution*, and boil gently until the precipitate becomes granular; collect the precipitate in a Gooch crucible, wash it with hot water, and dry to constant weight at 120°. Each g of residue is equivalent to 1.025 g of $Pb(NO_3)_2$.

Lead Solution, Standard –See limit test for heavy metals, Appendix 2.3.3.

Liquid Paraffin –General reagent grade.

Liquid paraffin is a mixture of liquid hydrocarbons obtained from petroleum.

A transparent, colourless, oily liquid, free or nearly free from fluorescence by day light; odourless and tasteless when cold, and develops not more than a faint odour of petroleum when heated.

Solubility –Practically insoluble in water, and in alcohol; soluble in chloroform, in solvent ether and in volatile oils.

Wt. per ml. –At 25°, 0.860 to 0.904 g.

Litmus –Fragments of blue pigment prepared from various species of *Rocella lecanora* or other *lichens*. It has a characteristic odour.

Partly soluble in water and in alcohol. Gives a red colour with acids and a blue colour with alkalies (pH range, 5.0 to 8.0).

Litmus Solution –Boil 25 g of coarsely powdered litmus with 100 ml of *alcohol (90 per cent)* under a reflux condenser for one hour, and pour away the clear liquid; repeat this operation using two successive quantities, each of 75 ml, of *alcohol (90 per cent)*. Digest the extracted litmus with 250 ml of water.

Litmus Paper, Blue –Boil 10 parts of coaresely powdered litmus under reflux for one hour with 100 parts of alcohol, decant the alcohol and discard. Add to the residue a mixture of 45 parts of alcohol and 55 parts of water. After two days decant the clear liquid. Impregnate the strips of filter paper with the extract and allow to dry the paper; complies with the following test –

Sensitivity–Immerse a strip measuring 10 mm x 60 mm in 100 ml of a mixture of 10 ml of 0.02 *N hydrochloric acid* and 90 ml of *water*. On shaking the paper turns red within forty five seconds.

Litmus Paper, Red – To the extract obtained in the preparation of blue litmus paper add 2 *N hydrochloric acid* drop-wise until the blue colour becomes red. Impregnate strips of filter paper with the solution and allow to dry. The paper complies with the following test :

Sensitivity–Immerse a strip measuring 10 mm x 60 mm in 100 ml of 0.002 *N sodium hydroxide*. On shaking the paper turns blue within forty-five minutes.

Magenta Basic – Fuchsin; Rosaniline hydro-chloride; $[(H_2N.\ C_6H_4)_2C : C_6H_3(CH_3) : NH_2+]Cl$ – = 337.85.

The hydrochloride of rosaniline of such a purity that when used in the preparation of decolourised solution of magenta, a nearly colourless solution is obtained.

Description –Dark red powder, or green crystals with a metallic lustre.

Solubility –Soluble in water, giving a deep reddish-purple solution.

Sulphated ash –Not more than 5.0 per cent, Appendix 2.3.6.

Magenta Solution, Decolorised –Dissolve 1 g of basic *magenta* in 600 ml of water and cool in an ice bath; add 20 g of *sodium sulphite* dissolved in 100 ml of water; cool in an ice-bath and add, slowly with constant stirring, 10 ml of hydrochloric acid; dilute with water to 1000 ml.

If the resulting solution is turbid, it should be filtered and if brown in colour, it should be shaken with sufficient decolourising charcoal (0.2 to 0.3 g) to render it colourless and then filtered immediately. Occasionally it is necessary to add 2 to 3 ml *of hydrochloric acid*, followed by shaking, to remove the little residual pink colour. The solution resulting from any of the foregoing modifications should be allowed to stand over-night before use.

Decolourised magenta solution should be protected from light.

Magnesium Carbonate –Light hydrated basic grade of commerce, containing 42 to 45 per cent of MgO and complying with the following test :

Ammonia –Dissolve 0.50 g in 4 ml of 2 M hydrochloric acid, boil to remove carbon dioxide, and dilute with *water* to 95 ml. Add 5 ml of 5 *M sodium hydroxide* and allow to stand for one hour. Dilute 40 ml of the clear liquid to 50 ml with water and add 2 ml of *alkaline potassium-mercuric iodide solution*. Any yellow colour produced is not deeper than that produced by adding 2 ml of *alkaline potassium mercuric iodide solution* to a mixture of 44 ml of water, 2 ml of *ammonium chloride solution*, 2 ml of 2 *M hydrochloric acid* and 2 ml of 5 *M sodium hydroxide*.

Magnesium Sulphate – $MgSO_4, 7H_2O = 246.47$

Description –Colourless, crystals, usually needle-like; odourless, taste, cool, saline and bitter. Effloresces in warm dry air.

Solubility –Freely soluble in water; sparingly soluble in alcohol. Dissolves slowly in glycerin.

Acidity or alkalinity – 1 g dissolved in 10 ml of water is neutral to *litmus solution*.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Iron –2 g dissolved in 20 ml of water complies with the limit test for iron, Appendix 2.3.4.

Heavy metals –Not more than 10 parts per million, determined by Method A on a solution prepared by dissolving 2.0 g in 10 ml of water, 2.0 ml of *of dilute acetic acid* and sufficient *water* to make 25 ml, Appendix 2.3.3.

Zinc –Dissolve 2 g in 20 ml of water and acidify with 1 ml of *acetic acid*. No turbidity is produced immediately on the addition of few drops of *potassium ferrocyanide solution*.

Chloride –1 g complies with the *limit test for chlorides*, Appendix 2.3.2.

Loss on ignition –Between 48.0 per cent and 52.0 per cent, determined on 1.0 g by drying in an oven at 105° for two hours and igniting to constant weight at 400°.

Assay –Weigh accurately about 0.3 g and dissolve in 50 ml of *water*. Add 10 ml of *strong ammonia-ammonium chloride solution*, and titrate with 0.05 *M disodium ethylenediaminetetraacetate* using 0.1 g of *mordant black* II mixture as indicator, until the pink colour is discharged from the blue. Each ml of 0.05 *M disodium ethylenediaminetetraacetate* is equivalent to 0.00602 g of $MgSO_4$.

Storage –Store in well-closed containers.

Magnesium Sulphate, Dried, – $MgSO_4$

Dried, general reagent grade of commerce.

Magnesium Sulphate Solution, Ammoniacal –Dissolve 10 g of *magnesium sulphate* and 20 g of *ammonium chloride* in 80 ml of *water*, and add 42 ml of *5 M ammonia*. Allow to stand for a few days in a well closed container; decant and filter.

Mercuric Chloride –$HgCl_2$ =271.50.

Contains not less than 99.5 per cent of $HgCl_2$;

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, 0.2 M –

Dissolve 54.30 g of *mercuric chloride* in sufficient water to produce 1000 ml.

Mercuric Chloride Solution –A 5.0 per cent w/v solution of *mercuric chloride* in water.

Mercuric Oxide, Yellow – HgO = 216.59.

Contains not less than 99.0 per cent of HgO, calculated with reference to the substance dried at 105° for one hour.

Description – Orange-yellow, heavy, amorphous powder; odourless, stable in air but becomes discoloured on exposure to light.

Solubility –Practically insoluble in water and in *alcohol*; freely soluble in *dilute hydrochloric acid* and in dilute *nitric acid*, forming colourless solutions.

Acidity or alkalinity –Shake 1 g with 5 ml of *water* and allow to settle; the supernatant liquid is neutral to *litmus solution*.

Mercurous salts –A solution of 0.5 g in 25 ml of *dilute hydrochloric acid* is not more than slightly turbid.

Chloride – To 0.2 g add 1 g of zinc powder and 10 ml of *water*. Shake occasionally during ten minutes and filter; the solution complies with the *limit test* for chlorides, Appendix 2.3.2.

Sulphated ash –When moistened with *sulphuric acid* in a silica dish and heated strongly to constant weight, leaves not more than 0.5 per cent of residue.

Assay –Weigh accurately about 0.4 g, dissolve in 5 ml of nitric acid and 10 ml of *water* and *dilute* with *water* to 150 ml. Titrate with 0.1 *N ammonium thiocyanate*, using *ferric ammonium sulphate solution* as indicator. Carry out the titration at a temperature not above 20°. Each ml of 0.*1 N ammonium thiocyanate* is equivalent to 0.01083 g of HgO.

Storage –Preserve Yellow Mercuric Oxide in a well-closed container, protected from light.

Mercuric Potassium Iodide Solution –

See Potassium-Mercuric Iodide solution.

Mercuric Sulphate –Mercury (II) Sulphate $HgSO_4$= 296.68

Contains not less than 99.0 per cent of $HgSO_4$

Description- A white; crystalline powder, hydrolyses in water.

Solubility – Soluble in *dilute sulphuric acid.*

Chloride –Dissolve 2.0 g in a mixture of 2 ml of *dilute sulphuric acid* and 10 ml of *water*. Add 2 g of zinc powder, shake frequently for five minutes and filter. The filtrate complies with the *limit test* for *chlorides*, Appendix 2.3.2.

Nitrate –Dissolve 0.40 g in a mixture of 9 ml of water and 1 ml of dilute sulphuric acid, add 1 ml of indigo carmine solution and 10 ml of *nitrogen-free sulphuric acid* and heat to boiling, the blue colour is not entirely discharged.

Assay –Dissolve 0.6 g in a mixture of 10 ml of *dilute nitric acid* and 40 ml of *water*. Titrate with 0.1 *N ammonium thiocyanate*, using *ferric ammonium sulphate solution* as indicator. Each ml of 0.1 *N ammonium thiocyanate* is equivalent to 0.01483 g of $HgSO_4$.

Mercury Sulphate Solution – Mix 5 g of *yellow mercuric oxide* with 40 ml of *water*, and while stirring add 20 ml of *sulphuric acid*, and 40 ml of *water*, and stir until completely dissolved.

Methyl Alcohol : Methanol : CH_3OH = 32.04.

Description –Clear, Colourless liquid with a characteristic odour.

Solubility –Miscible with water, forming a clear colourless liquid.

Specific Gravity – At 25°, not more than 0.791.

Distillation range – Not less than 95 per cent distils between 64.5° and 65.5°.

Refractive Index –At 20°, 1.328 to 1.329.

Acetcone –Place 1 ml in a *Nessler cylinder*, add 19 ml of water, 2 ml of a 1 per cent w/v solution of *2-nitrobenzaldehyde* in *alcohol (50 per cent)*, 1 ml of 30 per cent w/v *solution of sodium hydroxide* and allow to stand in the dark for fifteen minutes. The colour developed does not exceed that produced by mixing 1 ml of standard acetone solution, 19 ml of water, 2 ml of the solution of *2-nitrobenzaldehyde* and 1 ml of the *solution of sodium hydroxide* and allowing to stand in the dark for fifteen minutes.

Acidity –To 5 ml add 5 ml of *carbon dioxide-free water*, and titrate with 0.1 *N sodium hydroxide*, using *bromothymol blue solution* as indicator; not more than 0.1 ml is required.

Non-volatile matter – When evaporated on a water-bath and dried to constant weight at 105°, leaves not more than 0.005 per ceant w/v of residue.

Methyl Alcohol, Dehydrated –Methyl alcohol which complies with the following additional requirement.

Water –Not more than 0.1 per cent w/w.

Methylene Blue –$C_{16}H_{18}ClN_3S$, $3H_2O$. Tetramethylthionine chloride.

A dark green or bronze crystalline powder, freely soluble in water, soluble in alcohol.

Loss on drying –Not less than 18 per cent and not more than 22 per cent, determined by drying in an oven at 100° to 105°.

Methylene Blue Solution – Dissolve 0.18 g of *methylene blue* in 100 ml of *water*. To 75 ml of this solution, add 5 ml of 0.1 *N sodium hydroxide* and 20 ml of water.

Methyl Orange –Sodium-p-dimethylamineazobenzene sulphate, $C_{14}H_{14}O_3N_3SNa$.

An orange-yellow powder or crystalline scales, slightly soluble in cold water; insoluble in alcohol; readily soluble in hot water.

Methyl Orange Solution –Dissolve 0.1 g of methyl orange in 80 ml of water and dilute to 100 ml with alcohol.

Test for sensitivity –A mixture of 0.1 ml of the methyl orange solution and 100 ml freshly boiled and cooled water is yellow. Not more than 0.1 ml of 0.1 N hydrochloric acid is required to change the colour to red.

Colour change – pH 3.0 (red) to pH 4.4 (yellow).

Methyl Red –p-Dimethylaminoazobenzene-o-carboxylic acid, $C_{15}H_{15}O_2N_3$.

A dark red powder or violet crystals, sparingly soluble in *water*; soluble in alcohol.

Methyl red solution –Dissolve 100 mg in 1.86 ml of 0.1 *N sodium hydroxide* and 50 ml of *alcohol* and dilute to 100 ml with water.

Test for sensitivity –A mixture of 0.1 ml of the *methyl red solution* and 100 ml of freshly boiled and cooled *water* to which 0.05 ml of 0.02 *N hydrochloric acid* has been added is red. Not more than 0.01 ml of 0.02 *N sodium hydroxide* is required to change the colour to yellow.

Colour change – pH 4.4 (red) to pH 6.0 (yellow).

Molish's Reagent –Prepare two solutions in separate bottles, with ground glass stoppers :

(a) Dissolve 2 g of α–naphthol in 95 per cent alcohol and make upto 10 ml with alcohol (α–naphthol can be replaced by thymol or resorcinol). Store in a place protected from light. The solution can be used for only a short period.

(b) Concentrated sulphuric acid.

Mordant Black II –See Eriochrome black T.

Mordant Black II Mixture –*Mordant black mixture.*

A mixture of 0.2 part of Mordant Black II with 100 parts of sodium chloride. Mordant Black II Mixture should be recently prepared.

α–Naphthol – 1-Naphthol; $C_{10}H_7OH$=144.17.

Description – Colourless or white crystals or a white, crystalline powder; odour, characteristic.

Solubility –Freely soluble in alcohol yielding not more than slightly opalescent, colourless or almost colourless solution, with no pink tint.

Melting range –93° to 96°.

Sulphated ash –Not more than 0.05 per cent, Appendix 2.3.6.

α–Naphthol Solution – 1-Naphthol solution.

Dissolve 1 g of *α–naphthol* in a solution of 6 g of *sodium hydroxide* and 16 g of *anhydrous sodium carbonate* in 100 ml of water.

α–naphthol solution must be prepared immediately before use.

1-Naphthylamine –$C_{10}H_9N$ = 143.2 – Analytical reagent grade.

Almost colourless crystals, or a white crystalline powder; melting point, about 50°.

Naphthylamine-Sulphanilic Acid Reagent –Immediately before use mix equal volumes of solutions A and B prepared as follows :

Solution A –Dissolve 0.5 g of sulphuric acid in 30 ml of 6 M *acetic acid* and dilute to 150 ml with water.

Solution B –Dissolve 0.15 g of 1 naphthylamine in 30 ml of 6 M *acetic acid* and dilute to 150 ml with water.

Ninhydrin Reagent – 30 mg ninhydrin is dissolved in 10 ml n-butanol, followed by 0.3 ml of 98 % acetic acid.

Nitric Acid –Contains 70.0 per cent w/w of HNO3 (limits, 69.0 to 71.0). About 16 N in strength.

Description –Clear, colourless, fuming liquid.

Wt. per ml. – At 20°, 1.41 to 1.42 g.

Copper and Zinc –Dilute 1 ml with 20 ml of water, and add a slight excess of dilute ammonia solution; the mixture does not become blue. Pass hydrogen sulphide; a precipitate is not produced.

Iron –0.5 ml of complies with the limit test for iron, Appendix 2.3.4.

Lead –Not more than 2 parts per million, Appendix 2.3.5.

Chloride –5 ml neutralised with dilute ammonia solution, complies with the limit test for chlorides, Appendix 2.3.2.

Sulphates –To 2.5 ml add 10 mg of sodium bicarbonate and evaporate to dryness on a water-bath, the residue dissolved in water, complies with the limit test for sulphates, Appendix 2.3.7.

Sulphated ash –Not more than 0.01 per cent w/w, Appendix 2.3.6.

Assay –Weigh accurately about 4 g into a stoppered flask containing 40 ml of water, and titrate with N Sodium hydroxide, using methyl orange solution as indicator. Each ml of N sodium hydroxide is equivalent to 0.06301 g of HNO_3.

Nitric Acid, XN –Solutions of any normality XN may be prepared by diluting 63x ml of nitric acid to 1000 ml with water.

Nitric Acid, Dilute –Contains approximately 10 per cent w/w of HNO_3. Dilute 106 ml of nitric acid to 1000 ml with water.

2-Nitrobenzaldehyde –0-Nitrobenzaldehyde $NO_2C_6H_4CHO$ =151.12.

Description –Yellow needles, odour, resembling that of benzaldehyde.

Solubility –Soluble in alcohol.

Melting range –40° to 45°.

Sulphated ash – Not more than 0.1 per cent, Appendix 2.3.6.

Oxalic Acid –$(CO_2H)_2$, $2H_2O$ =126.07.

Contains not less than 99.0 per cent of $C_2H_2O_4$, $2H_2O$, as determined by the methods A and B under the Assay.

Description –Colourless crystals.

Solubility – Soluble in water and in alcohol.

Chloride – To 1 g dissolved in 20 ml of water add 5 ml. of dilute *nitric acid* and 1 drop of silver nitrate solution; no turbidity is produced.

Sulphated ash –Not more than 0.05 per cent, Appendix 2.3.6.

Assay –

(A) Weigh accurately about 3 g and dissolve in 50 ml of carbon dioxide free water and titrate with N sodium hydroxide, using phenolphtahalein solution as indicator. Each ml of N sodium hydroxide is equivalent to 0.06304 of $C_2H_2O_4$, $2H_2O$.

(B) Weigh accurately about 3 g, dissolve in water, and add sufficient water to produce 250 ml. To 25 ml of this solution add 5ml of sulphuric acid previously diluted with a little water, and titrate at a temperature of about 70° with 0.1N potassium permanganate. Each ml of 0.1 *N potassium permanganate* is equivalent to 0.006303 g of $C_2H_2O_4$, $2H_2O$.

Oxalic Acid, 0.1 N – $C_2H_2O_4$, $2H_2O$ = 126.07, 6.303 g in 1000 ml.

Dissolve 6.45 g of oxalic acid in sufficient water to produce 1000 ml and standardise the solution as follows

Pipette 30 ml of the solution into a beaker, add 150 ml of water, 7 ml of *sulphuric acid* and heat to about 70°. Add slowly from a burette freshly standardised 0.1 *N potassium permanganate* with constant stirring, until a pale-pink colour, which persists for fifteen seconds, is produced. The temperature at the conclusion of the titration should not be less than 60°. Each ml of 0.1 *N potassium permanganate* is equivalent to 0.006303 g of $H_2C_2O_4$, $2H_2O$.

Petroleum Light – Petroleum Spirit

Description –Colourless, very volatile, highly flammable liquid obtained from petroleum, consisting of a mixture of the lower members of the paraffin series of hydrocarbons and complying with one or other of the following definitions :

Light Petroleum –(Boiling range, 30° to 40°).

Wt. per ml. –At 20°, 0.620 to 0.630 g.

Light Petroleum –(Boiling range, 40° to 60°).

Wt. per ml –At 20°, 0.630 to 0.650 g.

Light Petroleum –(Boiling range, 60° to 80°).

Wt. per ml. –At 20°, 0.670 to 0.690.

Light Petroleum –(Boiling range, 80° to 100°).

Wt. per ml. –At 20°, 0.700 to 0.720

Light Petroleum –(Boiling range, 100° to 120°).

Wt. per ml –At 20°, 0.720 to 0.740 g.

Light Petroleum –(Boiling range, 120° to 160°).

Wt. per ml –At 20°, about 0.75 g.

Non-volatile matter –When evaporated on a water-bath and dried at 105°, leaves not more than 0.002 per cent w/v of residue.

Phenacetin – $C_{10}H_{13}O_2N = 179.2$

Analytical reagent grade.

White, glistening, crystalline scales, or a fine, white, crystalline powder; odourless; taste, slightly bitter.

Melting range –134° to 136°.

Phenol – $C_6H_5OH = 94.11$

Analytical reagent grade.

Caustic, deliquescent crystals with a characteristic odour; freezing point, about 41°.

Phenol Liquified –General reagent grade.

A solution in water containing about 80 per cent w/w C_6H_6O.

Phenol Red –$C_{19}H_{14}O_5S$. Phenolsulphonphthalein.

A light to dark red crystalline powder, very slightly soluble in water, slightly soluble in alcohol, soluble in dilute alkaline solutions.

Phenol Red Solution –Dissolve 0.10 g of *phenol red* in 2.82 ml of 0.1 *N sodium hydroxide*, and add 20 ml of *alcohol* and dilute to 100 ml with water.

Test for sensitivity –A mixture of 0.1 ml of the *phenol red solution* in 100 ml of freshly boiled and cooled water is yellow. Not more than 0.1 of 0.02 *N* sodium hydroxide is required to change the colour to red-violet.

Colour change - pH 6.8 (yellow) to pH 8.4 (red-violet).

Phenolphthalein –$C_{20}H_{14}O_4$.

A white to yellowish-white powder, practically insoluble in water, soluble in alcohol.

Phenolphthalein Solution –Dissolve 0.10 g in 80 ml of *alcohol* and dilute to 100 ml with water.

Test for sensitivity –To 0.1 ml of the *phenolphthalein solution* add 100 ml of freshly boiled and cooled water, the solution is colourless. Not more than 0.2 ml of 0.02 *N sodium hydroxide* is required to change the colour to pink.

Colour change –pH 8.2 (colourless) to pH 10.0 (red)

Phloroglucinol – 1 : 3 : 5 – Trihydroxybenzene , $C_6H_3(OH)_3$, $2H_2O$.

