THE SIDDHA PHARMACOPOEIA OF INDIA

PART – I
VOLUME – I
First Edition

GOVERNMENT OF INDIA
MINISTRY OF HEALTH AND FAMILY WELFARE
DEPARTMENT OF AYURVEDA, YOGA & NATUROPATHY, UNANI, SIDDHA AND HOMOEOPATHY (AYUSH)
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स्वास्थ्य एवं परिवार कल्याण मंत्रालय
आयुर्वेद, योग व प्राकृतिक चिकित्सा,
यूनानी, सिद्ध एवं होम्योपैथी (आयुष) विभाग
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FOREWORD

Siddha System is an integral part of socio-cultural milieu of Tamil Nadu. This system is gaining popularity in adjoining states. Therefore, it is essential to have scientific standards for identity, purity, and strength of these medicines. Government of India appreciated the need for developing Pharmacopoeial standards of Ayurveda, Siddha and Unani medicines and established the Pharmacopoeial laboratory of Indian Medicine (PLIM) at Ghaziabad in the year 1970 to undertake Pharmacopoeial work on Ayurvedic, Siddha & Unani Medicines. In the year 1975, a Siddha Pharmacopoeia Committee, was constituted which took over the work of compilation of Siddha Formulary Volume-I.

The Siddha Pharmacopoeia Committee (SPC) comprising of experts in Pharmacognosy, Chemistry, Pharmaceuticals and Siddha Pharmacy have been constantly advising PLIM and other laboratories on Pharmacopoeial work. Quality standardization of natural products is a complex task and so 15 other laboratories of the Council of scientific and Industrial Research (CSIR), Central Council for Ayurveda & Siddha (CCRAS) and other eminent institutions have been associated in the development of the Pharmacopoeial standards under the APC Scheme of the Department of AYUSH. The Siddha Formulary of India Volume-I comprising 248 formulations was published in the year 1984 in Tamil and in 1992 in English. The scientific work of various laboratories has been regularly monitored by experts of the Siddha Pharmacopoeia Committee and ultimately 73 monographs on Siddha medicines have been prepared which constitute Volume-I of the Siddha Pharmacopoeia of India.

The volume is a result of hard work of various scientist and members representing Siddha on the Pharmacopoeia committee. I want to place on record my appreciation for their work resulting in the publication of this Volume. I hope that all those associated with the Siddha Pharmacopoeia Committee will redouble their efforts and expedite the work of finalizing Pharmacopoeial standards for all the classical poly-herbal/ herbo-metallic preparations and simultaneously also develop chromatographic fingerprints for inclusion in the Siddha Pharmacopoeia.

Anita Das
(Anita Das)

New Delhi
December 14, 2007

CONTENTS

MONOGRAPHS

19.	Ilavankam (Fl.Bud)	***Syzygium aromaticum*** (L.) Merr. & L.M. Perry
20.	Ilavankap paṭṭai (Bk.)	***Cinnamomum verum*** J.S.Presl
21.	Ilavankap pattiri (Lf.)	***Cinnamomum tamala*** (Buch.- Ham.) Nees & Eberm.
22.	Iñci (Fr.Rz.)	***Zingiber officinale*** Rosc.
23.	Kacakacā (Sd.)	***Papaver somniferum*** L.
24.	Kākkaṇa vēr (Rt.)	***Clitoria ternatea*** L.
25.	Kañcā (Lf.)	***Cannabis sativa*** L.
26.	Kaṇṭankattiric camūḷam (Wh.Pl.)	***Solanum surattense*** Burm.f.
27.	Kārpōkarici (Frt.)	***Psoralea corylifolia*** L.
28.	Karuñcempai ilai (Lf.)	***Sesbania sesban*** (L.) Merr.
29.	Karuñcīrakam (Sd.)	***Nigella sativa*** L.
30.	Kaṭuku rōkiṇi (Rt.)	***Picrorhiza kurroa*** Royle ex Benth.
31.	Kāṭṭuc cīrakam (Sd.)	***Vernonia anthelmintica*** (L.) Willd.
32.	Kaṭukkāi (Frt.)	***Terminalia chebula*** Retz.
33.	Kīḻkkāi nellic camūḷam (Wh.Pl.)	***Phyllanthus amarus*** Schum.&Thonn.
34.	Koḷḷu (Sd.)	***Vigna unguiculata*** (L.) Walp.
35.	Kōṭṭam (Rt.)	***Saussurea costus*** (Falc.) Lipsch.
36.	Kottumalli vitai (Frt.)	***Coriandrum sativum*** L.
37.	Kuṉrimaṇi (Sd.)	***Abrus precatorius*** L.
38.	Kurōcāṉi ōmam (Sd.)	***Hyoscyamus niger*** L.
39.	Mañcal (Rz.)	***Curcuma longa*** L.
40.	Maramañcaḷ (St.)	***Berberis aristata*** DC.Var. ***aristata*****.**
41.	Marutam paṭṭai (St.Bk.)	***Terminalia arjuna*** (Roxb.)W. & A.
42.	Māvilankap paṭṭai (St.Bk.)	***Crateva magna*** (Lour.) DC
43.	Miḷaku (Frt.)	***Piper nigrum*** L.
44.	Mūkkiraṭṭaic camūḷam (Wh.Pl.)	***Boerhaavia diffusa*** L.

45.	Naṉnāri (Rt.)	***Hemidesmus indicus*** (L.) R. Br.
46.	Nāyuruvic camūḻam (Wh.Pl.)	***Achyranthes aspera*** L.
47.	Nellikkāi (Fr.Frt.)	***Phyllanthus emblica*** L**.**
48.	Nellivaṟṟal (Drd.Frt.)	***Phyllanthus emblica*** L.
49.	Neruñci mul (Frt.)	***Tribulus terrestris*** L.
50.	Neruñci vēr (Rt.)	***Tribulus terrestris*** L.
51.	Nērvāḷam (Sd.)	***Croton tiglium*** L.
52.	Paṟankic cakkai (Tub.Rt.)	***Smilax china*** L.
53.	Pātiri vēr (Rt.)	***Stereospermum chelonoides*** (L.f.) DC.
54.	Pērarattai (Rz.)	***Alpinia galanga*** Willd.
55.	Pērunkāyam (Oleo-gum-resin)	***Ferula foetida*** Regel.
56.	Pirammi vaḷukkai (Wh.Pl.)	***Bacopa monnieri*** (L.) Wettst.
57.	Poṉṉāṉkaṇi (Wh.Pl.)	***Alternanthera sessilis*** (L.) R.Br.,ex DC.
58.	Poṭutalai (Wh.Pl)	***Phyla nodiflora*** (L.**)** Greene
59.	Puṇkam vērpaṭṭai (Rt.Bk.)	***Pongamia pinnata*** (L) Pierre
60.	Puṇkam vittu (Sd.)	***Pongamia pinnata*** (L) Pierre
61.	Pūvaracam paṭṭai (St.Bk.)	***Thespesia populnea*** (L.) Soland. ex Correa.
62.	Tāmarai malar (Fl.)	***Nelumbo nucifera*** Gaertn.
63.	Tāmaraik kiḻaṅku (Rz.)	***Nelumbo nucifera*** Gaertn.
64.	Tāṇṟikkāi (Frt.)	***Terminalia belerica*** (Gaertn.) Roxb
65.	Tippili (Frt.)	***Piper longum*** L.
66.	Vāiviṭaṅkam (Frt.)	***Embelia ribes*** Burm.f.
67.	Vālmiḷaku (Frt.)	***Piper cubeba*** L.f.
68.	Valuḷuvai (Sd.)	***Celastrus paniculatus*** Willd.
69.	Ventayam (Sd.)	***Trigonella foenum-graecum*** L.
70.	Vēppam paḷam(Frt.)	***Azadirachta indica*** A. Juss.

71.	Vēppam paṭṭai (St.Bk.)	***Azadirachta indica*** A. Juss.
72.	Vēppam pū (Fl.)	***Azadirachta indica*** A. Juss.
73.	Vilva vēr (Rt.)	***Aegle marmelos*** (L.) Corr.

APPENDIX-1

1.1 Apparatus for Tests and Assays

1.1.1- Nessler Cylinder
1.1.2- Sieves
1.1.3- Thermometers
1.1.4- Volumetric Glass- Ware
1.1.5- Weights and Balances

APPENDIX- 2

2.1 Testing of Drugs

2.1.1- Systematic Study of Crude Drugs
2.1.2- Microscopic Methods of Examining Crude Vegetable Drugs
2.1.3- Types of Stomata
2.1.4- Determination of Stomatal Index
2.1.5- Determination of Palisade Ratio
2.1.6- Determination of Vein-Islet Number
2.1.7- Determination of Stomatal Number

2.2. Determination of Quantitative Data for Vegetable Drugs

2.2.1- Sampling of Vegetable Drugs
2.2.2- Foreign Matter and Determination of Foreign Matter
2.2.3- Determination of Total Ash
2.2.4- Determination of Acid Insoluble Ash
2.2.5- Determination of Water Soluble Ash
2.2.6- Determination of Alcohol Soluble Extractive
2.2.7- Determination of Water Soluble Extractive
2.2.8- Determination of Ether Soluble Extractive (Fixed Oil Content)
2.2.9- Determination of Moisture Content (Loss on Drying)
2.2.10- Determination of Volatile Oil in Drugs
2.2.11- Special Processes used in Alkaloidal Assays
2.2.11- a- Continuous Extraction of Drugs
2.2.11- b- Tests for Complete Extraction of Alkaloids
2.2.12- Thin Layer Chromatography (TLC)
2.2.13- Starch estimation (Montgomery 1957)
[Spectrophotometric method]

2.2.14- Sugar estimation (Montgomery 1957) [Spectrophotometric method]
2.2.15- Fatty oil estimation
2.2.16- Determination of foaming index
2.2.17- Protein estimation (Lowry *et al,* 1951)
2.2.18- Method for Alkaloid estimation

2.3 Limit Tests

2.3.1- Limit Test for Arsenic
2.3.2- Limit Test for Chlorides
2.3.3- Limit Test for Heavy Metals
2.3.4- Limit Test for Iron
2.3.5- Limit Test for Lead
2.3.6- Sulphated Ash
2.3.7- Limit Test for Sulphates

APPENDIX- 3

3.1 Physical Tests and Determination

3.1.1- Powder Fineness
3.1.2- Refractive Index
3.1.3- Weight Per Millilitre and Specific Gravity

APPENDIX- 4

4.1 - Reagents and Solutions

APPENDIX- 5

5.1 - Definition and Methods of preparing Cūraṇam, Kuṭinīr and Kaṟkam
5.2 - Cutti (Purification) of Crude drugs
5.3 - Cutti Muṟaikaḷ (Purification Methods of Drugs)

APPENDIX- 6

6.1 - Weights and Measures
6.2 - Metric Equivalents of Classical Weights and Measures and Tamil Numericals

APPENDIX-7

7.1 - Classical Siddha References

APPENDIX-8

8.1 - Approximate English Equivalents of Siddha Clinical Conditions and Diseases

APPENDIX- 9

9.1 - English equivalants of Ceykai (Therapeutic actions)

APPENDIX-10

10.1 - Properties and Actions

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

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

GENERAL NOTICES

Title – The title of the book is "Siddha Pharmacopoeia of India". Wherever the abbreviation S.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 Tamil as mentioned in the Siddha classics and/or in the Siddha Formulary of India, Part-I 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 used, scientific name of the drug in Latin with short description of its habitat, distribution, cultivation, method of collection and purification process, if any.
Tiṇai - Olden Tamil Society classified the habitats on Geographical area into four major types, namely **Kuṟiñji** (Mountains and land abutting mountains), **Mullai** (Forest and forested land), **Marutam** (Cultivated, plain land), **Neytal** (the seashore and sea forming an integral part of a coastal region). During the periods of great drought, Kurinji and Mullai become drought and converted into dry land, unfit for cultivation of pasture. This was described as **Pālai** (Desert land). This five types are collectively called as Tiṇai. In this Pharmacopoeia we mentioned the name of the relevant Tiṇai, under each plant, where the concerned plants are naturally available.

Synonyms – Synonyms of each drug appearing in each monograph in Sanskrit, English, Hindu, Urdu and other Indian regional languages have been mentioned as found in the classical texts, Siddha Formulary of India, Part-I as procured from the experts, scholars of Siddha 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 and for the three humours.

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 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 continues 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 on the tip of moist glass rod and applying it on tongue previously rinsed with water. This should not be done in case of 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 gram (g.) or of a milligram (mg.). Fluid measures are given in multiples or fractions of milliliter (ml.).

When the term "drop" is used, the measurement is to be made by means of a tube which delivers 20 drops from one gram 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 namely, 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, the statements appearing in the SPI, Part-I, Vol. I, 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 heading, wherever given, the number of spots and Retention factor 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 weighing 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, 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 grams of active substance, in 100 gram of product.

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

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

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

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

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

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

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

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

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

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

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

When the exact solubility of pharmacopoeial substance is not known, a descriptive terms 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 recognized Siddha classics and in the Siddha Formulary of India, Part-I. Appendix 5 to 10 provides the definitions and purification methods mentioned in the Siddha literature, classical weights and measures, classical Siddha references, approximate English equivalents of Siddha clinical conditions and diseases, pharmaceutical preparations characterized by action, and properties and actions respectively.

Doses – The doses mentioned in each monograph are in metric system of weights which are the approximate conversions from classical weights mentioned in Siddha texts. A conversion table is appended giving classical weights of Siddha System of Medicine with their metric equivalents. Doses mentioned in the Siddha Pharmacopoeia of India (S.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 Siddha 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:

µ	.	.	Micron (0.001 mm)
cm.	.	.	Centimeter
dia.	.	.	Diameter
Fam.	.	.	Family
Ft.			Feet
g.	.	.	Gram
hr.	.	.	Hour
Kg.	.	.	Kilogram
l	.	.	Liter
m.	.	.	Meter
mg.	.	.	Milligram
min.	.	.	Minute
ml.	.	.	Millilitre
mm.	.	.	Millimeter
PS.	.	.	Primary Standards
1 N.	.	.	Normal solution
0.1 N	.	.	Decinormal solution
0.5 N	.	.	Half-normal solution
1 M.	-	-	Molar solution

Abbreviations used for languages

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

PREFACE

The Siddha system of Medicine is a practice of Arts and Science, the citadel of medical Systems. It was propounded by Lord Siva as a scientific and spiritual benevolence to his disciples. It is a byproduct of spiritual ascendance aiming the union on microcosm with macrocosm. The system was woven into a discipline of reputation by symphony of eighteen Siddhars namely Thirumoolar, Ramadevar, Agathiyar, Edaikadar, Tanvantri, Vanmigar, Pambatti Siddhar, Kamalamuni, Boganather, Konganar, Kuthambai, Siddhar, Pathanjali, Nandidevar, Karuvurar, Machamuni, Korakkar, Chittamuni, Sundarananthar.

India is a country of rich traditions and culture. The requirements of people were more oriented to abstract things of life rather than the material ones. Joy, happiness, peace were the main objectives sought for, by the ancient men and thus the astanga yoga of pathanjali sprouted.

During this spiritual pursuit, the mind and body are to integrate. However, the practice of this astanga yoga may lead to unforeseen physiological changes leading to a pathological manifestations. This had led to the discovery of diseases and the sources for the treatment of such diseases. This is in essence the genesis of Siddha system of medicine.

The aforesaid eighteen siddhars practiced various specialized arts in Siddha medicine. Again, this had resulted in alchemy meant for the preparation of long acting, potent, high-tech medicines for the treatment of incurable diseases.

A few others practiced exclusively herbal components as a source of nutrition, medicine and food, thus testifying a plant with medicinal property as herb.

Further, for the management of a few clinical conditions a long acting potent minerals were also transformed into medicines.

In brief, Siddha System envisages the use of herbs, minerals, metals and as a matter of fact any organic material available in the universe.

The Siddha system of medicine is unique and is perpetuating for centuries because of its merits. The basis of this system is that, innumerable clinical trials were conducted by various Siddhars during different phases of human history and existence. This singularity in preparation, indication for diseases the observable therapeutic outcomes are matching with established allopathy counterparts meant for various diseases.

Siddhar's knowledge of Iatro-chemistry, minerals, metals and plants were stupendous. This was successfully used by them from time immemorial. The processes like calcinations of mercury, minerals and metals and the preparation of a super salt known as 'Muppu' animated mercury pills with high potency possessing marveling properties of transmuting metals.

Methods of preparation described for certain rare and efficacious Siddha Parmaceutical forms such as Kattu, Kalanku, Chunnam, Muppu etc. are unique to Siddha system of medicine. These medicines are capable of rejuvenating the entire human system, bearing testimony to the fact that, even in the remote past when knowledge in the chemical technology was not fully developed, Siddhars had unparalleled knowledge in medicine, including the knowledge on various branches of medicines such as Anatomy, Physiology, Pathology, Pharmacology, Biochemistry, Microbiology, Veterinary (Mattu Vagadam), Forest Science (Malai Vagadam), Astrology, Astronomy etc.

As already mentioned, Siddha medicine is an intuitive system of medicine borne out of wisdom. Therefore, nature is seeding this system. The plants in and around the hills were exploited for the curation of maladies originating near hills and hillocks (Kurinji). Similarly, small animals, the contents of sea animals were employed for curing diseases of inhabitants on the seashore and its neighborhood (Neythal). The diseases of inhabitants on the plains and the inhabitants on the shores of rivers were treated with available herbs and herbo minerals in the plains as well as on the shore of rivers (Marutham).

Thus, the system is unique and unsurpassing in that the herbs available in the hills and hillocks were employed for the treatment of diseases of that area without mutating the culture, traditions and habits of the place and of the people. Then alone the patients will be comfortable with the medications. For eg. a person in the seashore is adapt to sea food which is not normally relished by inhabitants of plains (usually they are vegetarians). Therefore, Siddhars evolved a system of regional therapy with a geographical significance for the convenience of treatment and for the comfort of the patients.

To bring global recognition to the Siddha system of medicine, the Government of India took up intelligent measures by the formation of a scientific committee styled Siddha Pharmacopoeia Committee in 1968 by acknowledging independent status from the level of a sub-committee functioning under Ayurvedic Pharmacopoeia Committee in February 1964.

Then, Central Council for Research in Indian Medicine and Homoeopathy was established in 1969 for an integrated multi-disciplinary research and for clinical studies including drug standardization in Indian Medicine & Homoeopathy. This Council was

bifurcated into 4 different councils for advanced research in 1978 and the research work in Ayurveda and Siddha was entrusted to the Central Council for Research in Ayurveda & Siddha. The Pharmacopoeial Laboratory for Indian Medicine (PLIM), at Ghaziabad was established in 1970 for testing and standardization of single drugs and compound formulations. Under the auspices of the Central Council for Research in Ayurveda & Siddha several survey units in different States were established for the work of standardization of single drugs and compound medicines. In addition clinical trials, clinical research, applied, fundamental research were also conceived as a routine work of this Council.

To keep up verifiable quality and standards for commercial preparations of Siddha medicines drug control measures were initiated by following Siddha Formulary of India and Siddha Pharmacopoeia of India.

In the year 1975 a Siddha Pharmacopoeia Committee, a separate body was constituted under the Chairmanship of Dr.C.S. Uthamaroyan, which took over the work of compilation of Siddha formulary, which in turn served as a prerequisite for undertaking the work of Siddha Pharmacopoeia.

This committee published the first par of the Siddha Formulary of India in the year 1984 in Tamil and 1992 in English and Part-II of the Formulary is now under preparation. The first part of the Siddha Formulary of India comprises of 248 formulations covering more than 311 single drugs of plant origin, 93 drugs of metal and mineral origin and 48 drugs of animal origin.

The Siddha Pharmacopoeia of India Part – I, Vol – I comprises of 73 monographs of Siddha single drugs of plant origin, which are included in one or more formulations enlisted in the Siddha Formulary of India Part – I. In compiling the monographs, the title of each drug had been provided in Tamil as mentioned in the Siddha 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.

List of synonyms of drugs have been provided in Tamil and the other Indian regional languages. The monographs ten record the detailed gross or macroscopic description of the drug and its microscopic tissue structure, the individual elements, deposition of crystals, starch grains, trichomes etc. each having a pharmacognostic value in identification, especially when the drug is in powder form.

The monograph then gives norms and limits under ‘Identify, Purity and Strength” like tolerance of foreign matter, total ash, acid insoluble extractive, water soluble extractive,

volatile oil contents etc. and thin layer chromatography (TLC). Some of them have a direct bearing on the purity and strength' while other enable to detect substitution or adulteration, if any. Assay has also been included wherever necessary. The names of important chemical constituents 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 variations in climatic conditions, geographical distributions, source and season of collection and lack of scientific methods of preservation and storage.

The accent of the classical attributes of respective drugs according to the doctrine of Cuvai (taste), Gunam (quality or property), Pirivu (stage after digestive or metabolic changes), Virium (potency) and Ceykai (specific action) has not been lost sight of, in this publication. Important formulations as mentioned in the Siddha Formulary of India Part –I, therapeutic uses of the drugs and their Standard dosages according to age and the chronicity of the diseases have also been provided.

The Union Government has brought the Siddha drugs under the perview of the Drugs and Cosmetic Act 1940 from 15-09-1964, which would give Government a base to maximize the enforcement of the Act in respect of standards. In the absence of technical information officially published by Government for statutory purposes, the Indian Pharmaceutical Industry, in general, would experience a great hardship in imposing standards as a part of their own internal discipline.

To meet the acute need of the hour felt by the commercial institutions, academic institutions, research scholars, teachers and students of Siddha system of medicine, the Siddha Pharmacists and Pharmaceutical Industry and the authorities and enforcement authorities, implementing Drugs and Cosmetics Act, the Siddha Pharmacopoeia Committee has made a modest effort to lay down earlier some norms for single drugs based on experimental data worked out at 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 making additions wherever possible.

The Legal Notices and General Notices have been given for guidance of the analysts, the Pharmaceutical suppliers and manufacturers and the research workers engaged in this field. Details about the apparatus, reagents and solutions, tests, methods of preparation of specimens for microscopical examinations have been given in the Appendices. The Committee requests the Government of India to recommend the adoption of the 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 organizations. The Siddha Pharmacopoeia of India, 2007 part I Vol.I may also be notified by Government as a book of reference for implementation of the Drugs and Cosmetics Act 1940 all over India.

My sincere thanks are due to the Department of AYUSH, Government of India, Government of State, Academic bodies and Teaching institutions, Councils, Scientists of various disciplines and systems of medicine and Siddha scholars, Teachers, Students and Practitioners of this prestigious systems of medicine as well as my appreciation, on behalf of the Siddha Pharmacopoeia Committee, for their whole hearted extended co-operation in preparing the monographs on single drugs.

I am glad to thank Prof. Dr.C.N. Deivanayagam, Chairman and all the members of the Siddha Pharmacopoeia Committee and sub-committees for their strenuous efforts to bring out this volume. I am thankful to Dr.M.A.Kumar, Deputy Advisor (S), who was the previous member secretary of Siddha Pharmacopoeia Committee, for his contribution to bring this Pharmacopoeial work. The efforts of Editorial Committee, members of Indian Council of Medical Research, New Delhi and publications departments are acknowledged for their overlapping referential guidance.

My sincere appreciation goes to the staff of Central Research Institute for Siddha, Chennai who were very helpful for the completion of this work.

Dr.G.VELUCHAMY

Member Secretary

Siddha Pharmacopoeia Committee

Chennai- 106

Dated:

INTRODUCTION

The History of Siddha medicine is as old as the History of the Tamil culture and civilization. The Siddha system of medicine with greater antiquity is serving the society mainly in the Southern peninsular India and also amongst the Tamil Diaspora who have spread out throughout the world. The period of Siddha medicine is traceable to the dim past of the pre-vedic times perambulating period of the three syndicates of the Tamil academicians (Sangams) of Siddha medicine dating between 3000 to 5000 B.C. Though Siddha has undergone 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. The Siddha practitioners used to prepare medicines by themselves for their patients as per their individual needs. Once mass production of Siddha medicines for commercialization came into existence, the quality and purity of the drugs tender to vary from manufacturer to manufacturer. In order to ensure safety to the public, the Government of India, considered it expedient to extend the provisions of Drugs and Cosmetics Act, 1940 and exercise supervisory control over manufacture of Siddha, Ayurveda and Unani drugs to enhance uniform standards.

The Act was accordingly amended in 1964, to ensure necessary control over the production and sale of these medicines. The main thrust was on:-

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

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

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

The development of standards for identity, quality, purity and strength of the Siddha drugs and formulations assumed importance for the effective enforcement of the provisions of the Act. To identity the drugs and to detect the adulterations and to lay down standards, the setting up of Drug Standardization units, Research centres, Drug testing institutes and Central Drug laboratories for Siddha medicines are essential.

There is a need for a standard to be followed by all manufacturers. Therefore, the Government of India took interest and constituted the Siddha sub- committee under the Ayurvedic pharmacopoeia committee in February 1964 to standardize the various compound Siddha formulations and publications of Siddha Pharmacopoeia. It consisted of the following scholars:

1. Dr. C.S.Uthamaroyan, Chennai	-	Chairman
2. Dr. R.Thyagarajan, Chennai	-	Member
3. Dr. M.V. Ramanan, Jamnagar	-	Member
4. Shri. Sunderananda Saraswati, Chennai	-	Member
5. Vaidya Bhagwan Das, New Delhi	-	Convenor.

The functions of the Committee were:

1. To prepare an Official Formulary for Siddha Medicine in two parts
   a. Single drugs, the identity and their therapeutic value that are beyond doubt and
   b. Compound preparations which are frequently used in Siddha Medicine.
2. To lay down tests for identity, quality and purity.
3. To ensure, as far as possible, uniformity in physical properties and active constituents.
4. To provide standards for drugs and medicines commonly used in the practice of Siddha Medicine; and
5. To provide all other information regarding the distinguishing characteristics methods of preparation, dosage, method of administration in various Anupanas or vehicles and toxicity.

On the recommendations of the Sub-committee and taking into consideration the demands of the Siddha profession, and the views of the Government of Tamil Nadu, considering its separate identity, the Government of India took a policy decision in the year 1968 to accord independent status to the Siddha System of Medicine instead of bracketing it with the Ayurvedic System. Accordingly, with effect from the 1st October, 1975, the Siddha Pharmacopoeia Committee (SPC), a separate body consisting of the following experts, was constituted, replacing the earlier Sub-Committee:-

1.	Dr. C.S.Uthamaroyan, Chennai	-	Chairman
2.	Dr. K. Subramaniam, Bangalore	-	Member
3.	Dr. R. Thyagarajan, Chennai	-	Member
4.	Dr. A. Ananda Kumar, Chennai	-	Member
5.	Prof. S. Rangaswami, New Delhi	-	Member
6.	Dr. G.M. Yahya, Chennai	-	Member
7.	Dr. P.M. Venugopal, Chennai	-	Member
8.	Dr. Miss Jaibala (Dec. 69 to Aug.77)	-	Secretary
9.	Dr. K. Palanichamy since 18-8-79	-	Secretary

Dr. P.N.V. Kurup, was designated later as the Vice-Chairman of the Committee. The Research Officer, Siddha, Secretary of the Pharmacopoeia Committee was approved as Secretary of all the Sub-Committees.

The Siddha Pharmacopoeia Committee held its first meeting on 1st to 4th October, 1975. As recommended at the above meeting, various Sub-committees, as detailed below were constituted:-

I. Formulary Sub-Committee:

Members of the Committee:

1.	Dr. R. Thyagarajan, L.I.M.,Chennai	-	Chairman

Co-opted Experts

1.	Dr. T.S. Parthasarathy, L.I.M.,Chennai	-	Member

2. Dr. V. Viswanathan, L.I.M., Chennai - Member
3. Dr. P. Chitsabai, Kancheepuram - Member

Functions:

(1) To decide the groups and formulations in each group for inclusion in the Siddha Formulary.
(2) To scrutinize the formula for each formulation.
(3) To indicate the general method of preparation for each group of formulations.

II. Single Drugs Sub- Committee:

Members of the Committee:

1. Dr. K. Subramaniam, Bangalore - Chairman
2. Prof.S. Rangaswamy, Delhi - Member

Co- opted Experts

3. Shri. R.M.K. Sivasubramaniam Om, Palani - Member
4. Dr.S. Usman Ali, Chennai - Member

Functions:

(1) To decide on the botanical identity of the single drugs.
(2) To consider and recommend the use of substitute drugs.
(3) To prepare monographs on single drugs, providing information on identity, synonyms, vernacular names, descriptions etc.

III. Drugs Standardization Sub-Committee:

Members of the Committee:

1. Prof. S. Rangaswami, Delhi - Chairman
2. Dr.G.M. Yahya, Chennai - Member

Co- opted Expert

3. Dr. M. Shanmugavelu, Ramnad - Member

Functions:

(1) To lay down standards for compound formulation.
(2) To stipulate the packaging and storage conditions.
(3) To recommend permissible colours and preservatives that may be added to individual or groups of formulations.

IV. Co-ordination Committee:

Members of the Main Committee:

1. Dr. C. S. Uthamaroyan, Chennai - Chairman
2. Dr. R. Thyagarajan, Chennai - Member
3. Dr. K. Subramaniyam, Bangalore - Member
4. Prof. S. Rangaswamy, Delhi - Member

Functions:

To co-ordinate the activities of all the Sub-Committees and periodically review the progress of work.

As a first step, the Siddha pharmacopoeia committee started preparing the official Siddha Formulary of India Part- I in Tamil and English and published the same in the years 1984, 1992 respectively.

In the year 1986 the SPC was reconstituted with the following members.

1. Dr. P. Gurusironmani (Principal, Govt. College of Indian Medicine and the Drug Controller of India)	-	Chairman
2. Dr. M.A.Kumar (Research Officer. Siddha)	-	Member Secretary
3. Dr. S.K. Mishra (Advisor, Ayurveda & Siddha)	-	Member
4. Dr. G.C. Gaur	-	Member
(Senior Technical Assistant, Ay.)	-	Member
5. Dr. V. Subramanian	-	Member
6. Dr. C.H.S. Sastry Deputy Adviser (Ayurveda)	-	Member
7. Dr. Gopalakrishnan Arignar Anna Hospital, Chennai	-	Member
8. Dr. Justus Reader, Modern Medicine	-	Member
9. Dr. G. Veluchamy, Chennai	-	Ex. officio Member
10. Dr. K. Palanichamy, Chennai	-	Ex. officio Member
11. Dr. Vijayarangan	-	Ex. officio Member
12. Dr. R. Thiyagarajan	-	Ex. officio Member
13. Miss. N. Naga Prema, Palayamkottai	-	Ex. officio Member

In view of the importance of laying down standards of single drugs and compound formulations used in Siddha for quality control purposes the Government of India further reconstituted the Siddha Pharmacopoeia Committee, F.No. S.21013/2/91- APC, dated 3rd December 1991, with the following members and the functions assigned as under.