Description – White or yellowish crystals or a crystalline powder.

Solubility –Slightly soluble in water; soluble in *alcohol*, and in *solvent ether*.

Melting range –After drying at 110° for one hour, 215° to 219°.

Sulphated ash – Not more than 0.1 per cent, Appendix 2.3.6.

Phloroglucinol should be kept protected from light.

Phloroglucinol Solution –A 1.0 per cent w/v solution of phloroglucinol in alcohol (90 per cent).

Phosphoric Acid – H_3PO_4 = 98.00.

(Orthophosphoric Acid; Concentrated Phosphoric Acid).

Description –Clear and colourless syrupy liquid, corrosive.

Solubility –Miscible with water and with alcohol.

Hypophoshorous and phosphorous acid – To 0.5 ml add 10 ml of water and 2 ml of *silver nitrate solution* and heat on a waterbath for five minutes; the solution shows no change in appearance.

Alkali phosphates - To 1 ml in a graduated cylinder add 6 ml of *solvent ether* and 2 ml of *alcohol*; no turbidity is produced.

Chloride –1 ml complies with the limit test for chlorides, Appendix 2.3.2.

Sulphate –0.5 ml complies with the limit test for sulphate, Appendix 2.3.7.

Arsenic – Not more than 2 parts per million, Appendix 2.3.1.

Heavy metals –Not more than 10 parts per million, determined by Method A on a solution prepared by diluting 1.2 ml with 10 ml of *water*, neutralising with dilute *ammonia solution*, adding sufficient dilute *acetic acid* to render the solution acidic and finally diluting to 25 ml with *water*, Appendix 2.3.3.

Iron –0.1 ml complies with the limit test for iron, Appendix 2.3.4.

Aluminium and calcium –To 1 ml add 10 ml of water and 8 ml of dilute *ammonia solution* the solution remains clear.

Assay –Weigh accurately about 1 g. and mix with a solution of 10 g of *sodium chloride* in 30 ml of water. Titrate with *N sodium hydroxide*, using *phenolphthalein solution* as indicator. Each ml of *N sodium hydroxide* is equivalent to 0.049 g of H_3O_4

Storage –Store in a well-closed glass containers.

Phosphoric Acid, xN –

Solutions of any normality, x N may be prepared by diluting 49 x g of *phosphoric acid* with water to 1000 ml.

Phosphoric Acid, Dilute –

Contains approximately 10 per cent w/v of H_3O_4.

Dilute 69 ml of *phosphoric acid* to 1000 ml with water.

Piperazine Hydrate –$C_4H_{10}N_2$, $6H_2O$ = 194.2.

General reagent grade of commerce.

Colourless, glossy, deliquescent crystals, melting point, about 44°.

Potassium Antimonate –$KSbO_3$, $3H_2O$ =262.90.

Contains not less than 40.0 per cent of Sb.

Description – White, crystalline powder.

Solubility –Sparingly soluble in water, very slowly soluble in cold, but rapidly soluble on boiling.

Assay –Weigh accurately about 0.3 g, and dissolve in 100 ml of water, add 2 ml of dilute *hydrochloric acid*, and pass in *hydrogen sulphide* until the *antimony* is completely precipitated. Add 2 ml of *hydrochloric acid* and again pass in *hydrogen sulphide*. Boil, filter, wash the precipitate with hot *water* saturated with *hydrogen sulphide*, and dissolve the precipitate in 25 ml of *hydrochloric acid*. Boil to remove *hydrogen sulphide*, and dilute to 50 ml with *water*. Add 2 g of *sodium potassium tartrate*, neutralise carefully with *sodium 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 –$K2CO_3$ = 138.21

Contains not less than 98.0 per cent of $K2CO_3$.

Description –White, granular powder, hygroscopic.

Solubility –Very soluble in *water,* forming a clear solution.

Iron – 1 g, with the addition of 1.5 ml of *hydrochloric acid,* complies with the limit test for *iron,* Appendix 2.3.4.

Chloride –1g, with the addition of 5 ml of *nitric acid,* complies with the limit test for *chlorides,* Appendix 2.3.2.

Sulphate –1 g, with the addition of 5 ml of *hydrochloric acid,* complies with the limit test for *sulphates,* Appendix 2.3.7.

Chromium –To 25 ml of a 2 per cent w/v solution in *water,* add about 0.2 g of *sodium peroxide and* boil gently for five minutes, cool, acidify with *dilute sulphuric acid* and add 2 drops of *diphenylcarbazide solution;* no violet colour is produced.

Assay –Weigh accurately about 3 g, dissolve in 50 ml of *water,* and titrate with *N hydrochloric acid,* using *bromophenol blue solution* as indicator. At the first colour change, boil the solution, cool, and complete the titration. Each ml of *N hydrochloric acid* is equivalent to 0.06911 g of $K2CO_3$.

Potassium Carbonate, Anhydrous. –Potassium carbonate dried at 135° for two hours spread in a thin layer and then cooled in a desiccator.

Potassium Chlorate – $KClO_3$ =122.55

Contains not less than 99.0 per cent of $KClO_3$.

Description –White powder or colourless crystals. In admixture with organic or readily oxidisable substances, it is liable to explode if heated or subjected to percussion or trituration.

Solubility –Soluble in *water*, and in *glycerin*; practically insoluble in *alcohol.*

Lead –Not more than 10 parts per million, Appendix 2.3.5.

Chloride –0.5 g complies with the limit test for *chlorides,* Appendix 2.3.2.

Sulphate –0.5 g complies with the limit test for *sulphates,* Appendix 2.3.7.

Assay –Weigh accurately about 0.3 g and dissolve in 10 ml of *water* in a stoppered-flask, add 1 g of *sodium nitrate,* dissolved in 10 ml of *water,* and then 20 ml of *nitric acid;* stopper the flask and allow to stand for ten minutes; and 100 ml of water and sufficient *potassium permangnate solution* to produce a permanent pink colour; decolorise by the addition of a trace of *ferrous sulphate* and add 0.1 g of *urea.* Add 30 ml of 0.1 *N silver nitrate,* filter, wash with *water,* and titrate the filtrate and washings with 0.1 *N ammonium thiocyanate,* using *ferric ammonium sulphate solution* as indicator. Each ml of 0.1 *N silver nitrate* is equivalent to 0.01226 g of $KClO_3$

Potassium Chloride –KCl = 74.55

Analytical reagent grade

Potassium Chromate – K_2CrO_4 = 194.2

Analytical reagent grade

Potassium Chromate Solution –A 5.0 per cent w/v solution of potassium chromate.

Gives a red precipitate with *silver nitrate* in neutral solutions.

Potassium Cupri-Tartrate Solution –Cupric Tatrate Alkaline Solution : Fehling's Solution.

(1) **Copper Solution** –Dissolve 34.66 g of carefully selected small crystals of *copper sulphate,* showing no trace of efflorescence or of adhering moisture, in sufficient water to make 500 ml. Keep this solution in small, well-stoppered bottles

(2) **Alkaline Tartrate Solution** – Dissolve 176 g of sodium *potassium tartrate* and 77 g of *sodium hydroxide* in sufficient *water* to produce 500 ml.

Mix equal volumes of the solutions No. 1 and No. 2 at the time of using.

Potassium Cyanide –KCN =65.12

Contains not less than 95.0 per cent of KCN.

Description –White, crystalline powder, gradually decomposing on exposure to air.

Solubility –Readily soluble in *water,* forming a clear, colourless solution.

Heavy metals – To 20 ml of a 5 per cent w/v solution in *water,* add 10 ml of *hydrogen sulphide solution;* no darkening is produced immediately or on the addition of 5 ml of *dilute hydrochloric acid.*

Assay – Weigh accurately about 0.5 g and dissolve in 50 ml of *water,* add 5 ml of dilute *ammonia solution* and 1 drop of *potassium iodide solution*; titrate with 0.1 *N silver nitrate until a faint* permanent turbidity appears. Each ml of 0.1 *N silver nitrate* is equivalent to 0.01302 g of KCN.

Potassium Cyanide Solution –A 10.0 per cent w/v solution of *potassium cyanide* in *water.*

Potassium Cyanide Solution, Lead –free –Weigh accurately about 10 g of *potassium cyanide* and dissolve in 90 ml of *water,* add 2 ml of *hydrogen peroxide solution,* allow to stand for twenty-four hours, and make up to 100 ml with *water.* It complies with the following tests.

Mix 2 ml with 5 ml of *lead-free ammonia solution* and 40 ml of water, and add 5 ml of *standard lead solution;* no darkening is produced.

Potassium Dichromate – $K_2Cr_2O_7$ =294.18.

Contains not less than 99.8 per cent of $K_2Cr_2O_7$

Description – Orange-red crystals or a crystalline powder.

Solubility – Soluble in *water*

Chloride. –To 20 ml of a 5 per cent w/v solution in *water* and 10 ml *nitric acid,* warm to about 50° and add a few drops of *silver nitrate solution*; not more than a faint opalescence is produced.

Assay –Carry out the Assay described under Potassium Chromate, using 2 g. Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.004904 g of $K_2Cr_2O_7$.

Potassium Dichromate Solution – A 7.0 per cent w/v solution of *potassium dichromate* in *water.*

Potassium Dichromate, Solution 0.1N – $K_2Cr_2O_7$ = 294.18, 4.903 g in 1000 ml.

Weigh accurately 4.903 g of *potassium dichromate* and dissolve in sufficient *water* to produce 1000 ml.

Potassium Dihydrogen Phosphate - KH_2PO_4 = 136.1

Analytical reagent grade of commerce.

Potassium Ferricyanide – $K_3Fe(CN)_6$ = 329.25

Contains not less than 99.0 per cent of $K_3Fe(CN)_6$

Description –Ruby-red crystals.

Solubility –Very soluble in *water.*

Ferrocyanide –Rapidly wash 1 g with water, then dissolve in 100 ml of *water,* and add 1 drop of *ferric ammonium sulphate solution;* no blue colour is produced.

Assay –Weigh accurately about 1 g and dissolve in 50 ml of *water,* add 5 g of *potassium iodide* and 3 g of *zinc sulphate,* and titrate the liberated *iodine* with 0.1 *N sodium thiosulphate, using starch solution,* added towards the end of the titration, as indicator.Each ml of 0.1 *N sodium thiosulphate* is equivalent to 0.03293 g of $K_3Fe(CN)_6$.

Potassium Ferricyanide Solution –Wash about 1 g of *potassium ferricyanide* crystals with a little *water,* and dissolve the washed crystals in 100 ml of *water.*

Potassium Ferricyanide solution must be freshly prepared.

Potassium Ferrocyanide – $K_4Fe(CN)_6$, $3H_2O$ =422.39

Contains not less than 99.0 per cent of $K_4Fe(CN)_6$, $3H_2O$.

Description –Yellow, crystalline powder.

Solubility --Soluble in water.

Acidity or Alkalinity –A 10 per cent w/v solution in water is neutral to litmus paper.

Assay –Weigh accurately about 1g and dissolve in 200 ml of *water,* add 10 ml of *sulphuric acid* and titrate with 0.1 *N potassium permanganate.* Each ml of 0.1 *N potassium permanganate* is equivalent to 0.04224 g of $K_4Fe(CN)_6$, $3H_2O$.

Potassium Ferrocyanide Solution –A 5.0 per cent w/v solution of *potassium ferrocyanide in water.*

Potassium Hydrogen Phthalate –$CO_2H.C_6H_4.CO_2K$ =204.22.

Contains not less than 99.9 per cent and not more than the equivalent of 100.1 per cent of $C_8H_5O_4K$ calculated with reference to the substance dried at 110° for one hour.

Description –White, crystalline powder.

Solubility –Slowly soluble in *water,* forming clear, colourless solution.

Acidity –A 2.0 per cent w/v solution in carbon dioxide free water gives with *bromophenol blue solution* the grey colour indicative of pH 4.0.

Assay –Weigh accurately about 9 g, dissolve in 100 ml of *water* and titrate with *N sodium hydroxide* using *phenolphthalein solution* as indicator. Each ml of *N Sodium hydroxide* is equivalent to 0.2042 g of $C_8H_5O_4K$.

Potassium Hydrogen Phthalate, 0.02 M –

Dissolve 4.084 g of *Potassium hydrogen phthalate* in sufficient *water* to produce 1000 ml.

Potassium Hydrogen Phthalate, 0.2 M –

Dissolve 40.84 g of *potassium hydrogen phthalate* in sufficient *water* to produce 1000 ml.

Potassium Hydroxide –Caustic Potash : KOH = 56.11

Contains not less than 85.0 per cent of total alkali, calculated as KOH and not more than 4.0 per cent of K_2CO_3.

Description –Dry white sticks, pellets or fused mass; hard, brittle and showing a crystalline fracture; very deliquescent; strongly alkaline and corrosive.

Solubility –Freely soluble in *water*, in *alcohol* and in *glycerin;* very soluble in boiling ethyl alcohol.

Aluminium, iron and matter insoluble in hydrochloric acid –Boil 5 g with 40 ml of *dilute hydrochloric acid,* cool, make alkaline with *dilute ammonia solution,* boil, filter and wash the residue with a 2.5 per cent w/v solution of *ammonium nitrate*; the insoluble residue, after ignition to constant weight, weighs not more than 5 mg.

Chloride –0.5 g dissolved in water with the additon of 1.6 ml of *nitric acid*, complies with the limit test for *chlorides*, Appendix 2.3.2.

Heavy metals –Dissolve 1 g in a mixture of 5 ml of *water* and 7 ml of *dilute hydrochloric acid.* Heat to boiling, add 1 drop of *phenolphthalein solution* and *dilute ammonia solution* dropwise to produce a faint pink colour. Add 2 ml of *acetic acid* and *water* to make 25 ml; the limit of heavy metals is 30 parts per million, Appendix 2.3.3.

Sulphate –Dissolve 1 g in water with the addition of 4.5 ml of *hydrochloric acid;* the solution complies with the limit test for *sulphates,* Appendix 2.3.7.

Sodium –To 3 ml of a 10 per cent w/v solution add 1 ml of *water*, 1.5 ml of *alcohol,* and 3 ml of *potassium antimonate solution* and allow to stand; no white crystalline precipitate or sediment is visible to the naked eye within fifteen minutes.

Assay –Weigh accurately about 2 g, and dissolve in 25 ml of *water,* add 5 ml of *barium chloride solution,* and titrate with *N hydrochloric acid,* 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 – Ag2 CO3 = 214

Prepared from *silver nitrate* and soluble *carbonate solution.* Light yellow powder when freshly precipitated, but becomes darker on drying and on exposure to light.

Silica Gel –

Partially dehydrated, polymerised, colloidal silicic acid containing cobalt chloride as an indicator.

Description –Blue granules, becoming pink when the moisture absorption capacity is exhausted. Silica Gel absorbs about 30 per cent of its weight of water at 20°. Its absorptive capacity may be regenerated by heating at 150° for two hours.

Silver Nitrate –$AgNO_3$ = 169.87

Description –Colourless crystals or white crystalline powder; odourless; taste, bitter and metallic.

Solubility –Very soluble in *water*, sparingly soluble in *alcohol;* slightly soluble in *solvent ether.*

Clarity and colour of solution –A solution of 2 g in 20 ml of water is clear and colourless.

Bismuth, Copper and Lead –To a solution of 1 g in 5 ml of *water, add a slight excess* of dilute *ammonia solution;* the mixute remains clear and colourless.

Foreign substances –To 30 ml of 4. 0 per cent w/v solution add 7.5 ml of 2 *N hydrochloric acid,* shake vigorously, filter and evaporate 10 ml of the filtrate to dryness on a water-bath; the residue weighs not more than 1 mg.

Assay – Weigh accurately about 0.5 g and dissolve in 50 ml of *water,* add 2 ml of *nitric acid,* and titrate with 0.1 *N ammonium thiocyanate,* using *ferric ammonium sulphate solution* as indicator. Each ml of 0.1 *N ammonium thiocyanate* is equivalent to 0.01699 g of $Ag NO_3$.

Storage –Store in tightly-closed, light resistant containers.

Silver Nitrate Solution –

A freshly prepared 5.0 per cent w/v solution of silver nitrate in water.

Silver Nitrate, 0.1 N– $Ag NO_3$ = 169. 87; 16.99 g in 1000 ml. Dissolve about 17 g in sufficient *water* to produce 1000 ml and standardise the solution as follows:

Weigh accurately about 0.1 g of *sodium chloride* previously dried at 110° for two hours and dissolve in 5 ml of *water.* Add 5 ml of *acetic acid,* 50 ml of *methyl alcohol* and three drops of *eosin solution is* equivalent to 1 ml of 0.1 *N silver nitrate.*

Sodium Bicarbonate – $NaHCO_3$ =84.01

Description –White, crystalline powder or small, opaque, monoclinic crystals; odourless; taste, saline.

Solubility –Freely soluble in *water*; practically insoluble in *alcohol.*

Carbonate –pH of a freshly prepared 5.0 per cent w/v solution in *carbon dioxide-free water,* not more than 8.6.

Aluminium, calcium and insoluble matter –Boil 10 g with 50 ml of *water* and 20 ml of *dilute ammonia solution,* filter, and wash the residue with water; the residue, after ignition to constant weight, not more than 1 mg.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Iron –Dissolve 2.5 g in 20 ml of *water* and 4 ml of *iron-free hydrochloric acid,* and *dilute* to 40 ml with *water*; the solution complies with the *limit test for iron,* Appendix 2.3.4.

Heavy metals –Not more than 5 parts per million, determined by Method A on a solution prepared in the following manner :

Mix 4.0 g with 5 ml of *water* and 10 ml of *dilute hydrochloric acid,* heat to boiling, and maintain the temperature for one minute. Add one drop of *phenolphthalein solution* and sufficient *ammonia solution* dropwise to give the solution a faint pink colour. Cool and dilute to 25 ml with *water, Appendix 2.3.3.*

Chlorides –Dissolve 1.0 g in *water* with the addition of 2 ml of *nitric acid;* the solution complies with the *limit test for chlorides,* Appendix 2.3.2.

Sulphates –Dissolve 2 g in *water* with the addition of 2 ml of *hydrochloric acid;* the solution complies with the limit test for *sulphates,* Appendix 2.3.7.

Ammonium compounds –1 g warmed with 10 ml of *sodium hydroxide solution* does not evolve ammonia.

Assay –Weigh accurately about 1 g, dissolve in 20 ml of *water,* and titrate with 0.5 *N sulphuric acid* using *methyl orange solution* as indicator. Each ml of 0.5 *N sulphuric acid* is equivalent to 0.042 g of $NaHCO_3$.

Storage –Store in well-closed containers.

Sodium Bicarbonate Solution –A 5 per cnet w/v solution of *sodium bicarbonate* in *water.*

Sodium Bisulphite –Consists of sodium bisulphite ($NaHSO_3$) and sodium metabisulphite ($Na2S2O_3$) in varying proportions. It yields not less than 58.5 per cent and not more than 67.4 per cent of SO_2.

Description –White or yellowish-white crystals or granular powder; odour of sulphur dioxide. It is unstable in air.

Solubility –Freely soluble in *water,* slightly soluble in *alcohol.*

Assay –Weigh accurately about 0.2 g and transfer to a glass-stoppered flask, add 50 ml of 0.1 *N iodine* and insert the stopper of the flask. Allow to stand for five minutes, add 1 ml of *hydrochloric acid,* and titrate the excess of iodine with 0.1 *N sodium thiosulphate,* using *starch solution* as indicator added towards the end of the titration. Each ml of 0.1 *N iodine* is equivalent to 0.003203 g of SO_2.

Storage –Preserve Sodium Bisulphite in tightly-closed containers in a cool place.

Sodium Bisulphite Solution –Dissolve 10 g of *sodium bisulphite* in sufficient *water* to make 30 ml.

Sodium Bisulphite Solution must be freshly prepared.

Sodium Carbonate – $Na_2CO_3.\ 10H_2O$ =286.2.

Analytical reagent grade.

Sodium Chloride – NaCl = 58.44

Analytical reagent grade.

Sodium Cobaltinitrite –$Na_3CO(NO_2)_6$ = 403.94

Description –An orange-yellow powder.

Solubility –Readily soluble in *water,* forming a clear orange-red solution.

Potassium – Dissolve 3 g in 10 ml of *water* , add the solution to a mixture of 5 ml of *water* and 2 ml of *dilute acetic acid,* and allow to stand for one hour; no precipitate is produced.

Sodium Cobaltinitrite Solution – A 30 per cent w/v solution of *sodium cobaltinitrite* in *water.*

Sodium Diethyldithiocarbamate –$(C_2H_5)_2$, N. CS.SNa, $3H_2O$ = 225.30.

Description –White or colourless crystals.

Solubility –Readily soluble in *water,* yielding a colourless solution.

Sensitivity –Add 10 ml of a 0.1 per cent w/v solution to 50 ml of *water* containing 0.002 mg of copper previously made alkaline with *dilute ammonia solution.* A yellowish-brown colour should be apparent in the solution when compared with a blank test containing no copper.

Sodium Diethyldithiocarbamate Solution – A 0.1 per cent w/v solution of *sodium diethyldithiocarbamate* in *water.*

Sodium Hydroxide –NaOH = 40.00

Description –White sticks, pellets, fused masses, or scales; dry, hard brittle, and showing a crystalline fracture, very deliquescent; strongly alkaline and corrosive.

Solubility –Freely soluble in *water* and in *alcohol.*

Aluminium, iron and matter insoluble in hydrochloric acid –Boil 5 g with 50 ml of dilute hydrochloric acid, cool, make alkaline with *dilute ammonia solution,* boil, filter, and wash with a 2.5 per cent w/v solution of *ammonium nitrate;* the insoluble residue after ignition to constant weight weighs not more than 5 mg.

Arsenic –Not more than 4 parts per million, Appendix 2.3.1.

Heavy metals –Not more than 30 parts per million, determined by Method A, Appendix 2.3.3. on a solution prepared by dissolving 0.67 g in 5 ml of water and 7 ml of 3 *N hydrochloric acid.* Heat to boiling, cool and dilute to 25 ml with water.

Potassium –Acidify 5 ml of a 5 per cent w/v solution with *acetic acid* and add 3 drops of *sodium cobaltnitrite solution;* no preciptitate is formed.

Chloride –0.5 g dissolved in *water* with the addition of 1.8 ml of *nitric acid,* complies with the limit test for *chlorides,* Appendix 2.3.2.

Sulphates –1 g dissolved in *water* with the addition of 3.5 ml of *hydrochloric acid* complies with the limit test for *sulphates,* Appendix 2.3.7.

Assay –Weigh accurately about 1.5 g and dissolve in about 40 ml of *carbon dioxide-free water.* Cool and titrate with *N sulphuric acid* using *phenolphthalein solution* as indicator. When the pink colour of the solution is discharged, record the volume of acid solution required, add *methyl orange solution* and continue the titration until a persistent pink colour is produced. Each ml of *N sulphuric acid* is equivalent to 0.040 g of total alkali calculated as NaOH and each ml of acid consumed in the titration with *methyl orange* is equivalent to 0.106 g of Na_2CO_3.

Storage –Store in tightly closed containers.

Sodium Hydroxide, xN – Solutions of any normality, xN may be prepared by dissolving 40 x g of *sodium hydroxide* in *water* and diluting to 1000 ml.

Sodium Hydroxide Solution – A 20.0 per cent w/v solution of *sodium hydroxide* in *water.*

Sodium Hydroxide Solution, Dilute –

A 5.0 per cent w/v solution of *sodium hydroxide* in water.

Sodium Nitrite –$NaNO_2$ = 69.00, Analytical reagent grade.

Sodium Nitroprusside –(Sodium penta cyano nitrosyl ferrate (iii) dihydrate; $Na_2[Fe(CN)_5(NO)]$, $2H_2O$ = 298.0

Analytical reagent grade of commerce.

Sodium Peroxide – Na_2O_2 =77.98.

Analytical grade reagent.

Sodium Potassium Tartrate –Rochelle Salt COONa.CH(OH). CH(OH), COOK, $4H_2O$ = 282.17

Contains not less than 99.0 per cent and not more than the equivalent of 104.0 per cent of $C_4H_4O_6KNa$, $4H_2O$.

Description –Colourless crystals or a white, crystalline powder; odourless; taste saline and cooling. It effloresces slightly in warm, dry air, the crystals are often coated with a white powder.

Solubility –Soluble in *water;* practically insoluble in alcohol.

Acidity or Alkalinity –Dissolve 1 g in 10 ml of recently boiled and cooled *water,* the solution requires for neutralisation not more than 0.1 ml of 0.1 *N sodium hydroxide* or of 0.1 *N hydrochloric acid,* using *phenolphthalein solution as indicator.*

Iron –0.5 g complies with the *limit test for iron,* Appendix 2.3.4.

Chloride –0.5 g complies with the *limit test for chlorides,* Appendix 2.3.2.

Sulphate –0.5 g complies with the *limit test for sulphate* , Appendix 2.3.7.

Assay –Weigh accurately about 2 g and heat until carbonised, cool, and boil the residue with 50 ml of *water* and 50 ml of 0.5 *N sulphuric acid;* filter, and wash the filter with *water;* titrate the excess of acid in the filtrate and washings with 0.5 *N sodium hydroxide,* using *methyl orange solution* as indicator. Each ml of 0.5 *N sulphuric acid* is equivalent to 0.07056 g of $C_4H_4O_6KNa$, $4H_2O$.

Sodium Sulphide –Na_2S + aq.

Analytical reagent grade. Deliquescent, crystalline masses turning yellow on storage.

Sodium Sulphide Solution –Dissolve with heating, 12 g of *sodium sulphide* in a mixture of 10 ml of *water* and 25 ml of *glycerol,* cool and dilute to 100 ml with the same mixture.

Sodium Sulphite, Anhydrous –Na_2SO_3 =126.06

Description –Small crystals or powder.

Solubility –Freely soluble in *water,* soluble in *glycerin;* almost insoluble in *alcohol.*

Sodium Thiosulphate – $Na_2S_2O_3$, $5H_2O$ =248.17.

Description –Large colourless crystals or coarse, crystalline powder; odourless; taste, saline, deliquescent in moist air and effloresces in dry air at temperature above 33°.

Solubility –Very soluble in *water;* insoluble in *alcohol.*

pH –Between 6.0 and 8.4, determined in a 10 per cent w/v solution.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Heavy metals –Not more than 20 parts per million, determined by Method A, Appendix 2.3.3. on a solution prepared in the following manner : Dissolve 1 g in 10 ml of *water,* slowly add 5 ml of *dilute hydrochloric acid* and evaporate the mixture to dryness on a water-bath. Gently boil the residue with 15 ml of *water* for two minutes, and filter. Heat the filtrate to boiling, and add *sufficient bromine solution* to the hot filtrate to produce a clear solution and add a slight excess of *bromine solution.* Boil the solution to expel the *bromine* completely, cool to room temperature, then add a drop of *phenolphthalein solution* and *sodium hydroxide solution* until a slight pink colour is produced. Add 2 ml of *dilute acetic acid* and dilute with *water* to 25 ml.

Calcium –Dissolve 1 g in 20 ml of *water,* and add a few ml of *ammonium oxalate solution;* no turbidity is produced.

Chloride –Dissolve 0.25 g in 15 ml of *2N nitric acid* and boil gently for three to four minutes, cool and filter; the filtrate complies with the *limit test for chlorides,* Appendix 2.3.2.

Sulphate and Sulphite –Dissolve 0.25 g in 10 ml of *water,* to 3 ml of this solution add 2 ml of *iodine solution,* and gradually add more *iodine solution,* dropwise until a very faint-persistant yellow colour is procduced; the resulting solution complies with the limit test for sulphates, Appendix 2.3.7.

Sulphide –Dissolve 1 g in 10 ml of *water* and 10.00 ml of a freshly prepared 5 per cent w/v solution of *sodium nitroprusside;* the solution does not become violet.

Assay –Weigh accurately about 0.8 g and dissolve in 30 ml of *water.* Titrate with 0.1 *N iodine,* using 3 ml of *starch solution* as indicator as the end-point is approached. Each ml of 0.1 iodine is equivalent to 0.02482 g of $Na_2S_2O_3$, $5H_2O$.

Storage –Store in tightly-closed containers.

Sodium Thiosulphate 0.1 N – $Na_2S_2O_3$, $5H_2O$. = 248.17, 24.82 g in 1000 ml.

Dissolve about 26 g of *sodium thiosulphate* and 0.2 g of *sodium carbonate* in *carbon dioxide-free water* and dilute to 1000 ml with the same solvent. Standardise the solution as follows :

Dissolve 0.300 g of *potassium bromate* in sufficient *water* to produce 250 ml. To 50 ml of this solution, add 2 g of *potassium iodide* and 3 ml of 2 *N hydrochloric acid* and titrate with the *sodium-thiosulphate solution* using *starch solution,* added towards the end of the titration, as indicator until the blue colour is discharged. Each 0.002784 g of *potassium bromate* is equivalent to 1 ml of 0.1*N sodium thiosulphate.* Note: –Re-standardise 0.1 *N sodium thiosulphate* frequently.

Stannous Chloride – $SnCl_2$, $2H_2O$ =225.63.

Contains not less than 97.0 per cent of $SnCl_2$, $2H_2O$.

Description –Colourless crystals.

Solubility –Soluble in *dilute hydrochloric acid.*

Arsenic- Dissolve 5.0 g in 10 ml of *hydrochloric acid,* heat to boiling and allow to stand for one hour; the solution shows no darkening when compared with a freshly prepared solution of 5.0 g in 10 ml of *hydrochloric acid.*

Sulphate –5.0 g with the addition of 2 ml of *dilute hydrochloric acid,* complies with the *limit test for sulphates,* Appendix 2.3.7.

Assay –Weigh accurately about 1.0 g and dissolve in 30 ml of *hydrochloric acid* in a stoppered flask. Add 20 ml of *water* and 5 ml of *chloroform* and titrate rapidly with 0.05 *M potassium iodate until* the *chloroform* layer is colourless. Each ml of 0.05 M potassium iodate is equivalent to 0.02256 g of $SnCl_2$, $2H_2O$.

Stannous Chloride Solution – May be prepared by either of the two methods given below :

1. Dissolve 330 g of *stannous chloride* in 100 ml of *hydrochloric acid* and add sufficient *water* to produce 1000 ml.

2. Dilute 60 ml of *hydrochloric acid* with 20 ml of *water,* add 20 g of tin and heat gently until gas ceases to be evolved; add sufficient *water* to produce 100 ml, allowing the undissolved tin to remain in the solution.

Starch Soluble – Starch which has been treated with *hydrochloric acid* until after being washed, it forms an almost clear liquid solution in hot water.

Description –Fine, white powder.

Solubility –Soluble in hot *water,* usually forming a slightly turbid *solution.*

Acidity or Alkalinity –Shake 2 g with 20 ml of *water* for three minutes and filter; the filtrate is not alkaline or more than fainthy acid to litmus paper.

Sensitivity –Mix 1 g with a little cold *water* and add 200 ml *boiling water.* Add 5 ml of this solution to 100 ml of *water* and add 0.05 ml of 0.1 *N iodine.* The deep blue colour is discharged by 0.05 ml of 0.1 *N sodium thiosulphate.*

Ash – Not more than 0.3 per cent, Appendix 2.2.3.

Starch Solution –Triturate 0.5 g of *soluble starch,* with 5 ml of *water,* and add this, with constant stirring, to sufficient water to produce about 100 ml. Boil for a few minutes, cool, and filter.

Solution of *starch must be recently prepared.*

Sudan Red G –Sudan III; Solvent Red 23; 1-(4-Phenyl-azophenylazo)-2-naphthol; $C_{22}H_{16}N_4O$ = 352.40.

Description –Reddish-brown powder.

Solubility –Insoluble in *water*; soluble in *chloroform,* in *glacial acetic acid;* moderately soluble in *alcohol,* in solvent *ether* and in *acetone.*

Sulphamic Acid –NH_2SO_3H =97.09.

Contains not less than 98.0 per cent of H_3NO_3S .

Description -White crystals or a white crystalline powder.

Solubility –Readily soluble in water.

Melting Range –203° to 205°, with decomposition.

Sulphuric Acid – H2SO4 = 98.08.

When no molarity is indicated use analytical reagent grade of commerce containing about 98 per cent w/w of *sulphuric acid.* An oily, corrosive liquid weighing about 1.84 g per ml and about 18 M in strength.

When solutions of molarity xM are required, they should be prepared by carefully adding 54 x ml of sulphuric acid to an equal volume of water and diluting with water to 1000 ml.

Solutions of sulphuric acid contain about 10 per cent w/v of H_2SO_4 per g mol.

Sulphuric Acid, Dilute –Contains approximately 10 per cent w/w of H_2SO_4.

Dilute 57 ml of sulphuric acid to 1000 ml with water.

Sulphuric Acid, Chlorine-free –Sulphuric acid which complies with the following additional test:

Chloride –Mix 2 ml with 50 ml of water and add 1 ml of solution of *silver nitrate,* no opalescence is produced.

Sulphuric Acid, Nitrogen-free-Sulphuric acid which contains not less than 98.0 per cent w/w of H_2SO_4 and complies with the following additional test :

Nitrate –Mix 45 ml with 5 ml of *water*, cool and add 8 mg of *diphenyl benezidine;* the solution is colourless or not more than very pale blue.

Tartaric Acid –$(CHOH.\ COOH)_2$ =150.1

Analytical reagent grade.

Thioglycollic Acid – Mercapto acetic acid, – $HS.\ CH_2COOH$ =92.11.

Contains not less than 89.0 per cent w/w of $C_2H_4O_2S$, as determined by both parts of the Assay described below :

Description –Colourless or nearly colourless liquid; odour strong and upleasant.

Iron –Mix 0.1 ml with 50 ml of water and render alkaline with *strong ammonia solution;* no pink colour is produced.

Assay –

(1) Weigh accurately about 0.4 g and dissolve in 20 ml of *water* and titrate with 0.1 *N sodium hydroxide* using *cresol red solution* as indicator. Each ml of 0.1 *N sodium hydroxide is equivalent to* 0.009212 g of $C_2H_4O_2S$.

(2) To the above neutralised solution and 2 g of *sodium bicarbonate* and titrate with 0.1 *N iodine* Each ml of 0.1 *N iodine is equivalent to 0.009212 g of* $C_2H_4O_2S$.

Thymol – 2-Isopropyl-5-methylphenol; $C_{10}H_{14}O$ = 150.2

General reagent grade.

Colourless crystals with an aromatic odour; freezing point not below 49°.

Thymol Blue –6, 6' –(3H-2, 1 Benzoxathil –3 –ylidene) dithymol SS =dioxide; $C_{27}H_{30}O_5S$ = 466.6

Gives a red colour in strongly acid solutions, a yellow colour in weakly acid and weakly alkaline solutions, and a blue colour in more strongly alkaline solutions (pH range, 1.2 to 2.8 and 2.0 to 9.6).

Thymol Blue Solution –Warm 0.1 g of *thymol blue* with 4.3 ml of 0.05 M sodium hydroxide and 5 ml of *ethanol (90 per cent);* after solution is effected add sufficient *ethanol (20 per cent)*to produce 250 ml.

Complies with the following test –

Sensitivity –A mixture of 0.1 ml and 100 ml of carbon dioxide-free water to which 0.2 ml of 0.02 *N sodium hydroxide* has been added is blue. Not more than 0.1 ml of 0.2 *N hydrochloric* acid is required to change the colour to yellow.

Titanous Chloride Solution –General reagent grade of commerce containing about 15 per cent w/v to TiCl3.

Weight per ml, about 1.2 g.

Dull purplish liquid with a strongly acid reaction.

Titanous Chloride 0.1 N – $TiCl_3$=154.26; 15.43 g in 1000 ml.

Add 103 ml of *titanous chloride solution* to 100 ml of *hydrochloric acid,* dilute to 1000 ml with recently boiled and cooled water, and mix, standardise, immediately before use, as follows :

Place an accurately measured volume of about 30 ml of standardised 0.1 *N ferric ammonium sulphate* in a flask and pass in a rapid stream of *carbon dioxide* until all the air has been removed. Add the *titanous chloride solution* from a burette and in an atmosphere of carbon dioxide until near the calculated end point then add 5 ml of *ammonium thiocyanate solution,* and continue the titration until the solution is colourless. Each ml of 0.1 *N ferric ammonium sulphate* is equivalent to 0.01543 g of $TiCl_3$.

Vanillin-Sulphuric Acid Reagent – 5 % Ethanolic sulphuric acid (Solution I)
1 % Ethanolic vanillin (Solution II)

The plate is sprayed vigorously with 10 ml Solution I, followed immediately by 5-10 ml of Solution II.

Water –See purified water.

Water, Ammonia-free –Water which has been boiled vigorously for a few minutes and protected from the atomosphere during cooling and storage.

Xylenol Orange –[3H-2,1-Benzoxathiol–3-ylidene bis –(6-hydroxy-5-methyl-m-phenylene) methylenenitrilo] tetra acetic acid SS-dioxide or its tetra sodium salt.

Gives a reddish-purple colour with mercury, lead, zinc and contain other metal ions in acid solution. When metal ions are absent, for example, in the presence of an excess of *disodium ethylenediamine tetraacetate*, this solution is yellow.

Xylenol Orange Solution –Shake 0.1 g of *xylenol orange* with 100 ml of *water* and filter, if necessary.

Zinc, Granulated –Zn=65.38.

Analytical reagent grade of commerce.

Zinc Powder –Zn =65.38.

Analytical reagent grade of commerce.

Zinc Sulphate –$ZnSO_4$. $7H_2O$ = 287.6.

Analytical reagent grade of commerce.

APPENDIX –5

5.1 WEIGHT AND MEASURES

METRIC SYSTEM

Measure of Mass (Weights)

1 Kilogram (Kg) – is the mass of the International Prototype Kilogram.
1 Gramme (g) – the 1000^{th} part of 1 Kilogram.
1Milligram (mg) – the 1000^{th} part of 1 gramme.
1 Microgram (μg) – the 1000^{th} part of 1 milligram.

Measures of capacity (Volumes)

1 Litre (1) is the volume occupied at its temperature of maximum density by a quantity of water having a mass of 1 Kilogram.
1 Millilitre (ml) the 1000^{th} part of 1 litre.

The accepted relation between the litre and the cubic centimetre is 1 litre –1000.027 cubic centimeters.

Relation of capacity of Weight (Metric)

One litre of water at 20° weighs 997.18 grammes when weighed in air of density 0.0012 gramme per millilitre against brass weights of density 84 grammes per millilitre.

Measures of Length

1 Metre (m) is the length of the International Prototype Metre at 0.
1 Centimetre (cm) – the 100^{th} part of 1 metre.
1 Millimetre (mm) – the 1000^{th} part of 1 metre.
1 Micron (μ) – the 1000^{th} part of 1 millimetre
1 Milliimicron (mμ) – the 1000^{th} part of micron.

5.2 APPROXIMATE EQUIVALENTS OF DOSES IN INDIAN SYSTEM AND METRIC SYSTEM :

1	Ratti or Gunja		=125 mg
8	Rattis or Gunjas	=1 Masa	=1 g
12	Masa	=1 Karsa (Tola)	=12 g
2	Karsas (Tolas)	=1 Sukti	=24 g
2	Suktis (4 Karsas or Tolas)	=1 Pal	=48 g
2	Palas	=1 Prasrti	=96 g
2	Prasrtis	=1 Kudava	=192 g
2	Kudavas	=1 Manika	=384 g
2	Manikas	=1 Prastha	=768 g
4	Prasthas	=1 Adhaka	=3 Kg 73 g
4	Adhakas	=1Drona	= 12 Kg 288 g
2	Dronas	=1Surpa	= 24 Kg 576 g
2	Surpas	=1 Droni (Vahi)	= 49 Kg 152 g
4	Dronis	=1 Khari	=196 Kg 608 g
100	Palas	=1 Tula	= 4 Kg 800 g
20	Tulas	=1 Bhara	= 96 Kg

APPENDIX-6
6.1 CLASSICAL AYURVEDIC REFERENCES

आढकी (बीजम्)

आढकीनां च बीजानि पटोलामलकैः सह ।
भोजनार्थं प्रयोज्यानि पानं चानु मधूदकम्।।
अरिष्टांश्चानुपानार्थे मेदोमांसकफापहान् ।
अतिस्थौल्यविनाशाय संविभज्य प्रयोजयेत्।।

(च. सू. 21/26)

आढकी कफपित्तघ्नी वातला कफवातनुत्।।

(च. सू. 27/33)

आढकी कफपित्तघ्नी किञ्चिन्मारुतकोपनी।
कषाया स्वादुसंग्राही कटुपाका हिमा लघुः।।
मेदःश्लेष्मास्रपित्तेषु हिता लेपोपसेकयोः।

(ध. नि. सुवर्णादि वर्ग 83 पृ0 193)

तुवरी ग्राहिणी शीता लघुः कफविषास्रजित्।

(म.नि.धान्यवर्ग 51)

आढकी तुवरी चाथ कालवृन्ता कुलत्थका।
तुवरी तुवरा रूक्षा मधुरा शीतला लघुः ।।
ग्राहिणी वातला वर्ण्या कफपित्तविषापहा।

(कै. नि. धान्यवर्ग 74-75)

आढकी तुवरी चापि सा प्रोक्ता शणपुष्पिका ।
आढकी तुवरा रूक्षा मधुरा शीतला लघुः।।
ग्राहिणी वातजननी वर्ण्या पित्तकफास्रजित्।

(भा.प्र.नि.धान्यवर्ग5/52)

अगुरु (रालीय काष्ठ)

शैलेयमेलाऽगुरुणी सकुष्ठे चण्डा नतं त्वक्सुरदारु रास्ना।
शीतं निहन्यादचिरात्प्रदेहो विषं शिरीषस्तु ससिन्धुवारः।।28।।

(च.सू.3)

शटी पुष्करमूलाम्लवेतसैला हिङ्.ग्वागुरुसुरसातामलकी।।
जीवन्तीचण्डा इति दशेमानि श्वासहराणि भवन्ति।।37।।

(च.सू.4)

तगरागुरुधान्यकशृङ्गवेरभूतीकवचाकण्टकार्यग्निमन्थ-
श्योनाकपिप्पल्य इति दशेमानि शीतप्रशमनानि भवन्ति।।42।।

(च.सू. 4)

अतोभूयःकर्मौषधानां च प्राधान्यतः सानुबन्धानि च
द्रव्याण्यनुव्याख्यास्यामः। तद्यथा .....रास्नाऽगुरुणी
शीतापनयनप्रलेपनानां।।40।।

(च.सू. 25)

अर्कागुरुगुडूचीनां तिक्तानामुष्णमुच्यते।।71।।

(च.सू. 26)

शिरोविरेचनद्रव्याणि पुनरपामार्ग.....
.....देवदार्वगुरुसरलशल्लकी .....।
हिङ्.गुनिर्यासाश्च ।।158।।

(च. वि. 8)

सुश्रुते सालसारादिगणे एलादिगणे श्लेष्मसंशमनवर्गे च
कुष्ठमेहपाण्डुवातकफविषकण्डूपिडकाकोठमेदरोगेषु
एवं वर्ण प्रसादनार्थं पठ्यते॥ 8-9, 24-25, 9॥

(सु. सू.38,39)