1. Dr. R. Kannan Honorary Physician (Siddha) to the President of India Priya Nursing Home, Tennur, Trichy-17 Tamil Nadu.	-	Chairman

2. Dr. V. Subramanian - Member
Principal,
Government Siddha Medical College,
Palayamkottai
Tamil Nadu - 627 002.

3. Dr. G. Veluchamy - Member
Assistant Director,
Central Research Institute for Siddha,
Arumbakkam , Chennai- 600 106.

4. Dr. P. Jayaprakash Narayanan - Member
Secretary,
Indian Medical Practitioners
Co-operative Pharmacy and Stores
(IMPCOPS)
Adyar, Chennai - 600 020.

5. Dr. K. Palanichamy - Member
District Siddha Medical Officer,
Government Headquarters Hospital
Erode
Tamil Nadu.

6. Dr. V. Chelladurai - Member
Assistant Research Officer
(Botany)
S.M.P. Unit (CCRAS)
Government Siddha Medical College,
Palayamkottai- 627 002.

7. Dr. Joseph Thas - Ex-officio Member
Head of the Department of Pharmacology
P.G. Department
Govt. Siddha Medical College,
Palayamkottai
Tamil Nadu.

8. Dr. Justus - Ex- officio Member
Head of the Department of Modern Medicine
P.G. Department,
Govt. Siddha Medical College,
Palayamkottai
Tamil Nadu.

9. Miss. Naga Prema - Ex-officio Member
   Head of the Department of Bio-chemistry
   P.G. Department,
   Govt. Siddha Medical College,
   Palayamkottai
   Tamil Nadu.

10. Dr.C.H.S. Shastry - Ex-officio Member
    Adviser (Ayurveda & Siddha)
    Ministry of Health & Family Welfare
    New Delhi.

11. Dr. V. Kannan - Ex- officio Member
    Drugs Controller (India)/
    Deputy Drugs Controller
    Directorate of General Health Services
    New Delhi.

12. Dr. M.A.Kumar - Member Secretary
    Research Officer (Siddha)
    Ministry of Health & Family Welfare
    New Delhi.

2. The functions of the Committee are as under:-
   (i) To prepare an official Siddha Formulary of India viz.
   (a) Single Drugs of whose identity and therapeutic value there is no doubt and
   (b) Compound formulations which are frequently used in Siddha practice through out the country.
   (ii) To provide standards for drugs and medicines of therapeutic usefulness of pharmaceutical, necessity, commonly used in Siddha practice.
   (iii) To lay down tests for identity, quality and purity.
   (iv) To ensure as far as possible uniformity in physical properties and active constituents, and
   (v) To provide all other information regarding the distinguishing characteristics, methods of preparations, dosage, methods of administration with various vehicles and their toxicity.

Constitution of Sub- Committees:

Various Sub-Committees as detailed below were constituted:-

1. **Formulary Sub- Committee:**
   Members of the Committee:
   Dr. V. Subramanian - Chairman
   Dr. G. Veluchamy - Member
   Dr. Justus - Member

Functions:

a) To decide the groups and formulations in each group for inclusion in the Siddha Formulary.
b) To scrutinize the Formulary for each formulation.
c) To indicate the general method of preparation of each group of formulation.

2. Single Drugs Sub- Committee:

Members of the Committee:

Dr. K. Palanichamy	-	Chairman
Dr. V. Chelladurai	-	Member
Dr. P. Jayaprakash Narayanan	-	Member

Functions:

a) To decide the botanical Identity of the Single Drugs.
b) To consider and recommend the use of substitute drugs.
c) To prepare monographs on Single drugs providing information of identity, synonyms, vernacular names and description etc.

3. Drugs Standardisation Sub- Committee:

Members of the Committee:

Dr. P. Jayaprakash Narayanan	-	Chairman
Dr. Joseph Thas	-	Member
Dr. V. Kannan	-	Member

Functions:

a) To lay down standards for compound formulations.
b) To stipulate the packing and storage condition.
c) To recommend permissible colour and preservatives that may be added to individual or group of formulations.

4. Coordination Sub- Committee:

Dr. R. Kannan	-	Chairman
Dr. V. Subramanian	-	Member
Dr. C.H.S. Shastry	-	Member
Dr. V. Kannan	-	Member

Functions:

To coordinate the activities of all the Sub-Committees and periodically review the progress of work.

Member-Secretary of the Siddha Pharmacopoeia Committee Dr. M.A. Kumar will be the Member-Secretary to all the above Sub-Committees.

The Siddha Pharmacopoeia Committee (SPC) was reconstituted under the Dept. of ISM & H, consisting of following members vide letter No. S 21013/3/96-APC dated 9th June, 1997.

1. Dr. R. Kannan - Chairman
   Tennur,
   Tiruchy
   Tamil Nadu - 620 017.

Official Members:

2. Drug Controller of India - Member
3. Director, PLIM, Ghaziabad - Member
4. Director, CRI (Siddha) - Member
   Arumbakkam, Chennai – 106.

Non-official Members:

5. Dr. C. Ananta Narayanan - Member
   Department of Chemistry,
   Presidency College,
   Chepauk, Chennai.

6. Dr. Arunachalam, - Member
   Secretary IMPCOPS,
   Thiruvanmiyur, Chennai -600 041.

7. Dr. P. Jeyaprakash Narayanan, - Member
   Vice Principal Incharge,
   Professor of Special Medicine,
   Govt. Siddha Medical College,
   Chennai- 600 106.

8. Dr. Joseph Thas, - Member
   20, Pudupet Middle Street,
   Palayamkottai,
   Tamil Nadu - 627 002.

9. Dr. Dhayanandan - Member
   Department of Botany
   Madras Christian College,
   Tambaram, Chennai.

10. Prof. V. Dhandapani - Member
    Department of Plant Physiology,
    Agricultural College & Research Station,
    Madurai,
    Tamil Nadu.

11. Dr. M.A.Kumar - Member Secretary
    Asst. Adviser, (Siddha), Department
    of AYUSH, ISM & H,
    Ministry of Health and Family Welfare,
    New Delhi.

1. The term of the Committee shall be for a period of three years from the date of its first meeting and the members shall hold office for that period.
2. The Chairman of the Committee shall have the powers to form sub- committees whenever required and to co-opt experts from outside on such sub-committees.
3. The Committee will have the power to frame its own rules and procedures.

Functions:

(i) To prepare draft Pharmacopoeia of Siddha drugs.
(ii) To lay down principles and standards for the preparation of Siddha drugs.
(iii) To lay down tests of identity, quality, purity and
(iv) Such other matters as are incidental and necessary for the preparation of Siddha Pharmacopoeia.

The Committee will achieve the following targets within the next three years:

(i) Standards of single drugs mentioned in the Siddha Formulary of India, Part- I. Standards of compound formulations mentioned in Siddha Formulary of India, Part- I.
(ii) The Committee shall complete the publication of Siddha Formulary of India, Part-II, Tamil Version.
(iii) The Committee will meet once in 2 months.

The Siddha Pharmacopoeia Committee (SPC) has been reconstituted under the Dept. of AYUSH, consisting of the following members vide letter No. S. 21013/3/2005-APC dated 17th January 2006.

1. Dr.C.N. Deivanayagam, - Chairman
   Chairman, SAC (Siddha), CCRAS,
   101, Usman Road, Chennai- 600 107.

Official Members:

2. Dr.S.K. Sharma - Member
   Adviser (Ayurveda), Dept. of AYUSH
   New Delhi.
3. Dr. M.A. Kumar - Member Secretary
   Deputy Advisor (Siddha),
   Dept. of AYUSH.

Ministry of Health and Family Welfare,

4. Dr. P.R.Lohar - Member
   Director, PLIM
   Ghaziabad.

Non-official Members:

5. Prof. P. Jayaprakash Narayanan, - Member
   Retired Vice Principal,
   No.5, Panchali Amman Koil Street,
   Arumbakkam, Chennai -106.

6. Dr. M. Murugesan - Member
   Reader, Government Siddha Medical College,

   Palayamkottai

   Tamil Nadu - 627002.

7. Dr. S.K. Sasi, - Member

   Associate Professor,

   National Insititute of Siddha,

   Tambaram, Chennai- 47.

8. Dr. G. Sivaraman - Member

   C-18, Divyam Appartments,

   474, 1st Main Road, Mugapair Eri Scheme,

   Mugapair East, Chennai- 37.

9. Dr. A. Saraswathy - Member
   Asst. Director (Chemistry)
   CSMDRI (A)
   Arumbakkam, Chennai -106.

10. Dr. J. Mohanasundaram - Member
    Rtd. Prof. of Pharmacology &
    Dy. Director of Medical Education,
    H-44-B, Kaveri Road,
    Kalachetra Colony, Besant Nagar, Chennai -90.

11. Dr.Sheshadri - Member
    Secretary,
    IMPCOPS, Chennai -41.

12. Dr. Sasikala Ethirajulu - Member
    Research Officer (Botany)
    Central Research Institute for Siddha,
    Arumbakkam, Chennai – 106.

13. Dr. G. Veluchamy -\Member Secretary
    Director,
    Central Research Institute for Siddha,
    Arumbakkam,
    Chennai -106.

The Committee shall function till further orders, and the members of this Committee shall also hold the office till further orders.

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

The Committee will have the power to frame its own rules and procedures.

Functions:

(i) To prepare Siddha Formulary of India, Part-II.
(ii) To prepare Pharmacopoeia of Siddha drugs.
(iii) To prepare standards of single drugs mentioned in the Siddha Formulary of India, Part -I.
(iv) To prepare standards of compound formulations mentioned in Siddha Formulary of India, Part- I.
(v) To lay down principles and standards for the preparation of Siddha drugs.
(vi) To lay down tests of identity, quality, purity and
(vii) Such other matters as are incidental and necessary for the preparation of Siddha Formulary/Siddha Pharmacopoeia.

Constitution of Sub-Committees

The various sub-committees of Siddha Pharmacopoeia Committee were constituted, consisting of following members vide letter Dy. No.1110 Director (APC) 2007, dated 8th March 2007.

(1) Classical Siddha methods of quality control and assurance sub-committee:

(i) Dr.P. Jayaprakash Narayanan	-	Chairman
(i) Dr.A. Saraswathy	-	Member
(iii) Dr.G. Sivaraman	-	Member

Functions

1. To collect and classify all the classical Siddha Medical quality control and assurance methods.
2. To work out the specific recommendation on the application of the most suitable and effective tests for quality control and assurance of Siddha preparations.

(2) Identification of formulations/Single drug for inclusion in Formulary II:

(i) Dr. V. Murugesan	-	Chairman
(ii)Dr.V.R.Seshadri	-	Member
(iii)Dr.S.K.Sasi	-	Member

Functions

1. Suggest priority list of formulations (multi ingredient preparation) and single drugs to be included in the Siddha Formulary Part – II.

2. Suggest principles and standards for the preparation of such Siddha drugs and formulations.

(3) Pharmacology and Pharmacognosy sub-committee:

(i)	Miss. Savita Satagopan	-	Chairman
(ii)	Dr. J. Mohanasundram	-	Member
(iii)	Dr. Sasikala Ethirajulu	-	Member

Functions

1. To prepare all the details necessary to create monographs for all such single drugs and formulations.

2. To prepare all the details of the medicinal plants which are the sources of the drugs and other natural sources for the drugs and update the existing data with current and recent experiences.

ABBREVIATIONS FOR PARTS OF PLANTS

Bark	Bk.
Dried Fruit	Drd.Frt.
Dried Rhizome	Drd.Rz.
Flower	Fl.
Flower Bud	Fl.Bud
Fresh Fruit	Fr.Frt.
Fruit	Frt.
Fruit Pulp	Frt.Pulp
Fresh Rhizome	Fr.Rz.
Kernel	Ker.
Leaf	Lf.
Root Bark	Rt.Bk.
Root	Rt.
Rhizome	Rz.
Seed	Sd.
Stem Bark	St.Bk.
Stem	St.
Stolon	Stl.
Tuberous Root..	Tub.Rt.
Unripe Fruit	Unripe Frt.
Whole Plant	Wh.Pl.

THE TRANSLITERATION TABLE WITH DIACRITICAL MARKS FOR TAMIL

அ	A	**a**		க்	K	k
ஆ	Ā	**ā**		ங்	Ṅ	ṅ
இ	I	**i**		ச்	C	c
ஈ	Ī	**ī**		ஞ்	Ñ	ñ
உ	U	**u**		ட்	Ḍ	ḍ
ஊ	Ū	**ū**		ண்	Ṇ	ṇ
எ	E	**e**		த்	T	t
ஏ	Ē	**ē**		ந்	N	n
ஐ	Ai	**ai**		ப்	P	p
ஒ	O	**o**		ம்	M	m
ஓ	Ō	**ō**		ய்	Y	y
ஔ	Ou	**au**		ர்	R	r
				ல்	L	l
				வ்	V	v
				ழ்	Z̲	z̲
				ள்	Ḷ	ḷ
				ற்	R̲	r̲
				ன்	N̲	n̲n̲

We followed as per CDAC, Pune Indian multi-lingual package system (Roman Script Transliteration facility provided for south Indian languages).

e-Book Development Team,
IIHM, Hyderabad.

THE SIDDHA PHARMACOPOEIA OF INDIA

PART – I
VOLUME – I
First Edition

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

AMUKKARĀ (Root) - அமுக்கரா

Amukkarā is the dried root of *Withania somnifera* (L.) Dunal Syn. *Physalis somnifera* L., *P. flexuosa* L., *P. arborescense* DC. (Fam. Solanaceae), a perennial shrub, found in waste land, cultivated fields and open grounds throughout India. It is also cultivated in certain areas of Madhya Pradesh and Rajasthan. Roots are collected in winter, washed and cut into small pieces.The dried root is subjected to purification process before use. It grows in Mullai and Marutham thiṇai.

SYNONYMS

Tamil	:	Acuvakanthi (அசுவகந்தி), Amukkarā Kiẕaṅku (அமுக்கரா கிழங்கு)
Assamese	:	Ashvagandha
Bengali	:	Ashvagandha
Gujrati	:	Asgandha
Hindi	:	Asgandh
Kannada	:	Angarberu, Hiremaddina- gida
Kashmiri	:	Asagandh
Malayalam	:	Amukkuram
Marathi	:	Asagandha, Askagandha
Oriya	:	Aswagandha
Punjabi	:	Asgandh
Sanskrit	:	Asvagandha, Hayagandha, Vajigandha
Telugu	:	Pennerugadda
Urdu	:	Asgand

DESCRIPTION

a) Macroscopic

Roots straight, unbranched, thickness varying with age, roots bear fibre-like secondary roots, outer surface buff to grey-yellow with longitudinal wrinkles; crown consists of remains of variously thickened stem bases; fracture short and uneven; odour characteristic; taste bitter and acrid.

b) Microscopic

Transverse section of root shows cork exfoliated or crushed; when present rectangular, radially flattened and non-lignified; cork cambium 2 to 4 diffused rows of cells; secondary cortex about twenty layers of compact parenchymatous cells mostly filled with starch grains; phloem consists of sieve tubes, companion cells, phloem parenchyma; cambium 4 or 5 rows of tangentially

elongated cells; xylem hard forming a closed vascular ring separated by multiseriate medullary rays.

Powder:

Yellowish grey; shows cork cells, parenchyma cells, tracheids, vessels, fibres and starch grains.

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	15	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	27	per cent, Appendix	2.2.7.

ASSAY

HPLC conditions for the separation of withaferin A in Alcohol extract.

Mobile phase	:	n- Hexane: Isopropanol (9:1)
Flow rate	:	0.2 ml/min.
Column	:	Porasil A coiled column (1.2ft. x 1/8 inch)
Detector	:	UV at 225 nm

T.L.C.

T.L.C. of Petroleum ether soluble fraction of Alcohol extract on an aluminium plate precoated with silica gel 60 F_{254} (E.Merck) 0.2 mm. thickness using Petroleum ether (80 -100° C): Chloroform (1:1) spraying with 10% Methanolic Sulphuric acid reagent and heating the plate for ten minutes at 105ºC shows two spots at Rf. 0.17 (violet) and 0.92 (greyish brown).

CONSTITUENTS

Withanolides- withaferin A, withanone, withanolides I, II, III, III A, C, D, E, F, G, H, I, J, K, L, M, WS-I, P and S, withasomidienone, cuscohygrine, anahygrine, tropine, pseudotropine, anaferine, isopellatierine, 3- tropyltigloate.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Āṇmaiperukki (ஆண்மைபெருக்கி), Ciṟunīrperukki (சிறுநீர்பெருக்கி), Kāyakaṟpamākki (காயகற்பமாக்கி), Uṟakkamuṇḍākki (உறக்கமுண்டாக்கி), Uramākki (உரமாக்கி), Uḍalveppakaṟṟi (உடல்வெப்பகற்றி), Uḍaṟtēṟṟi (உடற்தேற்றி), Vīkkamurukki (வீக்கமுருக்கி)

IMPORTANT FORMULATIONS

Amukkarāc Cūraṇam (அமுக்கராச் சூரணம்), Iracakanthi Mez̲uku (இரசகந்தி மெழுகு), Iḍivallāthi Mez̲uku (இடிவல்லாதி மெழுகு), Kantaka Iracāyaṉam (கந்தக இரசாயனம்), Makā Ēlāthi Kuḷikai (மகா ஏலாதி குளிகை), Makāvallāti Iḷakam (மகாவல்லாதி இளகம்), Nanthi Mez̲uku (நந்தி மெழுகு), Nārathtai Iḷakam (நாரத்தை இளகம்), Paṟaṅkippaḍḍai Iracāyaṉam (பறங்கிப்பட்டை இரசாயனம்)

THERAPEUTIC USES

Cūlai (சூலை), Curam/Kāyccal (சுரம்/காய்ச்சல்), Karappāṉ (கரப்பான்), Kayam (கயம்), Tōḍam (தோடம்), Uḍal Vaṉmaikkuṟaivu (உடல் வன்மைக்குறைவு), Vaḷi Nōykaḷ (வளி நோய்கள்), Veḷuppu Nōy/Pāṇḍu (வெளுப்பு நோய்/பாண்டு), Vīkkam (வீக்கம்), Vintukkuṟaivu (விந்துக்குறைவு)

DOSE - Powder 3 - 6 g

ĀR̲R̲UTHUMMAṬṬI (Unripe fruit) - ஆற்றுதும்மட்டி

Ār̲r̲uthummaṭṭi is the unripe fruit of ***Citrullus colocynthis*** (L.) Schrad. Syn. ***Colocynthis vulgaris*** Schrad.(Fam. Cucurbitaceae), an annual or perennial prostrate creeper growing wild in the warm, arid and sandy tracts of North West, Central and Southern parts of the country. Fruits are harvested when mature but unripe, peeled and cut into pieces. The fruit is subjected to purification process (cutti) before use. It grows in Marutham thiṇai.

SYNONYMS

Tamil : Kaliṅkam (கலிங்கம்), Kumaṭṭikkāy (குமட்டிக்காய்), Pēykumaṭṭi (பேய் குமட்டி), Piccikkāy (பிச்சிக்காய்), Thumaṭṭi (துமட்டி), Variththumaṭṭi (வரித்துமட்டி)

Assamese	:	Gavadani
Bengali	:	Rakhal
English	:	Colocynth
Gujrati	:	Indrayan
Hindi	:	Indrayan
Kannada	:	Havumekke
Malayalam	:	Valiya Pekkummatti
Marathi	:	Endrayana
Oriya	:	Gothakakudi, Indrayanalata, Garukhiya
Punjabi	:	Indrayana
Sanskrit	:	Indravaruni, Gavaksi, Indravalli, Aendri
Telugu	:	Chedupuchcha, Peikummatti
Urdu	:	Hanjal

DESCRIPTION

a) Macroscopic

Peeled and cut pieces of fruit about 6 cm. long and 2 cm. thick; white or pale yellowish-white, externally convex with ridges and flattened areas marked by peeling with a knife; internally irregularly concave and showing numerous ovoid depressions about 10 mm. long, left by fallen seeds; pulp bitter; seeds flattened, ovoid, yellowish-white to dark brown, about 7 mm. long, 5 mm. broad and 2 mm. thick; odourless; taste intensely bitter.

b) Microscopic

Epicarp, where present, with epidermis of radially elongated cells having thick outer walls and thin inner walls and partially thickened anticlinal walls with occasional stomata of the anomocytic type; the adjacent parenchymatous layer about 15 layers of cells thick, and an inner layer of sclereids; outer sclereids very thick, smaller, about 15 to 30 mm in diameter, isodiametric and the inner sclereids layer upto about 60 mm, radially elongated, with thinner walls. Pulp consists of large, thin-walled, pitted parenchyma of rounded cells showing oval, flat, pitted areas where they are in contact with many slender bicollateral vascular strands having spiral vessels and occasional associated latex vessels; testa of seed with outer epidermis of thick-walled unlignified palisade cells having vertical strips of thickening on the anticlinal walls, with inner layers of very thick-walled, striated, pitted, lignified sclereids, and an innermost layer of sclereids with reticulately thickened walls; endosperm and cotyledons parenchymatous with fixed oil and aleurone grains.

Powder:

Yellowish-brown; shows groups of pitted parenchyma cells; annular and spiral vessels, sclereids; oil globules and aleurone grains.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	14	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	7	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	20.5	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	16.5	per cent, Appendix	2.2.7.

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

ASSAY

HPTLC densitometric estimation of 2-O-β-D-glucopyranosyl- cucurbitacin I.

TLC plates

Aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm thickness.

Solvent system

Chloroform: Methanol (95:10).

Spray reagent

Vanillin-Phosphoric acid reagent.

Test solution

3 g of the powdered drug is extracted in a Soxhlet apparatus with 150 ml of ethanol (8 to 9 hr). The solvent is filtered and removed under vacuum. 20 mg of the residue is dissolved in 1 ml of methanol.

Standard solution

1 mg of 2-O-β-D-glucopyranosyl-cucurbitacin I is dissolved in 1 ml of methanol.

Calibration curve

2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0 and 16.0 µl of the standard solution is applied on a TLC plate. The plate is developed in the solvent system to a distance of 8 cm. and derivatized with Vanillin-Phosphoric acid reagent. The plate is heated at 100-105ºC until the colour develops. The plate is scanned immediately at 560 nm. The peak areas are recorded and plotted to get the calibration curve.

Estimation of 2-O-β-D-glucopyranosyl-cucurbitacin I in the drug

10 µl of the test solution is applied on a TLC plate. The plate is developed in the solvent system and the chromatogram is recorded .The amount of 2-O-β-D-glucopyranosyl-cucurbitacin I present in the sample is calculated from the calibration curve.

The percentage of 2-O-β-D-glucopyranosyl-cucurbitacin I ranges from 1.46 to 1.72 in the samples analyzed.

T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'G' plate using n-Butanol: Acetic acid: Water (4:1:5) shows under UV (366 nm) two fluorescent zones at Rf. 0.88 (light blue) and 0.98 (yellow). On exposure to iodine vapours two spots appear at Rf. 0.88 and 0.98 (both yellow). On spraying with 5% Methanolic- Phosphomolybdic acid reagent and heating the plate at 105°C until the colour develops, the plate shows four spots at Rf. 0.65 (blue), 0.84 (blue), 0.96 (blue) and 0.98 (dark blue).

CONSTITUENTS

2- O- β- D- Glucopyranosyl- cucurbitacin L, 2- O - β- D- glucopyranosyl- (22- 27) -hexanorcucurbitacin I, coloside A (α- elaterin -2- D- glucopyranoside); cucurbitacin E (elaterin), cucurbitacin I (elatericin B), cucurbitacin L (dihydroelatericin B), cucurbitacin J, cucurbitacin T, isovitexin, iso- orientin, iso- orientin 3′- methyl ether, colocynthin, colocynthitin, citrullol, α- spinasterol, hentriacontane, lipids and essential oil constituents.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை), Va̲ṛaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai :

In small Dose 25 - 50 mg:

Kōz̲aiyaka̲r̲r̲i (கோழையகற்றி), Uḍa̲ṛtē̲r̲r̲i (உடற்தேற்றி),

In medium Dose 50 - 100 mg :

Ci̲run̄irperukki (சிறுநீர்பெருக்கி), Malamn̄irākki (மலம்நீராக்கி),

In standard Dose 125 - 500 mg:

Kuḍa̲rpuraḍḍi (குடற்புரட்டி), Namaiccaluṇḍākki (நமைச்சலுண்டாக்கி), Vāntiyuṇḍākki (வாந்தியுண்டாக்கி)

IMPORTANT FORMULATIONS

Kummaḍḍik Ku̲zampu (கும்மட்டிக் குழம்பு), Nava Uppu Me̲zuku (நவ உப்பு மெழுகு)

THERAPEUTIC USES

Cūtakataḍai (சூதகதடை), Cūtakavali (சூதகவலி), Vaḷi Nōykaḷ (வளி நோய்கள்)

DOSE - Powder 0.125 - 0.5g

Contraindicated in pregnancy.

ĀṬĀTHŌṬAI ILAI (Leaf) - ஆடாதோடை இலை

Āṭāthōṭai Ilai is the dried, mature leaves of *Justicia adhatoda* L. Syn. *Adhatoda zeylanica* Medic., *A. vasica* (L.) Nees (Fam. Acanthaceae), an evergreen shrub, flowering during February-March and also at the end of rainy seasons, distributed throughout India upto an altitude of 1300 m.; cultivated also as hedges; leaves stripped off from older stems and dried in drying sheds. It grows in Marutham thiṇai.

SYNONYMS

Tamil	:	Vācai (வாசை)
Assamese	:	Bahak, Titabahak, Vachaka
Bengali	:	Bakas, Basak
English	:	Vasaka, Malabar nut
Gujrati	:	Ardusi, Aradusi, Araduso
Hindi	:	Adoosa, Arusa, Aduss
Kannada	:	Adusoye
Kashmiri	:	Vasa
Malayalam	:	Adalodakam, Adarooshaka
Marathi	:	Adulsa, Vasa
Oriya	:	Vasanga, Basanga
Punjabi	:	Vishuti, Bhekar, Vansa, Arusa
Sanskrit	:	Vasa, Vrsa, Atarusa, Vasaka, Simhasya, Vajidnta
Telugu	:	Addasaramu
Urdu	:	Adusa (Arusa)

DESCRIPTION

a) Macroscopic

Leaves dull brown above, light greyish brown below;10 to 30 cm. long and 3 to 10 cm. broad, lanceolate to ovate-lanceolate, slightly acuminate, base tapering, petiolate; petioles 2 to 8 cm. long, exstipulate, glabrescent, 8 to 10 pairs of lateral vein bearing a few hairs; odour characteristic; taste bitter.

b) Microscopic

Transverse section of leaf shows a dorsiventral type with 2 layers of palisade cells; in surface view, epidermal cell walls sinuous with diacytic stomata on both surface, more numerous

on the lower; covering trichomes a few, 1 to 3, rarely upto 5, celled, thin-walled, uniseriate, upto 500 µm; glandular trichomes with unicellular stalk and 4 celled head measuring, 25 to 36 µm in diameter in surface view; cystoliths in mesophyll layers elongated and cigar shaped; acicular and prismatic forms of calcium oxalate crystals present in mesophyll; palisade ratio 5 to 9; stomatal index 10 to 18 for lower surface; vein- islet number 6 to 8 per square mm.

Powder:

Green; shows fragments of wavy epidermal cells with diacytic stomata; cystoliths, acicular and prismatic crystals of calcium oxalate; spiral and reticulate vessels and debris of trichomes.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	21	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	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	22	per cent, Appendix	2.2.7.

ASSAY

HPLC analysis of vasicine, the major bioactive constituent.

Mobile phase	:	Methanol: Water (2:3)
Flow rate	:	0.7 ml/min.
Column	:	Resolve C18 spherical 5µ (15cm. x 3.9 mm.)
Detector	:	UV at 298 nm

Standard preparation:

A solution of known concentration (conc. range: 50-80 µg/ml) of vasicine in methanol is prepared.

Sample preparation:

1g of dried leaves are refluxed with Methanol for 2 hr., filtered and the marc is subjected for another two cycles of (1 hr.each) reflux with Methanol. The combined filtrates are concentrated to about 1ml, and diluted with water to 20ml, acidified with dilute HCl (3 ml), partition with Chloroform (2x 10 ml), and the Chloroform fractions are rejected. The aqueous phase is basified with dilute Ammonia solution and extracted with Chloroform (5 x10ml). The pooled Chloroform fractions are concentrated under vacuum to dryness, and dissolved in Methanol (10 ml). 1 ml of this solution is diluted to 100 ml with Methanol. If necessary further dilutions are prepared.

Procedure:

Known volumes of standard and sample preparations are subjected to HPLC and the respective peak area for vasicine in triplicate is recorded and accordingly its percentage in the sample is calculated.

The above method may also be used for the estimation of vasicine in polyherbal formulations with suitable modifications in the sample preparation.

T.L.C.

T.L.C. of Alcoholic extract on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using 1, 4 - Dioxone: Ammonia (9:1) v/v, and spraying with Dragendorff reagent, shows one spot at Rf.0.79 (orange).

CONSTITUENTS

Vasicine, vasicinone, vasicol, vasicinol, vasicoline, adhatonine, vasicinolone, vasicolinone, anisotine, adhavasinone, 1, 2, 3, 9 - tetrahydro - 5 - methoxy pyrrolo (2, 1 -b) quinazoline - 3-ol, deoxy vasicinone, deoxy vasicine, anisoline, desmethoxy aniflorine, 7-methoxy vasicinone.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ciṟunīrperukki (சிறுநீர்பெருக்கி), Icivakaṟṟi (இசிவகற்றி), Kōzaiyakaṟṟi (கோழையகற்றி), Puzukkolli (புழுக்கொல்லி)

IMPORTANT FORMULATIONS

Āḍātōḍai Kuḍinīr (ஆடாதோடை குடிநீர்), Āḍātōḍai Maṇappāku (ஆடாதோடை மணப்பாகு), Āḍātōḍai Ney (ஆடாதோடை நெய்), Kakkuvāṉ Iḷakam (கக்குவான் இளகம்), Kapacurak Kuḍinīr (கபசுரக் குடிநீர்)

THERAPEUTIC USES

Curam/Kāyccal (சுரம்/காய்ச்சல்), Irumal (இருமல்), Kuruti Azal (குருதி அழல்)

DOSE - Powder 3 -5 g

Juice 5 -10 ml

Decoction 30 - 50 ml twice daily. 15 - 30 g coarse powder in 200 ml of water for preparing decoction.