कटुतित्कोष्णमगुरु स्निग्धं वातकफापहम्।
श्रुतिनेत्ररुजं हन्ति माङ्गल्यं कुष्ठनुत्परम् ॥25॥

(ध. नि. चंदनादिवर्ग)

कृष्णागुरु कटुस्तिक्तस्तीक्ष्णोष्णः पित्तलो लघुः॥127॥
कर्णाक्षिरोगत्वग्दोष शीतवातकफप्रणुत्।

(कै. दे. नि. ओषधिवर्ग)

कृष्णागुरु कटूष्णञ्च तिक्तं लेपे च शीतलम्।
पाने पित्तहरं किञ्चित् त्रिदोषघ्नमुदाहृतम्॥87॥

(रा.नि. चन्दनादिवर्ग)

अगुरुष्णं कटु त्वच्यं तिक्तं तीक्ष्णञ्च पित्तलम्।
लघु कर्णाक्षिरोगघ्नं शीतवातकफप्रणुत् ॥22॥
कृष्णं गुणाधिकं तत्तु लोहवद्वारि मज्जति।
अगुरुप्रभवः स्नेहः कृष्णागुरुसमः स्मृतः ॥23॥

(भा. प्र. नि. कर्पूरादिवर्ग)

अक्लारि (बीज मज्जा)

समुद्रनारिकेलस्तु मधुरः कटुको लघुः।
वीर्योष्णः कफवातघ्नः शीतप्रशमनो मतः।।
हृद्यो विषघ्नोऽनलकृत् तृष्णानिग्रहणः परम्।
विषूचिकायां हृद्रोगे ज्वरे शीते च शस्यते।

(प्रो.प्रियव्रतशर्मा कृत द्रव्य गुण विज्ञान)
पृ. क्र. 732

अपराजिता (गिरिकर्णी पत्रम्)

गिरिकर्णीद्वयं तिक्तं पित्तोपद्रवनाशनम्।
चक्षुष्यं विषदोषघ्नं त्रिदोषशमनं च तत्॥78॥

(ध. नि., करवीरादिवर्ग)

गिरिकर्णी हिमा तिक्ता ग्रहघ्नी कण्ठदृष्टिदा।
त्रिदोषशूलकुष्ठामव्रणशोफविषापहा॥1080॥

(कै.नि.,)

गिरिकर्णी हिमा तिक्ता पित्तोपद्रवनाशिनी ।
चक्षुष्या विषदोषघ्नी त्रिदोषशमनी च सा ॥ 89॥

(रा. नि. गुडूच्यादिवर्ग)

आस्फोता गिरिकर्णीस्याद्विष्णुक्रान्ताऽपराजिता ।
अपराजिते कटू मेध्ये शीते कण्ठ्ये सुदृष्टिदे ॥
कुष्ठमूत्रत्रिदोषामशोथव्रणविषापहे ।
कषाये कटुके पाके तिक्ते च स्मृतिबुद्धिदे॥112॥

(भा. प्र. नि. गुडूच्यादिवर्ग)

आत्मगुप्ता (मूलम्)

ऐन्द्री ऋषभी अतिरसा ....बला इति
दशेमानि बल्यानि भवन्ति ।।7।।

(च.सू.4)

विदारिगन्धा... ऋषभी चेति।
विदारिगन्धादिरयं गणः पित्तानिलापहः।
शोषगुल्माङ्गमर्दोर्ध्वश्वासकासविनाशनः।।4-5।।

(सु. सू. 38)

क्षीरपक्वांस्तु गोधूमानात्मगुप्ताफलैः सह।
शीतान्घृतयुतान् खादेत्तत्पश्चात्पिबेत्पयः।।30।।

(सु. चि. 26)

स्वयंगुप्तेक्षुरकयोः फलचूर्णं सशर्करम्।
धारोष्णेन नरः पीत्वा पयसा न क्षयं व्रजेत्।।33।।

(सु. चि. 26)

वातव्याधौ.... तथात्मगुप्तास्वरसं (बीजक्वाथं) पिबेत् वा।
.... मासाद् भवेद् वज्रसमान बाहुः ।।27।।

(चक्रदत्त 22)

कपिकच्छुः रसे स्वादु तिक्ता शीताऽनिलापहा।
वृष्या पित्तास्रहन्त्री च दुष्टव्रणविनाशिनी।।148।।

(ध. नि. गुडूच्यादिवर्ग)

कपिकच्छुः स्वादुतिक्ता वातपित्तकफास्त्रजित्।
शीतलं बृंहणं वृष्यं माषतुल्यं तयोः फलम् ॥608॥
कपिकच्छूफलं वृष्यं शीतं स्वादुरसं गुरु।
रक्तपित्तानिलहरं दुष्टव्रणविशोधनम् ॥609॥

(कै. नि. ओषधिवर्ग)

कपिकच्छुः स्वादुरसा वृष्या वातक्षयापहा।
शीतपित्तास्त्रहन्त्री च विकृताव्रणनाशिनी ॥53॥

(रा.नि.गुडूच्यादिवर्ग)

कपिकच्छुर्भृशं वृष्या मधुरा बृंहणी गुरुः।
तिक्ता वातहरी बल्या कफपित्तास्त्रनाशिनी ॥130॥
तद्बीजं वातशमनं स्मृतं वाजीकरं परम् ॥131॥

(भा.प्र.नि.गुडूच्यादिवर्ग)

कच्छुरा तुवरा तिक्ता योनिदोषापहा मता।
कुष्ठव्रणं रक्तकोपं नाशयेदिति कीर्त्तिता॥

(नि.र.)

बिल्वः (शा.त्वक्)

बिल्वं साङ्.ग्राहिकदीपनीय वातकफप्रशमनानाम् ॥40॥
(च.सू.25)

वरुणआर्तगल....शतावरीबिल्व .... चेति ॥10॥
वरुणादिर्गणोह्येष कफमेदोनिवारणः ॥
विनिहन्ति शिरःशूलगुल्माभ्यन्तरविद्रधीन्॥11॥
(सु.सू.38)

बिल्वाग्निमन्थ .... काश्मरी चेति महत् ॥68॥
सतिक्तं कफवातघ्नं पाके लघ्वग्निदीपनम्॥
मधुरानुरसं चैव पञ्चमूलं महत् स्मृतम्॥69॥
(सु.सू.38)

बिल्वमूलं त्रिदोषघ्नं छर्दिघ्नं मधुरं लघु ॥106॥
(ध.नि. गुडूच्यादिवर्ग)

श्रीफलस्तुवरस्तिक्तो ग्राही रूक्षोऽग्निपित्तकृत्।
वातश्लेष्महरो बल्यो लघुरुष्णश्च पाचनः ।13॥

(भा. प्र. नि., गुडूच्यादिवर्ग)
बिल्वत्वचो गुडूच्या वा क्वाथः क्षौद्रेण संयुतः ।
छर्दि त्रिदोषजां हन्ति पर्पटः पित्तजां तथा ॥23॥
(भा.प्र.म.ख.17 छर्द्यधिकार)

चम्पकः (पुष्पम्)

चम्पकं रक्तपित्तघ्नं शीतोष्णं कफनाशनम् ॥288॥
(सु.सू.46)

चम्पकः कथितः शीतो वीर्य्यऽतिकटुको रसे ।
हृद्यः सुगन्धिर्विषहा कफपित्तविनाशनः ॥132॥
(ध. नि. आम्रादिवर्ग)

चम्पकः कटुकस्तिक्तः कषायो मधुरो हिमः।
निहन्ति कफपित्तास्रमूत्रकृच्छ्रविषकृमीन्॥1500॥
(कै. नि. ओषधिवर्ग)

चंपकः कटुकस्तिक्तः शिशिरो दाहनाशनः ।
कुष्ठकण्डूव्रणहरो गुणाढ्यो राजचम्पकः ॥241॥
(रा. नि. करवीरादिवर्ग)

चंपकः कटुकस्तिक्तः कषायो मधुरो हिमः।
विषक्रिमिहरः कृच्छ्रकफवातास्रपित्तजित्॥32॥
(भा.प्र.नि. पुष्पवर्ग)

चिञ्चा (फलकल्कम्)

अम्लिकायाः फलं पक्वं तस्माद् (ग्राहि रूक्षोष्णं
वातश्लेष्मणि शस्यते) अल्पान्तरं गुणैः ॥151-152॥
(च.सू.27)

अम्लिकायाः फलं पक्वं तद्वत्
(तिन्तिडीकवत्) भेदि तु केवलम्॥160॥
(सु.सू.46)

अम्लिकायाः फलं चाम्लमत्यन्तं पित्तकृल्लघुः।
रक्तकृत् वातशमनं बस्तिशुध्दिकरं परम् ॥28॥
पक्वं तु मधुराम्लं च भेदि विष्टम्भि वातजित्। ॥29॥
(ध.नि. आम्रादिवर्ग)

अम्लिकाऽम्ला गुरुर्वातहरा पित्तकफास्रजित् ।
पक्वा तद्वत्सरा रुच्या वह्निवस्तिविशुध्दिकृत्।
शुष्का हृद्या श्रमभ्रान्तितृष्णाक्लमहरा लघुः॥
(म. पा. नि.)

चिञ्चाम्लोष्णा गुरुर्वातहरी पित्तकफास्रदा।
तिन्तिडीकफलं बालमसृक्पित्तबलासकृत् ॥365॥
ग्राह्युष्णं दीपनं रुच्यं मध्यमं कफवातनुत्।
तद्वत्पक्वा सरा रूक्षा रुच्याग्निबस्तिशुध्दिकृत् ॥366॥
हृद्या कफघ्नी शुष्कैवं तृट्क्लमश्रमजिल्लघुः।
वातश्लेष्मकरं ज्ञेयं नवं तिन्तिडिकाफलम् ॥367॥

सम्वत्सरस्थितं तत्तु पित्तघ्नमनिलापहम्।

(कै.नि. ओषधिवर्ग)

चिञ्चात्यम्ला भवेदामा पक्वा तु मधुराम्लिका।
वातघ्नी पित्तदाहास्त्रकफदोषप्रकोपनी ॥163॥
अम्लिकायाः फलं त्वाममत्यम्लं लघु पित्तकृत्।
पक्वं तु मधुराम्लं स्याद्भेदि विष्टम्भवातजित्॥164॥
पक्वचिञ्चाफलरसो मधुराम्लो रुचिप्रदः ।
शोफपाककरो लेपाद्व्रणदोषविनाशनः ॥165॥

(रा.नि. आम्रादिवर्ग)

अम्लिकाऽम्ला गुरुर्वातहरी पित्तकफास्त्रकृत्।
पक्वा तु दीपनी रूक्षा सरोष्णा कफवातनुत् ॥143॥

(भा. प्र. नि. आम्रादिफलवर्ग)

शुष्कं चिञ्चाफलं हृद्यं लघु भ्रान्तिश्रमापहम्।
तृषाहरं क्लमहरं कृमिनाशकरं मतम्॥

(नि. र.)

दाडिम (फलः, फलत्वक्, पत्रम्)

दाडिममातुलुङ्गानि इति दशेमानि हृद्यानि भवन्ति॥ 10॥

(च. सू. 4)

दाडिमयवषष्टिको ..... इति दशेमानि छर्दिनिग्रहणानि भवन्ति॥ 28॥

(च. सू. 4)

दाडिमफल्गुपरुषकेक्षुयवषष्टिका इति दशेमानि श्रमहराणि भवन्ति ॥40॥

(च. सू. 4)

अम्लं कषायमधुरं वातघ्नं ग्राहि दीपनम्॥ 149॥
स्निग्धोष्णं दाडिमं हृद्यं कफपित्ताविरोधि च ।
रूक्षाम्लं दाडिमं यत्तु तत् पित्तानिलकोपनम् ॥150॥
मधुरं पित्तनुत् तेषां तध्दि दाडिममुत्तमम् ॥151॥

(च.सू. 27)

रक्तार्शसि-त्वग्दाडिमस्य तद्वत् .....॥185॥

(च.चि.14)

गव्यं घृतं सैन्धवदाडिममामलकमित्येव वर्गः सर्वप्राणिनां सामान्यतः पथ्यतमः ॥5॥

(सु.सू. 20)

परूषक... दाडिमराजादन.... त्रिफला चेति ।
परूषकादिरित्येष गणोऽनिलनाशनः॥
मूत्रदोषहरो हृद्यः पिपासाघ्नो रुचिप्रदः ॥44॥

(सु.सू. 38)

कषायानुरसं तेषां दाडिमं नातिपित्तलम्।
दीपनीयं रुचिकरं हृद्यं वर्चोविबन्धनम् ॥141॥
द्विविधं तत्तु विज्ञेयं मधुरं चाम्लमेव च।
त्रिदोषघ्नं तु मधुरमम्लं वातकफापहम् ॥142॥
अम्लं समधुरं तिक्तं कषायं कटुकं सरम्।
(सु.सू. 46)
दाडिममामलकं....फलवर्गे अम्लेषु च प्रशस्यते ॥334-336॥
(सु.सू. 46)

उद्रिक्तपित्ताञ्जयति त्रीन्दोषान्स्वादु दाडिमम्॥117॥
पित्ताविरोधि नात्युष्णमम्लं वातकफापहम्।
सर्वं हृद्यं लघु स्निग्धं ग्राहि रोचनदीपनम्॥118॥
(अ. हृ. सू. 6)

रक्तार्शसि - त्वचं वा दाडिमोद्भवाम्.... ॥103॥
(अ. हृ. चि. 8)

व्यङ्गे अजाक्षीरेण वार्द्रदाडिमत्वक् ॥24॥
(अ.सं.उ. 37)

स्निग्धोष्णं दाडिमं हृद्यं कफपित्ताविरोधि च।
द्विविधं तच्च विज्ञेयं मधुरं चाम्लमेव च ॥62॥
(ध.नि. शतपुष्पादिवर्ग)

मधुरं तु त्रिदोषघ्नं स्वाद्वम्लं वातपित्तनुत् ।
असृक्पित्तकरं चाम्लं संग्राहि सर्वमुच्यते ॥307॥
दाडिमं रोचनं हृद्यं दीपनं नातिपित्तलम् ।
मेध्यं कण्ठास्यरोगघ्नं तर्पणं कफवातजित् ॥308॥
वर्चोविबन्धनं स्निग्धं कषायानुरसं लघु।

द्विविधं तत्तु विज्ञेयं मधुराम्लविभेदतः ॥309॥
अम्लं तु द्विविधं ज्ञेयं रूक्षाम्लं स्निग्धचुक्रकम्॥
स्वादु त्रिदोषतृड्दाहज्वरहृद्रोगनाशनम् ।
पित्ताविरोधि नात्युष्णं स्निग्धाम्लं कफवातनुत् ॥311॥
(कै. नि. ओषधिवर्ग)

दाडिमं मधुरमम्लकषायं कासवातकफपित्तविनाशी ।
ग्राहि दीपनकरं च लघूष्णं शीतलं श्रमहरं रुचिदायि ॥75॥
दाडिमं द्विविधमीरितमार्यैरम्लमेकमपरं मधुरं च ।
तत्र वातकफहारि किलाम्लं तापहारि मधुरं लघु पथ्यम् ॥76॥
(रा.नि. आम्रादिवर्ग)

तत्फलं त्रिविधं स्वादु स्वाद्वम्लं केवलाम्लकम् ॥101॥
तत्तु स्वादु त्रिदोषघ्नं तृड्दाहज्वरनाशनम् ।
हृत्कण्ठमुखरोगघ्नं तर्पणं शुक्रलं लघु ॥102॥
कषायानुरसं ग्राहि स्निग्धं मेधाबलावहम्॥103॥
स्वाद्वम्लं दीपनं रुच्यं किञ्चित् पित्तकरं लघु ।
अम्लं तु पित्तजनकमामं वातकफापहम् ॥104॥
(भा.प्र.नि. आम्रादिफलवर्ग)

पूयमेहे-प्रातः पिबेद् दाडिमवल्कफाण्टकं
सौजाकवान् कर्करशर्करासखम् ॥811॥
(सिद्ध भे. म. 4)

देवदारुः (काष्ठसारः)

पाठामहौषधसुरदारुमुस्त .... इति दशेमानि
स्तन्यशोधनानि भवन्ति ॥18॥

(च. सू. 4)

हिक्काश्वासयोः - दशमूलस्य वा क्वाथमथवा देवदारुणः ।
तृषितो मदिरां वापि हिक्काश्वासी पिबेन्नरः ॥105॥

(च. चि. 17)

सरलदेवदारु.... स्नेहास्तिक्तकटुकषाया ।
दुष्टव्रणशोधनाः कृमिकफकुष्ठानिलहराश्च ॥123॥

(सु. सू. 45)

ज्वरे.... देवदारुणी ।
कषायं विधिवत् कृत्वा पेयमेतज्ज्वरापहम्॥204॥

(सु. उ. 39)

देवदारु रसे तिक्तं स्निग्धोष्णं श्लेष्मवातजित्।
आमदोषविबन्धाध्मप्रमेहविनिवर्तकम् ॥77॥

(ध. नि. गुडूच्यादिवर्ग)

देवकाष्ठं लघु स्निग्धं तिक्तोष्णं कटुकं रसे।
विपाके हन्ति कासामश्वासहिध्माकफानिलान्॥1310॥
ज्वरमेहविबन्धाध्मकण्डूशोफास्त्रपीनसान्॥

(कै. नि. ओषधिवर्ग)

स्निग्धदारु स्मृतं तिक्तं स्निग्धोष्णं श्लेष्मवातजित्।
आमदोषविबन्धार्शः प्रमेहज्वरनाशनम् ।।29।।

(रा. नि. चन्दनादिवर्ग)

देवदारु लघु स्निग्धं तिक्तोष्णं कटुपाकि च।
विबन्धाध्मानशोथामतन्द्राहिक्काज्वरास्त्रजित्।।
प्रमेहपीनसश्लेष्मकासकण्डूसमीरनुत् ।।25।।

(भा. प्र. नि. कर्पूरादिवर्ग)

स्निग्धदारुः कटुः पाके स्निग्धोष्णस्तिक्तको लघु।
कफवातप्रमेहार्शोमलस्तम्भामदोषहा।।
ज्वराध्मानश्वासकासशोफकण्डूविनाशकः।
हिक्कां तन्द्रां रक्तदोषं पीनसं चैव नाशयेत् ।।

(नि. र.)

धत्तूरः (सं.व.)

धत्तूरः कटुरुष्णश्च कान्तिकारी व्रणार्तिनुत्।
कुष्ठानि हन्ति लेपेन प्रभावेण ज्वरं जयेत्॥7॥
त्वग्दोषकृच्छ्रकण्डूतिज्वरहारी भ्रमावहः।

(ध. नि. करवीरादिवर्ग)

धत्तूरो मधुरस्तिक्तस्तीक्ष्णोष्णस्तुवरो गुरुः।
उन्मादवांतिमंदाग्निकांतिदो ज्वरकुष्ठनुत्॥1547॥
यूकालिक्षाव्रणश्लेष्मकृमिकण्डूविषापहा॥

(कै. नि. ओषधि वर्ग)

धत्तूरः कटुरुष्णश्च कान्तिकारी व्रणार्तिनुत्।
त्वग्दोषखर्जूकण्डूतिज्वरहारी भ्रमप्रदः ॥19॥

(रा. नि. करवीरादिवर्ग)

धत्तूरो मदवर्णाग्निवातकृज्वरकुष्ठनुत्॥86॥
कषायो मधुरस्तिक्तो यूकालिक्षाविनाशकः।
उष्णो गुरूर्व्रणश्लेष्मकण्डूकृमिविषापहः॥87॥

(भा. प्र. गुडूच्यादिवर्ग)

दूर्वा (पञ्चाङ्गम्)

चन्दन....सितालता इति दशेमानि वर्ण्यानि भवन्ति।।8।।
(च. सू. 4)

ऐन्द्रीब्राह्मीशतवीर्या.... सहस्रवीर्या.....
प्रजास्थापनानि भवन्ति ।।49।।
(च. सू. 4)

दूर्वा च नलमूलं .... शीतलाश्च गणाः
सर्वे प्रलेपः पित्तशोफहृत् ।।4।।
(सु.सू. 37)

चन्दन .... दूर्वा .... प्रभृतीनि .... पित्तसंशमनो वर्गः ।।8।।
(सु. सू. 39)

दूर्वा शीता कषाया च रक्तपित्तकफापहा ।। 129।।
(ध. नि. करवीरादिवर्ग)

नीलदूर्वा हिमा तिक्ता मधुरा तुवरा हरेत्।
(दूर्वा स्वाद्वी हिमा तिक्ता कषाया जीवनी जयेत् ।)
कफपित्तास्रविसर्पतृष्णादाहत्वगामयान् ।। 1231।।
(कै. नि., ओषधिवर्ग)

दूर्वाः कषाया मधुराश्च शीताः
पित्ततृषाऽरोचकवान्तिहन्त्र्यः ।
सदाहमूर्च्छाग्रहभूतशान्ति-
श्लेष्मश्रमध्वंसनतृप्तिदाश्च॥117॥
नीलदूर्वा तु मधुरा तिक्ता शिशिररोचनी ।
रक्तपित्तातिसारघ्नी कफवातज्वरापहा ॥ 108॥

(रा. नि. शाल्मल्यादिवर्ग)

नीलदूर्वा हिमा तिक्ता मधुरा तुवरा हरेत् ।
कफपित्तास्त्रवीसर्पतृष्णादाहत्वगामयान् ।173॥
श्वेता दूर्वा कषाया स्यात्स्वाद्वी व्रण्या च जीवनी।
तिक्ता हिमा विसर्पास्त्रतृट्पित्तकफदाहहृत् ॥175॥

(भा. प्र. नि. गुडूच्यादिवर्ग)

नीलदूर्वा तु मधुरा तिक्ता शीता रुचिप्रदा ।
सञ्जीवनी च तुवरा रक्तशुध्दिकरी मता ॥
रक्तपित्तातिसारघ्नी ज्वरपित्तवमीहरा।
कफं रक्तरुजं तृष्णां विसर्पं च विनाशयेत्॥
दाहं च चर्मदोषं च नाशयेदिति कीर्तिता।

(नि. र.)

गम्भारी (काण्डत्वक्)

काश्मर्य .... विरेचनोपगानि भवन्ति ।।24।।
(च. सू. 4)

काश्मर्य .... इति दशेमानि श्वयथुहराणि भवन्ति ।।38।।
(च. सू. 4)

गर्भे शुष्के तु वातेन बालानाञ्चापि शुष्यताम्।।
सिता काश्मर्यमधुकैर्हितमुत्थापने पयः ।।95।।
(च. चि. 28)

सिध्दं (तैलं) मधुककाश्मर्यरसैर्वा वातरक्तनुत् ।।121।।
(च. चि. 29)

श्रीपर्णी स्वरसे तिक्ता गुरूष्णा रक्तपित्तजित् ।।
त्रिदोषश्रमदाहार्त्तिज्वरतृष्णाविषाञ्जयेत्।।115।।
(ध. नि. गुडूच्यादिवर्ग)

श्रीपर्णी मारुतश्लेष्मशोफमेहकृमीञ्जयेत् ।।153।।
(सो. नि. गुडूच्यादिवर्ग)

केश्या त्रिदोषशमनी कषायमधुरा रसे।
रसायनी भेदनी च मेध्या श्रीपर्णिका मता ।।
(म. नि.)

श्रीपर्णी मधुरा तिक्ता वीर्योष्णा तुवरा गुरु ।
दीपनी पाचनी मेध्या भेदनी भ्रमशोषजित् ।। 30।।
दोषतृष्णामशूलार्शोविषदाहज्वरापहा।
(कै. नि. ओषधिवर्ग)

काश्मरी कटुका तिक्ता गुरूष्णा कफशोफनुत् ।
त्रिदोषविषदाहार्त्तिज्वरतृष्णारक्तदोषजित् ॥ 38॥

(रा. नि. प्रभद्रादिवर्ग)

काश्मरी तुवरातिक्ता वीर्योष्णा मधुरा गुरुः ॥ 15॥
दीपनी पाचनी मेध्या भेदनी भ्रमशोफजित्।
दोषतृष्णामशूलार्शोविषदाहज्वरापहा ॥16॥

(भा. प्र. नि. गुडूच्यादिवर्ग)

काश्मरी कटुका तिक्ता स्वादूष्णा तुवरा गुरुः।
मधुरा दीपनी मेध्या पाचनी भेदिका मता ॥
हृद्या तृषामशूलघ्नी कफशोफत्रिदोषहा।
विषदाहज्वररक्तदोषार्शोभ्रमनाशिनी॥

(नि. र.)

इक्षुः (मूलस्तम्भः)

सारिवेक्षुमूलमधुक .... कण्टकारिका
इति दशेमानि कण्ठ्यानि भवन्ति ॥9॥
(च. सू.4)

इक्षवो मधुरा मधुरविपाका गुरवः शीताः स्निग्धा बल्या वृष्या
मूत्रला रक्तपित्तप्रशमनाः कृमिकफकराश्चेति ॥148॥
(सु. सू.45)

इक्षुः सरो गुरुः स्निग्धो बृंहणः कफमूत्रकृत् ।
वृष्यः शीतः पवनजिद्भुक्ते वातप्रकोपनः ॥110॥
अतीव मधुरो मूले मध्ये मधुर एव च ।
अग्रे त्वचि च विज्ञेय इक्षूणां लवणो रसः ॥112॥
इक्षुयुग्मं रसे स्वादु पित्तघ्नं वृष्यशीतलम्।
(ध. नि. करवीरादिवर्ग)

इक्षुः शीतो गुरुः स्निग्धो मधुरो रसपाकयोः।
जीवनो बृंहणः वृष्यः कृमिमूत्रकफप्रदः ॥139॥
सरः संतर्पणो बल्यो ह्लादी पित्तास्त्रनाशनः।
ओजस्यो वातजित् भुक्तमात्रे वातप्रकोपणः ॥140॥
(कै. नि. ओषधिवर्ग)

मूलादूर्ध्वन्तु मधुरा मध्येऽतिमधुरास्तथा ।
इक्षवस्तेऽग्रभागेषु क्रमाल्लवणनीरसाः ॥94॥
(रा. नि. पानीयादिवर्ग)

इक्षवो रक्तपित्तघ्ना बल्या वृष्याः कफप्रदाः।
स्वादुपाकरसाः स्निग्धा गुरवो मूत्रला हिमाः॥2॥
(भा. प्र. नि. इक्षुवर्ग)

कदली (पुष्पम्)

संपक्वं पनसं मोचं राजादनफलानि च ।
स्वादूनि सकषायाणि स्निग्धशीतगुरूणि च ॥140॥
(च. सू. 27)

लोध्र .... कदलीचेति ॥14॥
एष रोध्रादिरित्युक्तो मेदःकफहरो गणः ।
योनिदोषहरः स्तम्भी वर्ण्यो विषविनाशनः ॥15॥
(सु.सू.38)

तालनारिकेलपनसमोचप्रभृतीनि ॥77॥
स्वादुपाकरसान्याहुर्वातपित्तहराणि च ॥
बलप्रदानि स्निग्धानि बृंहणानि हिमानि च ॥ 178॥
(सु.सू. 46)

मौचं (फलं)स्वादुरसं प्रोक्तं कषायं नातिशीतलम् ॥
रक्तपित्तहरं वृष्यं रुच्यं श्लेष्मकरं गुरु ॥181॥
(सु.सू.46)

कदली मधुरा शीता रम्या पित्तहरा मृदुः ।
कदल्यास्तु फलं स्वादु कषायं नातिशीतलम्
रक्तपित्तहरं वृष्यं रुच्यं कफकरं गुरु ॥76॥
(ध.नि. करवीरादिवर्ग)

कदली कुसुमं तिक्तं कषायं ग्राहि दीपनम् ।
उष्णवीर्यं बलासघ्नं तादृशाः तत् सटादयः ॥286॥
(कै.नि. ओषधिवर्ग)

बालं फलं मधुरमल्पतया कषायं पित्तापहं
शिशिररुच्यमथापिनालम् ।
पुष्पं तदप्यनुगुणं क्रिमिहारि कन्दं पर्णञ्च शूलशमकं
कदलीभवं स्यात् ॥108॥

(रा. नि. आम्रादिवर्ग)

मोचाफलं स्वादु शीतं विष्टम्भि कफकृद् गुरु ।
स्निग्धं पित्तास्रतृड्दाहक्षतक्षयसमीरजित् ॥
पक्वं स्वादु हिमं पाके स्वादु वृष्यञ्च बृंहणम्।
क्षुत्तृष्णानेत्रगदह्रन्मेहघ्नं रुचिमांसकृत् ॥34॥

(भा. प्र. नि. आम्रादिफलवर्ग)

कर्चूरः (काण्डकन्दः)

रोचनो दीपनो हृद्यः सुगन्धिः त्वग्विवर्जितः ।
कर्चूरः कफवातघ्नः श्वासहिक्कार्शसां हितः ॥155॥

(च. सू. 27)

वातसंशमनो वर्गे काञ्चनक स्थाने कर्चूरः
पाठभेदो डल्हणेन पठितः ॥7॥

(सु. सू.39)

कर्चूरः कटुतिक्तोष्णो रुच्यो वातबलासजित् ।
दीपनः प्लीहगुल्मार्शः शमनः कुष्ठकासहा ॥94॥

(ध.नि. चन्दनादिवर्ग)

कर्चूरो मरुदामघ्नो दीपनो रक्तपित्तकृत्।
अजीर्णजरणः श्वासे चापस्मारेऽपि पूजितः ॥ 356॥

(सो. नि.II)

कर्चूरो दीपनो रुच्यः कुष्ठार्शोव्रणकासनुत् ।
उष्णो लघुर्जयेत् श्वासगुल्मवातकफकृमीन्॥

(म.पा.नि.)

कर्चूरः कटुकस्तिक्तस्तीक्ष्णोष्णो दीपनो लघुः ॥1389॥
रोचनः कटुपाकोऽस्रपित्तकृत् कफवातजित् ।
श्वासकासकृमिप्लीहकुष्ठार्शोव्रणगुल्मनुत् ॥ 1390॥

(कै.नि. ओषधिवर्ग)

कर्चूरः कटुतिक्तोष्णः कफकासविनाशनः ।
मुखवैशद्यजननो गलगण्डादिदोषनुत् ॥ 118॥

(रा.नि. पिप्पल्यादिवर्ग)

कर्चूरो दीपनो रुच्यः कटुकस्तिक्त एव च ॥95॥
सुगन्धिः कटुपाकः स्यात्कुष्ठार्शोव्रणकासनुत् ॥
उष्णो लघुर्हरेच्छ्वासगुल्मवातकफकृमीन् ॥96॥

(भा.प्र. नि. कर्पूरादिवर्ग)

कतकं (बीजम्)

सैन्धवक्षौद्रकतकाः .... योज्यमत्राञ्जने सदा ॥ 23 ॥
(सु. उ.12)

कतकं शीतलं प्राहुस्तृष्णाविषविनाशम् ।
नेत्रोत्थरोगविध्वंसि विधिनाञ्जनयोगतः ॥ 153 ॥
कतकस्य फलं तिक्तं चक्षुष्यं शीतलं मृदु।
वारिप्रसादनं कृच्छ्रशर्करामश्मरीं जयेत् ॥154॥
(ध. नि. चन्दनादिवर्ग)

कतकं तुवरं तिक्तं विशदं शीतलं लघु ॥1140॥
विकाशि मधुरं छेदि चक्षुष्यं कफवातनुत्।
तृष्णां दाहं विषं गुल्मं हन्ति तोयमलापहम् ॥1141॥
तस्यैव च फलं पक्वं वातकृन्मेहनाशनम् ॥1142॥
सपिच्छिलं छर्दिकरं श्लेष्मपित्तप्रसेककृत्।
शोफपाण्डुप्रतिश्यायकामलागरनाशनम् ॥ 1143॥
(कै. नि. ओषधिवर्ग)
कतकः कटुतिक्तोष्णश्चक्षुष्यः कृमिदोषनुत् ।
रुचिकृच्छूलदोषघ्नो बीजमम्बुप्रसादनम् ॥ 197॥
(रा. नि. आम्रादिवर्ग)

कतकस्य फलं नेत्र्यं जलनिर्मलताकरम्।
वातश्लेष्महरं शीतं मधुरं तुवरं गुरु ॥108॥
(भा. प्र. नि. आम्रादिफलवर्ग

कर्षप्रमाणं कतकस्य बीजं तक्रेण पिष्ट्वा सह माक्षिकेण।
प्रमेहजालं विनिहन्ति सद्यो रामो यथा रावणमाहवेषु ॥
(योगरत्नाकर, पृष्ठ 287)

कतकः कटुकस्तिक्तो लेखनो रुचिकृल्लघु ।
चक्षुष्यः तुवरः शीतो विशदश्च विकासकः
छेदनो मधुरश्चैव तृषादाहविषापहः ।
गुल्मशूलकृमीन्मेहं नेत्ररुग्जलजं मलम् ॥
नाशयेदिति च प्रोक्तं फलं तस्य च कोमलम्।
कतकस्य च बीजं तु चक्षुष्यं तुवरं गुरु ।
जलप्रसादनं शीतं मधुरं चाश्मरीहरम्।
वातं कफं मूत्रकृच्छ्रं तृषां नेत्ररुजं विषम्।
प्रमेहशीर्षरोगं च नाशयेदिति कीर्त्तितम्।

(नि. र.)

खर्जूरम् (फलम्)

द्राक्षाखर्जूर .... इति दशेमानि श्रमहराणि भवन्ति ॥ 40 ॥

(च. सू. 4)

मधुरं बृंहणं वृष्यं खर्जूरं गुरु शीतलम् ।
क्षयेऽभिघाते दाहे च वातपित्ते च तद्धितम्॥127॥

(च. सू.27)

क्षतक्षयापहं हृद्यं शीतलं तर्पणं गुरू ।
रसे पाके च मधुरं खर्जूरं रक्तपित्तजित्॥185॥

(सु. सू. 46)
(ध. नि. आम्रादिफलवर्ग)

....खर्जूर .....परुषकम्।
.....॥119॥
.....च बृहणं गुरु शीतलम्॥120॥
दाहक्षतक्षयहरं रक्तपित्तप्रसादनम्।
स्वादुपाकरसं स्निग्धं विष्टम्भिकफशुक्रकृत्॥121॥

(अ. हृ. सू. 6)

खर्जूरिका फलं शीतं स्वादु स्निग्धं क्षतास्रजित्।
बल्यं हन्ति मरुत्पित्तमदमूर्च्छामदात्ययान् ॥19॥

(म. नि. फलादिवर्ग 6)

खर्जूरं तुवरं शीतं मधुरं रसपाकयोः ॥ 294॥
स्निग्धं रुचिकरं हृद्यं क्षतक्षयहरं गुरु ।
तर्पणं रक्तपित्तघ्नं पुष्टिविष्टम्भशुक्रदम् ॥295॥
कोष्ठमारुतहृद् बल्यं दाहवातकफापहम्।
ज्वराभिघातक्षुत्तृष्णाकासश्वासान्नियच्छति ॥296॥
(कै. नि. ओषधिवर्ग)

खर्जूरी तु कषाया च पक्वा गौल्या कषायका।
पित्तघ्नी कफदा चैव कृमिकृत वृष्या च बृंहणी ॥ 56 ॥
(रा. नि. आम्रादिवर्ग)

खर्जूरी त्रितयं शीतं मधुरं रसपाकयोः ॥ 117॥
स्निग्धं रुचिकरं हृद्यं क्षतक्षयहरं गुरु ।
तर्पणं रक्तपित्तघ्नं पुष्टिविष्टम्भशुक्रदम् ॥118॥
कोष्ठमारुतहृद्बल्यं वान्तिवातकफापहम्।
ज्वरातिसारक्षुत्तृष्णाकासश्वासनिवारकम् ॥119॥
मदमूर्च्छामरुत्पित्तमद्योद्भूतगदान्तकृत् ॥120॥
(भा. प्र. आम्रादिफलवर्ग)

कृष्णसारिवा (मूलम्)

विदारिगन्धा .... सारिवा कृष्णसारिवा ....ऋषभी चेति।।4।।
विदारिगन्धादिरयं गणः पित्तानिलापहः ।
शोषगुल्माङ्गमर्दोर्ध्वश्वासकासविनाशनः ।।5।।
(सु. सू. 38)

सारिवे द्वे तु मधुरे कफवातास्रनाशने ।
कुष्ठकण्डूज्वरहरे मेहदुर्गन्धिनाशने ।।160।।
कृष्णमूली तु संग्राही शिशिरा कफवातजित्।
तृष्णारुचिप्रशमनी रक्तपित्तहरा स्मृता ।।161।।
(ध. नि. गुडूच्यादिवर्ग)

सारिवा मधुरा तिक्ता सुस्निग्धा शुक्रला हिमा ।
गुर्वी ज्वरातिसारामदोषत्रयविषापहा ।।995।।
अग्निसादारुचिश्वासकासास्त्रप्रदरान् जयेत् ।।
(कै. नि. ओषधिवर्ग)

सारिवे द्वे तु मधुरे कफवातास्रनाशने।
कुष्ठकण्डूज्वरहरे मेहदुर्गन्धिनाशने ।।160।।
(रा. नि. चन्दनादिवर्ग)

सारिवायुगलं स्वादु स्निग्धं शुक्रकरं गुरु ।
अग्निसादारुचिश्वासकासामविषनाशनम् ।
दोषत्रयास्त्रप्रदरज्वरातीसारनाशनम् ।।238।।
(भा. प्र. नि. गुडूच्यादिवर्ग)

श्वेता तु सारिवा शीता मधुरा शुक्रला गुरु ।
स्निग्धा तिक्ता सुगन्धिश्च कुष्ठकण्डूज्वरापहा।।
देहदौर्गन्ध्याग्निमांद्यश्वासकासारुचीहरा।
आमत्रिदोषविषहृद्रक्तरुक्प्रदरापहा।।
कासातिसारतृड्दाहरक्तपित्तहरा परा।
वातनाशकरी प्रोक्ता ऋषिभिस्तत्वदर्शिभि : ।।
कृष्णा तु सारिवा शीता वृष्या च मधुरा मता ।
कफघ्नी चैव सम्प्रोक्ता गुणाश्चान्ये तु पूर्ववत्।।

(नि. र.)

कुन्दुरुः (-कः) (निर्यासः)

एला .... कुन्दुरुकागुरु .... पुन्नागकेशरम् चेति ॥24॥
एलादिको वातकफौ निहन्याद्विषमेव च ।
वर्णप्रसादनः कण्डूपिडकाकोठनाशनः ॥25॥

(सु. सू. 38)

कुन्दुरुः कटुकस्तिक्तो वातश्लेष्मामयापहः।
पाने लेपे च शिशिरः प्रदरामयशांतिकृत् ॥ 132 ॥

(ध. नि. चन्दनादिवर्ग)

शर्करासहितो मेहं वृषणस्य व्यथां हरेत्

(शोढल)

कुन्दुरुः मधुरस्तिक्तः कफपित्तार्त्तिदाहनुत् ॥191॥

(रा. नि. चन्दनादिवर्ग)

कुन्दुरुः मधुरस्तिक्तः तीक्ष्णस्त्वच्यः कटुर्हरेत्।
ज्वरस्वेदग्रहालक्ष्मी मुखरोगकफानिलान् ॥ 51 ॥

(भा. प्र. नि. कर्पूरादिवर्ग)

कुन्दुरुः मधुरः तीक्ष्णः तिक्तो रुच्यः कटुस्मृतः ।
स्निग्धश्चोष्णस्तथा त्वच्यो ज्वरस्वेदकफापहः ॥
रक्तरुक्प्रदरं वातमलक्ष्मी ग्रहपीडनम् ।
रक्तातिसारं यूकां च नाशयेदिति कीर्तितः॥

(नि. र.)

कुंकुमम् (जायाङ्गम्)

मधुमधुकरुधिर ....लाजा इति
दशेमानि शोणितास्थापनानि ।।46।।
(च. सू. 4)

एलातगर ... कुंकुमानि पुन्नागकेशरं चेति ।।24।।
एलादिको वातकफौ निहन्याद्विषमेव च ।
वर्णप्रसादनः कण्डूपिडकाकोठनाशनः ।।25।।
(सु. सू. 38)

श्लेष्मापित्तविषघ्नं तु नागं तद्वच्च कुंकुमम् ।। 287।।
(सु. सू. 46)

कुंकुमं कटुकं तिक्तं उष्णं श्लेष्मसमीरजित्।
व्रणदृष्टिशिरोरोगविषहृत् कायकान्तिकृत् ।। 12 ।।
(ध. नि. चन्दनादिवर्ग)

स्निग्धोष्णं वातशमनं वर्णकृद्देहगन्धहृत् ।
कुंकुमं रसतस्तिक्तं कषायं कृमिनाशनम् ।।
(म. नि.)

कुंकुमं कटुकं तिक्तं वर्ण्यं व्रणविशोधनम्।
हन्ति दोषत्रयं हिक्काशिरोरोगवमिकृमीन्।। 1302।।
(कै. नि. ओषधिवर्ग)

कुंकुमं सुरभि तिक्तकटूष्णं कासवातकफकण्ठरुजाघ्नम्।
मूर्धशूलविषदोषनाशनं रोचनं च तनुकान्तिकारम् ।।41।।
(रा. नि. चन्दनादिवर्ग)

कुंकुमं कटुकं स्निग्धं शिरोरुग्व्रणजन्तुजित्।
तिक्तं वमिहरं वर्ण्यं व्यङ्गदोषत्रयापहम् ।।78।।
(भा. प्र. नि. कर्पूरादिवर्ग)

कूष्माण्डम् (फलम्)

सक्षारं पक्वकूष्माण्डं मधुराम्लं तथा लघु ।
सृष्टमूत्रपुरीषं च सर्वदोषनिबर्हणम् ॥ 113 ॥
(च. सू. 27)

पित्तघ्नं तेषु कूष्माण्डं बालं, मध्यं कफावहम्।
शुक्लं लघूष्णं सक्षारं दीपनं बस्तिशोधनम् ॥ 213॥
(सु. सू. 46)

वल्लीफलानां प्रवरं कूष्माण्डं वातपित्तजित्।
बस्तिशुद्धिकरं वृष्यं हृद्यं चेतोविकारजित् ॥ 181 ॥
(ध. नि. गुडूच्यादिवर्ग)

कूष्माण्डं भेद्यभिष्यन्दि विष्टम्भि वातपित्तजित् ॥185॥
बस्तिशुद्धिकरं वृष्यं स्वादुपाकरसं गुरु ।
विशेषात् पित्तनुत् बालं, मध्यं चैव कफापहम् ॥186॥
पक्वं लघूष्णं सक्षारं दीपनं पाचनं तथा ।
सर्वदोषहरं हृद्यं पथ्यं चेतोविकारनुत् ॥187॥
(सो. नि. II)

कूष्माण्डं शीतलं वृष्यं स्वादुपाकरसं गुरु।
हृद्यं रूक्षं रसस्यन्दि श्लेष्मलं वातपित्तजित् ॥527॥
(कै. नि. ओषधिवर्ग)

मूत्राघातहरं प्रमेहशमनं कृच्छ्राश्मरीछेदनम्।
विण्मूत्रग्लपनं तृषार्तिशमनं जीर्णाङ्गपुष्टिप्रदम्।
वृष्यं स्वादुतरं त्वरोचकहरं बल्यंच पित्तापहम् ।
कूष्माण्डं प्रवरं वदन्ति भिषजो वल्लीफलानां पुनः ॥161॥

(रा. नि. मूलकादिवर्ग)

कूष्माण्डं बृंहणं वृष्यं गुरु पित्तास्त्रवातनुत्॥
बालं पित्तापहं शीतं मध्यमं कफकारकम् ॥54॥
वृद्धं नातिहिमं स्वादु सक्षारं दीपनं लघु ।
बस्तिशुद्धिकरं चेतोरोगहृत् सर्वदोषजित् ॥55॥

(भा. प्र. नि. शाकवर्ग)

कूष्माण्डकफलं वृष्यं पुष्टिकृद्धातुवर्द्धकम्।
बस्तिशुद्धिकरं बल्यमतिस्वादु च शीतलम्॥
गुरु रूक्षं सारकं च हृद्यं कफकरं मतम् ।
मूत्राघातं प्रमेहं च मूत्रकृच्छ्राश्मरीं तृषाम्।
अरोचकं वातपित्तं पित्तं रक्तरुजं तथा।
वातोरेतोविकारं च नाशयेदिति तन्मतम्॥
तत्कोमलं चातिशीतं दोषकृत्पित्तहारकम्॥
दीपकं च लघु स्वादु क्षारं बस्तेश्च शुद्धिदम्।
सर्वदोषहरं पथ्यं पक्वमज्जा च माधुरी।
बस्तिशुद्धिकरी वृष्या पित्तनाशकरी मता ।

(नि. र.)