ĀṬĀTHŌṬAI VĒR (Root) - ஆடாதோடை வேர்

Āṭāthōṭai Vēr is the dried root of ***Justicia adhatoda*** L. Syn. ***Adhatoda zeylanica*** Medic. ***A. vasica*** (L.) Nees (Fam. Acanthaceae), an evergreen shrub, flowering during February - March and also at the end of rainy seasons, distributed throughout India upto an altitude of 1300 m.; cultivated also as hedges.

SYNONYMS

Tamil	:	Vācai (வாசை)
Assamese	:	Bahak, Titabahak, Vachaka
Bengali	:	Bakas, Basak
English	:	Malabar nut, Vasaka
Gujrati	:	Aradusi, Ardusi, Araduso
Hindi	:	Adoosa, Aduss, Arusa
Kannada	:	Adusoye
Kashmiri	:	Vasa
Malayalam	:	Adalodakam, Adarooshaka
Marathi	:	Adulsa, Vasa
Oriya	:	Basanga, Vasanga
Punjabi	:	Arusa, Bhekar, Vansa, Vishuti
Sanskrit	:	Atarusa, Simhasya, Vajidnta, Vasa, Vasaka, Vrsa
Telugu	:	Addasaramu
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 µm in dia., having concentric striations and hilum, present in secondary cortex and secondary phloem.

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 µm 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.

ASSAY

T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'G' plate using Chloroform: Methanol (4:1) shows under UV (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 vapours 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

Vasicine, vasicinol, vasicinolene, tritriacontane and essential oil.

PROPERTIES AND ACTIONS

Cuvai : Kārppu (கார்ப்பு)

Guṇam : Ilaku (இலகு), Noymai (நொய்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Cirunīrperukki (சிறுநீர்பெருக்கி), Icivakarri (இசிவகற்றி), Īral Tērri (ஈரல் தேற்றி), Kōzaiyakarri (கோழையகற்றி)

IMPORTANT FORMULATIONS

Tūtuvēḷai Ney (தூதுவேளை நெய்)

THERAPEUTIC USES

Iraippu (இரைப்பு), Irumal (இருமல்), Aiyacuram (ஐயசுரம்)

DOSE - : Powder 3 - 6 g

Decoction 30- 50 ml twice daily.

15 - 30 g coarse powder in 200 ml of water for preparing decoction.

ATHIMATHURAM (Stolon and Root) - அதிமதுரம்

Athimathuram is the dried, unpeeled, stolon and root of *Glycyrrhiza glabra* L. (Fam. Fabaceae), a tall perennial herb or under shrub upto 2 m. high found wild and cultivated in Europe, Persia, Afghanistan and to a small extent in some parts of India. It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil	:	Athiṅkam (அதிங்கம்), Mathūkam (மதூகம்)
Assamese	:	Jesthimadhu, Yeshtmadhu
Bengali	:	Yashtimadhu
English	:	Liquorice root
Gujrati	:	Jethimadha, Jethimard, Jethimadh
Hindi	:	Mulethi, Mulathi, Muleti, Jethimadhu, Jethimadh
Kannada	:	Jestamadu, Madhuka, Jyeshtamadhu, Atimadhura
Kashmiri	:	Multhi
Malayalam	:	Irattimadhuram
Marathi	:	Jesthamadh
Oriya	:	Jatimadhu, Jastimadhu
Punjabi	:	Jethimadh, Mulathi
Sanskrit	:	Yasti, Yastimadhuka, Yastika, Madhuka, Madhuyasti, Yastyahva
Telugu	:	Atimadhuramu
Urdu	:	Mulethi, Asl-us-sus

DESCRIPTION

a) Macroscopic

Stolon consists of yellowish brown or dark brown outer layer, externally longitudinally wrinkled, with occasional small buds and encircling scale leaves; transversely cut and smoothed surface shows a cambium ring at about one-third distance from periphery and a small central pith; root similar without a pith; fracture coarsely fibrous in bark and splintery in wood; odour faint and characteristic; taste sweetish.

b) Microscopic

Stolon - Transverse section of stolon shows cork of 10 to 20 or more layers of tabular cells, outer layers with reddish-brown amorphous contents, inner 3 or 4 rows having thicker, colourless walls;

secondary cortex usually of 1 to 3 layers of radially arranged parenchymatous cells containing isolated prisms of calcium oxalate; secondary phloem a broad band, cells of inner part cellulosic and outer lignified, radially arranged groups of about 10 to 50 fibres, surrounded by a sheath of parenchyma cells, each usually containing a prism of calcium oxalate about 10 to 35 µm in size; cambium of 3 or more layers of cells; secondary xylem distinctly radiate with medullary rays, 3 to 5 cells wide, vessels with thick, yellow, pitted, reticulate walls; groups of lignified fibres with crystal sheaths similar to those of phloem; xylem parenchyma of two kinds, those between the vessels having thick pitted walls without intercellular spaces, the remaining with thin walls; pith of parenchymatous cells in longitudinal rows with intercellular spaces.

Root - Transverse section of root shows structure closely resembling that of stolon except that no medulla is present; xylem tetrarch; usually four principal medullary rays at right angles to each other; all parenchymatous tissues containing abundant, simple, oval or rounded starch grains, 2 to 20 µm in length.

Powder:

Yellowish-cream; shows parenchyma cells containing a small prism of calcium oxalate; vessels with spiral thickening, fragments of fibres; starch grains simple, oval or rounded with wide lumen having 2 to 4 or more components, measuring 2 to 20 µm in diameter.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Nil, Appendix	2.2.2.
Total Ash	Not more than 10 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 2.5 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 10 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 20 per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of the Chloroform extract of the drug on silica gel 'G' plate shows under UV light (254 nm) 2 spots at Rf. 0.41 (glycyrrhetic acid marker) and 0.45. After spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate at 105º C until the colour develops , the plate shows 6 spots at 0.27 (violet), 0.41 (dark violet, glycyrrrhetic acid, marker), 0.45 (dark yellow) 0.49 (dark yellow), 0.70 (violet) and a dark blue spot running along with the solvent front.

CONSTITUENTS

Glycyrrhizin, glycyrrhetinic acid, glycyrrhetic acid, 24 - hydroxy glycyrrhetic acid, mixture of potassium and calcium salts of glycyrrhizinic (glycyrrhizic) acid, glabranin A & B, glycyrrhetol, glabrolide, isoglabrolide, formononetin, glabrone, neoliquiritin, hispaglabridin A & B; herniarin, umbelliferone; licoagrodin, glabrol, onocerin, ß- amyrin, stigmasterol, ß- sitosterol, glabroisoflavanone A and B, glabrocoumarin, glychionide Aand B and flavonoids.

PROPERTIES AND ACTIONS

Cuvai : I̲nippu (இனிப்பு)

Guṇam : Noymai (நொய்மை), Tiṇmai (திண்மை)

Vīrium : Taḍpam (தட்பம்)

Pirivu : Iṉippu (இனிப்பு)

Ceykai : Kōzaiyakaṟṟi (கோழையகற்றி), Malamiḷakki (மலமிளக்கி), Uḷḷazalāṟṟi (உள்ளழலாற்றி), Uramākki (உரமாக்கி), Vaṟaḍciyakaṟṟi (வறட்சியகற்றி)

IMPORTANT FORMULATIONS

Arakku Tailam (அரக்கு தைலம்), Āḍātōḍai Kuḍinīr (ஆடாதோடை குடிநீர்), Makā Ēlāthi Kuḷikai (மகா ஏலாதி குளிகை), Pīṉicat Tailam (பீனிசத் தைலம்), Tāḷicāthi Cūraṇam (தாளிசாதி சூரணம்), Vacanta Kucumākaram (வசந்த குசுமாகரம்), Veṇpūcaṇi Iḷakam (வெண்பூசணி இளகம்)

THERAPEUTIC USES

Ciṟunīr Ericcal (சிறுநீர் எரிச்சல்), Elumpu Nōykaḷ (எலும்பு நோய்கள்), Irumal (இருமல்), Kāmālai (காமாலை), Kaṇ Nōykaḷ (கண் நோய்கள்), Nīrvēḍkai (நீர்வேட்கை), Vayiṟṟuppuṇ (வயிற்றுப்புண்), Veṇ Kuḍḍam (வெண் குட்டம்), Veppu Nōy (வெப்பு நோய்)

DOSE - Powder 2 - 4 g

ATHIVIḌAYAM (Root) - அதிவிடயம்

Athiviḍayam is the dried, tuberous root of ***Aconitum heterophyllum*** Wall. ex. Royle (Fam. Ranunculaceae), an annual herb, native of western Himalayas and found in Garhwal, Kumaon and Kashmir at an altitude between 2,500 to 4,000 m. It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil	:	Atthiraṇam (அத்திரணம்), Māthiri (மாதிரி), Paṅkurai (பங்குரை)
Assamese	:	Aatich
Bengali	:	Ataicha
English	:	Atis root
Gujrati	:	Ativishni Kali, Ativikhani Kali
Hindi	:	Atis
Kannada	:	Ativisha, Athihage
Malayalam	:	Atividayam, Ativitayam
Marathi	:	Atvisha
Oriya	:	Atushi
Punjabi	:	Atisa, Atees
Sanskrit	:	Ativisa, Aruna, Ghunapriya, Visa
Telugu	:	Ativasa
Urdu	:	Atees

DESCRIPTION

a) Macroscopic

Roots conical, fusiform or cylindrical, about 2.0 to 7.5 cm. long and 0.4 to 1.6 cm. or more thick at its upper extremity, gradually decreasing in thickness towards tapering end, externally yellowish to greyish white, external surface wrinkled marked with scars of fallen rootlet and with a rosette of scaly rudimentary leaves on top; fracture short, starchy, white, fractured surface marked towards center by 4 to 7 concentrically arranged yellowish-brown dots, corresponding to end of fibrovascular bundles; taste bitter with no tingling sensation; odourless.

b) Microscopic

Transverse section of mature root shows a single layered epidermis consisting of light-brown tabular cells rupturing on formation of cork; cork consists of 5 to 10 rows of tangentially elongated, thin-walled cells; cork cambium single layered consisting of tangentially elongated, thin-walled cells; cortex much wider consisting of tangentially elongated or rounded, thin-walled

parenchymatous cells with intercellular spaces, cells fully packed with both simple as well as compound starch grains, compound starch grains composed of 2 to 4 components, spherical; endodermis distinct composed of barrel-shaped cells; elements of vascular bundles poorly developed, vascular bundles arranged in a ring; inter-fascicular cambium present in the form of a ring composed of a few layered thin-walled cells; central core consisting of thin-walled parenchymatous cells, possessing starch grains similar to those found in cortical cells.

Powder:

Ash coloured to light brown; shows abundant simple and compound starch grains; fragments of reticulate xylem vessels and parenchyma cells.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	4	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	6	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	24	per cent, Appendix	2.2.7.

ASSAY

HPTLC densitometric estimation of Atisine.

TLC plates

Aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness.

Solvent system

Toluene: Ethyl acetate: Diethylamine (7:2:1).

Test solution

5 g of powdered drug is accurately weighed and extracted in a Soxhlet apparatus with 50 ml Methanol for 4 hr., filtered and the volume was made up to 50 ml with Methanol. 3 ml is pipetted out and diluted to 10 ml with Methanol.

Standard solution

1.0 mg/ml stock solution of Atisine is prepared in Methanol. Aliquots of 0.5 to 3 ml is pipetted out in increments of 1 ml into 10 ml in volumetric flasks and made up to the volume in each flask with Methanol.

Calibration curve

10 µl of each concentration of standard solution is applied in triplicate on a TLC plate. The plate was developed in the solvent system to a distance of 8 cm. and dried in a current of hot air and scanned at 232 nm. The peak areas for Atisine are recorded and the calibration curve is constructed.

Estimation of atisine in the drug

10 µl of the test solution is applied in triplicate on a TLC plate. The plate was developed with the solvent system to a distance of 8 cm. and the chromatogram is recorded. The amount of Atisine is determined in the test sample from the calibration curve.

The percentage of Atisine ranges from 0.36 to 0.44 in the samples analyzed.

T.L.C.

T.L.C. of Alcoholic extract on silica gel 'G' plate using 1,4 -Dioxone: Ammonia (9:1) v/v, and on spraying with Dragendorff reagent, four spots appear at Rf.0.31, 0.49, 0.73 and 0.95 (all orange).

CONSTITUENTS

Atisine, F- dihydroatisine, hetisine, heteratisine, heterophyllisine, heterophylline, heterophyllidine, hetidine, hetisinone and atisenol.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு), Vaṟaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Āṇmaiperukki (ஆண்மைபெருக்கி), Kaẓiccalaḍakki (கழிச்சலடக்கி), Muṟaiveppakaṟṟi (முறைவெப்பகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Tuvarppi (துவர்ப்பி), Uramākki (உரமாக்கி), Veppakaṟṟi (வெப்பகற்றி)

IMPORTANT FORMULATIONS

Kapāḍa Mātthirai (கபாட மாத்திரை), Nanthi Meẓuku (நந்தி மெழுகு), Nārathtai Iḷakam (நாரத்தை இளகம்), Pūra Mātthirai (பூர மாத்திரை)

THERAPEUTIC USES

Kōẓai (கோழை), Mūlam (மூலம்), Muṟaicuram (முறைசுரம்), Peruṅkaẓiccal (பெருங்கழிச்சல்), Puṇ (புண்), Vānti (வாந்தி)

DOSE - Powder 600 mg - 2 g

ATTHIPPAḌṬAI (Bark) - அத்திப்பட்டை

Atthippaḍṭai is the dried bark of ***Ficus racemosa*** L. Syn. ***Ficus glomerata*** Roxb. (Fam. Moraceae), a deciduous tree distributed all over India in moist localities and banks of streams to the elevation of 1800 m.; often cultivated in villages for its shade and edible fruits. It grows in Kuṟiñci and Marutham thiṇai.

SYNONYMS

Tamil	:	Aḍam (அடம்), Atavu (அதவு), Kōḷi (கோளி), Utumparam (உதும்பரம்)
Assamese	:	Jangedumuru, Yagyadimru
Bengali	:	Jagnadumur, Yagnadumur
English	:	Cluster fig, Country fig
Gujrati	:	Umbro, Umerdo, Umardo, Umarado
Hindi	:	Gulara, Gular
Kannada	:	Attihannianmara, Oudumbara, Athimara, Attigida
Kashmiri	:	Rumbal
Malayalam	:	Athi
Marathi	:	Atti, Gular, Umber
Oriya	:	Jajnadimbri, Dimbiri
Punjabi	:	Kath Gular, Gular
Sanskrit	:	Udambara, Sadaphala
Telugu	:	Atti, Medi
Urdu	:	Gular

DESCRIPTION

a) Macroscopic

Bark greyish-green, surface soft and uneven, 0.5 to 1.8 cm. thick; on rubbing white papery flakes come out of outer surface, inner surface light brown; fracture fibrous; taste mucilaginous without any odour.

b) Microscopic

Transverse section of bark shows cork, 3 to 6 layers of thin-walled cells filled with brownish contents; cork cambium single layered; secondary cortex 6 to 12 layered, composed of thin-walled, rectangular cells arranged regularly, a number of secondary cortex cells contain starch grains and some contain rhomboidal crystals of calcium oxalate; most of the cells filled with chloroplast; cortex a fairly wide zone composed of circular to oblong, thin-walled cells containing

orange-brown contents; most of the cells filled with simple and compound starch grains, a number of cells also contain cubical and rhomboidal crystals of calcium oxalate, some cortical cells are lignified with pitted walls, scattered singly or in large groups throughout; secondary phloem a very wide zone composed of parenchyma with patches of sieve tubes, companion cells and traversed by medullary rays; phloem parenchyma circular to oval and thin-walled; phloem fibres much elongated, lignified, very heavily thickened and possess a very narrow lumen; medullary rays uni to pentaseriate, widen towards peripheral region; a number of ray cells also get lignified and show pitted wall as described above; laticiferous cells found in phloem parenchyma cells filled with small granular masses; starch grains and rhomboidal crystals of calcium oxalate also found in most of phloem parenchyma and ray cells; cambium, when present, 2 to 3 layered of tangentially elongated thin-walled cells.

Powder:

Brown; shows cork cells, single or in groups; elongated, lignified, phloem fibres with thick walls and narrow lumen; laticiferous cells; cortical cells with cubical and rhomboidal crystals of calcium oxalate; simple and compound starch grains.

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	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	9 per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of Dichloromethane extractive of alcohol extract on silica gel 'G' plate using Petroleum Ether:Chloroform (1:1) v/v, shows under UV (366 nm) one fluorescent spot at Rf.0.30 (blue). On spraying with Anisaldehyde - Sulphuric acid reagent and heating the plate for five minutes at 105ºC four spots appear at Rf. 0.21, 0.36, 0.89 and 0.97 (all violet).

CONSTITUENTS

Leucocyanidin-3-O-β-D-glucopyranoside, leucopelargodinin, 3-O-α-L- rhamnopyranoside, cerylbehanate, lupeol and its acetate, α-amyrin acetate and tannins.

PROPERTIES AND ACTIONS

Cuvai	:	Tuvarppu (துவர்ப்பு)
Guṇam	:	Tiṇmai (திண்மை), Vaṟaḍci (வறட்சி)
Vīrium	:	Taḍpam (தட்பம்)
Pirivu	:	Iṉippu (இனிப்பு)
Ceykai	:	Tuvarppi (துவர்ப்பி)

IMPORTANT FORMULATIONS

Karicālai Iḷakam (கரிசாலை இளகம்)

THERAPEUTIC USES

Cīitakkaẕiccal (சீதக்கழிச்சல்), Kurutippōkku (குருதிப்போக்கு), Mūlam (மூலம்), Veḷḷai (வெள்ளை)

DOSE - Powder 3 - 6g

Decoction 30- 50 ml twice daily.

20 - 30 g coarse powder in 200 ml of water for preparing decoction.

AVURI (Whole Plant) - அவுரி

Avuri is the dried whole plant of *Indigofera tinctoria* L. (Fam. Fabaceae), an under shrub, upto 2m. high, found throughout India and widely cultivated in many parts of the country. It grows in Marutham thiṇai.

SYNONYMS

Tamil	:	Aviri (அவிரி), Nīli (நீலி)
Assamese	:	Nilbam
Bengali	:	Nil
English	:	Indigo, Indian indigo
Gujrati	:	Gali, Gari, Nil
Hindi	:	Nili
Kannada	:	Karunili, Neeligida
Malayalam	:	Nilam, Amari
Marathi	:	Neel
Oriya	:	Nili, Nila
Punjabi	:	Neel
Sanskrit	:	Nili, Nilika, Nilini, Rangapatri
Telugu	:	Nili Chettu, Nili, Aviri
Urdu	:	Neel

DESCRIPTION

a) Macroscopic

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

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

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

Flower - Numerous in nearly sessile spicate racemes, 10.0 cm. long; calyx 1.2 to 1.5 mm. long, hairy outside, teeth triangular, acute, as long as tube; corolla pink, papilionaceous, about 4 mm.

long, back of standard petal pubescent, stamen 10, diadelphous; ovary sessile, linear, downy; stigma capitate.

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

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

b) Microscopic

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

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

Leaf

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

Midrib - Shows a similar structure of epidermis, cuticle and hairs as in petioles; lower and upper epidermis followed by single and 2 or 3 layers of collenchymatous hypodermis respectively; parenchyma 2 or 3 layered, present on both sides; vascular bundle single, collateral, crescent-shaped, present centrally.

Lamina - Shows a dorsiventral structure; epidermis, cuticle and hairs as in petiole and midrib; palisade 2-layered; spongy parenchyma 2 to 4 layered; a few patches of veins scattered between palisade and spongy parenchyma; a few prismatic crystals of calcium oxalate present in mesophyll

cells; stomata paracytic; unicellular hairs present on both surface but abundant on lower surface; palisade ratio not more than 4; stomatal index 18 to 40 on lower surface and 10 to 16 on upper surface; vein -islet number 15 to 18 per square mm.

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

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

Powder:

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

IDENTITY, PURITY AND STRENGTH

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

T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'G' plate using n-Butanol: glacial Acetic acid: Water (5:1:4) in visible light shows three spots at Rf. 0.38, 0.75 and 0.88 (all grey). On exposure to iodine vapours seven spots appear at Rf. 0.15, 0.38, 0.50, 0.59, 0.67, 0.75 and 0.88 (all yellow). On spraying with 5% Methanolic - Sulphuric acid reagent and heating the plate at 105° C until the colour develops, the plate shows nine spots at Rf.0.15, 0.25, 0.38, 0.50, 0.59, 0.67, 0.75, 0.84 and 0.88 (all grey).

CONSTITUENTS

Indigotin, indirubin, indoxyl, indican, kaempferol, luteolin, apigenin, ercetin, tephrosin, degalin, dehydrodegalin, sumatrol, kaempferol -4-7-dirhamnoside, trans-tetracos-15-enoic acid, semiglabrin and pseudo semiglabrin.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Acaivu (அசைவு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Mu̲raiveppaka̲r̲r̲i (முறைவெப்பகற்றி), Nu̲ṇpu̲zukkolli (நுண்புழுக்கொல்லி), Veppamu̲ṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Nanthi Me̲zuku (நந்தி மெழுகு)

THERAPEUTIC USES

Ku̲nmam (குன்மம்), Nañcu Nīkkum (நஞ்சு நீக்கும்), Ve̲ḷḷai (வெள்ளை)

DOSE - Decoction 25- 50 ml twice daily. 10 - 20 g coarse powder in 200 ml of water for preparing decoction.

AVURI VĒR (Root) - அவுரி வேர்

Avuri Vēr is the dried root of *Indigofera tinctoria* L. (Fam. Fabaceae), an under shrub up to 2 m. high, found throughout India and widely cultivated in many parts of the country. It grows in Marutham thiṇai.

SYNONYMS

Tamil	:	Aviri (அவிரி), Nīli (நீலி)
Assamese	:	Nilbam
Bengali	:	Nil
English	:	Indian indigo, Indigo
Gujrati	:	Gali, Gari, Nil
Hindi	:	Nili
Kannada	:	Karunili, Neeligida
Malayalam	:	Nilam, Amari, Neela Amari
Marathi	:	Neel
Oriya	:	Nila, Nili
Punjabi	:	Neel
Sanskrit	:	Nili, Nilika, Nilini, Rangapatri
Telugu	:	Aviri, Nili, Nili chettu
Urdu	:	Neel

DESCRIPTION

a) Macroscopic

Root mostly availabe in pieces, hard, woody, cylindrical, 0.1 to1.5 cm. thick, surface nearly smooth except for a few scattered lenticels; pale-yellow to light yellowish-brown; odour not distinct; taste slightly bitter.

b) Microscopic

Root - Shows a narrow zone of cork consisting of 4 to 10 layers of tangentially elongated, rectangular, thin-walled cells, with lenticels; secondary cortex a narrow zone, consisting of rectangular to polygonal, thin-walled cells; group of fibres thick-walled and lignified with wide lumen; secondary phloem composed of usual elements; wood occupies bulk part of the root, consisting of usual elements; vessels solitary or 2 to 4 in groups having simple pits; fibres present in the form of alternating bands of parenchyma; parenchyma cells rectangular to polygonal in shape and present on both external and internal sides of vessels; medullary rays 1 to 4 cells wide; prismatic crystals of calcium oxalate present in secondary cortex, phloem and xylem parenchyma

and rays; oil globules present in cortex and phloem parenchyma; starch grains simple, round to oval, measuring upto 12 mm in dia., present in cortex, phloem, xylem parenchyma and rays.

Powder:

Creamish- brown; shows aseptate fibres; pitted vessels; simple and compound starch grains, measuring 3 to 11 mm in dia.; occasionally oil globules and prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 per cent, Appendix	2.2.2.
Total Ash	Not more than	6 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	0.7 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	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 of the drug on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Chloroform: Ethylacetate (3:2) shows under UV light (366 nm) ten fluorescent zones at Rf. 0.14 (blue), 0.30 (bluish green), 0.40 (blue), 0.47 (blue), 0.58 (blue), 0.63(bluish green), 0.75 (blue), 0.81 (blue), 0.86 (green) and 0.91 (blue). On exposure to iodine vapours thirteen spots appear at Rf. 0.06, 0.10, 0.14, 0.27, 0.33, 0.40, 0.50, 0.58, 0.63, 0.75, 0.80, 0.86 and 0.91 (all yellow). On spraying with 5 % Methanolic Sulphuric acid reagent and heating the plate at 105°C until the colour develops, the plate shows fourteen spots at Rf. 0.06, 0.10, 0.14, 0.21, 0.27, 0.33, 0.40, 0.50, 0.58, 0.63, 0.75, 0.81, 0.86, and 0.91 (all grey).

CONSTITUENTS

Indican.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Acaivu (அசைவு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Muṟaiveppakaṯṟi (முறைவெப்பகற்றி), Nuṇpuzukkolli (நுண்புழுக்கெல்லி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Karicālai Iḷakam (கரிசாலை இளகம்)

THERAPEUTIC USES

Kuṉmam (குன்மம்), Nañcu Nīkkum (நஞ்சு நீக்கும்), Veḷḷai (வெள்ளை), Mūrccai (மூர்ச்சை)

DOSE - Decoction 30- 50 ml twice daily.30- 60 g powder in 200 ml of water for preparing decoction.

CARAKKONRAI PULI (Fruit Pulp) - சரக்கொன்றை புளி

Carakkonrai Puḷi is the pulp of fruit (devoid of seeds, septa and pieces of pericarp) of *Cassia fistula* L. (Fam. Fabaceae), a moderate sized deciduous tree, common throughout India as wild or cultivated plant; fruits collected when pods are ripe and black, and pulp separated and dried. It grows in Kuṟiñci, Mullai and Marutham thiṇai.

SYNONYMS

Tamil	:	Itaẓi (இதழி), Koṇṇai (கொண்ணை), Kirutāmalam (கிருதாமலம்)
Assamese	:	Sonaroo
Bengali	:	Sondala
English	:	Indian laburnum, Purging cassia
Gujrati	:	Garamala, Garmalo
Hindi	:	Amaltas
Kannada	:	Aragvadha, Kakke, Kakke-gida, Kakkemara, Kakkedai, Rajataru
Kashmiri	:	Kriyangal Phali
Malayalam	:	Konna, Kritamlam
Marathi	:	Bahava, Garamala, Amaltas
Oriya	:	Sunari
Punjabi	:	Amaltas
Sanskrit	:	Aragvadha, Krtamala, Vyadhigata, Samopaka, Nrpadruma
Telugu	:	Rela
Urdu	:	Khiyar Shambar

DESCRIPTION

a) Macroscopic

Pulp dark brown; sticky, sweet and mucilaginous; odour characteristic, somewhat disagreeable.

b) Microscopic

Pulp shows oval to polygonal thin walled parenchyma cells and lignified stone 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	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	15	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	46	per cent, Appendix	2.2.7.

ASSAY

TLC densitometric estimation of rhein

TLC plates

Aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness

Solvent system

Petroleum ether (40-60º): Ethyl acetate: Formic acid (7.5: 2.5: 0.1).

Test solution

1 g of powdered drug is extracted with 0.01N Methanolic potassium hydroxide (3 x 25 ml) under reflux on a water bath. Filtered, pooled the filtrates and concentrated the extract and made up the volume to 25 ml with methanol.

Standard solution

5 mg of rhein is dissolved in 5 ml of 0.01 N Methanolic potassium hydroxide in a volumetric flask. Further dilution is made by pipetting 2.5 ml into a 25 ml volumetric flask and making up the final volume to 25 ml with Methanol. From this stock solution standard solutions of 10 to 35 µg/ml are prepared by transferring aliquots (1 to 3.5 ml) of stock solution to 10 ml volumetric flasks and adjusting the volume to 10 ml with Methanol.

Calibration curve

10 µl of the standard solutions (100 to 350 ng per spot) are applied on a TLC plate. The plate is developed with the solvent system in twin trough chamber to a distance of 8 cm. and scanned densitometrically at 434 nm. The peak areas are recorded and the calibration curve is obtained by plotting peak area vs concentration of rhein applied.

Estimation of rhein in the drug

10 µl of the test solution is applied in triplicate on a TLC plate. The plate is developed in the solvent system and the peak area is recorded as described above for the calibration curve. The amount of rhein present in the sample is calculated from the calibration curve of rhein.

The percentage of rhein ranges from 0.07 to 0.14 in the samples analyzed.

T.L.C.

1 gm. of the powdered drug is extracted with 25 ml of 0.01N Potassium hydroxide for 1 hr. on a boiling water bath. The solution is filtered, cooled, acidified with dilute hydrochloric acid and then extracted with diethyl ether (3 x 25 ml). The combined ether layer is evaporated to dryness and

dissolved in 25 ml of Methanol. T.L.C. of the solution on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Toluene: Ethyl acetate : Formic acid : Methanol (3:3: 0.8:0.2) shows under UV light (254 nm) seven spots at Rf. 0.11, 0.24, 0.38, 0.55, 0.62, 0.69 and 0.76 (rhein marker). Under UV light, (366 nm) shows seven spots at Rf. 0.17 (blue), 0.25 (green), 0.37 (light blue), 0.48 (light blue), 0.58 (fluorescent blue), 0.76 (greenish yellow, rhein marker) and 0.86 (green). On spraying with 5 percent ethanolic potassium hydroxide shows six spots at Rf. 0.10, 0.21, 0.25, 0.51, 0.67 (all light brown) and 0.76 (purple, rhein marker).

CONSTITUENTS

Fistulic acid, rhein, 3- formyl-1- hydroxy-8- methoxy- anthraquinone, 3ß- hydroxy-17- norpimer- 8 (9) -en-15-one, (+) catechin, epicatechin and its derivatives, argenine, leucine, methionine, phenylalanine, tryptophan, aspartic acid, glutamic acid, glucose, sucrose, fructose, galactomannan, procyanidin-B-2.