महानिम्बः (काण्डत्वक्)

महानिम्बो रसे तिक्तः शीतः पित्तकफापहः ।
कुष्ठरक्तविनाशी च विसूचीं हन्ति शीलितः ॥ 32 ॥
(ध. नि. गुडूच्यादिवर्ग)

महानिम्बः परं ग्राही कषायो रूक्षशीतलः ॥ 127॥
(सो. नि.II)

महानिम्बो हिमो रूक्षस्तिक्तो ग्राही कषायकः।
कफपित्तकृमिच्छर्दिकुष्ठहृल्लासरक्तजित्।
(म. पा. नि)

महानिम्बो हिमो रूक्षो ग्राही तिक्तः कषायकः ।
निहन्ति कफपित्तास्रकुष्ठकोठवमिकृमीन् ॥888॥
(कै. नि. ओषधिवर्ग)

महानिम्बस्तु शिशिरः कषायः कटुतिक्तकः।
अस्रदाहबलासघ्नो विषमज्वरनाशनः ॥12॥
(रा. नि. प्रभद्रादिवर्ग)

महानिम्बो हिमो रुक्षस्तिक्तो ग्राही कषायकः॥98॥
कफपित्त भ्रमछर्दिकुष्ठहृल्लासरक्तजित्।
प्रमेहश्वासगुल्मार्शोमूषिकाविषनाशनः॥99॥
(भा. प्र.नि. गुडूच्यादिवर्ग)

महानिम्बो कटुस्तिक्तः शीतश्च तुवरो मतः।
रूक्षो ग्राही कफं दाहं व्रणं रक्तरुजं तथा ॥
पितं कृमीश्च विषमज्वरं च हृदयव्यथाम्।
सर्वकुष्ठानि छर्दीं च प्रमेहं च विषूचिकाम् ॥
मूषिकाया विषं गुल्मं शीतपित्तं च नाशयेत् ।
कोठरोगं चार्शरोगं श्वासं च विनिवारयेत्॥

(नि. र.)

मण्डूकपर्णी (सं.व.)

अमृताभया .... मण्डूकपर्णी .... इति
दशेमानि वयःस्थापनानि भवन्ति ॥50॥

(च. सू. 4)

मण्डूकपर्णी वेत्राग्रं .... शाकं पार्पटकं च यत् ।
कफपित्तहरं तिक्तं शीतं कटु विपच्यते ॥93-95॥

(च. सू. 27)

चन्दननलद....वृषमण्डूकपर्णी ....इति तिक्तस्कन्धः॥150॥

(च. वि. 8)

मण्डूकपर्ण्याः स्वरसः प्रयोज्यः
.... आयुः प्रदान्यामयनाशनानि
बलाग्निवर्णस्वरवर्धनानि मेध्यानि चैतानि रसायनानि ॥30॥

(च. चि. 1-3)

आहारार्थवर्गे-मण्डूकपर्ण्यः .... सामान्यतः पथ्यतमः ॥5॥

(सु. सू. 20)

आरग्वधादि .... मण्डूकपर्णी .... तिक्तो वर्गः ॥11॥

(सु. सू. 42)

मण्डूकपर्णीसप्तला .... अर्कपुष्पीप्रभृतीनि .... ॥ 262॥
रक्तपित्तहराण्याहुर्हृद्यानि सुलघूनि च॥
कुष्ठमेहज्वरश्वासारुचिहराणि च ॥ 263॥
कषाया तु हिता पित्ते स्वादुपाकरसा हिमा।
लघ्वी मण्डूकपर्णी तु .....॥264॥

(सु. सू. 46)

पटोल .... मण्डूकपर्णी .... कर्कशम् ।
तिक्तं पाके कटु ग्राहि वातलं कफपित्तजित् ॥75-78॥

(अ. हृ. सू. 6)

मंडूकपर्णी जीवन्ती शाकवर्गे प्रशस्यते ॥1172॥

(शो. नि. मिश्रकवर्ग)

सरस्वती ....ब्राह्मी ब्रह्मसुवर्चला ।
मण्डूकपर्णी मण्डूकी ब्राह्मणी .... सोमवल्यपि ॥721॥
ब्राह्मी शीता सरा तिक्ता कषाया मधुरा लघुः।
मेध्या स्वर्या स्वादुपाका हृद्यायुष्या रसायनी॥722॥
मतिस्मृतिप्रदा हन्ति कुष्ठकण्डूज्वरं मलान्।
शोफारुचिविषश्वासकासमेहास्त्र पाण्डुताः ॥723॥

(कै. नि. ओषधिवर्ग)

ब्राह्मी हिमासरा तिक्ता लघुर्मेध्या च शीतला।
कषाया मधुरा स्वादुपाकाऽऽयुष्या रसायनी॥
स्वर्या स्मृतिप्रदा कुष्ठपाण्डुमेहास्त्रकासजित्॥
विषशोथज्वरहरी तद्वन्मण्डूकपर्णिनी ॥281॥

(भा. प्र. नि. गुडूच्यादिवर्ग)

मयक्कु(मायुकम्), (कीटगृहम्)

मायुकं शीतलं रूक्षं कषायं लघु दीपनम् ।
विपाके कटुकं ग्राही कफपित्तहरं परम् ।।564-565।।

(सो. नि. 2)

मायाफलं वातहरं कटूष्णकं
शैथिल्यसंकोचकेशकाष्र्यदम् ।।259।।

(रा. नि., पिप्पल्यादिवर्ग)

कीटावासो मज्जफलं ग्राहि बल्यं ज्वरापहम्।
शोणितस्रुतिहृद् हन्ति मुखदन्तगतान् गदान् ।।
श्वेतप्रदरमर्शांसि योनिकन्दं सुदारुणम् ।
अतिसारं महाघोरं ग्रहणीं सप्रवाहिकाम् ।।

(आ. वि.)

कषायः शीतलः प्रोक्तः कैशिकाऽक्षणगुणः स्मृतः ।
दीपनः कटुकः ग्राही रक्तपित्तहरः परम् ।।
रूक्षो नेत्रहितो व्रण्यः तृट्छर्दिकफपित्तहृत् ।
आमातिसारग्रहणीगुल्मार्शांसि च नाशयेत् ।। स्व.।।

(इंडियन् मेडिसिनल् प्लाँट्स, कोट्टकल)

मुद्गपर्णी (सं. व.)

जीवक....मुद्गपर्णी .... इति दशेमानि
शुक्रजननानि भवन्ति ॥19॥

(च. सू. 4)

मधुरस्कन्धे पठ्यते ॥146॥

(च. वि. 8)

काकोली .... मुद्गपर्णी .... मधुकं चेति ॥35॥
काकोल्यादिरयं पित्तशोणितानिलनाशनः ।
जीवनो बृंहणो वृष्यः स्तन्यश्लेष्मकरस्तथा ॥36॥

(सु. सू. 38)

मुद्गपर्णी हिमा स्वादुः वातरक्तविनाशिनी।
पित्तदाहज्वरान् हन्ति कृमिघ्नी कफशुक्रनुत्॥139॥

(ध. नि. गुडूच्यादिवर्ग)

मुद्गपर्णी हिमा कासवातरक्तक्षयापहा।
पित्तदाहज्वरान् हन्ति चक्षुष्या शुक्रवृद्धिकृत्॥176॥

(रा. नि. गुडूच्यादिवर्ग)

मुद्गपर्णी हिमा रूक्षा तिक्ता स्वादुश्च शुक्रला ॥53॥
चक्षुष्या क्षतशोथघ्नी ग्राहिणी ज्वरदाहनुत् ।
दोषत्रयहरी लघ्वी ग्रहण्यर्शोऽतिसारजित् ॥54॥

(भा. प्र. नि. गुडूच्यादिवर्ग)

मुण्डितिका (श्रावणी) (सं. व.)

मुण्डिका कटुतिक्ता स्यादनिलास्रविनाशिनी।
आमारुचिघ्न्यपस्मारगण्डश्लीपदनाशिनी ॥161॥

(ध. नि. गुडूच्यादिवर्ग)

श्रावणी मधुरा तिक्ता कटुपाका कटुर्लघुः ॥989॥
वीर्योष्णा तुवरा मेध्या स्थिरा वातकफापहा ।
जयेत् गण्डापचीप्लीहमेदोऽपस्मारपाण्डुताः ॥990॥
श्लीपदारुचियोन्यर्तिकासकृच्छ्रगुदकृमीन् ।

(कै. नि. ओषधिवर्ग)

श्रावणी तु कषाया स्यात् कटूष्णा कफपित्तनुत्।
आमातीसारकासघ्नी विषच्छर्दिविनाशिनी ॥218॥
महामुण्डोष्णतिक्ता च ईषद् गौल्या मरुच्छिदा।
स्वरकृद्रोचनी चैव मेहकृच्च रसायनी ॥222॥

(रा. नि. गुडूच्यादिवर्ग)

मुण्डितिका कटुः पाके वीर्योष्णा मधुरा लघुः।
मेध्या गण्डापचीकृच्छ्रकृमियोन्यर्त्तिपाण्डुनुत्॥217॥
श्लीपदारुच्यपस्मारप्लीहमेदोगुदार्तिहृत्।

(भा. प्र. नि. गुडूच्यादिवर्ग)

न्यग्रोधः (वटांकुरः)

विशेषतो विट्पथसंप्रवृत्ते पयो मतं मोचरसेन सिद्धम्।
वटावरोहैर्वटशुङ्गकैर्वा ह्रीवेरनीलोत्पलनागरैर्वा॥86॥
(च. चि. 4)

वटः शीतः कषायश्च स्तम्भनो रूक्षणात्मकः ।
तथा तृष्णाछर्दिमूर्च्छारक्तपित्तविनाशनः ॥70॥
(ध. नि. आम्रादिवर्ग)

वटो रूक्षो हिमो ग्राही कषायो योनिदोषहृत्।
वर्ण्यो व्रणविसर्पघ्नः कफपित्तहरो गुरुः॥423॥
(कै. नि. ओषधिवर्ग)

वटः कषायो मधुरः शिशिरः कफपित्तजित्।
ज्वरदाहतृषामोहव्रणशोफापहारकः ॥118॥
(रा. नि. आम्रादिवर्ग)

वटःशीतो गुरुर्ग्राही कफपित्तव्रणापहः।
वर्ण्यो विसर्पदाहघ्नः कषायो योनिदोषहृत्॥2॥
(भा. प्र. वटादिवर्ग)

निम्बूकः (जम्बीरःदन्तशठं) (फलम्)

आम्रातकं दन्तशठमम्लं सकरमर्दकम् ॥58॥
रक्तपित्तकरं विद्यादैरावतकमेव च।
(च. सू. 27)

आम्रातक .... दन्तशठैरावतक .... फलानि
.... इति अम्लस्कन्धः ॥147॥
(च. वि. 8)

सुश्रुते दन्तशठं अम्लवर्गे पठितः ॥11॥
(सु. सू. 42)

तृष्णाशूलकफोत्क्लेशच्छर्दिश्वासनिवारणम्।
वातश्लेष्मविबन्धघ्नं जम्बीरं गुरु पित्तकृत्॥
ऐरावतं दन्तशठमम्लं शोणितपित्तकृत् ॥162; 191॥
(सु. सू. 46)

तृष्णाशूल .... गुरुपित्तलम् ॥15॥
सुश्रुतोक्तपाठः अन्यच्च-जम्बीरं गुरु नात्यम्लं-
वातश्लेष्मविबन्धहृत् ॥16॥
कटुकमधुरमम्लं सुप्रतीतं रसे स्याद्रुचिकरमुदराग्नेस्तर्पणं-
चातिसारि।
हरति कफसमीरौ पित्तमाहन्ति वीर्यकरणमपि-
न हृद्यं रक्तपित्त तनोति ॥17॥
(ध. नि. आम्रादिवर्ग)

जम्बीरं तृट्कफोत्क्लेदशूलश्वासविबंधनुत् ।
गुरुश्लेष्मानिलच्छर्दिनाशनं पित्तकोपनम् ॥463॥
(शो. नि. आम्रादिवर्ग)

जम्बीरमुष्णगुर्वम्लं वातश्लेष्मविबंधनुत् ॥316॥
शूलकासकफोत्क्लेशच्छर्दितृष्णामदोषजित्।
आस्यवैरस्यहृत्पीडाजन्तुघ्नं पित्तकोपनम् ॥317॥
(कै. नि. ओषधिवर्ग)

जम्बीरस्य फलं रसेऽम्लमधुरं वातापहं पित्तकृत्पथ्यं
पाचनरोचनं बलकरं वह्नेर्विवृद्धिप्रदम्।
पक्वं चेन्मधुरं कफार्तिशमनं पित्तास्रदोषापनुद्वर्ण्यं
वीर्यविवर्धनं च रुचिकृत्पुष्टिप्रदं तर्पणम् ॥19॥
(रा. नि. आम्रादिवर्ग)

जम्बीरमुष्णं गुर्वम्लं वातश्लेष्मविबन्धनुत् ॥
शूलकासकफोत्क्लेशच्छर्दितृष्णाऽमदोषजित् ॥
आस्यवैरस्यहृत्पीडावह्निमान्द्यक्रिमीन् हरेत् ॥
स्वल्पजम्बीरिका तद्वत्तृष्णाच्छर्दिनिवारिणी ॥135॥
(भा. प्र. नि. आम्रादिवर्ग)

निर्गुण्डी (मूलम्)

विषघ्न कृमिघ्न गणे च पठ्यते ॥15, 16॥
(च. सू. 4)

निर्गुण्ड्या मूलपत्राभ्यां गृहीत्वा स्वरसं ततः ॥134॥
तेन सिद्धं समं तैलं नाडीकुष्ठानिलार्तिषु।
हितं पामाऽपचीनां च पानाभ्यञ्जनपूरणम् ॥135॥
(च. चि. 28)

सुरसा .... निर्गुण्डी .... विषमुष्टिकश्चेति
सुरसादिर्गणो ह्येष कफहृत् कृमिसूदनः ।
प्रतिश्यायारुचिश्वासकासघ्नो व्रणशोधनः ॥19॥
(सु. सू. 38)

गण्डमालामयार्तानां नस्यकर्मणि योजयेत्।
निर्गुण्ड्यास्तु शिफां सम्यग् वारिणा परिपेषिताम् ॥24॥
(वृन्दमाधव, 41)

निर्गुण्डीमूलकं जग्ध्वा ह्यपस्माराद् विमुच्यते ॥57॥
(रसरत्नसमुच्चय, 21)

निर्गुण्डीमूलचूर्णन्तु कर्षं तैलेन लेहयेत्।
सन्धिवातः कटिवातः कम्पवातश्च शाम्यति ॥164॥
(रसरत्नसमुच्चय, 21)

निर्गुण्डी कटुतिक्तोष्णा कृमिकुष्ठरुजापहा ।
वातश्लेष्मप्रशमनी प्लीहगुल्मारुचीर्जयेत्॥74॥
(ध. नि. करवीरादिवर्ग)

निर्गुण्डी तुवरा तिक्ता मेध्या शीतोषणा लघुः ॥127॥
चक्षुष्या दीपनी केश्या कफानिलविषापहा।
हन्त्यरोचकशूलामगुल्ममेदोव्रणकृमीन् ॥128॥
शोफकुष्ठप्रतिश्यायश्वासकासांश्च सा द्विधा ॥129॥
(कै. नि. ओषधिवर्ग)

कटूष्णा नीलनिर्गुण्डी तिक्ता रूक्षा च कासजित् ।
श्लेष्मशोफसमीरार्त्तिप्रदराध्मानहारिणी ॥154॥
(रा. नि. शताह्वादिवर्ग)

सिन्दुकः स्मृतिदस्तिक्तः कषायः कटुको लघुः ।
केश्यो नेत्रहितो हन्ति शूलशोथाममारुतान् ।
कृमिकुष्ठारुचिश्लेष्मज्वरान्नीलापि तद्विधा ॥114॥
(भा. प्र. नि. गुडूच्यादिवर्ग)

निर्गुण्डी कटुका तिक्ता रूक्षोष्णा च कषायका ।
स्मृतिप्रदा नेत्रहिता केश्या लघ्वग्निदीपनी ॥
मेध्या वर्ण्या च संप्रोक्ता गुदवातक्षयापहा ।
सन्धिवातं च वातं च शोफं त्वामं कृमींस्तथा ॥
कुष्ठं कफं व्रणं प्लीहां गुल्मं कण्ठरुजं तथा।
विषशूलं चारुचीं च ज्वरमेदोरुजं तथा ।
गृध्रसी च प्रतिश्यायं कासं श्वासं च नाशयेत् ॥
(नि. र.)

पलाशः (पुष्प)

किंशुकं (पुष्पं) कफपित्तघ्नम् ॥288॥

(सु. सू. 46)

किंशुकस्यापि कुसुमं सुगन्धि मधुरं च यत् ॥150॥

(ध. नि. आम्रादिवर्ग)

.... तत् पुष्पं स्वादुतिक्तकम्।
कषायं कटुकं पाके वातलं ग्राहि शीतलम्
तृड्दाहकफपित्तास्रकुठह्रत् .... ॥834॥

(कै. नि. ओषधिवर्ग)

तस्येपुष्पञ्च सोष्णंच कण्डूकुष्ठार्तिनाशनम् ॥38॥
रक्तः पीतः सितो नीलः कुसुमैस्तु विभज्यते ।
किंशुकैर्गुणसाम्येऽपि सितो विज्ञानदः स्मृतः ॥39॥

(रा. नि. करवीरादिवर्ग)

तत्पुष्पं स्वादु पाके तु कटु तिक्तं कषायकम् ॥51॥
वातलं कफपित्तास्रकृच्छ्रजिद् ग्राहि शीतलम् ।
तृड्दाहशमकं वातरक्तकुष्ठहरं परम् ॥52॥

(भा. प्र. नि. वटादिवर्ग)

पलाशः (निर्यास)

पित्ताभिष्यन्दे .....
पालाशं स्याच्छोणितं चाञ्जनार्थे ॥7॥

(सु. उ. 10)

पलाशमूलस्वरसो नेत्रच्छायान्ध्यपुष्पजित्॥535॥
तद्रक्तमपि तद्वच्च पुष्पं बकुलपुष्पवत् ।

(शो. नि. आम्रादिवर्ग)

दिनावसाने रुधिरं पलाशादादाय नेत्रे सहसैव दद्यात्।
नक्तान्ध्यमाश्वेव विजित्य जीवेच्चन्द्रातपे चाक्षरवाचकः स्यात्॥

(वैद्यमनोरमा)

पलाशो दीपनो वृष्यः सरोष्णो व्रणगुल्मजित्।
भग्नसंधानकृद् दोषग्रहण्यर्शः कृमीन् हरेत् ॥
कषायः कटुकस्तिक्तः स्निग्धो गुदजरोगजित् ॥50॥

(भा. प्र. नि. वटादिवर्ग)

पलाशः (बीजम्)

....पलाशतैलानि मधुरकषायाणि कफपित्तप्रशमनानि ॥121॥
(सु. सू. 45)

बीजं तु कटुकं स्निग्धमुष्णं कृमिबलासजित् 150॥
(ध. नि. आम्रादिवर्ग)

तद्बीजं कृमिविध्वंसि ..... ॥536॥
(सो. नि. ॥)

तृड्दाहकफपित्तास्रकुष्ठहृत् फलमस्य च ॥834॥
कषायं कटुकं पाके वातलं ग्राहि शीतलम्।
रूक्षं विपाके कटुकं लघूष्णं कफवातजित् ॥835॥
कुष्ठगुल्मोदरप्लीहमेहार्शः कृमिशूलनुत्।
(कै. नि. ओषधिवर्ग)

पलाशस्तु कषायोष्णः कृमिदोषविनाशनः ।
तद्बीजं पामकण्डूतिदद्रुत्वग्दोषनाशकृत् ॥37॥
(रा. नि. करवीरादिवर्ग)

पलाशो दीपनो वृष्यः सरोष्णो व्रणगुल्मजित् ।
कषायः कटुकस्तिक्तः स्निग्धो गुदजरोगजित् ॥50॥
भग्नसंधानकृद् दोषग्रहण्यर्शः कृमीन् हरेत् ॥
फलं लघूष्णं मेहार्शः कृमिवातकफापहम्।
विपाके कटुकं रूक्षं कुष्ठं गुल्मोदरप्रणुत् ॥53॥
(भा. प्र. नि. वटादिवर्ग)

फलबीजं च स्निग्धोष्णं कटुकृमिकफान् जयेत् ।
(नि. र.)

पर्पटकः (सं.व.)

नागर..पर्पटक..इति दशेमानि तृष्णानिग्रहणानि भवन्ति ।।29।।

(च. सू. 4)

.... शाकं पार्पटकं च यत् ।
कफपित्तहरं तिक्तं शीतं कटु विपच्यते ।।95।।

(च. सू. 27)

आटरूषक .... पर्पटाः ।
किराततिक्तसहितास्तिक्ता पित्तकफापहाः ।।270।।

(सु. सू. 4)

पर्पटः शीतलस्तिक्तः पित्तश्लेष्मज्वरापहः ।
रक्तदाहारुचिग्लानिमदभ्रमविनाशनः ।।45।।

(ध. नि. गुडूच्यादिवर्ग)
(रा. नि. पर्पटादि वर्ग 10)

पर्पटः कटुकः पाके रसे तिक्तो हिमो लघुः ।।1108।।
संग्राही वातलो हन्ति दाहपित्तकफज्वरान्।
पिपासारोचकच्छर्दिरक्तपित्तमदभ्रमान् ।। 1109।।

(कै. नि. ओषधिवर्ग.)

पर्पटो हन्ति पित्तास्रभ्रमतृष्णाकफज्वरान् ।
संग्राही शीतलस्तिक्तो दाहनुद्वातलो लघु ।।90।।

(भा. प्र. नि. गुडूच्यादिवर्ग)

पाटला (काण्डत्वक्)

पाटला..गोक्षुरका इति दशेमानि श्वयथुहराणि भवन्ति ॥38॥
(च. सू.4)

मृदुक्षारनिर्माणे .. पाटला .. समूलफलपत्रशाखा दहेत् ॥11॥
(सु. सू.11)

अपामार्गः सर्जरसः पाटलालकुचत्वचौ ।
उत्पाटके प्रलेपः स्यात्तैलमेभिश्चपाचयेत् ॥27(8)॥
(सु. सू.16)

मेहकुष्ठज्वरवमी कण्डूघ्नो व्रणशोधनः ॥6-7॥
(सु. सू.38)

बिल्व .... पाटलाः काश्मरी चेति महत् (पञ्चमूलम्)
सतिक्तं कफवातघ्नं पाके लघ्वग्निदीपनम्।
मधुरानुरसं चैव पञ्चमूलं महत् स्मृतम् ॥68-69॥
(सु. सू.38)

त्रिवृता .... रम्यकपाटलापूग .... चेत्यधोभागहराणि ।
तत्र .... पाटलान्तानां त्वचः ॥4॥
(सु. सू.39)

पाटलाकरवीराणां क्षारमेवं समाचरेत् ॥23॥
(सु. चि.7)

मूत्राघातेऽश्मर्याञ्च-पाटलाक्षारमाहृत्य सप्तकृत्वः परिस्रुतम्।
पिबेन्मूत्रविकारघ्नं संसृष्टं तैलमात्रया ॥46॥
(सु. उ.58)

सिध्दं कल्ककषायाभ्यां पाटल्याः कटुतैलकम्।
दग्धव्रणरुजास्रावदोहविस्फोटनाशनम् ॥22॥
(वृ. मा. 45)

पाटला तु रसे तिक्ता गुरूष्णा पवनास्रजित् ।
पित्तहिक्कावमीशोफकफारोचकनाशिनी ॥117॥
(ध. नि. गुडूच्यादिवर्ग)

पाटला कफपित्तास्रछर्दितृट्मारुतापहा ॥156॥
(सोढल नि. ॥)

पाटलाऽरुचिशोफार्शःश्वासतृट्छर्दिनाशिनी।
(म.पा.नि.)

पाटला तुवराऽनुष्णा तिक्ता दोषत्रयापहा ।
अरुचिश्वासशोफास्रछर्दिहिध्मातृषापहा ॥37॥
(कै. नि. औषधिवर्ग)

पाटली तु रसे तिक्ता कटूष्णा कफवातजित् ।
शोफाध्मानवमिश्वासशमनी सन्निपातनुत् ॥50॥
(रा. नि. करवीरादिवर्ग)

पाटला तुवरा तिक्तानुष्णा दोषत्रयापहा ।
अरुचिश्वासशोफास्रछर्दिहिक्कातृषाहरी ॥21॥
(भा. प्र. नि. गुडूच्यादिवर्ग)

पत्तङ्गम् (मध्यकाष्ठ)

स्वादु पाकरसे शीतं पतङ्गं नातिशीतलम् ।
कुचन्दनं तु तिक्तं स्यात्सुगन्धि व्रणरोपणम् ॥7॥
(ध. नि. चन्दनादिवर्ग)

पतङ्गंतिक्तमधुरं वर्ण्यं पित्तकफापहम् ॥328॥
(शो. नि. चन्दनादिवर्ग)

पतङ्गंमधुरं शीतं व्रणपित्तकफापहम् ॥1431॥
(कै. नि. ओषधिवर्ग)

पतङ्गंकटुकं रूक्षमम्लं शीतं तु गौल्यकम् ।
वातपित्तज्वरघ्नं च विस्फोटोन्मादभूतहृत् ॥141॥
(रा. नि. चन्दनादिवर्ग)

पतङ्गं मधुरं शीतं पित्तश्लेष्मव्रणास्रनुत्।
हरिचन्दनवद्वेद्यं विशेषाद्दाहनाशम् ॥19॥
(भा. प्र. नि. कर्पूरादिवर्ग)

पिप्पली (फलम्)

पिप्पल्यादिः कफहरः प्रतिश्यायानिलारुचीः।
निहन्याद्दीपनो गुल्मशूलघ्नश्चामपाचनः॥23॥

(सु. सू. 38)

पिप्पली कटुका स्वादुर्हिमा स्निग्धा त्रिदोषजित् ।
तृड्ज्वरोदरजन्त्वामनाशिनी च रसायनी॥74॥

(ध. नि. शतपुष्पादिवर्ग)

पिप्पली दीपनी वृष्या स्वादुपाका रसायनी।
अनुष्णा कटुका स्निग्धा वातश्लेष्महरी लघुः॥54॥
पिप्पली रेचनी हन्ति श्वासकासोदरज्वरान्।
कुष्ठप्रमेहगुल्मार्शःप्लीहशूलाममारुतान्॥55॥

(भा. प्र. नि. हरीतक्यादिवर्ग)

पिप्पली ज्वरहा वृष्या स्निग्धोष्णा कटुतिक्तका।
दीपनी मारुतश्वासकासश्लेष्मक्षयापहा॥13॥

(रा. नि. पिप्पल्यादिवर्ग)

शुष्का लघुः स्वादुपाका स्निग्धानुष्णा रसे कटुः।
कफवातहरा रुच्या सरा वृष्या रसायनी॥1166॥
दीपनी पाचनी हृद्या पित्तला श्वासकासनुत्।
निहन्ति कफगुल्मार्शो मेहप्लीहज्वरोदरान्॥1167॥
तीक्ष्णोष्णभावात् श्लेष्मघ्नी तस्माच्चैवाग्निदीपनी।
शैत्यप्रसादमाधुर्यात् पित्तं हन्ति च पिप्पली।
औष्ण्यात् सरत्वात् पाकाच्च वातस्याप्यनुलोमनी॥1168॥

(कै. नि. ओषधिवर्ग)

प्लक्षः (फलम्)

प्लक्षः कटुः कषायश्च शीतलो रक्तपित्तजित्।
मूर्च्छाश्रमप्रलापाश्च हरेत् प्लक्षो विशेषतः ॥75॥
(ध. नि. आम्रादिवर्ग)

क्षीरवृक्षफलं साम्लं कषायं मधुरं हिमम् ।
कफपित्तहरं रूक्षं स्तम्भनं गुरु लेखनम्॥
विबन्धाध्मानजननं परं वातप्रकोपनम् ॥498-499॥
(सो. नि.॥)

पिप्परिस्तुवरः शीतो व्रणयोनिविसर्पनुत् ।
दाहपित्तकफास्त्रघ्नो मेदःपित्तास्त्रशोफजित् ॥437॥
(कै. नि. ओषधिवर्ग)

फलं तेषां (पञ्चक्षीरीणां) तु वातकृत् ॥441॥
कषायं मधुरं साम्लं गुरुविष्टंभि पित्तजित् ॥442॥
(कै. नि. ओषधिवर्ग)

प्लक्षः कटुकषायश्च शिशिरो रक्तदोषजित् ।
मूर्च्छाभ्रमप्रलापघ्नो ह्रस्वप्लक्षो विशेषतः ॥125॥
(रा. नि. आम्रादिवर्ग)

प्लक्षः कषायः शिशिरो व्रणयोनिगदापहः ।
दाहपित्तकफास्त्रघ्नः शोफहा रक्तपित्तहृत् ॥12॥
(भा. प्र. नि. वटादिवर्ग)

प्रसारिणी (पत्रम्)

वातव्याधौ - कल्पो ....प्रसारण्याम्.... पचेत् पृथक् ॥166॥
(च. चि.28)

मूत्रकृच्छ्रेजलेन नारिकेलस्य पिबेत् प्रातः प्रसारणीम् ।
मूत्रकृच्छ्रविनाशाय शर्करापातनाय च ॥6॥
(चक्रदत्त 7)

प्रसारणी गुरुस्तिक्ता सरा सन्धानकृन्मता ।
त्रिदोषशमनी वृष्या तेजः कान्तिबलप्रदा ॥279॥

(ध. नि. गुडूच्यादिवर्ग)

सारणी वातरक्तघ्नी सोष्णा वृष्या बलप्रदा।
कट्वी च लघु चक्षुष्या स्वर्या ज्वरनिशान्ध्यजित् ॥254॥

(सो. नि.॥)

प्रसारणी गुरुर्वृष्या सन्धानबलकृत्सरा।
वीर्योष्णा वातनुत्तिक्ता वातरक्तकफापहा॥
(म. पा. नि.)

प्रसारणी सरा तिक्ता वीर्योष्णा शुक्रला गुरुः ॥1061॥
व्रणसन्धानबलकृत् वातरक्तत्रिदोषहा।
(कै. नि. ओषधिवर्ग)

प्रसारणी गुरूष्णा च तिक्ता वातविनाशिनी।
अर्शःश्वयथुहन्त्री च मलविष्टम्भहारिणी ।।38।।

(रा. नि. पर्पटादिवर्ग)

प्रसारणी गुरुर्वृष्या बलसन्धानकृत्सरा।
वीर्योष्णा वातहृत्तिक्ता वातरक्तकफपहा ।।235।।

(भा. प्र. नि. गुडूच्यादिवर्ग)

प्रसारणी गुरुश्चोष्णा तिक्ता बल्या सरा मता ।
भग्नसन्धानकरी कान्तिकृद्धातुवर्धका ।।
वातार्शःशोफकफहा मलस्तम्भकरी मता ।
वातरक्तं त्रिदोषं च नाशयेदिति कीर्त्तिता ।।

(नि. र.)

प्रियालः (शा.त्वक्)

तिन्दुकपियालबदरखदिरकदरसप्तपर्णाश्वकर्णार्जुनासनारिमेदा
इति दशेमान्युदर्दप्रशमनानि भवन्ति ॥43॥

(च. सू. 4)

प्रियङ्ग्वनन्ता .... तिन्दुकप्रियालबदरखदिर ....
इति कषायस्कन्धः ॥151॥

(च. वि. 8

रक्तातिसारे - शल्लकी बदरीजम्बुप्रियालाम्रार्जुनत्वचः ।
पीताः क्षीरेण मध्वाढ्याः पृथक् शोणितनाशनः ॥69॥

(चक्रदत्त 3

वातपित्तहरं वृष्यं प्रियालं गुरुशीतलम् ॥73॥

(ध. नि. आम्रादिवर्ग

प्रियालः कफपित्तघ्नः .... ॥395॥

(कै. नि. ओषधिवर्ग

चारः पित्तकफास्रघ्नः :.... ॥84॥

(भा. प्र. नि. आम्रादिवर्ग)

प्रियङ्गुः (फलम्)

चरके सन्धानीये पुरीषसंग्रहणीये मूत्रविरजनीये
शोणितास्थापने च महाकषाये पठ्यते ॥5,31,34,46॥
(च. सू. 4)

गन्धप्रियङ्गुःशोणितपित्तातियोगप्रशमनानाम्। 40॥
(च. सू. 25)

अञ्जन.....प्रियङ्गु .... मधुकं चेति ।43
अञ्जनादिर्गणो ह्येष रक्तपित्तनिबर्हणः॥
विषोपशमनो दाहं निहन्त्याभ्यन्तरं भृशम् ॥20॥
(सु. सू. 38)

गणौ प्रियङ्ग्वम्बष्ठादौ पक्वातिसारनाशनौ।
सन्धानीयौ हितौ पित्ते व्रणानां चापि रोपणौ ॥22॥
(सु. सू. 38)

प्रियङ्गुः शीतला तिक्ता मोहदाहविनाशिनी।
ज्वरवान्तिहरा रक्तमुद्रिक्तं च प्रसादयेत् ॥16॥
(ध. नि. चन्दनादिवर्ग)

प्रियङ्गुरास्यदौर्गन्ध्यरक्तपित्तज्वरापहा ॥1331॥
(सो. नि.II)

प्रियङ्गुः शीतला वान्तिदाहपित्तज्वरास्रजित्।
मुखकान्तिप्रजननी गात्रदौर्गन्ध्यनाशिनी ॥
(म. पा. नि.)

तत्फलं मधुरं रूक्षं कषायं शीतलं गुरु।
विबन्धाध्मानबलकृत् संग्राहि कफपित्तजित् ॥1356॥
(कै. नि. ओषधिवर्ग)

प्रियङ्गुः शीतला तिक्ता दाहपित्तास्रदोषजित्।
वान्तिभ्रान्तिज्वरहरा वक्त्रजाड्यविनाशनी ॥46॥
(रा. नि. चन्दनादिवर्ग)

तत्फलं मधुरं रूक्षं कषायं शीतलं गुरु ।
विबन्धाध्मानबलकृत् सङ्ग्राहि कफपित्तजित् ॥104॥
(भा. प्र. नि. कर्पूरादिवर्ग)

पृश्निपर्णी (सं.व.)

चरके-सन्धानीय शोथहर अङ्गमर्दप्रशमन -
दशेमानिगणेषु मधुरस्कन्धे च पठ्यते।।38,44।।

(च. सू. 4,5)

पृश्निपर्णी संग्राहकवातहरदीपनीयवृष्याणां।।39।।

(च.सू.25)

विदारिगन्धा ....पृथक्पर्णी .... ऋषभी चेति ।।4।।
विदारिगन्धादिरयं गणः पित्तानिलापहः ।।
शोषगुल्माङ्गमर्दोर्ध्वश्वासकासविनाशनः ।।5।।

हरिद्रा.... कलशी .... मधुकं चेति ।।27।।
एतौ वचाहरिद्रादिगणौ स्तन्यविशोधनौ।
आमातिसारशमनौ विशेषाद्दोषपाचनौ।।28।।

तत्र त्रिकण्टक .... पृथक्पर्ण्यो .... चेति कनीयः ।।66।।
कषायतिक्तमधुरं कनीयः पञ्चमूलकम्।।
वातघ्नं पित्तशमनं बृंहणं बलवर्धनम् ।।67।।

(सु. सू. 38)

पृष्टिपर्णी रसे स्वादुः लघूष्णाऽस्त्रत्रिदोषजित्।
कासश्वासप्रशमनी ज्वरतृड्दाहनाशिनी।।91।।

(ध. नि. गुडूच्यादिवर्ग)

पृश्निपर्णी त्रिदोषघ्नी वृष्योष्णा मधुरा सरा।
हन्ति दाहज्वरश्वासरक्तातिसारतृड्वमीः ।।48।।

(कै. नि. ओषधिवर्ग)

पृश्निपर्णी कटूष्णाम्ला तिक्तातीसारकासजित्।
वातरोगज्वरोन्मादव्रणदाहविनाशिनी ।।119।।

(रा. नि. शताह्वत्तदिवर्ग)

पृश्निपर्णी त्रिदोषघ्नी वृष्योष्णा मधुराऽसरा।
हन्ति दाहज्वरश्वासरक्तातिसारतृड्वमीः ।।35।।

(भा. प्र. नि. गुडूच्यादिवर्ग)

पुष्करम् (मूलम्)

शटीपुष्करमूल .... कुलीरश्रृंग्य इति
दशेमानि हिक्कानिग्रहणानि भवन्ति ।।30।।
(च. सू. 4)

शटीपुष्करमूल .... चण्डा इति
दशेमानि श्वासहराणि भवन्ति ।।37।।
(च. सू. 4

पुष्करमूलं हिक्काश्वासकासपार्श्वशूलहराणाम् ।।40।।
(च. सू. 25)

तिक्तं पुष्करमूलन्तु कटूष्णं कफवातजित्।।
ज्वरारोचककासघ्नं शोफाध्मानविनाशनम् ।।66।।
श्वासं हिक्का जयत्येव सेव्यमानं शनैः शनैः।
(ध. नि. गुडूच्यादिवर्ग)

पौष्करं पार्श्वरुक्श्वासकासहिक्काज्वरापहम् ।।137।।
(सो. नि.II)

पौष्करं कटुतिक्तोष्णं कासश्लेष्मानिलापहम् ।
ज्वरशोफारुचिश्वासहिक्कापार्श्वरुजो जयेत् ।।1322।।
(कै. नि. ओषधिवर्ग)

पौष्करं कटुतिक्तोष्णं कफवातज्वरापहम् ।
श्वासारोचककासघ्नं शोफघ्नं पाण्डुनाशनम् ।।154।।
(रा. नि. पिप्पल्यादिवर्ग)

पौष्करं कटुकं तिक्तमुष्णं वातकफज्वरान्।
हन्ति शोथारुचिश्वासान् विशेषात् पार्श्वशूलनुत् ॥174॥
(भा. प्र. नि. हरीतक्यादिवर्ग)

रुद्राक्षः (बीजम्)

रुद्राक्षमम्लमुष्णं च वातघ्नं कफनाशनम्।
शिरोऽर्त्तिशमनं रुच्यं भूतग्रहविनाशनम् ॥187॥
(रा. नि. आम्रादिवर्ग)

जम्बीरनीरपरिपीतगुडं नराणामारम्भकालसमयेषु मसूरिकार्तिम् ।
सद्यः शमं नयति गोपयसा प्रभाते-
रुद्राक्षमप्यलमतीव रहस्यमेतत् ॥19॥
(वैद्यमनोरमा, 11)

रुद्राक्षस्य फलास्थि स्यान्मधुरं शीतलं लघु ।
मनोविकारशमनं रक्तभारापहं सरम्।
दाहज्वरप्रशमनं शस्यते वातपैत्तिके ।
अपस्मारे तथोन्मादे रक्तभारेऽधिके तृषि॥
मसूरिकायां विस्फोटे श्वासे यकृद्गदेषु च ॥ स्व. ॥
(प्रो. प्रि. व्र. शर्मा, द्र. गु. वि., ॥ पृ. 220)

अम्लोष्णं फलमस्य स्यात् कफवातहरं तथा।
भूतापस्मारकोन्मादबालग्रहविनाशकम् ।
बीजमस्य धृतं कण्ठे श्रीकरं पावनं स्मृतम् ।
सर्वपापहरं प्रोक्तं स्वास्थ्यसंरक्षणं शिवम् ॥स्व.॥
(इ. मे. प्लँ., कोट्टक्कल)

लताकस्तूरिका (बीजम्)

..... तिक्तंकटु कफापहम्।
लघु तृष्णापहं वक्त्रक्लेददौर्गन्ध्यनाशनम्।
सतिक्तः सुरभिः शीतः कर्पूरो लघु लेखनः ॥ 203॥
तृष्णायां मुखशोषे च वैरस्ये चापि पूजितः ॥
लताकस्तूरिका तद्वच्छीता बस्तिविशोधनी ॥ 204॥

(सु. सू.46)

लताकस्तूरिका ज्ञेया कटु दक्षिणदेशजा ।
लताकस्तूरिका तिक्ता स्वाद्वी वृष्या हिमा लघुः॥1298॥
चक्षुष्या छेदनी श्लेष्मतृष्णाबस्त्यास्यरोगजित्।

(कै. नि. ओषधिवर्ग)

लताकस्तूरिका तिक्ता स्वाद्वी वृष्या हिमा लघुः ।
चक्षुष्या छेदिनी श्लेष्मतृष्णाबस्त्यास्यरोगहृत्॥ 9॥

(भा. प्र. नि. कर्पूरादिवर्ग)

सर्जः (निर्यासः)

आरनालाढके तैलं पादसर्ज रसंश्रृतम् (घृतम्-पाठा.)।
प्रभूते खजितं (मथितं-पाठा.)-
तोये ज्वरदाहार्तिनुत् (परम् पाठा.)॥122॥
(च. चि. 29)

श्रीवेष्टके सर्जरसे सरले .... व्रणधूपनम् ॥71॥
(सु. सू. 37)

कुष्ठकण्डूकृमिश्लेष्मवातपित्तरुजां जयेत् ॥
सर्जयुग्मं कषायं स्याद् वर्ण्यं रुक्षं कफापहम् ॥1141॥
(ध. नि. आम्रादिवर्ग)

सर्जः कषायो वर्ण्यश्च कफस्वेदमदकृमीन् ।
वर्ध्मविद्रधिबाधिर्ययोनिकर्णरुजाः हरेत् ॥843॥
(कै. नि. ओषधिवर्ग)