PROPERTIES AND ACTIONS

Cuvai	:	Puḷippu (புளிப்பு)
Guṇam	:	Tiṇmai (திண்மை)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)
Ceykai	:	Nīrmalampōkki (நீர்மலம்போக்கி), Puz̲uvakar̲r̲i (புழுவகற்றி)

IMPORTANT FORMULATIONS

Karuṇai Iḷakam (கருணை இளகம்), Neruñcik Kuḍinīr (நெருஞ்சிக் குடிநீர்), Nīrmuḷḷik Kuḍinīr (நீர்முள்ளிக் குடிநீர்)

THERAPEUTIC USES

Kuḍal Vali (குடல் வலி), Malakkaḍḍu (மலக்கட்டு), Veḷḷai (வெள்ளை)

DOSE - Powder 4 - 8 g

CAḌĀMĀÑCIL (Rhizome) - சடாமாஞ்சில்

Caḍāmāñcil is the dried rhizome of *Nardostachys grandiflora* DC. Syn. *N. jatamansi grandiflora* DC.(Fam. Valerianaceae), an erect perennial herb, 10 to 60 cm. high, found in the sub-alpine Himalayas from Punjab to Sikkim and Bhutan at altitudes of 3000 to 5000 m .It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil	:	Caḍāmāñci (சடாமாஞ்சி), Caḍilai (சடிலை), Paicāci (பைசாசி), Pūtakēciṉi (பூதகேசினி)
Assamese	:	Jatamansi, Jatamangshi
Bengali	:	Jatamamsi
English	:	Nardus root
Gujrati	:	Baalchad, Kalichad
Hindi	:	Balchara
Kannada	:	Bhootajata, Ganagila maste
Kashmiri	:	Bhutijata
Malayalam	:	Manchi, Jatamanchi
Marathi	:	Jatamansi
Oriya	:	Jatamansi
Punjabi	:	Billilotan, Balchhar, Chharguddi
Sanskrit	:	Jatamansi, Mamsi, Jata jatila
Telugu	:	Jatamamsi
Urdu	:	Sumbul-ut-teeb

DESCRIPTION

a) Macroscopic

Dried rhizome dark brown, 2.5 to 7.5 cm. long, cylindrical, covered with reddish-brown fibres forming a net work, which are skeletons of sheathing leaf bases; fracture brittle; internal colour reddish-brown; odour strongly aromatic; taste acrid, slightly bitter.

b) Microscopic

Transverse section of rhizome shows cork consisting of 2 to 5 layers of cells filled with oil globules; cortex characterized by the presence of schizogenous canals; phloem in form of patches

of small cells; cambium ring distinct and continuous; xylem consists of vessels, scattered individually or in rows of two or three vessels with scalariform thickening; older rhizomes show one or more stellate shaped rings of interxylary and medullary cork, completely or incompletely separating the rhizome into four to nine vascular strands by joining outer cork; each separated strand encircled by a few layers of cork cell consisting of an outer cortex zone followed by two or more functional vascular bundles, tissues in between the strands usually non-functional except for the cork cells which act as storage organ for oil globule.

Powder:

Dark brown; shows cork cells; parenchyma and oleo- resin cells with resinous matter and oil globules; fragments of vessels with scalariform thickening, tracheids and a few linear fibres.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 5 per cent, Appendix	2.2.2.
Total Ash	Not more than 9 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 2 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 5 per cent, Appendix	2.2.7.
Volatile oil	Not less than 0.1 per cent, v/wAppendix	2.2.10.

ASSAY

GC profile of volatile oil (yield upto 1.9%) with valeranone as marker

Column	:	OV-1 Chrom W (80 -100), SS- 2m. x 3.2mm.
Oven temperature	:	Programmed from 180 -220ºC at a rate of 10ºC/min.
Injector temperature	:	240ºC.
Detector (FID) temperature	:	240ºC.
Carrier gas (N_2)	:	(3.8 kg/cm^2)

T.L.C.

TLC of Petroleum Ether (40-60°C) extract of the drug on silica gel 'G' precoated plate using Toluene: Ethyl acetate (7:3), on exposure to iodine vapours shows six spots appear at Rf.. 0.48, 0.58, 0.69, 0.77, 0.82 and 0.95 (all yellow). On spraying with Anisaldehyde -Sulphuric acid reagent and heating the plate for five minutes at 105°C six spots appear at Rf. 0.48 (grey), 0.58 (blue), 0.69(indigo blue), 0.77 (orange), 0.82 (light violet) and 0.95 (violet).

CONSTITUENTS

Jatamansin, jatamansone, jatmansinol, nardol, oroselol, angelicin, β- endesrol, elemol, nardostachone, α- β- pinene, 3- carene, jatamanshic acid, seychellen, seychelane, norseychelanone, patchouli alcohol, nardostachysin, α & β - patchoulenes, narostachone, actinidine, virolin, spirojatamol, jatamol A and B.

PROPERTIES AND ACTIONS

Cuvai : I̲ippu (இனிப்பு) , Kārppu (dried) (கார்ப்பு)

Guṇam : Ilaku (இலகு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ci̲runīrperukki (சிறுநீர்பெருக்கி), Icivaka̲r̲ri (இசிவகற்றி), Kō̲zaiyaka̲r̲ri (கோழையகற்றி), U̲rakkamuṇḍākki (உறக்கமுண்டாக்கி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Cirōpāra Nivāraṇat Tailam (சிரோபார நிவாரணத் தைலம்), Ilaku Canta̲nāthi Tailam (இலகு சந்தனாதி தைலம்), Iñci Cūraṇam (இஞ்சி சூரணம்), Makā Ēlāthi Kuḷikai (மகா ஏலாதி குளிகை), Maya̲nat Tailam (மயனத் தைலம்), Nanthi Me̲zuku (நந்தி மெழுகு), Noccit Tailam (நொச்சித் தைலம்), Tāḷicāthi Cūraṇam (தாளிசாதி சூரணம்)

THERAPEUTIC USES

Kuḍḍam (குட்டம்), Purāṇa Curam (புராண சுரம்), Tūkkami̲nmai (தூக்கமின்மை), Uḍal Cūḍu (உடல் சூடு)

DOSE - Powder 500 mg - 1 g

Decoction 30- 50 ml twice daily.

5 - 10 g coarse powder in 200 ml of water for preparing decoction.

CĀTHIKKĀY (Kernel) - சாதிக்காய்

Cāthikkāy is the dried endosperm (kernel) of the seed of *Myristica fragrans* Houtt. (Fam. Myristicaceae), dioecious or occasionally monoecious aromatic tree, about 10-20 m high, native of Moluccas, now found under cultivation in India. It is mainly grown in Tamil Nadu, Kerala, Andhra Pradesh and Assam. The seed is cracked to remove shell, and the kernel is collected for the market. It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil	:	Jāthikkāy (ஜாதிக்காய்), Kulakkāy (குலக்காய்)
Assamese	:	Jaiphal, Kanivish
Bengali	:	Jaiphala, Jaitri
English	:	Nutmeg
Gujrati	:	Jaiphala, Jayfar
Hindi	:	Jaiphal
Kannada	:	Jadikai, Jaykai, Jaidikai
Kashmiri	:	Jafal
Malayalam	:	Jatika
Marathi	:	Jaiphal
Oriya	:	Jaiphal
Punjabi	:	Jaiphal
Sanskrit	:	Jatiphala, Jatisasya
Telugu	:	Jajikaya
Urdu	:	Jauzbuwa, Jaiphal

DESCRIPTION

a) Macroscopic

Kernel ellipsoid, 20 to 30 mm. long and about 20 mm. broad; externally greenish-brown sometimes marked with small irregular dark brown patches or minute dark points and lines slightly furrowed reticulately; a small light-coloured area at one end indicated the position of the radicle; a groove runs along the line of raphe to the darker chalaza at the opposite end; a thin layer of perisperm with infoldings appearing as dark ruminations surrounding the abundant greyish-brown endosperm; embryo, in an irregular cavity, small with two widely spreading crumpled cotyledons and a small radicle; odour strong and aromatic; taste pungent and aromatic.

b) Microscopic

Transverse section of endosperm shows peripheral perisperm of several layers of strongly flattened, polyhedral cells with brown contents, or containing prismatic crystals; inner layer of perisperm of thin-walled parenchyma about 40 µm thick, infolding into the tissue of the endosperm to form the ruminations containing numerous, very large oil cells with brown cell walls; vascular strands in the peripheral region with numerous small spiral vessels; large celled, endosperm, parenchymatous with occasional tannin idioblasts, with thin brown walls, containing numerous simple, rounded and compound starch grains, with upto about 10 components usually 2 to 8, individual grains, upto 20 µm in diameter present; most of the cells with crystalline fat and often a large aleurone grain in each cell, containing a rhombic protein crystal upto 12 µm and small aleurone grains with less regular crystalloids; embryo, of shrivelled and collapsed parenchyma.

Powder:

Brown, oily; shows fragments of endosperm cells containing prismatic crystals and starch grains; a few cells of endosperm containing brown contents; starch grains numerous, oval to rounded, measuring upto 20 µm in diameter having 2 to10 components; a few cells containing oil globules and a few aleurone grains.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	3	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	0.5	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	11	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	7	per cent, Appendix	2.2.7.
Ether -soluble extractive	Not less than	25	per cent v/w Appendix	2.2.8
Volatile oil	Not less than	5	per cent v/w Appendix	2.2.10

T.L.C.

T.L.C. of the Alcoholic extract on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Toluene: Ethyl acetate (9:1) in visible light shows five spots at Rf. 0.12, 0.18 (both light yellow), 0.44, 0.48 and 0.50 (all yellow). On exposure to iodine vapours eleven spots appear at Rf. 0.12, 0.18, 0.22, 0.26, 0.31 0.34, 0.44, 0.57, 0.74, 0.84 and 0.95 (all yellow). On spraying with Anisaldehyde - Sulphuric acid reagent and heating the plate for five minutes at 105ºC seventeen spots appear at Rf. 0.12, 0.14(both pinkish brown), 0.18 (grey), 0.26, 0.31(both pinkish brown), 0.34 (violet), 0.39, 0.44 (both pink), 0.51 (pinkish brown), 0.57 (pinkish red), 0.62, 0.74 (both brown), 0.78 (violet), 0.84 (pinkish violet), 0.86 (brown), 0.89 and 0.95 (both greyish violet).

CONSTITUENTS

Dimeric phenylpropanoids I-VI, myricetin, essential oil and fixed oil.

PROPERTIES AND ACTIONS

Cuvai : Kārppu (கார்ப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Kāmamperukki (காமம்பெருக்கி), Maṇamūṭṭi (மணமூட்டி), Mūrccaiyuṇṭākki (மூர்ச்சையுண்டாக்கி), Uramākki (உரமாக்கி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Aśḍapayiravak Kuḷikai (அஷ்டபயிரவக் குளிகை), Cāmpirāṇippū Pataṅkam (சாம்பிராணிப்பூ பதங்கம்), Carapuṅka Vilvāti Iḷakam (சரபுங்க வில்வாதி இளகம்), Ilaku Cantaṉāthi Tailam (இலகு சந்தனாதி தைலம்), Kapāḍa Mātthirai (கபாட மாத்திரை)

THERAPEUTIC USES

Pacittīkkuṟaivu (பசித்தீக்குறைவு), Iraippu (இரைப்பு), Irumal (இருமல்), Nāḷpaḍḍa Kaẕiccal (நாள்பட்ட கழிச்சல்), Peruṅkaẕiccal (பெருங்கழிச்சல்), Vintukkuṟaivu (விந்துக்குறைவு)

DOSE - Powder 500 mg - 1g

CĪNTHIL THAṆḌU (Stem) - சீந்தில் தண்டு

Cīnthil Thaṇḍu is the dried, matured pieces of stem of ***Tinospora cordifolia*** (Willd.) Miers. (Fam. Menispermaceae), a perennial climber found throughout tropical India; drug is collected during summer preferably in the month of May; drug is used in fresh form also. It grows in Kuṟiñci, Mullai, Marutham and Neythal thiṇai.

SYNONYMS

Tamil	:	Amirtavalli (அமிர்தவல்லி), Amutavalli (அமுதவல்லி), Cañcīvi (சஞ்சீவி), Cīnthil Koḍi (சீந்தில் கொடி), Cōmavalli (சோமவல்லி), Kuṇḍali (குண்டலி)
Assamese	:	Siddhilata, Amariat
Bengali	:	Gulancha
Gujrati	:	Galac, Garo
Hindi	:	Giloe, Gurcha
Kannada	:	Amrutaballi
Kashmiri	:	Amrita, Gilo
Malayalam	:	Chittamrutu
Marathi	:	Gulvel
Oriya	:	Guluchi
Punjabi	:	Gilo
Sanskrit	:	Guduci, Amrtavalli, Amrta, Madhuparni, Guducika, Chinnodbhava
Telugu	:	Thippateega
Urdu	:	Gilo

DESCRIPTION

a) Macroscopic

Drug occurs in pieces of varying thickness ranging from 0.6 to 5 cm. in diameter; young stems green with smooth surfaces and swelling at nodes, older ones show a light brown surface marked with warty protuberances due to circular lenticels; transversely smoothened surface shows a radial structure with conspicuous medullary rays traversing porous tissues; taste bitter.

b) Microscopic

Transverse section of stem shows outermost layer of cork, differentiating into outer zone of thick-walled brownish and compressed cells, inner zone of thin walled colourless, tangentially

arranged 3 to 4 rows of cells; cork broken at some places due to opening of lenticels, followed by 5 or more rows of secondary cortex of which the cells of outer rows smaller than the inner one; just within the opening of lenticels, groups of sclereids consisting of 2 to 10 cells found in secondary cortex region, outer zone of cortex consists of 3 to 5 rows of irregularly arranged, tangentially elongated chlorenchymatous cells; cortical cells situated towards inner side, polygonal in shape and filled with plenty of starch grains, simple, ovoid, or irregularly ovoid-elliptical, occasionally compound of 2 to 4 components; several secretory cells found scattered in the cortex; pericyclic fibres lignified with wide lumen and pointed ends, associated with a large number of crystal fibres containing a single prism in each chamber; vascular zone composed of 10 to 12 or more wedge-shaped strips of xylem, externally surrounded by semi-circular strips of phloem, alternating with wide medullary rays; phloem consists of sieve tubes, companion cells and phloem parenchyma of polygonal or tangentially elongated cells, some of them contain crystals of calcium oxalate; cambium composed of one or two layers of tangentially elongated cells in each vascular bundle; xylem consists of vessels, tracheids, parenchyma and fibres; in primary xylem, vessels comparatively narrow devoid of tyloses; secondary xylem elements thick-walled, lignified, vessels cylindrical in shape bearing bordered pits on their walls, some large vessels possess several tyloses and often contain transverse septa; medullary rays 15 to 20 or more cells wide containing rounded, hemispherical, oblong, ovoid, with faintly marked concentric striations and central hilum appearing like a point, starch grains of 6 to 13 µm in diameter and 6 to 11µm in length, variously shaped; pith composed of large, thin-walled cells mostly containing starch grains.

Powder:

Yellowish-cream; shows cork cells, parenchyma cells; fragments of vessels with bordered pits, fibres, crystal fibres containing prisms of calcium oxalate; starch grains simple, oval to rounded with faintly marked concentric striations and central hilum, measuring 6 to 13 µm in diameter.

IDENTITY, PURITY AND STRENGTH

For dry drug:

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 3 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 3 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 11 per cent, Appendix	2.2.7.
For fresh drug:	- -	
Foreign matter	Nil, Appendix 2.2.2	
Moisture content	75 percent, Appendix	2.2.9

T.L.C.

T.L.C. of Chloroform soluble part of the Alcoholic extract on silica gel 'G' plate using Chloroform : Methanol (9:1). On spraying with Anisaldehyde - Sulphuric acid reagent and heating

for five minutes at 105°C shows eight spots at Rf. 0.19 (violet), 0.26 (violet), 0.58 (violet), 0.65 (violet), 0.84 (violet), 0.88, 0.93 and 0.97 (all pinkish violet).

CONSTITUENTS

Diterpenoid furanolactone, 3- (α 4 - dihydroxy-3-methoxy benzyl) 4-(4-hydroxy-3-medoxybenzy1) tetra-hydrofuran, tinosporaside. tinosporide, magnoflorium, giloin, gilosterol, gilenin, columbin, chasmanthin, palmaria, tinosporin, tinosporic acid,tinosporal and amritoside A,B,C and D.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ciṟunīrperukki (சிறுநீர்பெருக்கி), Kāyakaṟpamākki (காயகற்பமாக்கி), Kāmamperukki (காமம்பெருக்கி), Muṟaiveppakaṟṟi (முறைவெப்பகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Uḷḷaẕalāṟṟi (உள்ளழலாற்றி), Uramākki (உரமாக்கி), Uḍaṟtēṟṟi (உடற்தேற்றி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Cīnthil Cūraṇam (சீந்தில் சூரணம்), Cīnthil Ney (சீந்தில் நெய்), Kapacurak Kuḍinīr (கபசுரக் குடிநீர்)

THERAPEUTIC USES

Coṟi (சொறி), Curam/Kāyccal (சுரம்/காய்ச்சல்), Kayanōy (கயநோய்), Kuruti Aẕal (குருதி அழல்), Kuḍḍam (குட்டம்), Mēkam (மேகம்), Pīṉicam (பீனிசம்)

DOSE - Powder 3 - 5 g

Decoction 30- 50 ml twice daily.

20 - 30 g coarse powder in 200 ml of water for preparing decoction

CĪRAKAM (Fruit) - சீரகம்

Cīrakam is the ripe fruit of ***Cuminum cyminum*** L. (Fam. Apiaceae), a small slender, glabrous, annual herb, 30 to 90 cm. high; flowers very small, white, about 38 mm. long stalk in compound umbels, mostly cultivated in plains; plants pulled out, dried and threshed for collecting mature fruits.It grows in Mullai, Marutham and Neythal thiṇai.

SYNONYMS

Tamil : Acai (அசை), Naṟcīrakam (நற்சீரகம்), Pitthanāciṉi (பித்தநாசினி), Pōcaṉakuḍōri (போசனகுடோரி)

Assamese : Jira

Bengali : Jira, Sadajira

English : Cumin seed, Cumin

Gujrati : Jirautmi, Jiru, Jiraugi, Jeeru, Jirun

Hindi : Jira, Safed jira

Kannada : Jirage, Bilejirege

Kashmiri : Safed Zoor

Malayalam : Jeerakam

Marathi : Pandhare jire

Oriya : Dhalajeera, Dalajira, Jira

Punjabi : Safed jira, Chitta jira

Sanskrit : Sveta jiraka, Ajaji, Jiraka, Ajajika

Telugu : Jilakarra, Tella jilakarra

Urdu : Zirah, Zirasafed

DESCRIPTION

a) Macroscopic

Fruit, a cremocarp, often separated into mericarps, brown with light coloured ridges, ellipsoidal, elongated, about 4 to 6 mm. long, 2 mm. wide, tapering at ends and slightly compressed laterally; mericarps with 5 longitudinal hairy primary ridges from base to apex, alternating with 4 secondary ridges which are flatter and bear conspicuous emergences; seeds orthospermous; odour umbelliferous, characteristic; taste richly spicy.

b) Microscopic

Transverse section of fruit shows epidermis consisting of short polygonal, tabular cells densely covered with short, bristle hairs that are multicellular and multiseriate on ridges; mesocarp with a few layers of parenchyma and five vascular bundles under five primary ridges; six vittae under secondary ridges, four on dorsal and two on commissural surface; endocarp consists of polygonal cells containing fixed oil and aleurone grains; carpophore consists of slender fibres.

Powder:

Brownish-yellow; shows fragments of vittae; sclerenchymatous cells of the mesocarp; endosperm cells containing oil globules, aleurone grains, small rosette crystals of calcium oxalate; fragments of multiserial hairs.

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	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 Dichloromethane extractive of the Alcohol extract on silica gel 'G' plate using Dichloromethane, on exposure to iodine vapours shows six spots at Rf. 0.05, 0.09, 0.15, 0.26, 0.55 and 0.94 (all yellow). On spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate for five minutes at 105°C six spots appear at Rf. 0.15, 0.26 (both violet), 0.31 (pink), 0.55(grey), 0.73 (violet) and 0.94 (violet).

CONSTITUENTS

Cuminaldehyde, cuminin,1,3 - þ - menthadien -7-al, 1,4 - þ - menthadien -7-al,þ-cymene, ϒ-terpinene, β-pinene, 7-1(O-β-D-galalacturonide) -4-(1-O-β-D- glucopyranosyl)-3,5- dihydroxy flavone, glycosides of luteolin and apigenin.

PROPERTIES AND ACTIONS

Cuvai : I**n̲**ippu (இனிப்பு), Kārppu (கார்ப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை), Va**r̲**aḍci (வறட்சி)

Vīrium : Taḍpam (தட்பம்)

Pirivu : I**n̲**ippu (இனிப்பு)

Ceykai : Akaḍḍuvāyvaka**r̲r̲**i (அகட்டுவாய்வகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Tuvarppi (துவர்ப்பி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Aśḍāthic Cūraṇam (அஷ்டாதிச் சூரணம்), Cīrakac Cūraṇam (சீரகச் சூரணம்), Cīrakat Tailam (சீரகத் தைலம்), Kēcari Iḷakam (கேசரி இளகம்), Mayiliṟakāthi Cūraṇam (மயிலிறகாதி சூரணம்), Pañcatīpākkiṉi Cūraṇam (பஞ்சதீபாக்கினி சூரணம்), Pittacurak Kuḍinīr (பித்தசுரக் குடிநீர்)

THERAPEUTIC USES

Aẕal Nōykaḷ (அழல் நோய்கள்), Cītakkaẕiccal (சீதக்கழிச்சல்), Īral Nōy (ஈரல் நோய்), Kallaḍaippu (கல்லடைப்பு), Kāmālai (காமாலை), Kuṉmam (குன்மம்)

DOSE - Powder 1 - 5 g

CIṞUKUṞIÑCĀṈ VĒR (Root) - சிறுகுறிஞ்சான் வேர்

Ciṟukuṟiñcāṉ is the root of ***Gymnema sylvestre*** R. Br. (Fam. Asclepiadaceae), a large woody, climber, much branched, with pubescent young parts, found throughout India in dry forests upto 600 m.; occasionally cultivated. It grows in Kuṟiñci, Mullai , Marutham and Neythal thiṇai.

SYNONYMS

Tamil	:	Cakkaraikkolli (சக்கரைக்கொல்லி)
Bengali	:	Medhasingi
English	:	Periploca of the woods
Gujrati	:	Kaavalee, Medhasinge
Hindi	:	Gudmaar, Medhaasingee
Kannada	:	Kadhasige
Malayalam	:	Cakkarakkolli, Madhunaashini
Marathi	:	Kaavalee, Medhaashingi
Sanskrit	:	Mesasrngi, Madhunasini, Ajasrngi
Telugu	:	Podapatri

DESCRIPTION

a) Macroscopic

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

b) Microscopic

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

Powder:

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

IDENTITY, PURITY AND STRENGTH

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

T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'G' plate using Toluene: Ethylacetate: Methanol (5:5:2) as mobile phase shows on spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate at 105ºC until the colour develops, eight spots at Rf. 0.17 (brown), 0.25 (violet), 0.48 (grey), 0.57 (pink), 0.068, 0.80, 0.87 (violet) and 0.95 (pink).

PROPERTIES AND ACTIONS

Cuvai	:	Kaippu (கைப்பு)
Guṇam	:	Ilaku (இலகு), Va̲ṛaḍci (வறட்சி)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)
Ceykai	:	Kōz̲aiyaka̲ṛṛi (கோழையகற்றி), Vāntiyuṇḍākki (வாந்தியுண்டாக்கி)

IMPORTANT FORMULATIONS

Maṇḍūrāti Aḍaikkuḍinīr (மண்டூராதி அடைக்குடிநீர்)

THERAPEUTIC USES

Iraippu (இரைப்பு), Irumal (இருமல்), Nañcukaḷ (நஞ்சுகள்), Vaḷiccuram (வளிச்சுரம்), Nīriz̲ivu (நீரிழிவு)

DOSE - Powder 1 - 2 g

Decoction 30- 50 ml twice daily.

30 -50 g powder in 200 ml of water for preparing decoction.

CĪṟUPĪḶAI CAMŪLAM (Whole Plant) - சீறுபீளை சமூலம்

Cīṟupīḷai Camūlam is the whole plant of *Aerva lanata* (L.) Juss. ex Schult. (Fam. Amaranthaceae), an erect or prostrate branched herb, 30 to 60 cm. in height, found throughout India as a common weed in fields and in waste lands. It grows in Marutham and Neythal thiṇai.

SYNONYMS

Tamil : Ciṟukaṇpīḷai (சிறுகண்பீளை), Kaṇpīḷai (கண்பீளை), Kaṟpēti (கற்பேதி), Pāśāṇapēti (பாஷாணபேதி)

Bengali : Chaya

Gujrati : Gorakhganjo

Hindi : Gorakhaganja

Kannada : Bilihindisoppu

Malayalam : Cherupila

Marathi : Kapurphutee, Kumrapindee

Punjabi : Bhuikallan

Sanskrit : Pattura, Goraksaganja, Bhadra

Telugu : Pindichettu, Kanda Pindi

DESCRIPTION

a) Macroscopic

Root - Tap-root, laterally branched, cylindrical, up to 0.8 cm. in thickness and about 25 cm. long pieces, externally light brown and rough but cut surface white and smooth; fracture fibrous and hard.

Stem - Nearly cylindrical, branching alternate, external surface shows slight ridges and furrows, hairy and light brown in colour; cut surface white; fracture granular.

Leaf - Simple, opposite, alternate, shortly petiolate, lamina 2.0 to 2.5 cm. long and 1.0 to 1.6 cm. broad, elliptic-orbicular or ovate, acute, reticulate veined, margin entire, densely pubescent on both surfaces.

Flower - Minute cluster as axillary spike; greenish-white; perianth 5, bracteolate; actinomorphic, bisexual; stamen 5, opposite to perianth, anthers 2 lobed; stigma bifid, superior ovary, unilocular with campylotropous ovule.

Fruit - A greenish, roundish, compressed membranous, utricle or circumscissile capsule with a coriaceous upper part or lid and containing a single seed.

Seed - Seed minute, 0.5 to 0.7 cm. in dia., black, polished, lenticular; taste pungent.

b) Microscopic

Root - Shows 5 to 7 layers of cork cells, upper 2 or 3 layers filled with brownish content; secondary cortex a wide zone consisting of circular to oval, elongated, thin walled parenchymatous cells, most of the cells containing rosette crystals of calcium oxalate; endodermis not distinct; pericycle present in the form of interrupted ring of pericyclic fibres; anomalous secondary growth present; secondary xylem and phloem tissues in form of 3 or 4 alternating rings; medullary bundles present; phloem consisting of sieve tubes, companion cells and phloem parenchyma; xylem consists of vessels, tracheids, fibres and xylem parenchyma; vessels circular to oval having simple pits; pith cells circular in shape containing rosette crystals of calcium oxalate.

Stem - Shows slightly wavy outline, corresponding to ridges and furrows; epidermis single layered covered with thick cuticle; trichomes multicellular, end cells pointed or vesicular, warty and thick walled; cortex 6 or 7 layers with 3 or 4 layers below ridges being collenchymatous and 3 or 4 layers below furrows chlorenchymatous; rest of the cells oval to elongated, elliptical, thin walled and parenchymatous, with a few cells containing rosette crystals of calcium oxalate; endodermis single layered; pericycle present in the form of a ring, single or groups of 2 to 4 fibres; anomalous secondary growth present; vascular bundles arranged in 2 or 3 rings showing included phloem alternating with parenchymatous tissue; phloem consists of sieve tubes, companion cells and phloem parenchyma; xylem composed of vessels, tracheids, wood fibres and xylem parenchyma; vessels round to oval having simple pits; pith wide consisting of circular to polygonal having intercellular spaces, rosette crystals of calcium oxalate present in this region.

Leaf

Petiole - Shows single layered epidermis covered with cuticle; trichomes multicellular present on both surfaces; cortex consisting of 2 or 3 layers, upper collenchymatous and lower parenchymatous; vascular bundle collateral and 3 in number; rosette crystals of calcium oxalate present in cortical cells.

Midrib - Epidermis, cuticle and trichomes, similar to those in petiole; cortex 5 to 7 layers, upper 3 collenchymatous and lower 3 or 4 circular, thin walled and parenchymatous; vascular bundles 3 in number, 2 accessory and one middle; xylem towards the upper and phloem towards lower epidermis; rosette crystals of calcium oxalate present in cortical region.

Lamina - Epidermis, cuticle and trichomes similar as in petiole and midrib; palisade 1 or 2 layers; spongy parenchyma 3 to 5 layers composed of thin walled parenchymatous cells with intercellular spaces, a few rosette crystals of calcium oxalate present in spongy parenchyma; anomocytic stomata present on both surfaces; palisade ratio 2 or 3; stomatal index on upper surface 12 to 15 and on lower surface 16 to 18; vein -islet number 4 or 5 per square mm.

Powder:

Yellowish-green; shows straight walled epidermal cells, multicellular trichomes and anomocytic stomata in surface view; simple pitted vessels, cork cells, tracheids, fibres and rosette crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 17 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 2 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 2 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 11 per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of the Alcoholic extract on silica 'G' plate using Toluene: Ethyl acetate: Methanol (5:5:2) as mobile phase shows under UV (366 nm) ten fluorescent zones at Rf.0.11 (sky blue), 0.27 (red), 0.47 (red), 0.51 (sky blue), 0.73 (sky blue), 0.82 (pink), 0.87 (sky blue), 0.91 (red), 0.94 (red) and 0.97 (dark red). On spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate at 105ºC until the colour develops, the plate shows ten spots at Rf.0.11, 0.23, 0.37, 0.51, 0.61, 0.73, 0.85, 0.92 and 0.94 (all violet) and 0.97 (dark violet).

CONSTITUENTS

β-sitosterol, β-sitosterol palmitate, campesterol, stigmasterol, stigmasterol acetate, daucosterol, ergosterol, α-amyrin, β-amyrin, lupeol, betulin, olean-12-en-28-oic acid-3, 16-dioxymethyl ester, hentriacontane, chrysin, 3-glu (6"-coumaroyl) flavone, 4'-methoxy, 3-glu (6"p,-coumaroyl) flavone, 3-glu (4", 6" di-p-coumaroyl) flavone, 3-glu (4", 6" di-p-coumaroyl) flavone, 3'-methoxy flavone, kaempferol, kaempferol-3-galactoside,kaempferol-3-rhamno galactoside, aervine, methylaervine, aervoside, aervolonine, free sugars-fructose, galactose, rhamnose and sucrose.

PROPERTIES AND ACTIONS

Cuvai	:	Kaippu (கைப்பு)
Guṇam	:	Ilaku (இலகு), Kūrmai (கூர்மை)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)
Ceykai	:	Ciṟunīrperukki (சிறுநீர்பெருக்கி), Kaṟkaraicci (கற்கரைச்சி)

IMPORTANT FORMULATIONS

Kalluḍaikkuḍōri (கல்லுடைக்குடோரி), Naṇḍukkal Paṟpam (நண்டுக்கல் பற்பம்)

THERAPEUTIC USES

Cataiyaḍaippu (சதையடைப்பு), Kaẓiccal (கழிச்சல்), Kallaḍaippu (கல்லடைப்பு), Kuruti Vānti (குருதி வாந்தி), Nīrcurukku (நீர்சுருக்கு), Perumpāḍu (பெரும்பாடு), Vīkkam (வீக்கம்)

DOSE - Powder 5 -10 g

Decoction 15- 30 ml twice daily.

15 - 30 g coarse powder in 200 ml of water for preparing decoction.

CŌMPU (Fruit) - சோம்பு

Cōmpu is the dried ripe fruit of ***Foeniculum vulgare*** Mill. Syn. ***F. capillaceum*** Gilib., ***F.officinale*** All., ***Anethum foeniculum*** L. (Fam. Apiaceae), an erect, glabrous, aromatic herb, 1 or 2 m. high, native of southern Europe and Asia cultivated extensively throughout India upto 1830 m. and also sometimes found wild; fruits ripen in September; when dry, fruits are beaten out in a cloth in sun, cleaned by winnowing and collected. It grows in Kuṟiñci, Mullai, Marutham and Neythal thiṇai.

SYNONYMS

Tamil	:	Acai (அசை), Acuvakanthi (அசுவகந்தி)
Assamese	:	Guvamuri
Bengali	:	Marui, Panmauri
English	:	Fennel fruit
Gujrati	:	Variyali
Hindi	:	Saunf
Kannada	:	Badisompu, Doddasompu
Kashmiri	:	Sanuf, Badnai
Malayalam	:	Kattusatakuppa, Parinjaeragum
Marathi	:	Badishop
Oriya	:	Panamadhuri
Punjabi	:	Saunf
Sanskrit	:	Misreya, Misi, Madhurika
Telugu	:	Sopu
Urdu	:	Saunf

DESCRIPTION

a) Macroscopic

Fruits, usually entire with pedicel attached; mericarps, upto about 10 mm. long and 4 mm. broad, five sided with a wider commissural surface, tapering slightly towards base and apex, crowned with a conical stylopod, glabrous, greenish or yellowish-brown with five paler prominent primary ridges; endosperm, orthospermous.

b) Microscopic

Transverse section of fruit shows pericarp with outer epidermis of quadrangular to polygonal cells with smooth cuticle and a few stomata; trichomes, absent; vittae, 4 dorsal and 2 commissural extending with length of each mericarp, intercostal, with an epithelium of brown cells and volatile oil in cavity; mesocarp, with much reticulate lignified parenchyma; costae 5 in each mericarp, each with 1 vascular strand having 1 inner xylem strand and 2 lateral phloem strands separated by a bundle of fibres; inner epidermis of very narrow, thin-walled cells arranged parallel to one another in groups of 5 to 7, many of these groups with longer axis of their cells at an angle with those of adjacent groups (parquetry arrangement); endosperm consists of thick-walled, cellulosic parenchyma containing much fixed oil, micro-rosette crystals of calcium oxalate and numerous aleurone grains upto 5 µm in diameter; carpophore with very thick-walled sclerenchyma in two strands, often unsplit with two strands very close to each other.

Powder:

Greenish yellow; with characteristic aroma; shows lignified and reticulate parenchyma; thick walled endosperm cells containing aleurone grains; minute rosettes of calcium oxalate and oil globules; endocarp cells showing a parquetry arrangement and fragments of yellowish brown vittae.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	12	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	15	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	1	per cent, Appendix	2.2.7.
Volatile oil	Not less than	1.4	per cent, Appendix	2.2.10

T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'G' plate using Toluene: Ethyl acetate (9:1) v/v shows five spots (UV light 366 nm) at Rf. 0.04 (blue), 0.27 (red), 0.34 (red), 0.41 (sky blue) and 0.51(sky blue). On exposure to iodine vapours six spots appear at Rf. 0.20, 0.27, 0.31, 0.58 and 0.93 (all yellow). On spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate, for five minutes at 105°C six spots appear at Rf. 0.12, 0.20, 0.27, 0.31,0.37 and 0.93 (all violet).

CONSTITUENTS

E- anethole, fenchone, methyl chavicol, limonene, α- pinene, imperatorin, bergapten, xanthotoxol, miyabenol C, cis - miyabenol C and its glycosides, foeniculosides VI, VII, VIII, IX, zizybeoside I, icaviside A, syringin, synapyl alcohol, 1, 3'- di- O- β-D-glucopyranoside, adenosine, threo- anethole glycol and erythro- anethole glycol.

PROPERTIES AND ACTIONS

Cuvai : I̲nippu (இனிப்பு), Kārppu (கார்ப்பு)

Guṇam	:	Ilaku (இலகு), Va̱ṛaḍci (வறட்சி)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)
Ceykai	:	Akaḍḍuvāyvaka̱ṛṛi (அகட்டுவாய்வகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி)

IMPORTANT FORMULATIONS

Cōmput Tīnīr (சோம்புத் தீநீர்), Nākkuppūcci(Kolli) Kuḍinīr (நாக்குப்பூச்சி(கொல்லி) குடிநீர்), Neruñcik Kuḍinīr (நெருஞ்சிக் குடிநீர்), Tamarakak Kuḍinīr (தமரகக் குடிநீர்)

THERAPEUTIC USES

Ceriyāmai (செரியாமை), Iraippu (இரைப்பு), Īral Nōy (ஈரல் நோய்), Irumal (இருமல்), Kural Kammal (குரல் கம்மல்), Pīṉicam (பீனிசம்), Vali Nōy (வலி நோய்)

DOSE - Powder 1 - 3 g

CUKKU (Dried Rhizome) - சுக்கு

Cukku is the dried rhizome of *Zingiber officinale* Rosc. (Fam. Zingiberaceae), widely cultivated in India; rhizomes dug in January - February, buds and roots removed, soaked overnight in water, decorticated and some times treated with lime and dried. It grows in Kuṟiñci and Marutham thiṇai.

SYNONYMS

Tamil	:	Cuṇḍi (சுண்டி), Ularnta Iñci (உலர்ந்த இஞ்சி), Vērkkompu (வேர்க்கொம்பு), Viḍamūḍiya Amirtam (விடமூடிய அமிர்தம்)
Assamese	:	Adasuth, Aadar shuth
Bengali	:	Suntha, Sunthi
English	:	Ginger root, Ginger
Gujrati	:	Sunth, Sundh, Suntha
Hindi	:	Sonth
Kannada	:	Shunthi
Kashmiri	:	Shonth
Malayalam	:	Chukku
Marathi	:	Sunth
Oriya	:	Sunthi
Punjabi	:	Sund
Sanskrit	:	Ardraka, Ausadha, Mahausadha, Visvabhesaja, Srngavera, Visva, Visvausadha
Telugu	:	Sonthi, Sunti
Urdu	:	Sonth, Zanjabeel

DESCRIPTION

a) Macroscopic

Rhizome, laterally compressed bearing short, flattish, ovate, oblique, branches on upper side each having at its apex a depressed scar, pieces about 5 to15 cm. long, 1.5 to 6.5 cm. wide usually 3 to 4 cm. and 1 to 1.5 cm. thick; externally buff coloured showing longitudinal striations and occasional loose fibres; fracture short, smooth, transverse surface exhibiting narrow cortex, (about one-third of radius) a well-marked endodermis, a wide stele showing numerous scattered fibro-

vascular bundles and yellow secreting cells when examined under 10x lens; odour agreeable and aromatic; taste agreeable and pungent.

b) Microscopic

Transverse section of rhizome shows cortex of isodiametric thin-walled parenchyma with scattered vascular strands and numerous isodiametric idioblasts, about 40 to 80 µm in diameter containing a yellowish to reddish-brown oleo-resin; endodermis slightly thick walled, free from starch; immediately inside endodermis a row of nearly continuous collateral bundles usually without fibres, stele of thin-walled, parenchyma cells, arranged radially around numerous scattered, collateral vascular bundles, each consisting of a few unlignified, reticulate or spiral vessels upto about 70 µm in diameter; a group of phloem cells, unlignified, thin-walled; septate fibres upto about 30 µm wide and 600 µm long with small oblique slit like pits present; numerous scattered idioblasts, similar those of cortex, and associated with vascular bundles, also present; idioblasts about 8 to 20 µm wide and upto 130 µm long with dark reddish-brown contents; in single or in axial rows, adjacent to vessels, present; parenchyma of cortex and stele packed with flattened, rectangular, ovate starch grains upto 60 µm long about 25 µm wide and 7µm thick, marked by fine concentric striations.

Powder:

Cream; shows groups of polygonal thin walled parenchyma cells; yellowish to reddish brown oleo-resin cells; unlignified fibres, vessels with annular, reticulate or spiral thickening; numerous round to oval starch grains upto 60 µm long, about 25 µm wide and 7 ìm thick marked by fine concentric striations.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 1 per cent, Appendix	2.2.2.
Total Ash	Not more than 6 per cent, Appendix	2.2.3.
Water soluble ash	Not more than 1.5 per cent, Appendix	2.2.5.
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-Hexane: Diethyl ether (4:6) v/v shows two spots under (UV light 366 nm) at Rf. 0.55 and 0.60 (both sky blue). On exposure to iodine vapours seven spots appear at Rf. 0.23, 0.27, 0.43, 0.50, 0.55,0.81 and 0.94(all yellow). On spraying with Vanillin- Sulphuric acid reagent and heating the plate, for five minutes at 105°C eight spots appear at Rf. 0.23 (blackish brown), 0.27 (blackish brown), 0.37 (violet), 0.50 (violet), 0.60 (brown), 0.67 (brown), 0.81 (violet) and 0.94 (violet).

CONSTITUENTS

Gingerols, shogaols, dihydrogingerol, gingerdione, hexahydrocurcumin and desmethyl hexahydrocurcumin, α -zingiberene, ß-sesquiphellandrene, ar-curcumene, lipids, proteins, fats, waxes, and starch.

PROPERTIES AND ACTIONS

Cuvai : Kārppu (கார்ப்பு)

Guṇam : Ilaku (இலகு), Noymai (நொய்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Cukku Tailam (சுக்கு தைலம்), Ēlātic Cūraṇaṃ (ஏலாதிச் சூரணம்), Nilavākaic Cūraṇam (நிலவாகைச் சூரணம்), Pañcatīpākkiṉi Cūraṇam (பஞ்சதீபாக்கினி சூரணம்), Pāvaṉakkaḍukkāy (பாவனக்கடுக்காய்), Tayircuṇḍiccūraṇam (தயிர்சுண்டிச்சூரணம்), Tirikaḍukuc Cūraṇam (திரிகடுகுச் சூரணம்)

THERAPEUTIC USES

Ceriyāmai (செரியாமை), Irumal (இருமல்), Kuṉmam (குன்மம்), Neñcerippu (நெஞ்செரிப்பு), Talaivali (தலைவலி), Vāta Kuṉmam (வாத குன்மம்), Paciyiṉmai (பசியின்மை), Ēppam (ஏப்பம்)

DOSE - Powder 500 mg - 1g

ILAVAṄKAM (Flower Bud) - இலவங்கம்

Ilavaṅkam is the dried flower bud of ***Syzygium aromaticum*** (L.) Merr. & L.M. Perry Syn. ***Eugenia aromatica*** Kuntze, ***Eugenia caryophyllata*** Thunb. (Fam. Myrtaceae), a tree, cultivated in many parts of the world and also to a considerable extent in South India; flower buds collected twice a year, in the months of October and February when they change colour from green to crimson, dried carefully and separated from their peduncles. It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil : Añcukam (அஞ்சுகம்), Cōcam (சோசம்), Kirāmpu (கிராம்பு), Tirāḷi (திராளி), Varāṅkam (வராங்கம்)

Assamese : Lavang, Lan, Long

Bengali : Lavang

English : Clove

Gujrati : Lavang, Laving

Hindi : Lavanga, Laung

Kannada : Lavanga

Kashmiri : Rung

Malayalam : Karampu, Karayampoovu, Grampu

Marathi : Lavang

Oriya : Labanga

Punjabi : Laung, Long

Sanskrit : Lavanga, Devapuspa

Telugu : Lavangalu

Urdu : Qarnful, Laung

DESCRIPTION

a) Macroscopic

Flower bud measuring 10 to 17.5 mm. in length, dark brown to black, consisting of a sub-cylindrical, slightly flattened, four sided hypanthium readily exuding oil when pressed; hypanthium contains in its upper portion a two celled inferior ovary with numerous ovules attached to a axile placenta, surmounted by four thick, divergent sepals and covered by unopened corolla consisting of four membranous imbricate petals, frequently detached, enclosing numerous incurved stamens and

one erect-style; odour strongly aromatic; taste pungent, aromatic followed by slight tingling of the tongue.

b) Microscopic

Transverse section of hypanthium shows epidermis and calyx teeth composed of straight walled cells, with thick cuticle having large anomocytic stomata, hypanthium tissue spongy, clusters of calcium oxalate crystals varying in size from 6 to 20 µm in diameter, small number of stone cells and prismatic crystals of calcium oxalate present in stalk; stamens, each with an oil gland in the apex of the connective, triangularly centricular pollen grains, 15 to 20 µm in diameter; anther walls showing a typical fibrous layer, schizolysigenous glands found in all parts; occasional isolated pericyclic fibre present.

Powder:

Dark brown; fragments of parenchyma showing large, oval, schizolysigenous oil cavities; spiral tracheids and a few rather thick-walled, spindle shaped fibres; calcium oxalate crystals in rosette aggregates, 10 to 15 µm in diameter; fragments of anther walls with characteristic reticulated cells; pollen grains numerous, tetrahedral, 15 to 20 µm in diameter.

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	3	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	9	per cent, Appendix	2.2.7.
Volatile oil	Not less than	15	per cent, Appendix	2.2.10

ASSAY

GC Profile

GC analysis of volatile oil (yield 16.7%)

GC Conditions:

Column	:	Fused silica capillary column (0.25 mm. x 20 m.) with 0.25mm. coating of free fatty acid phase (FFAP)
Oven Temperature	:	Programmed from 90 to 210ºC at 7ºC/min.
Injector temperature	:	230ºC
Detector temperature	:	240ºC
Carrier gas	:	Helium
Flow rate	:	1.5 ml/min.
Injection volume	:	0.1µl.

T.L.C.

T.L.C. of the Petroleum ether extract on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm thickness using Toluene: Ethyl acetate (8:2), with Anisaldehyde - Sulphuric acid reagent and heating the plate, for five minutes at 105ºC shows eleven spots appear at Rf. 0.18 (light pink), 0.29 (pink), 0.35 (violet), 0.41 (violet), 0.47 (pinkish violet), 0.56 (pink), 0.62 (pinkish violet), 0.76 (reddish brown), 0.82 (red), 0.93 (red) and 0.96.

CONSTITUENTS

Caryophyllene oxide, caryophylla -3 (12), 6-dien-4-ol , caryophylla - 3 (12), 7 (13) -dien -6 α-al, eugenol (77.1 % of volatile oil), acetophenone, 2-hydroxy, 4, 6,di-methoxy-5- methyl acetophenone, β-caryophyllene, eugenol acetate, derivatives of β-caryophyllene, α-humulene and its expoxide, benzyl salicylate, α-cardinol, γ-decalacetate, fenchone, hexanal, 2-hexanone, methyl palmitate, α-murolene, palustrol, propyl benzoate, α-thujene, β- selinene and eugenine.

PROPERTIES AND ACTIONS

Cuvai : Kārppu (கார்ப்பு), Viṟuviṟuppu (விறுவிறுப்பு)

Guṇam : Ilaku (இலகு), Noymai (நொய்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Icivakaṟṟi (இசிவகற்றி), Pacittīt ūṇḍi (பசித்தீதூண்டி)

IMPORTANT FORMULATIONS

Amirtātik Kuḷikai (அமிர்தாதிக் குளிகை), Amukkarāc Cūraṇam (அமுக்கராச் சூரணம்), Ilavaṅkāti Māttirai (இலவங்காதி மாத்திரை), Kuṅkumappū Māttirai (குங்குமப்பூ மாத்திரை), Paṟakkirāmpu Pakkuva Veṇṇey (பழக்கிராம்பு பக்குவ வெண்ணெய்), Vāṟaippu Vaḍakam (வாழைப்பு வடகம்)

THERAPEUTIC USES

Kaṟiccal (கழிச்சல்), Paciyiṉmai (பசியின்மை), Pal Vali (பல் வலி), Vānti (வாந்தி), Pittamayakkam (பித்தமயக்கம்)

DOSE - Powder 200 - 500 mg

ILAVAṄKAP PAḌṬAI (Bark) - இலவங்கப் பட்டை

Ilavaṅkappaḍṭai is the dried inner stem bark of coppiced tree of ***Cinnamomum verum*** J.S.Presl Syn. ***C.zeylanicum*** Blume (Fam. Lauraceae), a moderate sized evergreen tree usually attaining a height of 6 to 7.5 m.; cultivated in the Western Ghats and adjoining hills; bark collected during April -July and October -December. It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil	:	Karuvāppaḍḍai (கருவாப்பட்டை), Lavaṅkappaḍḍai (லவங்கப்பட்டை)
Assamese	:	Dalcheni, Dalchini
Bengali	:	Daruchini, Darchini
English	:	Cinnamon bark
Gujrati	:	Dalchini
Hindi	:	Dalchini
Kannada	:	Dalchini Chakke
Kashmiri	:	Dalchini, Dalchin
Malayalam	:	Karuvapatta, Ilavarngathely
Marathi	:	Dalchini
Oriya	:	Dalechini, Guda twak
Punjabi	:	Dalchini, Darchini
Sanskrit	:	Tvak, Darusita
Telugu	:	Lavangapatta, Dalchini chekka
Urdu	:	Darchini

DESCRIPTION

a) Macroscopic

Bark pieces about 0.5 mm. thick, brittle, occurs as single or double, closely packed compound quills, upto a metre or more in length and upto about 1 cm. in diameter; outer surface, dull yellowish-brown, marked with pale wavy longitudinal lines with occasional small scars or holes; inner surface darker in colour, striated with longitudinally elongated reticulations; fracture splintery; odour fragrant; taste sweet, aromatic with sensation of warmth.

b) Microscopic

Transverse section of bark (devoid of cork and cortex) shows except at certain places pericyclic sclerenchyma, 3 or 4 rows of isodiametric cells, sometimes tangentially elongated, inner and radial walls often being thicker than the outer, some containing starch grains; small groups of pericyclic fibres embedded at intervals in the sclerenchyma; phloem of tangential bands of sieve tissue alternating with parenchyma, and containing axially elongated secreting cells containing volatile oil or mucilage; phloem fibres with very thick walls, upto 30 µm in diameter, isolated or in short tangential rows; sieve tubes narrow with transverse sieve plates, collapsed in outer periphery; medullary rays of isodiametric cells, mostly 2 cells wide; cortical parenchyma and medullary rays containing small starch grains mostly below 10 µm in diameter; minute acicular crystals of calcium oxalate present.

Powder:

Dark brown; shows fragments of parenchyma as well as sclerenchyma cells with thicker inner and radial walls; a few pieces of tracheids, fibres; oil globules; numerous small, simple, rounded starch grains measuring 2 to10 µm in diameter; minute acicular crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 3 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 2 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 2 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 3 per cent, Appendix	2.2.7.
Volatile oil	Not less than 1 per cent, v/w Appendix	2.2.10

T.L.C.

T.L.C. of Alcoholic extract on silica gel 'G' plate using Toluene: Ethyl acetate (9:1) under UV light (366 nm) shows four fluorescent zones visible at Rf.0.41(sky blue), 0.63 (sky blue), 0.70 (sky blue) and 0.93 (famthy sky blue). On spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate for five minutes at 105ºC four spots appear at Rf. 0.14, 0.28,0.66 and 0.93 (all violet).

CONSTITUENTS

Cinnacassiol A, B and C, trans-cinnamic acid, protocatechuic acid, cinnamaldehyde and eugenol.

PROPERTIES AND ACTIONS

Cuvai	:	I**ṉ**ippu (இனிப்பு), Kārppu (கார்ப்பு)
Guṇam	:	Ilaku (இலகு), Kūrmai (கூர்மை), Va**ṟ**a**ṭ**ci (வறட்சி)
Vīrium	:	Ta**ṭ**pam (தட்பம்)
Pirivu	:	I**ṉ**ippu (இனிப்பு)

Ceykai : Āṇmaiperukki (ஆண்மைபெருக்கி), Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Kakkuvāṉ Iḷakam (கக்குவான் இளகம்), Tāḷicāti Vaḍakam (தாளிசாதி வடகம்), Tamarakak Kuḍiṉīr (தமரகக் குடிநீர்), Vilvāti Iḷakam (வில்வாதி இளகம்)

THERAPEUTIC USES

Carvaviḍam (சர்வவிடம்), Iraippu (இரைப்பு), Irattakkaḍuppu (இரத்தக்கடுப்பு), Kuṉmam (குன்மம்), Porumal (பொருமல்), Vayiṟṟukkaḍuppu (வயிற்றுக்கடுப்பு)

DOSE - Powder 65 - 260 mg

ILAVAṄKAP PATHTHIRI (Leaf) - இலவங்கப் பத்திரி

Ilavaṅkappaththiri is the dried mature leaves of *Cinnamomum tamala* (Buch.-Ham.) Nees & Eberm. (Fam. Lauraceae), a small evergreen tree upto 7.5 m. high and occurs in tropical, sub-tropical Himalayas between 900 to 2300 m.; often raised from seeds sown in nursery; leaves collected in dry weather from about ten year old plants during October to March.It grows in Kuṟiñci and Marutham thiṇai.

SYNONYMS

Tamil	:	Lavaṅkappattiri (லவங்கப்பத்திரி)
Assamese	:	Tejpat, Mahpat
Bengali	:	Tejpatra, Tejpata
English	:	Indian cinnamon
Gujrati	:	Tamala patra, Develee
Hindi	:	Tejpatra
Kannada	:	Tamalapatra, Dalchini ele
Kashmiri	:	Dalchini pan, Tajpatra
Malayalam	:	Karuvapatta patram
Marathi	:	Tamalpatra
Oriya	:	Tejapatra
Punjabi	:	Tajpater
Sanskrit	:	Tvaka patra, Varanga, Coca
Telugu	:	Akupatri
Urdu	:	Tezpat

DESCRIPTION

a) Macroscopic

Leaves - 12.5 to 20 cm. long, 5 to 7.5 cm. wide at the center, 3 converging nerves from base to apex, young leaves pink; petiole 7.5 to 13 mm. long; margin entire, apex acute or acuminate, both surfaces smooth; stomata paracytic; odour aromatic; taste slightly sweet, mucilaginous and aromatic.

b) Microscopic

Petiole and midrib - Transverse sections of petiole and midrib show epidermis externally covered with cuticle, uniseriate, multicellular trichomes present with 1 to 3 cells; oil cells present as single

or groups; isolated large stone cells, much lignified and showing striations, are found scattered; most of the parenchymatous cells of cortex show reddish-brown contents; pericycle represented by a few layers of sclerenchymatous cells; stele more or less planoconvex as in the midrib of leaf; xylem on upper and phloem on lower side consisting of usual elements, present.

Lamina - Transverse section of lamina shows dorsiventral structure, represented by palisade tissue on upper and spongy parenchyma on lower side; in surface view the anticlinal walls of both the epidermii are straight with striated cuticle containing paracytic stomata on the lower side;below upper epidermis single row of closely packed palisade layer followed by multilayered, irregular, thin-walled cells of spongy parenchyma without intercellular spaces; idioblasts containing oil globules present in mesophyll and also in palisade; lower epidermis covered externally with cuticle; lamina intervened by several small veinlets; vascular bundles covered with thick-walled fibres on both side; palisade ratio 2 to 3; stomatal index 14 to 15 for lower surface; vein-islet number 7 to 11 per square mm.

Powder:

Light green; shows fragments of unicellular, multicellular trichomes, parenchyma cells, epidermal cells with wavy walls and paracytic stomata; oil globules, oil cells and pitted spiral or scalariform vessels.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	5	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	6	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	9	per cent, Appendix	2.2.7.
Volatile oil	Not less than	1	per cent v/w Appendix	2.2.10.

T.L.C.

T.L.C. of Toluene extractive of Alcoholic extract on silica gel 'G' plate using Toluene : Ethyl acetate (9:1) v/v, under UV (366 nm) shows five fluorescent zones visible at Rf. 0.27, 0.31, 0.38, 0.50 and 0.60 (all red).

CONSTITUENTS

β - Caryophyllene, linalool, caryophyllene oxide, d -β- phellandrene, eugenol, α and β - pinene, p- cymene, 3, 4', 5, 7 -tetrahydroxy flavone, 3, 3', 4', 5,7 - O- pentahydroxy flavone, kaempferol - 3-O-glucopyranoside, kaempferol - 3-O-sophoroside, quercetin 3-O-rutinoside.

PROPERTIES AND ACTIONS

Cuvai : Kārppu (கார்ப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை), Maṅkal (மங்கல்)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Veppamuṇḍākki (வெப்பமுண்டாக்கி), Viyarvaiyuṇḍākki (வியர்வையுண்டாக்கி)

IMPORTANT FORMULATIONS

Arakku Tailam (அரக்கு தைலம்), Kaṇattailam (கணத்தைலம்), Makāvallāti Iḷakam (மகாவல்லாதி இளகம்), Tāḷicāti Vaḍakam (தாளிசாதி வடகம்), Tippili Irācāyaṉam (திப்பிலி இராசாயனம்)

THERAPEUTIC USES

Cuvācam/Cuvācakācam (சுவாசம்/சுவாசகாசம்), Irumal (இருமல்), Mēkacuram (மேகசுரம்), Mēkakkaḍḍi (மேகக்கட்டி), Nīrvēḍkai (நீர்வேட்கை), Porumal (பொருமல்), Vānti (வாந்தி), Veḍḍai (வெட்டை)

DOSE - Powder 1- 3 g

IÑCI (Fresh Rhizome) - இஞ்சி

Iñci is the fresh rhizome of ***Zingiber officinale*** Rosc. (Fam. Zingiberaceae), a herbaceous rhizomatous perennial, reaching up to 90 cm. in height, extensively cultivated in India. Rhizomes are dug in January to February, buds and roots are removed and washed well. It grows in Kuṟiñci and Marutham thiṇai.

SYNONYMS

Tamil	:	Ārttarakam (ஆர்த்தரகம்), Allam (அல்லம்), Narumaruppu Matil (நருமருப்பு மதில்)
Bengali	:	Ada
English	:	Ginger
Gujrati	:	Adu
Hindi	:	Adarakha
Kannada	:	Alla, Hasishunti
Malayalam	:	Inchi
Marathi	:	Ardrak, Ale
Punjabi	:	Adi, Adrak
Sanskrit	:	Ardraka, Katubhadra, Srngavera
Telugu	:	Allamu, Allam
Urdu	:	Adrak

DESCRIPTION

a) Macroscopic

Drug occurs as entire rhizome or in pieces, rhizome laterally compressed bearing flattish ovate, oblique branches on upper side, each having a depressed scar at its apex, pieces 5 to 15 cm. long, 1.5 to 6.5 cm. wide (usually 3 to 4 cm.) and 1 to 1.5 cm. thick, fracture short with projecting fibres, transversely cut surface shows a wide central stele having numerous greyish cut ends of fibres and yellow secreting cells; odour characteristic; taste pungent.

b) Microscopic

Rhizome - Shows a few layered, irregularly arranged, tangentially elongated, brown cells of outer cork and 6 to 12 rows of thin-walled, colourless, radially arranged cells of inner cork; secondary cortex consisting of hexagonal to polygonal, isodiametric, thin-walled, parenchymatous cells containing numerous circular to oval starch grains with characteristic striations and hilum at one end measuring 5 to 25 mm in dia., idioblasts containing large yellowish to brownish globules of oleo-resin; walls of oil cells suberised; numerous closed, conjoint, collateral, cortical fibro-vascular

bundles scattered throughout cortical zone, greater number occurring in inner cortical region, larger bundles consists of 2 to 7 vessels, small cells of sieve tube, polygonal cells of parenchyma and group of fibres; vessels showing reticulate, scalariform and spiral thickening; fibres septate with a few oblique pores on their walls; endodermis single layered, free from starch; pericycle single layered enclosing central stele; stele consisting of thin-walled polygonal, isodiametric cells of parenchyma, filled with abundant starch grains, oleo-resin cells similar to those present in cortex; fibrovascular bundles of two types, those arranged along pericycle in a definite ring are smaller in size and devoid of fibres, vessels 2 to 5 in number, larger bundles found scattered throughout stele, composed of xylem, phloem, parenchyma and sheath of sclerenchyma.

Powder:

Light yellow; shows thin-walled parenchyma cells; septate fibres with oblique, elongated pits on their walls, reticulate and spiral vessels; oleo-resin cells abundant; single starch grains of varying shapes with eccentric hilum, measuring 5 to 25 mm in diameter.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	0.5	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	5	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	2	per cent, Appendix	2.2.7.
Moisture content	Not more than	90	percent, Appendix	2.2.9.

T.L.C.

T.L.C. of Alcoholic extract of drug on silica gel 'G' plate using Benzene: Ethyl acetate (9:1) shows in visible light four spots are seen at Rf. 0.16, 0.35, 0.63 & 0.69 (all light yellow). Under UV (366 nm), three fluorescent zones appear at Rf. 0.16(blue), 0.63(grey) & 0.69 (grey). On exposure to iodine vapours eleven spots appear at Rf. 0.03, 0.08, 0.13, 0.16, 0.35, 0.47, 0.63, 0.69, 0.76, 0.83 & 0.92 (all yellow). On spraying with Vanillin- Sulphuric acid reagent & heating the plate at 105ºC until the colour develops, the plate shows eight spots at Rf. 0.08(violet), 0.16 (brownish violet), 0.35 (light violet), 0.47 (light violet). 0.63 (light violet), 0.69 (light violet), 0.76 (violet) and 0.92 (violet).

CONSTITUENTS

Volatile oil containing cineole, zingiberol, zingiberene, bisabolene and phellandrene, gingerdione, dihydrogingerol, dexahydrocurcumin and desmethyl - hexahydrocurcumin, dehydrogingerdione.

PROPERTIES AND ACTIONS

Cuvai : Kārppu (கார்ப்பு)

Guṇam : Kūrmai (கூர்மை), Tiṇmai (திண்மை), Va̲ṛaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Ceripuṇḍākki (செரிப்புண்டாக்கி), Kāyakaṟpamākki (காயகற்பமாக்கி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Umiẕnīrperukki (உமிழ்நீர்பெருக்கி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Iñci Cūraṇam (இஞ்சி சூரணம்), Iñci Iracāyaṉam (இஞ்சி இரசாயனம்), Iñci Vaḍakam (இஞ்சி வடகம்), Kantaka Paṟpam (கந்தக பற்பம்), Kanti Meẕuku (கந்தி மெழுகு), Kummaḍḍik Kuẕampu (கும்மட்டிக் குழம்பு), Nārathtai Iḷakam (நாரத்தை இளகம்), Pāvaṉakkaḍukkāy (பாவனக்கடுக்காய்), Pirammāṉanta Pairavam (பிரம்மானந்த பைரவம்), Vacanta Kucumākaram (வசந்த குசுமாகரம்)

THERAPEUTIC USES

Caṉṉi (சன்னி), Ceriyākkaẕiccal (செரியாக்கழிச்சல்), Ceriyāmai (செரியாமை), Irumal (இருமல்), Mukkuṟṟanōy (முக்குற்றநோய்), Vali Nōy (வலி நோய்), Aẕal Nōy (அழல் நோய்)

DOSE - 2 - 3 ml of juice with honey.