सर्जस्तु कटुतिक्तोष्णो हिमः स्निग्धोऽतिसारजित् ।
पित्तास्रदोषकुष्ठघ्नः कण्डूविस्फोटवातजित् ॥80॥
(रा. नि. प्रभद्रादिवर्ग)

अजकर्णः कटुस्तिक्तः कषायोष्णो व्यपोहति ।
कफपाण्डुश्रुतिगदान् मेहकुष्ठविषव्रणान् ॥21॥
(भा. प्र. नि. वटादिवर्ग)

तैलं सर्जरसोद्भूतं विस्फोटव्रणनाशनम् ।
कुष्ठपामाकृमिहरं वातश्लेष्मामयापहम् ॥26॥
(भा. नि. तैलवर्ग)

शतावरी (मूलम्)

ऐन्द्री ..... अतिरसा .... अतिबला इति
दशेमानि बल्यानि भवन्ति ॥17॥

(च. चि. 4)

अमृता .... अतिरसा .... पुनर्नवा इति
दशेमानि वयःस्थापनानि भवन्ति ॥50॥

(च. चि. 4)

विदारिगन्धा .... शतावरी .... ऋषभी चेति ।
विदारिगन्धादिरयं गणः पित्तानिलापहः ।
शोषगुल्माङ्गमर्दोर्ध्वश्वासकासविनाशनः ॥4-5॥

(सु. सू. 38)

करमर्दी .... शतावरी .... इति कण्टकसंज्ञः ।
रक्तपित्तहरौ ह्येतौ शोफत्रयविनाशनौ।
सर्वमेहहरौ चैव शुक्रदोषविनाशनौ ॥74॥

(सु. सू. 38)

वातपित्तहरी वृष्या स्वादुतिक्ता शतावरी ।
महती चैव हृद्या च मेधाग्निबलवर्धिनी ॥301॥
ग्रहण्यर्शोविकारघ्नी वृष्या शीता रसायनी ।
कफपित्तहरास्तिक्तास्तस्या एवाङ्कुरा स्मृताः॥302॥

(सु. सू. 46)

शतावरी हिमा तिक्ता रसे स्वादुः क्षयास्रजित्।
वातपित्तहरा वृष्या रसायनवरा स्मृता ॥282॥
सहस्रवीर्या मेध्या तु हृद्या वृष्या रसायनी।
शीतवीर्या निहन्त्यर्शोग्रहणीनयनामयान् ॥284॥
तदङ्कुरस्त्रिदोषघ्नो लघुरर्शःक्षयापहः ।

(ध. नि. गुडूच्यादिवर्ग)

शतावरी हिमा तिक्ता स्वाद्वी गुर्वी रसायनी ॥1063॥
सुस्निग्धा शुक्रला बल्या स्तन्यमेधाग्निपुष्टिदा।
चक्षुष्या वातपित्तास्रगुल्मातिसारशोफजित् ॥1064॥
महाशतावरी हृद्या मेधाग्निबलशुक्रदा ॥1066॥
ग्रहण्यर्शोऽक्षिरोगघ्नी शीतवीर्या रसायनी।
तदंकुरो लघुस्तिक्तो वृष्यो हृद्यस्त्रिदोषनुत् ॥1067॥
निहन्ति वातपित्तास्रग्रहणीगुदजक्षयान् ।

(कै. नि. ओषधिवर्ग)

शतावर्यौ हिमे वृष्ये मधुरे पित्तजित्परे ।
कफवातहरे तिक्तो महाश्रेष्ठे रसायने ॥122॥
शतावरीद्वयं वृष्यं मधुरं पित्तजिद्धिमम्।
महती कफवातघ्नी तिक्ता श्रेष्ठा रसायने ।
कफपित्तहरास्तिक्तास्तस्या एवांकुराः स्मृताः ॥123॥

(रा. नि. शताह्वत्तदिवर्ग)

शतावरी गुरुः शीता तिक्ता स्वाद्वी रसायनी।
मेधाग्निपुष्टिदा स्निग्धा नेत्र्या गुल्मातिसारजित् ॥186॥
शुक्रस्तन्यकरी बल्या वातपित्तास्त्रशोफजित् ।
महाशतावरी मेध्या हृद्या वृष्या रसायनी ॥187॥
शीतवीर्या निहन्त्यर्शोग्रहणीनयनामयान् ।
तदङ्कुरस्त्रिदोषघ्नो लघुरर्शःक्षयापहा ॥188॥
(भा. प्र. नि., गुडूच्यादिवर्ग)

शिग्रुः (मूलत्वक्, बीजं, काण्डत्वक्)

चरके स्वेदोपगे शिरोविरेचनोपगे च महाकषाये पठ्यते ।।22,27।

(च. सू. 4)

कटुः सक्षारमधुरः शिग्रुस्तिक्तोऽथ पिच्छिलः ।
मधुशिग्रुः सरस्तिक्तः शोफघ्नो दीपनः कटुः ।।237।।

(सु. सू. 46)

शिग्रुस्तिक्तः कटुश्चोष्णः कफशोफसमीरजित्।
कृम्यामविषमेदोघ्नो विद्रधिप्लीहगुल्मनुत्।।38।।

(ध. नि. करवीरादिवर्ग)

शिग्रु कटुः कटुः पाके तीक्ष्णोष्णो मधुरो लघुः ।
दीपनो रोचनो रूक्षः क्षारस्तिक्तो विदाहकृत्।।744।।
संग्राह्यशुक्रलो हृद्यः रक्तपित्तास्रकोपनः ।
चक्षुष्यः कफवातघ्नो हन्ति श्वयथुविद्रधीन्।।745।।
मेदोऽपचीविषप्लीहगुल्मगण्डव्रणकृमीन्।।

(कै. नि. ओषधिवर्ग)

शिग्रुश्च कटुतिक्तोष्णस्तीक्ष्णो वातकफापहः ।
मुखजाड्यहरो रुच्यो दीपनो व्रणदोषनुत्।।27।।

(रा. नि. मूलकादिवर्ग)

शिग्रुः सरः कटुःपाके तीक्ष्णोष्णो मधुरो लघुः।
दीपनो रोचनो रूक्षः क्षारस्तिक्तो विदाहकृत्।।
संग्राह्यशुक्रलो हृद्यः पित्तरक्तप्रकोपणः।।
चक्षुष्यः कफवातघ्नो विद्रधिश्वयथुक्रिमीन्।
मेदोऽपचीविषप्लीहगुल्मकण्डूव्रणान्हरेत्।।
शिग्रुवल्कलपत्राणां स्वरसः परमार्त्तिहृत् ।।109।।

(भा. प्र. नि. गुडूच्यादिवर्ग)

चक्षुष्यं शिग्रुजं बीजं तीक्ष्णोष्णं विषनाशनम्।
अवृष्यं कफवातघ्नं तन्नस्येन शिरोर्तिनुत्।।110।।

(भा.प्र.नि. गुडूच्यादिवर्ग)

शृङ्गाटकम् (शुष्कबीजम्)

शृङ्गाटकांकलोड्यंच गुरु विष्टम्भि शीतलम् ॥117॥
(च. सू., 27)

गर्भस्थापने-शृङ्गाटकपुष्करबीजकशेरुकान् भक्षणार्थम् ॥24॥
(च. शा., 8)

मूत्रकृच्छ्रे-पिबेत्कषायं कमलोत्पलानाम्।
शृङ्गाटकानामथवा विदार्याः ॥49॥
(च. चि. 26)

गर्भस्थापने- शृङ्गाटकं बिसं द्राक्षा कशेरु मधुकं सिता ॥62॥
(सु. शा. 10)

गुरु विष्टम्भिशीतौ च शृङ्गाटककशेरुकौ ॥303॥
(सु.सू. 46)

शृङ्गाटकं कषायं तु मधुरं वृष्यवातलम्।
जीवनं पित्तशमनं कफमेहहरं गुरु ॥1621॥
(कै.नि.ओषधिवर्ग)

शृङ्गाटकः शोणितपित्तहारी लघुः सरो वृष्यतमो विशेषात्।
त्रिदोषतापश्रमशोफहारी रुचिप्रदो मेहनदार्ढ्यहेतुः ॥46॥
(रा.नि.मूलकादिवर्ग)

शृङ्गाटकं हिमं स्वादु गुरु वृष्यं कषायकम् ।
ग्राही शुक्रानिलश्लेष्मप्रदं दाहास्रपित्तनुत् ॥93॥

(भा.प्र. नि. आम्रादिफलवर्ग)

शृङ्गाटकश्चातिवृष्यो लघुर्ग्राही रुचिप्रदः ।
शुक्रलो वातकफकृत् गुरुर्मेहनदार्ढ्यकृत् ॥
तुवरो मधुरः शीतस्तर्पणः स्वादुपित्तजित्।
दाहत्रिदोषमेहघ्नो रक्तदोषभ्रमापहः ॥
शोफसन्तापहा प्रोक्तः पूर्ववैद्यैर्महर्षिभिः।

(नि. र.)

स्रुवावृक्षः (पत्रम्, काण्डत्वक्)

नीपं शताह्वकं पीलु तृणशून्यं विकङ्कतम् ।
प्राचीनामलकं चैव दोषघ्नं गरहारि च ॥ 145-146॥
(च. सू. 27)

प्रमेहे-श्रृङ्गाटकगिलोड्य- - विकङ्कतेषु वा।
यवागून्नविकारांश्च सेवेत॥10॥
(सु. चि. 11)

लूताविषे-ह्रीबेरवैकंकत- ---------- वराङ्गम्।
पित्तकफानिललूताः पानाञ्जननस्यलेपसेकेन॥82॥
(अ. हृ. उ. 37)

गोपघोटा रसे तिक्ता शीतला शोफनाशनी।
हन्ति श्लेष्माणमत्युग्रमुद्रक्तं हन्ति योगतः ॥38॥
(ध. नि. आम्रादिवर्ग)

स्रुवद्रुर्मधुरस्तिक्तः कषायः शीतलो जयेत्।
बलासपित्तशोफास्रं फलं पाकरसोषणम् ॥406॥
तीक्ष्णं पित्तास्रकृत् पक्वं स्वादु तिक्तं त्रिदोषजित् ।
(कै. नि. ओषधिवर्ग)
विकङ्कतोऽम्लो मधुरः पाकेऽतिमधुरो लघुः।
दीपनः कामलास्रघ्नः पाचनः पित्तनाशनः॥155॥
(रा.नि.प्रभद्रादिवर्ग)

विकङ्कतफलं पक्वं मधुरं सर्वदोषजित् ॥88॥
(भा. नि. आम्रादिफलवर्ग)

तालमूली (काण्डकन्दः)

मुषली रसपाकाभ्यां स्वादुः शीताग्निवर्ध्दनी।
वातपित्तहरा वृष्या स्थैर्यमार्दवदायिनी।।394।।

(सो.नि.2)

मुशली मधुरा गुर्वीतिक्ता वृष्या रसायनी।
वीर्योष्णा बृंहणी हन्ति दुर्नामानि प्रभञ्जनम्।।1606।।

(कै. नि. ओषधिवर्ग)

मुशली मधुरा शीता वृष्या पुष्टिबलप्रदा।
पिच्छिला कफदा पित्तदाहश्रमहरा परा।।116।।
मुशली स्याद्द्विधा प्रोक्ता श्वेता चापरसंज्ञकौ।
श्वेता स्वल्पगुणोपेता अपरा च रसायनी।।117।।

(रा.नि.मूलकादिवर्ग)

मुशली मधुरा वृष्या वीर्योष्णा बृंहणी गुरुः।
तिक्ता रसायनी हन्ति गुदजान्यानिलं तथा।।183।।

(भा.प्र.नि.गुडूच्यादिवर्ग)

मुशली मधुरा वृष्या धातुवृध्दिकरी गुरुः।
तिक्ता पुष्टिबलकारी पिच्छिला श्लेष्मला मता।।
रसायनी शीतला च पित्तदाहहरी मता।
रक्तदोषं श्रमञ्चैव नाशयेदिति कीर्तितम्।।
कृष्णाधिकगुणा प्रोक्ता श्वेता चाल्पगुणा मता।

(शा. नि.)

तालीसम् (शुष्कपत्रम्)

पिप्पलीविडङ्ग ... तालीश ... शिरोविरेचनानि ॥6॥
(सु. सू. 39)

तालीसं श्वासकासघ्नं दीपनं श्लेष्मपित्तजित् ।
मुखरोगहरं हृद्यं सुपत्रं पत्रसंवृतम् ॥54॥
(ध. नि. शतपुष्पादिवर्ग)

तालीसं तिक्तकटुकं कृमिवातकफापहम् ॥1382॥
(कै. नि. ओषधिवर्ग)

तालीसपत्रं तिक्तोष्णं मधुरं कफवातनुत् ।
कासहिक्काक्षयश्वासछर्दिदोषविनाशकृत् ॥184॥
(रा. नि. पिप्पल्यादिवर्ग)

तालीसं लघु तीक्ष्णोष्णं श्वासकासकफानिलान्।
निहन्त्यरुचिगुल्मामवह्निमान्द्यक्षयामयान् ॥115॥
(भा. प्र. नि., कर्पूरादिवर्ग)

तालीसपत्रं मधुरं तिक्तं चोष्णं लघु स्मृतम्।
तीक्ष्णं स्वर्यं च हृद्यं च अग्निदीप्तिकरं मतम् ।
श्वासं कासं कफं वातं क्षयगुल्मारुचिस्तथा।
रक्तदोषं वमिं चाममग्निमान्द्यं च नाशयेत्।
मुखरोगं च पित्तं नाशयेदिति कीर्तितम्॥
(नि. र.)

तिलः (बीजम्)

स्निग्धोष्णो मधुरस्तिक्तः कषायः कटुकस्तिलः।
त्वच्यः केश्यश्च बल्यश्च वातघ्नः कफपित्तकृत् ॥30॥
(च. सू. 27)

नवनीततिलाभ्यासात् .... अर्शांस्यपयान्ति रक्तानि॥210॥
(च. चि. 14)

ईषत्कषायो मधुरः सतिक्तः सांग्राहिकः पित्तकरस्तथोष्णः।
तिलो विपाके मधुरो बलिष्ठः स्निग्धो व्रणे लेपन एव पथ्यः ॥39
दन्त्योऽग्निमेधाजननोऽल्पमूत्रस्त्वच्योऽथ केश्योऽनिलहा गुरुश्च।
तिलेषु सर्वेष्वसितः प्रधानो मध्यः सितो हीनतरास्तथाऽन्ये ॥40॥
(सु. सू. 46)

तिलो रसे कटुस्तिक्तो मधुरस्तुवरो गुरुः।
विपाके कटुकः स्वादुः स्निग्धोष्णः कफपित्तकृत्॥110॥
बल्यः केश्यो हिमस्पर्शो त्वच्यः स्तन्यो व्रणे हितः ।
दन्त्योऽल्पमूत्रकृद् ग्राही वातघ्नोऽग्निमतिप्रदः ॥111॥
(ध. नि. सुवर्णादिवर्ग)

स्निग्धो वर्णबलाग्निवृध्दिजननस्तन्यानिलघ्नो गुरु।
सोष्णः पित्तकरोऽल्पमूत्रकरणः केश्योऽतिपथ्यो व्रणे ॥
संग्राही मधुरः(पाठा. कटुकः)कषायसहितस्तिक्तो विपाके कटुः।
कृष्णः पथ्यतमः सितोऽल्पगुणदः क्षीणास्तथाऽन्ये तिलाः ॥193॥
(रा. नि. सुवर्णादिवर्ग)

तिलो रसे कटुस्तिक्तो मधुरस्तुवरोगुरूः।
विपाके कटुकः स्वादुः स्निग्धोष्णः कफपित्तनुत्।
बल्यः केश्यो हिमस्पर्शो त्वच्यः स्तन्यो व्रणे हितः॥64॥
दन्त्योऽल्पमूत्रकृद् ग्राही वातघ्नोऽग्निमतिप्रदः ।
कृष्णः श्रेष्ठतमस्तेषु अन्ये हीनतरः शुक्लो मध्यमः सितः॥65॥

(भा. प्र. नि. धान्यवर्ग)

तुलसी (बीजम्)

शटीपुष्कर...सुरसा...जीवन्ती चण्डा इति दशेमानि
श्वासहराणि भवन्ति।।37।।

(च. सू. 4)

सुरसादिर्गणो ह्येष कफहृत् कृमिसूदनः।
प्रतिश्यायारुचि श्वासकासघ्नो व्रणशोधनः।।19।।

(सू.सू.38)

हिध्मकासविषश्वासपार्श्वरुक्पूतिगन्धहा।
सुरसः सुमुखो नातिविदाही गरशोफहा।।108।।

(अ. हृ. सू. 6)

तुलसी लघुरुष्णा च रूक्षा कफविनाशिनी।
कृमिदोषं निहन्त्येषा रुचिकृद्वह्निदीपनी।।45।।

(ध. नि. करवीरादिवर्ग)

तुलसी तुवरा तिक्ता तीक्ष्णोष्णा कटुपाकिनी।
रूक्षा हृद्या लघुः कट्वी दाहपित्ताग्निवर्द्धनी।।1554।।
जयेद्वातकफश्वासकासहिद्मावमिकृमीन्।
दौर्गन्ध्यपार्श्वरुक्कुष्ठविषकृच्छ्राश्मदृग्गदान्।।1555।।

(कै. नि. ओषधिवर्ग)

तुलसी कटुतिक्तोष्ण सुरभिः श्लेष्मवातजित्।
जन्तुभूतक्रिमिहरा रुचिकृद्वातशान्तिकृत्।।79।।

(रा. नि. करवीरादिवर्ग)

तुलसी कटुका तिक्ता हृद्योष्णा दाहपित्तकृत्॥62॥
दीपनी कुष्ठकृच्छ्रास्त्रपार्श्वरुक्कफवातजित्।
शुक्ला कृष्णा च तुलसी गुणैस्तुल्या प्रकीर्तिता॥63॥

(भा. प्र. पुष्पवर्ग)

तुलसी कटुका तिक्ता हृद्योष्णा दाहपित्तकृत् ।
दीपनी कुष्ठकृच्छ्रास्त्रपार्श्वरुक्कफवातजित्॥7॥

(म.पा.नि.कर्पूरादिवर्ग)

तुम्बुरुः (फलम्)

अपामार्गस्य बीजानि ....।
.... सर्षपांस्तुम्बुरूणि च ॥2॥
.... नागरं च दद्याच्छीर्षविरेचने ॥4॥
गौरवे शिरसः शूले पीनसेऽर्धावभेदके ।
क्रिमिव्याधावपस्मारे घ्राणनाशे प्रमोहके ॥5॥
(च. सू. 2)

गण्डीरो जलपिप्पल्यस्तुम्बुरुः शृङ्ग वेरिका ।
तीक्ष्णोष्णकटुरूक्षाणि कफवातहराणि च ॥168॥
कारव्यः कुञ्चिकाऽजाजी यवानी धान्यतुम्बुरु ।
रोचनं दीपनं वातकफदौर्गन्ध्यनाशनम् ॥302॥
(च. सू. 27)

चन्दनः .... निम्बतुम्बरु ... इति तिक्तस्कन्धः॥150॥
(च. वि. 8)

तुम्बुरुः कटुतीक्ष्णोष्णः कफमारुतशूलजित् ।
अपतन्द्रोदराध्मानकृमिघ्नो वह्निदीपनः ॥43॥
(ध. नि शतपुष्पादिवर्ग)

तुम्बुरु श्लेष्मशूलघ्नं गंधाढ्यमनिलापहम् ॥248॥
(शो. नि. शतपुष्पादिवर्ग)

तुम्बुरुः कटुस्तिक्तो रूक्षोष्णो दीपनो लघुः ॥1374॥
तीक्ष्णो हृद्यः कटुः पाके विदाही रोचनो जयेत्।
कफवातापतन्त्राक्षिकर्णकोष्ठशिरोरुजः ॥1375॥
कुष्ठशूलवमि श्वासप्लीहकृच्छ्रोदरकृमीन्।
(कै. नि. ओषधिवर्ग)

तुम्बुरुर्मधुरस्तिक्तः कटूष्णः कफवातनुत् ।
शूलगुल्मोदराध्मानकृमिघ्नो वह्निदीपनः ॥67॥

(रा. नि. आम्रादिवर्ग)

तुम्बुरु प्रथितं तिक्तं कटुपाकेऽपि तत्कटु ।
रूक्षोष्णं दीपनं तीक्ष्णं रुच्यं लघु विदाहि च ॥114॥
वातश्लेष्माक्षिकर्णौष्ठशिरोरुग्गुरुताकृमीन् ।
कुष्ठशूलारुचिश्वासप्लीहकृच्छ्राणि नाशयेत् ॥115॥

(भा. प्र. नि. हरीतक्यादिवर्ग)

उटिङ्गणम् (बीजम्)

कुमारी आसवे उटिङ्गण नाम्ना प्रयुक्तः॥23॥

(शार्ङ्गधर म. खं.10)

कामवृध्देस्तु बीजं स्यान्मधुरं बलवर्धनम्।
कामवृध्दिकरं रुच्यं बहुलेन्द्रियवृध्दिदम्॥52॥

(रा. नि. शताह्वादिवर्ग)

उटंगनस्य बीजं तु गुरु स्निग्धं सुपिच्छिलम्।
मधुरं तिक्तमुष्णं च वृष्यं मूत्रलमुच्यते ॥स्व.॥

(द्र. गु. वि., ॥, प्रो. प्रि. व्र. शर्मा)

वाराही (कन्दः)

वराहकन्दः श्लेष्मघ्नः कटुको रसपाकतः ।
मेहकुष्ठकृमिहरो बल्यो वृष्यो रसायनः ॥309॥
(सु. सू. 46)

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