KACAKACĀ (Seed) - கசகசா

Kacakacā is the seed of ***Papaver somniferum*** L. (Fam. Papaveraceae), a glaucous, erect, annual herb, 60 to 120 cm. high, cultivated under State control in certain areas of Rajasthan, Madhya Pradesh and Uttar Pradesh. It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil	:	Apiṉi (அபினி), Pōsttakkāy (போஸ்த்தக்காய்)
Bengali	:	Aaphim postadaanaa, Postabeej
English	:	Opium, Poppy seeds
Gujrati	:	Khaskhas
Hindi	:	Apheem, Postadaanaa, Khaskhas, Khasabija
Kannada	:	Gasgase, Aapheen, Aphini
Malayalam	:	Avil, Karappu, Kashkash, Aalan
Marathi	:	Khaskhas
Oriya	:	Aapu
Sanskrit	:	Ajasrngi, Madhunasini, Khaskhasa
Telugu	:	Gasgashaalu, Nallamandu
Urdu	:	Apheem

DESCRIPTION

a) Macroscopic

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

b) Microscopic

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

rarely 3, cotyledonary leaves, embedded in the oily endosperm; contents of the cotyledon are similar to those of endosperm.

Powder:

Light brown; coarse, not free flowing, clot or ball forming; shows large fatty oil droplets, characteristic penta to hexagonal testa cells; endosperm and reticulate layer cells; cells containing characteristic crystal and fibres.

IDENTITY, PURITY AND STRENGTH

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

T.L.C.

T.L.C. of Hexane extract on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm thickness using Toluene: Acetone (93:07) shows five spots at Rf. 0.25, 0.39, 0.50, 0.76 and 0.83, on spraying with Vanillin -Sulphuric acid reagent and heating the plate for five minutes at 105ºC.

CONSTITUENTS

Morphine, codeine, thebaine, narcotine, narceine, papaverine; 6-Acetonyl dihydrosanguinarine, cryptopine, allocryptopine, ß-allocryptopine, berberine, canadine, codamine, codeine, codeine-N-oxide, codeinone, captisine, coreximine, corytuberine, dihydroprotopine, dihydrosanguinarine, glaudine, gnoscopine, hydrocotamine, 10-hydroxycodeine, lanthopine, laudanine, laudanidine, laudanosine, magnoflorine, 6-methylcodeine, N-methyl-14-O-demethylepiporphyroxine, morphine-N-oxide, narceine imide, narcotoline, neopine, normorphine, nornarceine, norsanguinarine, orientaline, oripavine, 13-oxocryptopine, oxysanguinarine, palaudine, papaveraldine, papaveramine, papaverrubines C and D, protopine, pseudomorphine, reticuline, salutaridine, sanguinarine, scoulerine, stepholidine, thebaine-N-oxide, tetrahydropapaverine, narcotine-methohydroxide, choline, oxydimorphine, pacodine,1-pentanol, 1-hexanal,1- hexanol, 2-pentyl furan, fatty acids, amino acids, albumin, pectin and sugars.

PROPERTIES AND ACTIONS

Cuvai	:	I**ṉ**ippu (இனிப்பு)
Guṇam	:	Tiṉmai (திண்மை)
Vī**rium**	:	Veppam (வெப்பம்)
Pirivu	:	I**ṉ**ippu (இனிப்பு)

Ceykai : Amaitiyūṭṭi (அமைதியூட்டி), Tuvarppi (துவர்ப்பி), Uḷḷaẕalāṟṟi (உள்ளழலாற்றி), Uḍaluramākki (உடலுரமாக்கி)

IMPORTANT FORMULATIONS

Mēkaviraṇak Kaḷimpu (மேகவிரணக் களிம்பு), Nanthi Meẕuku (நந்தி மெழுகு)

THERAPEUTIC USES

Āṇmaikkuṟaivu (ஆண்மைக்குறைவு), Cītakkaẕiccal (சீதக்கழிச்சல்), Kurutikkaẕiccal (குருதிக்கழிச்சல்), Kuḍaṟpuẕu (குடற்புழு), Talaikkaṇam (தலைக்கனம்), Tiṇavu (தினவு), Tūkkamiṇmai (தூக்கமின்மை), Uḍal Nalivu (உடல் நலிவு)

DOSE - Powder 3 - 5 g

10 ml kacakaca milk.

15 g seeds ground with 15 ml of water for preparing kacakaca milk.

KĀKKAṆA VĒR (Root) - காக்கண வேர்

Kākkaṇavēr is the dried root of *Clitoria ternatea* L. (Fam. Fabaceae), a perennial climber with slender downy stem, found commonly throughout India, being cultivated in gardens every where and often also found growing over hedges and thickets. It grows in Marutham thiṇai.

SYNONYMS

Tamil	:	Caṅku Puṣpam (சங்கு புஷ்பம்), Kākkaḍḍāṉ (காக்கட்டான்)
Assamese	:	Aparajita
Bengali	:	Aparajita
English	:	Clitoria, Conch flower
Gujrati	:	Gokarni
Hindi	:	Aparajita
Kannada	:	Girikarnika Balli, Girikarnika
Malayalam	:	Shankhapushapam
Marathi	:	Gokarna, Aparajita
Oriya	:	Aparajita
Punjabi	:	Koyal
Sanskrit	:	Aparajita, Girikarnika, Visnukranta
Telugu	:	Dintena

DESCRIPTION

a) Macroscopic

Drug consisting of a stout tap root with a few tortuous branches, cylindrical, 1 to 5 m. in thickness, a few places show cracks due to presence of lenticels, colour light-brown; fracture fibrous; taste bitter.

b) Microscopic

Root - Shows 10 to 20 or more layers of rectangular, thin-walled, tangentially elongated exfoliating cork cells; secondary cortex consists of 10 to 12 rows of large, polygonal, thin-walled cells filled with starch grains; a few cells contain prismatic crystals of calcium oxalate in this region; single or groups of 2 to 10 lignified cortical fibres, distributed in the lower half of the cortex; secondary phloem consists of usual elements; phloem fibres 2 to 8 in groups, a few solitary fibres also present, very long, thin-walled with narrow lumen and pointed tips; secondary xylem consists of usual elements; vessels mostly occur 2 or 3 in groups, with oblong bordered pits and have short conical tail at one end, xylem fibres similar to those of phloem fibres, a few showing slit-like pits; medullary rays 1 to 5 cells wide, oblong and pitted; xylem parenchyma irregular in shape with

pitted walls; starch grains simple as well as compound having 2 to 6 components, single grains measuring upto 13 mm in dia., found in secondary cortex, phloem and xylem parenchyma.

Powder:

Yellowish-brown; shows simple and compound starch grains, measuring 3 to 13 mm in dia., tailed vessels with oblong bordered pits and fragments of fibres.

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 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 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 Chloroform: Ethyl acetate: Formic Acid (5:4:1) v/v shows one spot at Rf. 0.79 (dull yellow) in visible light. Under UV (366 nm) a spot is seen at Rf. 0.79(blue). On exposure to iodine vapours two spots appear at Rf. 0.54 and 0.79 (both yellow). On spraying with 10 % aqueous solution of Ferric chloride, the plate shows one spot at Rf. 0.79 (grey).

CONSTITUENTS

Kaempferol, cyanins- ternatins A1, A2, B1, B2, D1 and D2, taraxerol.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை), Va̲ṛaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ci̲ṛunīrperukki (சிறுநீர்பெருக்கி), Peruṅka̲ziccaluṇḍākki (பெருங்கழிச்சலுண்டாக்கி), U̲ḷḷa̲zalā̲ṛṛi (உள்ளழலாற்றி)

IMPORTANT FORMULATIONS

Kākkaṇa Māttirai (காக்கண மாத்திரை)

THERAPEUTIC USES

Curam/Kāyccal (சுரம்/காய்ச்சல்), Kaṇ Nōy (கண் நோய்), Kuḍa̲rpuz̲u (குடற்புழு), Māntam (மாந்தம்), Veḷḷai (வெள்ளை)

DOSE - Powder 250 - 500 mg for children

750 mg - 1.5 g for adults.

KAÑCĀ (Leaf) - கஞ்சா

Kañcā is the dried leaf of ***Cannabis sativa*** L. (Fam. Cannabinaceae), an annual, erect, dioecious herb, upto 2 m. high, found wild almost throughout the year, in the Sub-Himalayan tracts in India and abundantly found in waste lands from Punjab eastwards to Bengal and extending Southwards. The leaves are subjected to purification process (cutti) before use. It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil : Aṉanta Mūli (அனந்த மூலி), Civa Mūli (சிவ மூலி), Kōrakai (கோரகை), Kōrakkar Mūli (கோரக்கர் மூலி), Paṅki (பங்கி)

Assamese : Bhan, Bhang

Bengali : Bhang, Sidhi

English : Indian hemp

Gujrati : Bhang

Hindi : Bhaang, Bhanga

Kannada : Bhangigida, Ganjagida

Kashmiri : Pang, Bangi

Malayalam : Kanchavu

Marathi : Bhang, Ganja

Oriya : Bhanga, Ganjei

Punjabi : Bhang

Sanskrit : Vijaya, Bhanga, Madani

Telugu : Ganjayi

Urdu : Qinaab, Bhang

DESCRIPTION

a) Macroscopic

Leaves palmately compound, leaflets linear, lanceolate with serrate margins, 5 to 20 cm. long, pointed, narrow at base, upper surface dark green and rough, lower pale, downy; leaves of female plants longer than the male; odour strong and characteristic; taste slightly acrid.

b) Microscopic

Transverse section of leaves and bracts shows dorsiventral surface; upper epidermis with unicellular, pointed, curved, conical trichomes with enlarged bases containing cystoliths of calcium

carbonate; mesophyll contains cluster crystals of calcium oxalate in many cells consisting of usually one layer of palisade cell and spongy tissue; trichomes on lower epidermis conical, longer, 340 to 500 µm but without cystoliths; numerous glandular trichomes, sessile or with a multicellular stalk and a head of about eight radiating, club-shaped cells secreting oleo-resin, present in the lower epidermis especially on mid-rib; bracteoles with undifferentiated mesophyll and on lower surface bear numerous glandular trichomes; in surface view the upper epidermis devoid of stomata and lower epidermis shows sinuous walls with anomocytic stomata: palisade ratio 9 to 14; stomatal index 13 to 20 for lower surface; vein-islet number 22 to 28 per square mm.

Powder:

Green; shows fragments of epidermal cells with anomocytic stomata, numerous multicellular trichomes with or without cystolith; palisade cells, parenchyma cells with cluster crystals of calcium oxalate and fragments of vessels with spiral thickenings.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	15	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	10	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	13	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of Toluene soluble fraction of methanol extract on silical gel 'G' plate using n-Hexane: Diethyl ether (8:2) v/v, shows under UV (366 nm) one blue fluorescent spot at Rf. 0.14. On spraying with fast blue salt 'B' followed by 5% Alcoholic Potassium hydroxide five spots appear at Rf. 0.21, 0.31, 0.38, 0.43 and 0.51 (all red).

CONSTITUENTS

Cannabinol, tetrahydrocannabinol, cannabidiol, cannabichrome, cannabicitran, cannabicyclol, cannabigerol, cannabiglendol, cannabiallsvin, cannabitatrol, cannabinodiol, cannabicumaronone, flavocannobicide, flavosativaside, orientin, vitexin, quercetin, kaempferol. Essential oil-á pinene, myrcene, trans-ß-ocimene á-terpinolene, trans caryophyllene and á-humulene.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ciṟunīrperukki (சிறுநீர்பெருக்கி), Icivakaṟṟi (இசிவகற்றி), Kāyakaṟpamākki (காயகற்பமாக்கி), Kāmamperukki (காமம்பெருக்கி), Mūrccaiyuṇṭākki

(மூர்ச்சையுண்டாக்கி), Peruvaliyuṇḍākki (பெருவலியுண்டாக்கி), Tuyaraḍakki (துயரடக்கி), Uṟakkameẕuppi (உறக்கமெழுப்பி), Uṟakkamuṇḍākki (உறக்கமுண்டாக்கி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Kapāḍa Mātthirai (கபாட மாத்திரை), Ūẕi Māttirai (ஊழி மாத்திரை), Vāẕaippu Vaḍakam (வாழைப்பு வடகம்)

THERAPEUTIC USES

Kakkirumal/Kakkuvāṉ Irumal (கக்கிருமல்/கக்குவான் இருமல்), Mikupaci (மிகுபசி), Narampu Vali (நரம்பு வலி), Oṟṟaittalaivali (ஒற்றைத்தலைவலி), Perumpāḍu (பெரும்பாடு), Vānti Pēti (வாந்தி பேதி)

DOSE - It cannot be administered as a single drug It should be used in combination.

KAṆḌAṄKATHTHIRI CAMŪLAM (Whole Plant) - கண்டங்கத்திரி சமூலம்

Kaṇḍaṅkaththiri Camūlam is the mature, dried whole plant of ***Solanum surattense*** Burm.f., Syn. ***Solanum xanthocarpum*** Schrad. & Wendl. S. ***virginianum*** L. (Fam. Solanaceae), a perennial, very prickly diffused herb of waste lands; found throughout India. It grows in Marutham thiṇai.

SYNONYMS

Tamil	:	Kaṇḍaṅkattiri (கண்டங்கத்திரி)
Assamese	:	Kantakar, Katvaedana
Bengali	:	Kantakari
English	:	Febrifuge plant
Gujrati	:	Bharingani
Hindi	:	Bhatakataiya, Chhotikateri, Katai, Katali, Ringani
Kannada	:	Kiragulla, Nelagulla
Malayalam	:	Kantakari chunda
Marathi	:	Bhauringani, Kataringani
Oriya	:	Ankarati, Bhejibaugna, Chakada Bhoji
Punjabi	:	Kandiari
Sanskrit	:	Dhavani, Kantakari, Kantakarika, Ksudra, Nidigdhika, Vyaghri, Nidigdha, Dusparsa
Telugu	:	Chinnamulaka, Mulaka, Nelamulaka, Pinnamulaka, Vakudu

DESCRIPTION

a) Macroscopic

Root - 10 to 45 cm. long, few mm. to two cm. in diameter, almost cylindrical and tapering, bearing a number of fine longitudinal and few transverse wrinkles with occasional scars or a few lenticels and small rootlets, transversely smoothened surface shows a thin bark and wide compact cylinder of wood; fracture short; taste bitter.

Stem - Herbaceous, prickly with prominent nodes and internodes, green when fresh, young branches covered with numerous hairs, mature ones glabrous, furrows more prominent in young stem appearing almost circular towards basal region, stem pieces 8 to 10 mm. thick of variable length; external surface light green, when dry, surface yellowish green and smooth; transversely smoothened surface shows a very thin bark and a prominent wood; center shows a large and distinct pith; mature and dry stem often with a hollow pith; fracture short to slightly fibrous.

Leaf - Petiolate, exstipulate, ovate-oblong or elliptic, sinuate or sub-pinnatifid, sub-acute hairy; 4 to 12.5 cm. long and 2 to 7.5 cm. wide; green; veins and midrib full with sharp prickles; odour and taste not distinct.

Flower - Ebracteate, pedicellate, bisexual, pentamerous, regular, complete, bright blue or bluish purple; calyx-persistent, gamosepalous, tube short, globose, linear-lanceolate, acute, hairy, 0.5 to 1.3 cm. long and densely prickly; corolla-gamopetalous, lobes deltoid, acute, hairy; 1 to 2 cm. long and purple in colour; stamens 5, epipetalous, basifixed, filament short 1 to 1.5 mm. long; anther, oblong lanceolate, 0.7 to 0.8 cm. long; ovary superior, ovoid, glabrous, bilocular with axile placentation having numerous ovules.

Fruit - Berry, globular, measuring 0.8 to 1 cm. in diameter, surrounded by persistent calyx at base; unripe fruits variegated with green and white strips; ripe fruit shows yellow and white shades.

Seeds - Circular, flat, numerous, embedded in a fleshy mesocarp, about 0.2 cm. in diameter, glabrous; taste bitter and acrid.

b) Microscopic

Root - Transverse section of mature root shows cork composing of 3 to 6 layers of thin-walled, rectangular and tangentially elongated cells; cork cambium single layered followed by 6 to 15 layers of thin-walled, tangentially elongated to oval or circular parenchymatous cells; stone cells either single or in groups of 2 to 20 or even more present in this region; secondary phloem composed of sieve elements and phloem parenchyma traversed by medullary rays; stone cells present in singles or in groups of 2 to 20 or more in outer, and middle phloem regions; phloem rays 1 to 4 cells wide and 2 to 22 cells high; cambium 3 to 5 layers of thin-walled rectangular cells; xylem composed of vessels, tracheids, fibre tracheids, parenchyma and traversed by medullary rays, all elements being lignified; vessels and tracheids with bordered pits; fibres with a few simple pits; xylem parenchyma rectangular or slightly elongated with simple pits and rarely with reticulate thickening; xylem rays 1 to 3 cells wide and 1 to 20 cells high; microsphenoidal crystals of calcium oxalate as sandy masses and simple starch grains present in secondary cortex, phloem and medullary rays.

Stem - Transverse section of mature stem, 1.5 to 2 cm. thick consists of 6 to 12 layers of cork of thin-walled somewhat rectangular cells; secondary cortex consists of 7 to 11 layers of parenchymatous cells, some cells thickened and lignified forming stone cells; primary cortex remains intact even in quite mature stage but later gets crushed; pericyclic fibre, occur singly or in small groups of 2 or 3; secondary phloem consists of sieve elements, parenchyma, a few fibres, stone cells and traversed by phloem rays; fibres found scattered in singles or in small groups in outer and middle phloem region; inner phloem devoid of fibres; stone cells present in singles or in small groups of 2 to 4; phloem rays, 1 or 2 or rarely 3 cells wide, cambium composed of 2 or 3 layers; xylem consists of vessels, tracheids, parenchyma, fibres and traversed by xylem rays; vessels vary greatly in shape and size and show bordered pits; tracheids elongated with irregular walls and bordered pits; fibres much elongated, thick-walled and lignified with tapering and pointed ends, some having truncated ends or bifurcated at one or both ends with a few simple pits; tracheids fibres smaller than fibres, with both ends tapering and have reticulate thickening; xylem parenchyma cubical to rectangular with simple or bordered pits or reticulate thickening; xylem rays conspicuous by their pitted thickenings, longer size and radial elongation of cells, 1 or 2 or rarely 3 cells wide and 2 to 25 cells high; internal phloem composed of sieve elements and parenchyma, forming more or less continuous band and embedded in perimedullary zone; a few phloem fibres similar to those of outer phloem region also present; central region occupied by a large pith;

microsphenoidal crystals of calcium oxalate as sandy masses and simple starch grains present in cortex, secondary cortex, phloem, medullary rays and pith cells.

Leaf

Petiole - Transverse section of petiole shows circular to wavy outlines; epidermis single layered, covered externally by a thick cuticle; hypodermis consists of 3 or 4 layers of collenchymatous cells; one largecresent-shaped, bicollateral, central vascular bundle and two small lateral bundles present; rest of tissue of petiole composed of polygonal, angular, thin-walled, parenchymatous cells; epidermis shows mostly stellate and rarely uni to tricellular hairs.

Midrib - Transverse section of midrib shows a biconvex structure; epidermis on either side covered externally by a thick cuticle; below epidermis 3 or 4 layers of collenchyma present; stele composed of crescent-shaped, bicollateral, central vascular bundle and two small lateral vascular bundles; rest of tissue composed of thin-walled, parenchyma, some stellate hair present on epidermis.

Lamina - Transverse section shows dorsiventral structure; epidermis on either side, wavy in outline, covered externally by a thick cuticle; palisade single layered; 4 to 6 layers of loosely arranged spongy parenchyma present; some stellate hairs (4 to 8 armed) present on both sides of epidermis; anisocytic stomata present on both surfaces; palisade ratio 2 to 4; stomatal index 20 to 25 on lower epidermis, 14 to 24 on upper epidermis; vein-islet number 50 to 80 per square mm.

Fruit - Transverse section of mature fruit shows single layered epidermis, covered externally by a thin cuticle; 1 or 2 layers of collenchyma present below epidermis; mesocarp composed of thin-walled, oval to polygonal cells; some fibro vascular bundles present, scattered; seed consists of thick-walled radially elongated testa, narrow endosperm with embryo; some cells of endosperm contain oil globules.

Powder:

Greenish; shows single or groups of stone cells; groups of aseptate fibres with tapering ends, pitted vessels; groups of spongy parenchyma, fragments of palisade tissue; anisocytic stomata; stellate hairs and simple, rounded to oval starch grains measuring upto 11 μm in diameter.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	9	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	3	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	16	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of Chloroform extractive of Alcoholic extract on silica gel 'G' plate using Chloroform: Methanol (9:1), on spraying with Anisaldehyde -Sulphuric acid reagent and heating the plate for five minutes at 105°C minutes ten spots appear at 0.28 (violet), 0.34 (violet), 0.49

(violet), 0.55 (violet), 0.58 (violet), 0.78(violet), 0.84, 0.88, 0.92 (all pinkish violet) and 0.96 (violet).

CONSTITUENTS

Solasodine, solamargine, β- solamargine, solasonine, cycloartenol, neocarpesterol, cholesterol and their derivatives.

PROPERTIES AND ACTIONS

Cuvai : Kārppu (கார்ப்பு)

Guṇam : Ilaku (இலகு), Va̲ṛaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvaka̲ṛṛi (அகட்டுவாய்வகற்றி), Ci̲runīrperukki (சிறுநீர்பெருக்கி), Kōz̲aiyaka̲ṛṛi (கோழையகற்றி), Peruṅkaz̲iccaluṇḍākki (பெருங்கழிச்சலுண்டாக்கி)

IMPORTANT FORMULATIONS

Vātacurak Kuḍinīr (வாதசுரக் குடிநீர்)

THERAPEUTIC USES

Curam/Kāyccal (சுரம்/காய்ச்சல்), Iḷaippu Nōy (இளைப்பு நோய்), Irumal (இருமல்), Nīrkōvai (நீர்கோவை), Pacittīkku̲raivu (பசித்தீக்குறைவு), Iraippu (இரைப்பு)

DOSE - Powder 2 - 4 g

Juice 5 - 10 ml

Decoction 30- 50 ml twice daily.

15 - 30 g coarse powder in 200 ml of water for preparing decoction.

KĀRPŌKARICI (Fruit) - கார்போகரிசி

Kārpōkarici is the dried fruit of ***Psoralea corylifolia*** L. (Fam. Fabaceae), an erect, 0.3 to 1.8 m. high annual herb distributed throughout India, found commonly in Uttar Pradesh, Bengal and Maharashtra.It grows in Marutham thiṇai.

SYNONYMS

Tamil	:	Akkantam (அக்கந்தம்), Pākuci (பாகுசி)
Assamese	:	Habucha
Bengali	:	Bakuchi, Somraji, Fiakucha Veeja
Gujrati	:	Bavachi
Hindi	:	Bakuchi, Bavachi, Babchi
Kannada	:	Bauchige, Bhavantibeeja, Bhavanchigid, Baukuchi
Kashmiri	:	Babchi
Malayalam	:	Karkokil
Marathi	:	Bawchi
Oriya	:	Bakuchi
Punjabi	:	Babchi, Bavchi
Sanskrit	:	Bakuci, Avalguja, Somaraji
Telugu	:	Bavanchalu
Urdu	:	Babchi

DESCRIPTION

a) Macroscopic

Fruits dark chocolate to almost black with pericarp adhering to the seed-coat, 3 to 4.5 mm. long, 2 to 3 mm. broad, ovoid-oblong or bean shaped, somewhat compressed, glabrous rounded or mucronate, closely pitted; seeds camphylotropous, non-endospermous, oily and free from starch; odourless, but when chewed smell of a pungent essential oil felt; taste bitter, unpleasant and acrid.

b) Microscopic

Transverse section of fruit shows pericarp with prominent ridges and depressions, consisting of collapsed parenchyma and large secretory glands containing oleo-resinous matter; testa, an outer layer of palisade epidermis, layer of bearer cells which are much thickened in the inner tangential and basal radial walls and 2 or 3 layers of parenchyma; cotyledons of polyhedral parenchyma and three layers of palisade cells on the adaxial side.

Powder:

Dark brown, oily; shows fragments of parenchyma cells containing oil globules and aleurone grains; palisade-like cells of testa; epidermal cells with brown contents, bearer cells of hypodermis and fragments of oil cells.

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	13	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	11	per cent, Appendix	2.2.7.

ASSAY

TLC densitometric estimation of psoralen.

TLC plates

Aluminium plate precoated with silica gel 60 F_{254} plates (E. Merck) 0.2 mm thickness.

Solvent system

Toluene: Ethyl acetate (7: 3).

Test solution

2.0 g of powdered drug is macerated in 75 ml methanol on a boiling water bath for 10 to 15 min., cooled and filtered. The process is repeated thrice. The filtered extracts are pooled and evaporated to dryness. The residue is dissolved in 100 ml methanol.

Standard solution

12.5 mg of standard, psoralen is dissolved in 25 ml of methanol in a volumetric flask. From this stock solution, standard solutions of 50 to 250 µg/ml concentration are prepared by taking aliquots (1.0 to 5.0 ml) of stock solution in 10 ml volumetric flasks and adjusting the volume to 10 ml with methanol.

Calibration curve

5 µl each of the standard solution (250 to 1250 ng per spot) is applied on TLC plate. The plate is developed in the solvent system to a distance of 8 cm. The plate is scanned under UV light at 366 nm. The area under the curves are recorded and plotted to get the calibration curve for psoralen.

Estimation of psoralen in the drug

5 µl of the test solution is applied on TLC plate. The plate is developed in the solvent system and recorded the chromatogram as described above for the calibration curve. The amount of psoralen present in the sample is calculated from the calibration curve of psoralen.

The percentage of psoralen ranges from 0.70 to 0.76 in the samples analyzed.

T.L.C.

T.L.C. of the Alcoholic extract on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm thickness using Toluene: Ethyl acetate (9:1) shows ten spots under UV light (366 nm) at Rf. 0.08 (blue), 0.12 (black), 0.15 (yellow), 0.24 (sky blue), 0.26 (blue), 0.29 (yellow), 0.35 (sky blue), 0.47 (blue), 0.55 (blue) and 0.62 (blue). On exposure to iodine vapours seven spots appear at Rf. 0.08, 0.12, 0.15, 0.24, 0.31, 0.41 and 0.62 (all yellow). With Anisaldehyde -Sulphuric acid reagent and heating the plate for five minutes at 105ºC eight spots appear at Rf. 0.12, (blue), 0.15 (yellow), 0.19 (blue), 0.24 (blue), 0.41 (violet), 0.44 (violet), 0.62(blue) and 0.72 (pink).

CONSTITUENTS

Psoralen, psoralidin, isopsoralen, bakuchiol, angelicin, neobavaisoflavone, bavachin, 4'-0-methyl bavachalcone, isobavachalcone, corylin, corylinal, bakuchicin, β- sitosterol, stigmasterol, fatty acids, behanic, palmitic, stearic, oleic, lignoceric, linoleic, linolenic, essential oil and fixed oil.

PROPERTIES AND ACTIONS

Cuvai	:	Kaippu (கைப்பு)
Guṇam	:	Vaṟaḍci (வறட்சி)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)
Ceykai	:	Malamiḷakki (மலமிளக்கி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Iracakanthi Meẕuku (இரசகந்தி மெழுகு), Karappāṉ Tailam (கரப்பான் தைலம்), Makāvallāti Iḷakam (மகாவல்லாதி இளகம்), Mānta Eṇṇai Eṇ2 (மாந்த எண்ணை எண்2), Mēkaviraṇak Kaḷimpu (மேகவிரணக் களிம்பு)

THERAPEUTIC USES

Karappāṉ (கரப்பான்), Namaiccal (நமைச்சல்), Nañcu (நஞ்சு), Veṇ Paḍai (வெண் படை), Puṇ (புண்)

DOSE - Powder 1 - 2 g

KARUÑCEMPAI ILAI (Leaf) - கருஞ்செம்பை இலை

Karuñcempai Ilai is the dried leaf of ***Sesbania sesban*** (L.) Merr., Syn. ***S. aegyptiaca*** (Poir) Pers. (Fam: Fabaceae), a quick growing, short lived tall shrub, upto 6 m. high; found cultivated on paddy field bunds in Tamil Nadu as well as throughout the plains of India upto an altitude of 1200 m. It grows in Kuṟiñci and Marutham thiṇai.

SYNONYMS

Tamil	:	Karuñciṟṟakatti (கருஞ்சிற்றகத்தி)
Bengali	:	Jayanti
Gujrati	:	Rajashinganee, Jayanti
Hindi	:	Jaita, Jayata
Kannada	:	Arinintajinamgi, Karijimangai, Arishimajingai
Malayalam	:	Semp, Atti, Itthikkanni
Marathi	:	Jait
Oriya	:	Jayantipatra
Punjabi	:	Jainta
Sanskrit	:	Jayanti, Jaya, Suksma patra
Telugu	:	Sominta, Jalugu, Nelichettu

DESCRIPTION

a) Macroscopic

Leaves pinnately compound, 7.5 to 15.5 cm. long, rachis shortly produced above last pair of leaflet; paripinnate, leaflets 6 to 16 pairs, opposite, linear, oblong, glabrous, entire, mucronate to acuminate, very shortly stalked, 1.0 to 3.3 cm. long, 0.3 to 0.8 cm. wide.

b) Microscopic

Leaflet

Rachis - Shows single layered epidermis, followed by 2 or 3 layered collenchymatous and 4 to 7 layered round, thin-walled parenchymatous cells; vascular bundles arranged in a ring, having secretory cavities in phloem, each bundle covered externally by sclerenchymatous sheath; one smaller vascular bundle present in each of the wings; pith small, consisting of thin-walled, polygonal, parenchymatous cells.

Lamina - Shows single layered epidermis on both surfaces, stomata anisocytic, present on both surfaces, palisade single layered, spongy parenchyma consisting of round cells, small veins situated

between palisade and spongy parenchyma cells, palisade ratio 3 to 5; stomatal index on upper surface 11 to 20 and on lower surface 11 to 25 and vein- islet number 27 to 36 per square mm.

Powder:

Dull green; shows spongy parenchyma, palisade cells; xylem vessels with scalariform thickening and fragments of epidermal cells with anisocytic stomata.

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	2 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	7 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	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: Ethyl acetate (9:1) shows under UV (366 nm) shows six fluorescent zones at Rf. 0.05, 0.11 0.19, 0.29, 0.56 (all pink) and 0.97 (yellow). On exposure to iodine vapours ten spots appear at Rf. 0.05, 0.11, 0.19, 0.29, 0.37, 0.48, 0.56, 0.69, 0.91 and 0.97 (all yellow). On spraying with 5 % Methanolic-Phosphomolybdic acid reagent and heating the plate at 105ºC until the colour develops , the plate shows nine spots at Rf. 0.05, 0.11, 0.19, 0.29, 0.37, 0.48, 0.56, 0.91 and 0.97(all grey).

CONSTITUENTS

Stigmasterolglucoside, chikusetsusaponin, ilexoside, lablaboside A, kaikasaponin, kaempferol glucoside and oleanolic acid.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Ilaku (இலகு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ciṟunīrperukki (சிறுநீர்பெருக்கி), Puzukkolli (புழுக்கொல்லி), Rutuvuṇḍākki (ருதுவுண்டாக்கி), Tuvarppi (துவர்ப்பி), Veppamuṇḍākki (வெப்பமுண்டாக்கி), Vīkkaṅkaraicci (வீக்கங்கரைச்சி)

IMPORTANT FORMULATIONS

Cempu Paṟpam (செம்பு பற்பம்)

THERAPEUTIC USES

Aiya Nōykaḷ (ஐய நோய்கள்), Irumal (இருமல்), Perumpāḍu (பெரும்பாடு)

DOSE - Powder 3 - 6 g

Juice 5 - 10 ml

KARUÑCĪRAKAM (Seed) - கருஞ்சீரகம்

Karuñcīrakam is the dried seed of ***Nigella sativa*** L. (Fam. Ranunculaceae), a small herb, 45 to 60 cm. high; cultivated mostly in Punjab, Himachal Pradesh, Bihar and Assam. It grows in Mullai thiṇai.

SYNONYMS

Tamil	:	Āraṇam (ஆரணம்), Upakuñcikai (உபகுஞ்சிகை)
Bengali	:	Mota Kalajira, Kalajira
English	:	Small fennel, Nigella seed
Gujrati	:	Kalonji jeeru, Kalounji
Hindi	:	Kalaunji, Mangaraila
Kannada	:	Karijirige
Malayalam	:	Karinjirakam
Marathi	:	Kalaunji jire, Kalejire
Punjabi	:	Kalvanji
Sanskrit	:	Upakuncika, Sthulajiraka, Susavi
Telugu	:	Peddajila karra
Urdu	:	Kalongi

DESCRIPTION

a) Macroscopic

Seeds, flattened, oblong, angular, rugulose, tubercular, about 0.2 cm. long and 0.1 cm. wide, black; odour slightly aromatic; taste bitter.

b) Microscopic

Transverse section of seed shows single layer of epidermis consisting of elliptical, thick-walled cells covered externally by a papillose cuticle, filled with reddish-brown contents; epidermis followed by 2 to 4 layers of thick-walled, tangentially elongated, parenchymatous cells, followed by a pigmented layer composed of tangentially elongated, cylindrical thick-walled cells filled with reddish-brown pigments; below pigmented layer, a layer of parenchyma composed of thick-walled rectangular, radially elongated cells present; endosperm consists of moderately thick-walled, rectangular to polygonal cells; a few filled with oil globules; embryo embedded in endosperm.

Powder:

Black, oily to touch; shows groups of parenchyma, 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	6	per cent,	Appendix	2.2.3.
Acid-insoluble ash	Not more than	0.2	per cent,	Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	20	per cent,	Appendix	2.2.6.
Water-soluble extractive	Not less than	15	per cent,	Appendix	2.2.7.

T.L.C.

T.L.C. of Alcoholic extract on silica gel 'G' plate using n-Butanol: glacial Acetic acid: Water (5:1:4) v/v upper phase, on spraying with Anisaldehyde -Sulphuric acid reagent and heating the plate for five minutes at 105°C seven spots appear at Rf. 0.24, 0.29 (both greenish grey), 0.56, 0.65 (both grey), 0.78, 0.89 (both violet) and 0.95 (red).

CONSTITUENTS

Nigellinine- N-oxide, nigellicine, arenasterol-5-ene, lophenol, α-hederin and fatty acids.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு), Va̲ṛaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvaka̲ṛṛi (அகட்டுவாய்வகற்றி), Ci̲runīrperukki (சிறுநீர்பெருக்கி), Pacittītūṇḍi (பசித்தீதூண்டி), Pā̲rperukki (பாற்பெருக்கி), Pu̲zukkolli (புழுக்கொல்லி), Rutuvuṇḍākki (ருதுவுண்டாக்கி), Tūkkuṇippu̲zukkolli (தூக்குணிப்புழுக்கொல்லி), Va̲ṛaḍciyaka̲ṛṛi (வறட்சியகற்றி)

IMPORTANT FORMULATIONS

Akattiyar Ku̲zampu (அகத்தியர் குழம்பு), Nākkuppūcci(Kolli) Kuḍinīr (நாக்குப்பூச்சி(கொல்லி) குடிநீர்), Pa̲ṛaṅkippaḍḍai Iracāya̲ṇam (பறங்கிப்பட்டை இரசாயனம்), Viṣakku̲zampu (விஷக்குழம்பு)

THERAPEUTIC USES

Ciraṅku (சிரங்கு), Kāmālai (காமாலை), Ku̲ṉmam (குன்மம்), Maṇḍaikkarappā̲ṉ (மண்டைக்கரப்பான்), Puṇ (புண்), Vayi̲ṛṛupporumal (வயிற்றுப்பொருமல்)

DOSE - Powder 500 mg - 4 g

KAḌUKURŌKIṆI (Rhizome and Root) - கடுகுரோகிணி

Kaḍukurōkiṇi is the dried rhizome and root of ***Picrorhiza kurroa*** Royle ex Benth. (Fam. Scrophulariaceae), a perennial, more or less hairy herb common on the north-western Himalayas from Kashmir to Sikkim. Rhizome is cut into small pieces after harvesting It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil	:	Kaḍakarōkiṉi (கடகரோகினி), Kaḍurōkiṉi (கடுரோகினி)
Assamese	:	Katki, Kutki
English	:	Hellebore
Gujrati	:	Kadu, Katu
Hindi	:	Kutki
Kannada	:	Katuka rohini
Malayalam	:	Kaduk rohini, Katuka rohini
Marathi	:	Kutki, Kalikutki
Oriya	:	Katuki
Punjabi	:	Karru, Kaur
Sanskrit	:	Katuka, Tikta, Tiktarohini, Katurohini, Katvi, Sutiktaka
Telugu	:	Katukarohini
Urdu	:	Kutki

DESCRIPTION

a) Macroscopic

Rhizome - 2.5 to 8 cm. long and 4 to 8 mm. thick, subcylindrical, straight or slightly curved, externally greyish-brown, surface rough due to longitudinal wrinkles, circular scars of roots and bud scales and sometimes roots attached, tip ends in a growing bud surrounded by tufted crown of leaves, at places cork exfoliates exposing dark cortex; fracture short; odour pleasant; taste bitter.

Root - Thin, cylindrical, 5 to 10 cm. long, 0.05 to 0.1 cm. in diameter, straight or slightly curved with a few longitudinal wrinkles and dotted scars, mostly attached with rhizomes, dusky grey, fracture short, inner surface black with whitish xylem; odour pleasant; taste bitter.

b) Microscopic

Rhizome - Shows 20 to 25 layers of cork consisting of tangentially elongated, suberised cells; cork cambium 1 or 2 layered; cortex single layered or absent, primary cortex persists in some cases, one or two small vascular bundles present in cortex; vascular bundles surrounded by single layered endodermis of thick-walled cells; secondary phloem composed of phloem parenchyma and a few scattered fibres; cambium 2 to 4 layered; secondary xylem consists of vessels, tracheids, xylem fibres and xylem parenchyma, vessels vary in shape and size having transverse oblique articulation; tracheids long, thick-walled, lignified, more or less cylindrical with blunt tapering ends; xylem parenchyma thin-walled and polygonal in shape; centre occupied by a small pith consisting of thin-walled cells; simple round to oval, starch grains, measuring upto 105 mm in dia., abundantly found in all cells.

Root - Young root shows single layered epidermis, some epidermal cells elongate forming unicellular hairs; hypodermis single layered; cortex 8 to 14 layered; consisting of oval to polygonal, thick-walled, parenchymatous cells; primary stele tetrach to heptarch, enclosed by single layered pericycle and single layered, thick-walled cells of endodermis; mature root shows 4 to 15 layers of cork, 1 or 2 layers of cork cambium; secondary phloem poorly developed; secondary xylem consisting of vessels, tracheids, parenchyma and fibres; vessels have varying shape and size, some cylindrical with tail-like, tapering ends, some drum shaped with perforation on end walls or lateral walls; tracheids cylindrical with tapering pointed ends; fibres aseptate, thick-walled, lignified with tapering blunt chiesel-like pointed ends.

Powder:

Dusky grey; shows groups of fragments of cork cells, thick-walled parenchyma; pitted vessels and aseptate fibres; simple, round to oval starch grains, measuring 25 to 104 mm in diameter.

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	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 of the drug on silica gel 'G' plate using Chloroform: Methanol (95:5) shows under UV light (366 nm) three fluorescent zones at Rf. 0.05 (blue), 0.30 (blue), 0.35(green). On exposure to iodine vapours nine spots appear at Rf. 0.10, 0.17, 0.21, 0.30, 0.37, 0.41, 0.62, 0.72 and 0.84(all yellow). On spraying with 5 % Methanolic -Sulphuric acid reagent and heating the plate at 105° C until the colour develops, the plate shows seven spots at Rf. 0.05, 0.10, 0.17, 0.21, 0.30, 0.41 & 0.84 (all brownish grey).

CONSTITUENTS

Cucurbitacin glycosides, Kutkoside, picroside I, II and III, pikuroside, catalpol, 6-feruloylcatalpol, neronicoside, minecoside, picein, androsin, 4-hydroxy-3-methoxyacetophenone, veronicoside, arvenine III, kutakin and apocynin.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Kuḍaṟpuzuvakaṟṟi (குடற்புழுவகற்றி), Muṟaiveppakaṟṟi (முறைவெப்பகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Peruṅkaziccaluṇḍākki (பெருங்கழிச்சலுண்டாக்கி)

IMPORTANT FORMULATIONS

Emataṇḍak Kuḷikai (எமதண்டக் குளிகை), Keḷacikar Kuzampu (கௌசிகர் குழம்பு), Murukkaṉ Vitai Māttirai (முருக்கன் விதை மாத்திரை), Nākkuppūcci(Kolli) Kuḍiṉīr (நாக்குப்பூச்சி(கொல்லி) குடிநீர்), Vallārai Ney (வல்லாரை நெய்)

THERAPEUTIC USES

Curam/Kāyccal (சுரம்/காய்ச்சல்), Īral Nōy (ஈரல் நோய்), Karappāṉ (கரப்பான்), Māntam (மாந்தம்), Puṅkaḷ (புண்கள்)

DOSE - Powder 500 mg - 1 g

KĀṆṆU CĪRAKAM (Fruit) - காட்டு சீரகம்

Kāṇṇu Cīrakam is the seed of *Vernonia anthelmintica* (L.) Willd. Syn. *Centratherum anthelminticum* (L.) Kuntze (Fam. Asteraceae), an annual, robust, erect herb, found throughout India upto 1850 m. in Himalaya and Khasi hills and often cultivated. It is a weed growing in waste places near villages and bears seeds in the month of May to June. It grows in Mullai, Marutham and Neythal thiṇai.

SYNONYMS

Tamil	:	Kāṇṇu Cīrakam (காட்டு சீரகம்), Caṉi Ñāyiṟu (சனி ஞாயிறு)
Bengali	:	Somaraaj
English	:	Purple fleabane, Worm seed fleabane
Gujrati	:	Kaaleejeeree, Kadavijeeree
Hindi	:	Kaalijeeree, Karajiri, Soharaai
Kannada	:	Kaadujeerage, Kaarijirige
Malayalam	:	Krimishatru, Kattujirakam
Marathi	:	Kadujire
Sanskrit	:	Somaraji, Vanyajiraka, Aranyajirakah, Brhatpali
Telugu	:	Adavijilakara, Garetikamma

DESCRIPTION

a) Macroscopic

The fruits are cypsela, indehiscent, 3 to 5 mm. long and 1 to 2 mm. in diameter; tapering towards base, pappus present over flattened upper end; surface exhibits about 20 longitudinal ridges, hairy, blackish-brown to black in colour; taste bitter and odour indistinct.

b) Microscopic

T.S. of fruit exhibits about 20 ridges and furrows; the epidermis is single layered, covered externally with thick cuticle; trichomes are of two types - covering and glandular; covering trichomes unicellular, elongated with tapering ends, present mostly on the ridges; glandular hairs, sessile with unicellular heads are seen in the furrows; rest of the pericarp consists of thin walled parenchymatous cells; vascular bundles are present below the ridges, followed by discontinuous and laterally extending arches of thick walled and lignified sclerenchymatous tissues; testa is single layered followed by thin walled parenchymatous cells of the cotyledon, most of them consisting of aleurone grains and a few exhibit oil globules.

Powder:

Blackish brown to black; shows fragments of fibres, fibre sclereids, scalariform vascular elements; thin walled parenchymatous cells with aleurone grains and oil globules; covering as well as glandular trichomes; thin walled radially elongated cells of pappus.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	7.5	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	4.5	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	14	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of Petroleum ether extract on silica Gel 'G' plate using Petroleum ether (60 -80ºC): Diethyl Ether: Acetic acid (35:16:1), shows under UV (366 nm) one spot at Rf. 0.48 (light blue). On exposure to iodine vapours 4 spots appear at Rf. 0.48 (dark orange), 0.57, 0.68 and 0.84 (all faint orange). On spraying with 5% Ethanolic- Sulphuric acid and heating the plate at 105ºC until the colour develops, the plate shows 4 spots at Rf. 0.48 (black) 0.57, 0.68 and 0.84 (all faint brown).

CONSTITUENTS

Avenasterol, vernosterol, essential oil, resins and fixed oil consisting of myristic, palmitic, stearic, oleic, linoleic and vernolic acids.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ciṟunīrperukki (சிறுநீர்பெருக்கி), Muṟaiveppakaṟṟi (முறைவெப்பகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Puṯukkolli (புழுக்கொல்லி), Uramākki (உரமாக்கி), Uḍaṟtēṟṟi (உடற்தேற்றி)

IMPORTANT FORMULATIONS

Iracakanthi Meṯuku (இரசகந்தி மெழுகு), Karappāṉ Tailam (கரப்பான் தைலம்)

THERAPEUTIC USES

Kuṉmam (குன்மம்), Kuḍaṟpuzu (குடற்புழு), Veḷḷai (வெள்ளை), Veṇ Puḷḷi (வெண் புள்ளி)

DOSE - Powder 1 - 3 g

KAḌUKKĀY (Fruit) - கடுக்காய்

Kaḍukkāy is the pericarp of mature fruit devoid of seeds, of ***Terminalia chebula*** Retz. (Fam. Combretaceae), a moderate sized or large tree found throughout India, chiefly in deciduous forests and areas of light rainfall, but occasionally also in slightly moist forests, upto about 1500 m. elevation, throughout India; flowers appear from April-August and fruits ripen from October-January. It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil : Ammai (அம்மை), Amutam (அமுதம்), Aritaki (அரிதகி), Pattiyam (பத்தியம்), Varikkāy (வரிக்காய்)

Assamese : Shilikha

Bengali : Haritaki

English : Myrobalan

Gujrati : Hirdo, Himaja, Pulo-harda

Hindi : Harre, Harad, Harar

Kannada : Alalekai

Kashmiri : Halela

Malayalam : Katukka

Marathi : Hirda, Haritaki, Harda, Hireda

Oriya : Harida

Punjabi : Halela, Harar

Sanskrit : Haritaki, Abhaya, Kayastha, Siva, Pathya

Telugu : Karaka, Karakkaya

Urdu : Halela

DESCRIPTION

a) Macroscopic

Fruit yellowish-brown, ovoid, 20 to 35 mm. long, 13 to 25 mm. wide, wrinkled and ribbed longitudinally; pericarp fibrous, 3 to 4 mm. thick, non-adherent to the seed; taste astringent.

b) Microscopic

Transverse section of pericarp shows epicarp consisting of one layer of epidermal cells, inner tangential and upper portions of radial wall thick; mesocarp, 2 or 3 layers of collenchyma,

followed by a broad zone of parenchyma in which fibres and sclereids in group and vascular bundles scattered; fibres with peg like out growth and simple pitted walls; sclereids of various shapes and sizes but mostly elongated, tannins and raphides in parenchyma; endocarp consists of thick-walled sclereids of various shapes and sizes, mostly elongated; epidermal surface view reveal polygonal cells, uniformly thick-walled, several of them divided into two by a thin septa; starch grains simple, rounded or oval in shape, measuring 2 to 7 µm in diameter, found in plenty in almost all cells of mesocarp.

Powder:

Brown; shows a few fibres, vessels with simple pits and groups of sclereids; epidermal fragments with cells showing division by a thin septa.

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	40	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	60	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of Diethyl ether extract of the drug on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm thickness using Toluene: Ethyl acetate: Formic Acid (5:4:1) under UV light (254 nm) shows nine fluorescent zone at Rf. 0.09(blackish blue), 0.15(blackish blue), 0.27 (blackish blue), 0.35 (dark blackish blue), 0.43 (blue), 0.52 (blue) and 0.67 (blue) and 0.88 (blue). On spraying 5% Methanolic ferric chloride reagent six spots appear at Rf. 0. 09 (blackish blue), 0.15 (blackish blue), 0.27 (blackish blue), 0.35 (dark blackish blue), 0.43 (blackish blue) and 0.52 (blackish blue).

CONSTITUENTS

Gallic acid, chebupentol, terchebin, ellagitannin terchebulin, arjungenin, arjunolic acid, arjungenin, terminoic acid, ferulic acid, vanillic acid, p-coumaric acid, caffeic acid and fatty acids, tannin (30 - 32 %).

PROPERTIES AND ACTIONS

Cuvai : Mainly Tuvarppu (துவர்ப்பு), Slightly Iṉippu (இனிப்பு), Kārppu (கார்ப்பு), Kaippu (கைப்பு), Puḷippu (புளிப்பு)

Guṇam : Ilaku (இலகு), Vaṟaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Iṉippu (இனிப்பு)

Ceykai : Cerippuṇḍākki (செரிப்புண்டாக்கி), Kōẕaiyakaṟṟi (கோழையகற்றி), Malamiḷakki (மலமிளக்கி), Pacittīṯūṇḍi (பசித்தீதூண்டி), Uḍaluramākki (உடலுரமாக்கி)

IMPORTANT FORMULATIONS

Carapuṅka Vilvāti Iḷakam (சரபுங்க வில்வாதி இளகம்), Karuṇai Iḷakam (கருணை இளகம்), Maṇḍūrāti Aḍaikkuḍinīr (மண்டூராதி அடைக்குடிநீர்), Pāvaṉakkaḍukkāy (பாவனக்க டுக்காய்), Tāḷicāthi Cūraṇam (தாளிசாதி சூரணம்), Tiripalaic Cūraṇam (திரிபலைச் சூரணம்)

THERAPEUTIC USES

Kāmālai (காமாலை), Kaṇ Nōykaḷ (கண் நோய்கள்), Kuruti Aẕal (குருதி அழல்), Malakkaḍḍu (மலக்கட்டு), Peruvayiṟu (பெருவயிறு), Viḍam (விடம்)

DOSE - Powder 3 - 5 g

Decoction 30- 50 ml twice daily.

20 - 30 g coarse powder in 200 ml of water for preparing decoction.

KĪẔKKĀYNELLI CAMŪLAM (Whole Plant) - கீழ்க்காய்நெல்லி சமூலம்

Kīẓkkāynelli Camūlam is the whole plant of ***Phyllanthus amarus*** Schum.& Thonn.Syn: ***Phyllanthus fraternus*** Webst.; ***Phyllanthus niruri*** Hook. f. non L. (Fam. Euphorbiaceae), an annual herb, upto 60 cm. high; found wild throughout plains in India. It grows in Mullai, Marutham and Neythal thiṇai.

SYNONYMS

Tamil	:	Kīẓānelli (கீழாநெல்லி)
Assamese	:	Bhuin Amla
Bengali	:	Bhumamla, Bhumi amalaki
Gujrati	:	Bhoi Amali, Bhony amari, Bhonyamali
Hindi	:	Bhu Amala
Kannada	:	Nelanelli
Kashmiri	:	Embali, Amli
Malayalam	:	Kizanelli, Keezhanelli, Ajjahada
Marathi	:	Bhuiawali
Oriya	:	Bhuin Amla
Sanskrit	:	Tamalaki, Bhumyamalaki, Mahidhatrika, Bahuphala
Telugu	:	Nela vusirika

DESCRIPTION

a) Macroscopic

Root - Pieces 2.5 to 11.0 cm. long, nearly straight, gradually tapering, with a number of fibrous secondary and tertiary roots, external surface light brown; fracture short.

Stem - Slender, glabrous; light brown, cylindrical, 20 to 75 cm. long, branching profuse towards upper region bearing 5 to 10 pairs of leaves, internode, 1 to 3.5 cm. long; odour indistinct; taste slightly bitter.

Leaf - Compound, leaflets arranged in two rows on a rachis; alternate, opposite and decussate, almost sessile, stipulate, oblong, entire; upto 1.5 cm. long and 0.5 cm. wide, greenish-brown in colour; odour indistinct; taste slightly bitter.

b) Microscopic

Root - Transverse section shows, 4 to 6 layers of cork consisting of thin-walled, rectangular, tangentially elongated and radially arranged cells, filled with reddish-brown contents; secondary

cortex consists of 8 to 10 layers of thin-walled, tangentially elongated parenchymatous cells; secondary phloem narrow consisting of sieve elements, phloem parenchyma and traversed by narrow phloem rays; secondary xylem represented by a broad zone of tissue, composed of vessels, tracheids, fibres and parenchyma, all elements being thick-walled and lignified having simple pits; xylem rays uniseriate.

Stem - Transverse section shows a single layered epidermis composed of thick-walled, flattened, tangentially elongated cells; older stem shows 4 or 5 layers of cork, composed of thin-walled, tabular, tangentially elongated and radially arranged cells, filled with reddish-brown content; cortex composed of 4 to 6 layers of oval, tangentially elongated, thin-walled, parenchymatous cells, some cortical cells filled with yellowish-brown contents; endodermis quite distinct; pericycle represented by a discontinuous ring, composed of several tangentially elongated strands of lignified fibres with thick walls and narrow lumen; secondary phloem narrow, composed of sieve elements, dispersed in mass of phloem parenchyma; secondary xylem composed of vessels, fibres, parenchyma and traversed by numerous uniseriate rays; vessels mostly simple pitted, a few show spiral thickenings; fibres narrow, elongated, with narrow or sometimes blunt ends with simple pits; center, occupied by a pith composed of thin-walled, circular to oval parenchymatous cells, occasionally cluster crystals of calcium oxalate present in parenchymatous cells of ground tissue.

Leaflet:

Midrib: Shows epidermis on either side, single layered, covered externally by a thick cuticle; a single palisade layer present on the adaxial side intercepted by a few parenchymatous cells in the middle; meristele composed of small strands of xylem towards upper surface and phloem towards lower surface, rest of tissue of leaf composed of thin-walled, parenchymatous cells some having cluster crystals of calcium oxalate.

Lamina: Shows a dorsiventral structure, mesophyll differentiated into palisade and spongy parenchyma; epidermis on either side composed of thin-walled, tangentially elongated cells, covered externally by a thick cuticle; anisocytic stomata present on both epidermises; palisade single layered; mesophyll composed of 3 to 5 layers of loosely arranged cells having a number of veins traversed in this region, a few cluster crystals of calcium oxalate present in spongy parenchyma.

Powder:

Brown; shows fragments of cork cells; vessels and fibres; palisade cells, fragments of epidermal cells with anisocytic stomata and a few cluster 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	16	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	7	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	3	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	13	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of Hexane fraction of alcoholic extract of the drug on silica gel 'G' plate using Toluene : Ethyl acetate (80:20) v/v, on exposure to iodine vapours shows eight spots at Rf. 0.21, 0.38., 0.44, 0.50, 0.62, 0.78, 0.92 and 0.97 (all yellow). On Spraying with Anisaldehyde -Sulphuric acid reagent and heating the plate, for five minutes at 105°C seven spots appear at Rf. 0.38 (grey), 0.44 (green), 0.57, 0.78,0.88, 0.92 (all grey) and 0.97 (pink); Prominent spots at Rf. 0.38 (grey), 0.44 (green) and 0.97 (pink).

CONSTITUENTS

Phyllanthin, hypophyllanthin, geranin, corilagin, 1, 6 - digalloyl - β-D-glucoside, rutin, quercetin - 3-O-glucoside, 2, 3 - desmethoxy seco - isolintetralin, 2, 3 - desmethoxy seco - isolintetralin diacetate and linnanthin.

PROPERTIES AND ACTIONS

Cuvai : Iṉippu (இனிப்பு), Kaippu (கைப்பு), Puḷippu (புளிப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Ilaku (இலகு), Vaṟaḍci (வறட்சி)

Vīrium : Taḍpam (தட்பம்)

Pirivu : Iṉippu (இனிப்பு)

Ceykai : Ciṟunīrperukki (சிறுநீர்பெருக்கி), Īral Tēṟṟi (ஈரல் தேற்றி), Kuḷircciyuṇḍākki (குளிர்ச்சியுண்டாக்கி), Vīkkamurukki (வீக்கமுருக்கி), Tuvarppi (துவர்ப்பி)

IMPORTANT FORMULATIONS

Karicālai Iḷakam (கரிசாலை இளகம்), Kīẓānelli Tailam (கீழாநெல்லி தைலம்)

THERAPEUTIC USES

Aẓal Nōykaḷ (அழல் நோய்கள்), Captatāthu Curam (சப்ததாது சுரம்), Kāmālai (காமாலை), Kaṇ Nōykaḷ (கண் நோய்கள்), Kurutikkaẓiccal (குருதிக்கழிச்சல்), Matumēkam (மதுமேகம்), Vayiṟu Mantam (வயிறு மந்தம்), Veppu Nōy (வெப்பு நோய்)

DOSE - Medicinal paste 3 - 5 g of fresh whole plant

Powder 2 g

Decoction 30- 50 ml twice daily.

15 - 30 g coarse powder in 200 ml of water for preparing decoction.

KOḶḶU (Seed) - கொள்ளு

Koḷḷu is the dried seed of *Vigna unguiculata* (L.) Walp. Syn. *Dolichos biflorus* Linn. (Fam. Papilionaceae), an annual branched, sub-erect or twining, downy or glabrescent herb, cultivated all over India more for use as cattle feed after cooking It grows in Marutham thiṇai.

SYNONYMS

Tamil	:	Kāṇam (காணம்), Mutirai (முதிரை)
Bengali	:	Kulattha, Kalaya
English	:	Horse gram
Gujrati	:	Kalathi, Kulathi
Hindi	:	Kulathi, Kurathi
Kannada	:	Huruli, Hurali
Malayalam	:	Mudiraa
Marathi	:	Kulitha
Sanskrit	:	Kulattha, Khalva, Vardhipatraka
Telugu	:	Ulavalu
Urdu	:	Kulthi

DESCRIPTION

a) Macroscopic

Seeds, hard, surface smooth, ellipsoid, flattened, greyish to reddish brown; 4 to 6 mm. long and 4 mm. wide; micropyle prominent; taste somewhat astringent.

b) Microscopic

Transverse section of seed shows testa consisting of a single layer of columnar, thin-walled, parenchymatous, palisade like cells covered with a thin cuticle followed by single layer of rectangular to square bearer cells and 3 or 4 layers of thin-walled rectangular parenchymatous cells, wider at micropylar region; cotyledon consisting of single layer of upper and lower epidermis covered with a thin cuticle; epidermal cells thin-walled, rectangular and parenchymatous followed by mesophyll, consisting of angular parenchymatous cells, filled with numerous simple starch grains and protein bodies also present.

Powder:

Whitish in colour; shows broken pieces of testa; parenchyma cells and starch grains.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Nil , Appendix	2.2.2.
Total Ash	Not more than 5 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 1 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 3 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 12 per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of Petroleum ether (40-60°C) extractive of Alcoholic extract on silica gel 'G' plate using Toluene: Ethyl acetate (9:1) v/v, on spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate, for five minutes at 105°C shows seven spots at Rf. 0.20 (reddish violet), 0.29 (reddish violet), 0.33 (reddish violet), 0.55 (reddish violet), 0.63 (reddish violet), 0.95 (reddish violet) and 0.97 (reddish violet).

CONSTITUENTS

Galactosyl inositol and six oleanane glycosides -azukisaponins I, II, III, IV, V and VI.

PROPERTIES AND ACTIONS

Cuvai : Tuvarppu (துவர்ப்பு)

Guṇam : Acaivu (அசைவு), Ilaku (இலகு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ciṟunīrperukki (சிறுநீர்பெருக்கி), Tuvarppi (துவர்ப்பி), Uramākki (உரமாக்கி)

IMPORTANT FORMULATIONS

Iracakanthi Meẕuku (இரசகந்தி மெழுகு), Piraṇḍai Vaḍakam (பிரண்டை வடகம்)

THERAPEUTIC USES

Aiyanōykaḷ (ஐயநோய்கள்), Kaẕiccal (கழிச்சல்), Koẕuppaik Kuṟaikkum (கொழுப்பைக் குறைக்கும்), Kuḷirkāyccal (குளிர்காய்ச்சல்), Kuṉmam (குன்மம்), Vīkkam (வீக்கம்), Kallaik Karaikkum (கல்லைக் கரைக்கும்)

DOSE - Decoction 30- 50 ml twice daily.

30- 40 g coarse powder in 200 ml of water for preparing decoction.

KŌḌḌAM (Root) - கோட்டம்

Kōḍḍam is the dried root of ***Saussurea costus*** (Falc.) Lipsch. Syn. ***S. lappa*** (Decne.) C.B. Clarke (Fam. Asteraceae), a tall, robust, perennial herb 1 to 2 m. height found in Himalayas, Kashmir at an altitude of 2500 to 3600 m.; cultivated in Himachal Pradesh, Uttranchal and Sikkim; roots collected in September-October. It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil	:	Kōṣḍam (கோஷ்டம்), Kurā (குரா), Oli (ஓலி)
Assamese	:	Kud, Kur
Bengali	:	Kudo
Gujrati	:	Upleta, Kath
Hindi	:	Kutha
Kannada	:	Changal Kustha
Kashmiri	:	Kuth
Malayalam	:	Kottam
Marathi	:	Upleta, Kustha
Oriya	:	Kudha
Punjabi	:	Kuth
Sanskrit	:	Kustha, Amaya, Pakala
Telugu	:	Changalva Koshtu
Urdu	:	Qust

DESCRIPTION

a) Macroscopic

Drug greyish to dull brown, thick, stout, fusiform to cylindrical, 7 to 15 cm. long, 1.0 to 5.5 cm. broad, thicker roots with collapsed center; occasionally ridged, wrinkles longitudinal and anastomosed; rootlets rarely present; cut surface shows two regions under 10 x; outer periderm ring thin, inner porous woody portion lighter in colour showing fine radial striations and often the central portion collapsed; fracture short, horny; odour strong, characteristically aromatic; taste slightly bitter.

b) Microscopic

Transverse section of thin root shows thin periderm, followed by broad zone of phloem and still broader zone of xylem traversed by wide medullary rays; cork 3 to 5 layered wide, secondary cortical cells polygonal, mostly elongated; secondary phloem consists of mostly storage

parenchyma, small groups of sieve tubes and companion cells and often phloem fibres, bast fibres thick-walled, lignified, upto 350 µm in length, with many simple pits associated with fibres, tracheids and parenchyma; wood fibres smaller than bast fibres; with wider lumen and obtusely tapering ends; medullary rays multiseriate and wider in phloem region; resin canals found throughout as large cavities; some roots possess a central cylinder of sclerenchyma, while others have parenchymatous center with scattered xylem elements; in older roots, wood parenchyma collapses and takes a spongy appearance in the center of root; inulin present in storage parenchyma.

Powder:

Deep or rusty brown; shows irregular bits of yellow, brown or orange-red fragments of resins and oil drops associated with thin-walled parenchymatous cells; broken bits of xylem vessels with scalariform, reticulate thickening

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 4 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 1 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 12 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 Chloroform extractive of the Alcoholic extract on silica gel 'G' plate using n-Butanol :Acetic Acid : Water (5:1:4) v/v, on spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate, for five minutes at 105°C shows nine spots at Rf. 0.38, 0.50, 0.54 (violet), 0.61, 0.68 (violet), 0.74 (dark violet), 0.86 (grey), 0.90 and 0.97 (dark violet).

CONSTITUENTS

Costunolide, α-cyclocostunolide, β-cyclocostunolide, isoalantolactone, mokkolactone and dehydrocostus lactone.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு), Viṟuviṟuppu (விறுவிறுப்பு)

Guṇam : Ilaku (இலகு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Kōṟaiyakaṟṟi (கோழையகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Uramākki (உரமாக்கி), Veppamuṇḍākki (வெப்பமுண்டாக்கி), Viyarvaiyuṇḍākki (வியர்வையுண்டாக்கி)

IMPORTANT FORMULATIONS

Amirtātik Kuḷikai (அமிர்தாதிக் குளிகை), Kēcari Iḷakam (கேசரி இளகம்), Kōrōcaṉai Māttirai (கோரோசனை மாத்திரை), Pittacurak Kuḍiṉīr (பித்தசுரக் குடிநீர்), Vacanta Kucumākaram (வசந்த குசுமாகரம்), Vallārai Ney (வல்லாரை நெய்)

THERAPEUTIC USES

Iraippu (இரைப்பு), Irumal (இருமல்), Mūlam (மூலம்), Nañcu (நஞ்சு), Tōḍam (தோடம்)

DOSE - Powder 2 - 4 g

KOTHTHUMALLI VITAI (Fruit) - கொத்துமல்லி விதை

Koththumalli Vitai is the dried, ripe fruit of *Coriandrum sativum* L. (Fam.Apiaceae), a slender, glabrous, branched, annual aromatic herb 30 to 90 cm. high; extensively cultivated throughout India; crop matures in 2 or 3 months after sowing; herb is pulled out with roots; dried and fruits threshed, winnowed, and stored in bags, after proper drying It grows in Mullai and Marutham thiṇai.

SYNONYMS

Tamil	:	Malli (மல்லி), Taṉiyā (தனியா), Uruḷarici (உருளரிசி)
Assamese	:	Dhaniya
Bengali	:	Dhane, Dhania
English	:	Coriander fruit
Gujrati	:	Dhana
Hindi	:	Dhaniya
Kannada	:	Havija, Kothambari bija
Kashmiri	:	Dhaniwal, Dhanawal
Malayalam	:	Malli, Kothampatayari
Marathi	:	Dhane, Kothimbir
Oriya	:	Dhania
Punjabi	:	Dhania
Sanskrit	:	Dhanyaka, Danya, Vitunnaka, Kustumburu
Telugu	:	Dhaniyalu
Urdu	:	Kishneez

DESCRIPTION

a) Macroscopic

Fruit globular, mericarps usually united by their margins forming a cremocarp about 2 to 4 mm. in diameter, uniformly brownish-yellow or brown, glabrous, sometimes crowned by the remains of sepals and styles, primary ridges 10, wavy and slightly inconspicuous, secondary ridges 8, straight, and more prominent; endosperm coelospermous; odour aromatic; taste spicy and characteristic.

b) Microscopic

Transverse section of fruit shows pericarp with outer epidermis, with slightly thickened anticlinal wall, a few stomata, and many cells with small prisms of calcium oxalate; trichomes absent; outer layer of mesocarp parenchymatous with inner cells in wavy longitudinal rows and degenerated vittae as tangentially flattened cavities; middle layer of mesocarp sclerenchymatous, forming a thick layer of fusiform pitted cells in very sinuous rows, layers often crossing at right angles with definite longitudinal strands in the secondary ridges; sinuous primary cosate with some spiral vessel; inner cells of mesocarp, large, hexagonal with rather thin, lignified walls; inner epidermis of very narrow thin-walled cells slightly sinuous anticlinal wall showing parquetry arrangement; two or rarely more, normal vittae occurring on commissural side of each mesocarp containing volatile oil; endosperm of thick-walled cellulosic parenchyma containing much fixed oil, numerous aleurone grains, about 4 to 8 in diameter containing micro rosettes of calcium oxalate; split carpophore passing at apex of each mericarp into raphe, adjacent to which is a large cavity; inner side of this is a flattened vascular strand; carpophore consists of fibres surrounded by spiral vessels.

Powder:

Fawn to brown; epidermal cells of pericarp when present, slightly thick-walled and many containing small prism of calcium oxalate; parenchymatous cells of mesocarp without reticulate thickening; masses of sclerenchymatous cells of mesocarp in sinuous rows, often crossing at right angles, large tubular hexagonal rather thin-walled sclerenchymatous cells of endocarp; cells of inner epidermis with slightly sinuous anticlinal walls; thick-walled polygonal parenchymatous cells of endosperm, containing fixed oil and numerous small aleurone grains and micro rosettes of calcium oxalate.

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 less than 1.5 per cent, Appendix	2.2.4.
Alcohol soluble extractive	Not less than 10 per cent, Appendix	2.2.6.
Water soluble extractive	Not less than 19 per cent, Appendix	2.2.7
Volatile oil	Not less than 0.3 per cent v/w, Appendix	2.2.10

T.L.C.

T.L.C. of Alcoholic extract of the drug on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Toluene: Ethyl acetate (9:1) shows four spots under UV (366 nm.) at Rf. 0.24,0.43, 0.49 and 0.52 (all red). On exposure to iodine vapours seven spots appear at Rf. 0.20, 0.27, 0.36, 0.43, 0.49, 0.75 and 0.95 (all yellow). With Anisaldehyde- Sulphuric acid reagent, heating the plate for five minutes at 105ºC eight spots appear at Rf. 0.11(light violet), 0.20 (violet), 0.27, 0.36 (both light violet), 0.43 (violet), 0.49 (light green), 0.75 (violet) and 0.95(pink).

CONSTITUENTS

S-(+)-linalool, gnaphaloside A & B, quercetin, isorhamnetin, rutin, luteolin, furoisocoumarins - coriandrin and dihydro coriandrin, coriandrones A-E.

PROPERTIES AND ACTIONS

Cuvai : Kārppu (கார்ப்பு)

Guṇam : Ilaku (இலகு), Noymai (நொய்மை)

Vīrium : Taḍpaveppam (தட்பவெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Ciṟunīrperukki (சிறுநீர்பெருக்கி), Pacittītūṇḍi (பசித்தீதூண்டி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Iñci Vaḍakam (இஞ்சி வடகம்), Nārathtai Iḷakam (நாரத்தை இளகம்), Pittacurak Kuḍinīr (பித்தசுரக் குடிநீர்)

THERAPEUTIC USES

Cārāyaveṟi (சாராயவெறி), Kuḷirkāyccal (குளிர்காய்ச்சல்), Nāvaṟaḍci (நாவறட்சி), Puṇ (புண்), Tākam (தாகம்), Vānti (வாந்தி), Pittamāntam (பித்தமாந்தம்), Vikkal (விக்கல்), Veppam (வெப்பம்)

DOSE - Powder 1 - 3g

Decoction 20 - 30 ml twice daily.

20- 30 g coarse powder in 200 ml of water for preparing decoction

KUN̲R̲IMAṆI (Seed) - குன்றிமணி

Kun̲r̲imaṇi is the seed of ***Abrus precatorius*** L. (Fam.Papilionaceae), a climber common in the plains of India and ascending to 900 m. in the Himalayas; seeds are poisonous to cattle. The seeds are subjected to purification process (cutti) before use. It grows in Kur̲iñci, Mullai, Marutham and Pālai thiṇai.

SYNONYMS

Tamil	:	Kun̲r̲i (குன்றி), Kun̲r̲ivittu (குன்றிவித்து), Kuṇḍumaṇi (குண்டுமணி)
Assamese	:	Rati
Bengali	:	Kunch, Shonkainch
English	:	Jequirity
Gujrati	:	Rati, Chanothee
Hindi	:	Ratti, Ghungchi
Kannada	:	Galuganji, Gulagunjee
Malayalam	:	Kunni, Cuvanna Kunni
Marathi	:	Gunja
Oriya	:	Kainch
Punjabi	:	Ratti
Sanskrit	:	Gunja, Raktika, Kakananti
Telugu	:	Guriginia, Guruvenda
Urdu	:	Ghongcha, Ratti

DESCRIPTION

a) Macroscopic

Seed ovoid or sub globular, 5 to 8 mm. long, 4 to 5 mm. broad with the smooth, glossy surface and bright scarlet colour; hilum a black patch. The weight of 100 seeds is between 12 to 13 g

b) Microscopic

Transverse section of seed shows testa composed of radially much elongated cells, arranged irregularly and measuring 45 to 50 µm in length; inner region of testa consists of collapsed cells forming a hyaline layer; endosperm composed of thick-walled cellulosic parenchyma, isodiametric cells larger towards inside, walls mainly of hemicellulose and swell considerably in water; outer one or two layers of cells formed of rather smaller cells, walls of which swell to a less extent in water.

Powder:

Cream in colour; shows fragments of thick walled lignified palisade-like testa; pieces of numerous endosperm cells containing starch; a few rectangular, thick walled stone cells having wide lumen; simple, oval to rounded, starch grains measuring 3 to10 µm in diameter.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix		2.2.2.
Total Ash	Not more than 3 per cent, Appendix		2.2.3.
Acid-insoluble ash	Not more than 0.5 per cent, Appendix		2.2.4.
Alcohol-soluble extractive	Not less than 3 per cent, Appendix		2.2.6.
Water-soluble extractive	Not less than 15 per cent, Appendix		2.2.7.

T.L.C.

T.L.C. of Alcoholic extract on silica gel 'G' plate using Toluene: Ethyl acetate: Formic acid (5:4:1) shows under UV (366 nm) seven spots fluorescent zones visible at Rf. 0.30, 0.35, 0.44 0.46, 0.71 (all blue), 0.85 and 0.91 (both green). On spraying with 4% Methanolic -Sulphuric acid reagent and heating the plate for five minutes at 105ºC three spots appear at Rf. 0.27, 0.77 and 0.85 (all violet).

CONSTITUENTS

Abrine, hypaphorine, choline, trigonelline, precatorine, 5 β-cholanic acid, antitumour proteins - abrin A and B, globulin, arabinose, hemagglutin glucoside, abralin, stigmasterol, β-sitosterol,abrus saponin I and II.

PROPERTIES AND ACTIONS

Cuvai	:	Kaippu (கைப்பு)
Guṇam	:	Ilaku (இலகு), Kūrmai (கூர்மை), Vaṟaḍci (வறட்சி)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)
Ceykai	:	Nīrmalampōkki (நீர்மலம்போக்கி), Uramākki (உரமாக்கி)

IMPORTANT FORMULATIONS

Makāvacanta Kucumākaram (மகாவசந்த குசுமாகரம்), Mūcāmpara Paṟṟu(Kuṉṟipaṟṟu) (மூசாம்பர பற்று(குன்றிப்பற்று))

THERAPEUTIC USES

Aẕal Nōy (அழல் நோய்), Aiya Nōy (ஐய நோய்), Kaṇ Nōy (கண் நோய்), Kāmālai (காமாலை), Viyarvaiyōḍukūḍiya Muṟaiccuram (வியர்வையோடுகூடிய முறைச்சுரம்)

DOSE - It cannot be administered as a single drug It should be used only in combination.

KURŌCĀṆI ŌMAM (Seed) - குரோசாணி ஓமம்

Kurōcāṇi Ōmam is the seed of ***Hyoscyamus niger*** L. (Fam. Solanaceae), an annual or biennial foetid herb upto 5 ft. high; native to the Mediterranean region and temperate Asia, but also occurring in Western Himalayas from Kashmir to Kumaon at an altitude of 1600 to 4000 m.; seeds are imported into India.It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil	:	Kārapi (காரபி), Kārcavai (கார்சவை), Tippiyam (திப்பியம்)
Bengali	:	Khorasani ajwan
English	:	Henbane
Gujrati	:	Khurasanee ajma, Khurasanee ajmo
Hindi	:	Khurasanee ajvayan
Kannada	:	Khurasajnee, Ajawaana
Malayalam	:	Khurasaanee, Paarasika, Yavaani
Marathi	:	Khurasanee ova
Punjabi	:	Khurasanee ajvain, Bangidewana
Sanskrit	:	Parasikayavani, Khurasani yavani, Turusaka, Madakarini
Telugu	:	Kurasanee vamu, Khurasanee omam
Urdu	:	Ajvayanee, Khursanee

DESCRIPTION

a) Macroscopic

Seeds irregularly reniform or sub-quadrate, slightly over a mm. in size, dark grey, surface concave, odour pleasantly aromatic; taste bitter, mucilaginous and pungent.

b) Microscopic

Transverse section of seed shows the presence of a thick cuticle, testa with two layers, outer one with a row of osteosclereids, ranging from 50 to 80 µm in size, inner one with crushed parenchyma; endosperm cells thin walled, containing oil globules; embryo coiled; starch absent.

Powder:

Dark brown; aromatic smell, bitter mucilagenous taste and an oily texture; shows a number of flask-shaped or dumb-bell shaped osteosclereids; fragments of testa in surface view, showing cells with sinuous walls; powder when treated with Sudan IV and mounted in glycerine shows the presence of oil globules which turn orange red; powder cleared with dilute nitric acid shows surface view of sculpturing on testa.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	4	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	16	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	10	per cent, Appendix	2.2.7.

ASSAY

HPTLC densitometric estimation of hyoscyamine.

TLC plates

Aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm thickness.

Solvent system

Toluene: Ethyl acetate: Diethylamine (6.0:3.0:1.0).

Test solution

10 g of powdered drug is accularately weighed and refluxed with Methanol (2 x 50 ml) for 2 hr. The combined extract is concentrated to 10 ml and extracted with 2M Hydrochloric acid (2 x 15 ml). The aqueous solution is shaken with 2 x 25 ml portions of Petroleum ether (60-80º) to remove fatty material. The pH of the aqueous solution is adjusted to 10 using strong ammonia solution and extracted with Chloroform (3 x 30 ml). The combined Chloroform extract is concentrated and adjusted the volume to 10 ml with Chloroform.

Standard solution

1.0 mg/ml stock solution of hyoscyamine is prepared in Methanol. Aliquots of 0.5 to 3 ml in increments of 0.5 ml is pipetted out into 10 ml volumetric flask and made upto the volume with Methanol.

Calibration curve

10 µl of each concentration of standard solution is applied on TLC plate. The plate is developed in the solvent system to a distance of 8 cm. and dried in a current of hot air. The plate is scanned in the TLC scanner at 210 nm. The peak area for each concentration of hyoscyamine is recorded and the calibration curve is got.

Estimation of hyoscyamine in the drug

10 µl of the test solution is applied on TLC plate. The plate is developed in the solvent system to a distance of 8 cm. and the chromatogram is recorded and area of the peak is noted. The amount of hyoscyamine in the test sample is determined from the calibration curve of hyoscyamine.

The percentage of hyoscyamine ranges from 0.006 to 0.019 in the samples analyzed.

T.L.C.

T.L.C. of the Methanolic extract on silica gel 'G' plate using Toluene: Ethyl acetate: diethylamine (7:2:1) shows under UV (366 nm) one fluorescent spot at Rf. 0.49 (blue). After spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate at 105ºC until the colour develops, the plate shows three spots at Rf. 0.09 (brown), 0.49 (brown), 0.69 (greenish brown). After spraying with modified Dragendorff reagent spots appear at Rf.0.90, 0.77, 0.61, 0.23 and 0.10.

CONSTITUENTS

Hyoscyamine, hyoscine, isomeric N-oxides of hyoscyamine (equatorial and axial), hyoscine-N-oxide (equatorial isomer), tropine; 16á- acetoxyhyoscyamilactol, daturalactone-4, hyoscyamilactol; cannabisin D, cannabisin G, grossamide, hyoscyamide; rutin; daucosterol, ß-sitosterol, myristic, palmitic, stearic, oleic and linoleic acids, 1-O- (9Z, 12Z-octadecadienoyl) glycerol, 1-O-octadecanoylglycerol, 1-O- (9Z-12Z-octadecadienoyl) -3O-(9Z-Octadecenoyl) glycerol, 1-O- (9Z, 12Z-octadecadienoyl) -3-O-nonadecanoyl glycerol, 1-O- (9Z,12Z-octadecadienoyl) -2-O- (9Z,12Z-octadecadienoyl) glycerol, N-trans-feruloyl tyramine,1, 24-tetracosanediol diferulate and vanillic acid.

PROPERTIES AND ACTIONS

Cuvai : Cirukaippu (சிறுகைப்பு), Kārppu (கார்ப்பு)

Guṇam : Tiṇmai (திண்மை), Varaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Cirunīr Kuraipaḍaperukki (சிறுநீர் குறைபடபெருக்கி), Icivakarri (இசிவகற்றி), Tātuveppakarri (தாதுவெப்பகற்றி), Tuyaraḍakki (துயரடக்கி), Urakkamuṇḍākki (உறக்கமுண்டாக்கி)

IMPORTANT FORMULATIONS

Carapuṅka Vilvāti Iḷakam (சரபுங்க வில்வாதி இளகம்), Kapāḍa Mātthirai (கபாட மாத்திரை), Nanthi Mezuku (நந்தி மெழுகு), Tippili Irācāyaṉam (திப்பிலி இராசாயனம்), Veṇpūcaṇi Ney (வெண்பூசணி நெய்)

THERAPEUTIC USES

Ārampa Paittiyam (ஆரம்ப பைத்தியம்), Cūtakavali (சூதகவலி), Cūtakavāyu (சூதகவாயு), Mantāra Iraippu (மந்தார இரைப்பு), Niṉaivu Taḍumārram (நினைவு தடுமாற்றம்), Tamaraka Taḍippu (தமரக தடிப்பு), Tūkkaminmai (தூக்கமின்மை), Pallaḍi Nōykaḷ (பல்லடி நோய்கள்)

DOSE - Powder 125 - 500 mg

MAÑCAḶ (Rhizome) - மஞ்சள்

Mañcaḷ is the dried and cured rhizome of *Curcuma longa* L. Syn. *C. domestica* Valeton (Fam. *Zingiberaceae*), a perennial herb, extensively cultivated in all parts of the country; crop is harvested after 9 to 10 months when lower leaves turn yellow; rhizomes carefully dug up with hand-picks between October-April and cured by boiling in its own decoction and dried. It grows in Kuṟiñci and Marutham thiṇai.

SYNONYMS

Tamil	:	Aricaṉam (அரிசனம்), Kāṉcaṉi (கான்சனி), Mañcaḷ Kiẕaṅku (மஞ்சள் கிழங்கு), Nici (நிசி), Pīṯam (பீதம்)
Assamese	:	Haldhi, Haladhi
Bengali	:	Halud, Haldi
English	:	Turmeric
Gujrati	:	Haldar
Hindi	:	Haldi, Hardi
Kannada	:	Arishina
Kashmiri	:	Leadar, Ladhir
Malayalam	:	Manjal
Marathi	:	Halad
Oriya	:	Haladi
Punjabi	:	Haldi, Haldar
Sanskrit	:	Haridra, Rajant, Nisa, Nisi, Ratri, Ksanada, Dosa
Telugu	:	Pasupu
Urdu	:	Haldi

DESCRIPTION

a) Macroscopic

Rhizomes ovate, oblong or pyriform (round turmeric) or cylindrical, often short branched (long turmeric), former about half as broad as long, latter 2 to 5 cm. long and about 1 to 1.8 cm. thick, externally yellowish to yellowish-brown with root scars and annulations of leaf bases; fracture horny, fractured surface orange to reddish brown; central cylinder twice as broad as cortex; odour and taste characteristic.

b) Microscopic

Transverse section of rhizome shows epidermis with thick-walled, cubical cells of various dimensions; a few layers of cork developed under epidermis and oleo-resin cells with brownish contents scattered; cork generally composed of 4 to 6 layers of thin-walled, brick-shaped parenchyma; cortex characterized by the presence of mostly thin-walled rounded parenchyma cells and scattered collateral vascular bundles; cells of ground tissue contain starch grains of 4 to 15 µm in diameter; oil cell with suberised walls containing either orange-yellow globules of volatile oil or amorphous resinous matter; vessels mainly spirally thickened, a few reticulate and annular.

Powder:

Yellow; shows fragments of cork cells; parenchyma cells with gelatinised starch grains; oleo-resin cells with brownish content; vessels with spiral thickening; a few oil globules; starch grains simple, rounded, measuring 4 to 15 µm in diameter.

Identification

1. On the addition of concentrated Sulphuric acid or a mixture of concentrated Sulphuric acid and alcohol to the powdered drug, a deep crimson colour is produced.

2. A piece of filter paper is impregnated with an alcoholic extract of the powder, dried, and then moistened with a solution of Boric acid slightly acidified with Hydrochloric acid, dried again, the filter paper assumes a pink or brownish red colour which becomes deep blue or greenish-black on the addition of alkali.

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	8	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	12	per cent, Appendix	2.2.7.
Volatile oil	Not less than	4	per cent, Appendix	2.2.10

T.L.C.

T.L.C. of Alcoholic extract of the drug on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Toluene: Ethyl acetate (9:1) shows five spots under UV (366 nm) at Rf. 0.10 (yellow), 0.15 (greenish yellow), 0.38, 0.48 and 0.94 (all sky blue). With Anisaldehyde- Sulphuric acid reagent and heating the plate for five minutes at 105ºC ten spots appear at Rf. 0.10 (blackish yellow), 0.15 (dull yellow), 0.28, 0.35, 0.43, 0.51 (all violet), 0.58 (light pink), 0.64 (violet), 0.82 (red) and 0.94 (pink).

CONSTITUENTS

Curcumin, desmethoxy curcumin, bisdemethoxy curcumin, dihydrocurcumin, β-turmerone, bisabolane derivatives, ukonan A, B, C & D phytosterols and fatty acids.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு), Kārppu (கார்ப்பு)

Guṇam : Vaṟaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Īral Tēṟṟi (ஈரல் தேற்றி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Cīnthil Ney (சீந்தில் நெய்), Kummaḍḍik Kuzampu (கும்மட்டிக் குழம்பு), Nākaccentūram (நாகச்செந்தூரம்), Piraṇḍai Vaḍakam (பிரண்டை வடகம்), Piḍaṅku Nāṟikkuḍinīr (பிடங்கு நாறிக்குடிநீர்), Vallārai Ney (வல்லாரை நெய்), Veḷvaṅkap Paṟpam (வெள்வங்கப் பற்பம்)

THERAPEUTIC USES

Azal/Pittam (அழல்/பித்தம்), Aiya Nōykaḷ (ஐய நோய்கள்), Mūkkunīr Pāyccal (மூக்குநீர் பாய்ச்சல்), Puṇ (புண்), Vali (வலி), Vānti (வாந்தி), Vīkkam (வீக்கம்), Vaḷi (வளி)

DOSE - Powder 520 - 650 mg

MARAMAÑCAḶ (Stem) - மரமஞ்சள்

Maramañcaḷ is the dried stem of *Berberis aristata* DC. Var. *aristata*. (Fam. *Berberidaceae*), an erect, spinous, deciduous shrub, usually 1.8 to 3.6 m. in height found in the Himalayas at an elevation altitude of 1000 to 3000 m., and in the Nilgiri hills in South India. It grows in Kuṟiñci thiṇai.

SYNONYMS

Tamil	:	Kālēyakam (காலேயகம்), Tāruvi (தாருவி)
Bengali	:	Daruharidra
English	:	Indian berberry
Gujrati	:	Daruharidra, Daruhuladur
Hindi	:	Daruhaldi, Darhald
Kannada	:	Maradarishana, Maradarishina, Daruhaladi
Malayalam	:	Maramannal, Maramanjnal
Marathi	:	Daruhalad
Oriya	:	Daruharidra, Daruhalidi
Punjabi	:	Sumalu
Sanskrit	:	Daruharidra, Darvi, Katamkateri
Telugu	:	Manupasupu
Urdu	:	Darhald

DESCRIPTION

a) Macroscopic

Drug available in pieces of variable length and thickness, bark about 0.4 to 0.8 cm. thick, pale yellowish-brown, soft, closely and rather deeply furrowed, rough, brittle, xylem portion yellow, more or less hard, radiate with xylem rays; pith mostly absent, when present small, yellowish-brown when dried; fracture short in bark region, splintery in xylem; taste bitter.

b) Microscopic

Stem - Shows rhytidoma with cork consisting of 3 to 45 rows of rectangular and squarish, yellow coloured, thin-walled cells arranged radially; sieve elements irregular in shape, thin-walled, a few cells containing yellowish-brown contents; phloem fibres arranged in tangential rows, consisting of 1 to 4 cells, each fibre short thick-walled, spindle-shaped, lignified having wide lumen; half inner portion of rhytidoma traversed by secondary phloem rays; phloem rays run obliquely consisting of radially elongated parenchymatous cells, almost all phloem ray cells having single prismatic crystals of calcium oxalate, a few cells of rhytidoma also contain prismatic crystals of calcium

oxalate, stone cells also found scattered in phloem ray cells in groups, rarely single, mostly elongated, a few rounded, arranged radially, some of which contain a single prism of calcium oxalate crystals; secondary phloem, a broad zone, consisting of sieve elements and phloem fibres, traversed by multiseriate phloem rays; sieve elements arranged in tangential bands and tangentially compressed cells alternating with single to five rows of phloem fibres; short, lignified, thick-walled having pointed ends; secondary xylem broad consisting of xylem vessels, tracheids, xylem fibres and traversed by multiseriate xylem rays; xylem vessels numerous, small to medium sized, distributed throughout xylem region in groups or in singles, groups of vessels usually arranged radially; isolated vessels cylindrical with rounded or projected at one or both ends with spiral thickening; xylem fibres numerous, lignified, large, thick-walled with wide lumen and pointed tips; xylem rays quite distinct, straight, multiseriate, consisting of radially arranged rectangular cells, each ray 30 to 53 cells high, 8 to 12 cells wide, a few ray cells containing brown contents.

Powder:

Yellow; shows mostly fragments of cork cells; sieve elements, yellow coloured phloem fibres entire or in pieces; stone cells in singles or in groups; numerous prismatic crystals of calcium oxalate; xylem vessels having sprial thickening; thick-walled, lignified xylem fibres and ray cells; when an extract of the powder with chloroform and methanol is exposed under near UV light (254, 366 nm.) shows dark yellow and greenish yellow fluorescence respectively.

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 5 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 6 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 8 per cent, Appendix	2.2.7.

ASSAY

TLC densitometric estimation of berberine.

TLC plates

Aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness.

Solvent system

n- Butanol: Ethyl acetate: Acetic acid : Water (3:5:1:1).

Test solution

10 g of powdered drug is extracted in a Soxhlet apparatus with n-Hexane (150 ml) to defat the material (5 to 7 hr.) and further extracted with Methanol (150 ml) (8 to 9 hr.). The extract is filtered and concentrated and dried in vacuo. 2 mg of the residue is taken and dissolved in 1 ml of Methanol.

Standard solution

1 mg of the reference compound, berberine is dissolved, in 1 ml of Methanol.

Calibration curve

The calibration curve is drawn for berberine with 8 data points 1 to 8 µl of the standard solution is applied on a TLC plate. The plate is developed in the solvent system to a distance of 8 cm. The plate is scanned densitometrically at 366 nm. The peak area under curve is recorded and plotted the calibration curve for berberine.

Estimation of berberine in the drug

1 µl of the test solution in triplicate is applied on TLC plate. The plate is developed in the solvent system and recorded the chromatogram. The amount of berberine present in the samples is calculated from the calibration curve of the standard.

The percentage of berberine varies from 2.75 to 3.20 in the samples analyzed.

T.L.C.

T.L.C. of the Methanolic extract of the drug on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Butanol: Ethyl acetate: Acetic acid: Water (3:5:1:1) and visulalization with Dragendorff solution reagent shows seven spots at Rf. 0.15, 0.21, 0.26 (all yellowish brown), 0.32 (dark orange red), 0.40 (yellowish brown), 0.58 (orange red) and 0.67 (dark orange red, berberine marker).

CONSTITUENTS

Berberine, oxycanthine, palmatine, jatrorrhizine, karachine, taxilamine, pakistanine, kalashine, chitraline and 1 - o - methyl pakistanine.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Vaṟaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Pacittīṭūṇḍi (பசித்தீதூண்டி), Uramākki (உரமாக்கி), Veppakaṟṟi (வெப்பகற்றி)

IMPORTANT FORMULATIONS

Cāmpirāṇippū Paṭaṅkam (சாம்பிராணிப்பூ பதங்கம்)

THERAPEUTIC USES

Cuvaiyiṉmai (சுவையின்மை), Kaṇam (கணம்), Kāṇācuram (காணாசுரம்), Mūla Nōy (மூல நோய்), Uḍcuram (உட்சுரம்)

DOSE - Decoction 30- 50 ml twice daily.

50 g coarse powder in 200 ml of water for preparing decoction.

MARUTHAM PAḌṬAI (Stem bark) - மருதம் பட்டை

Marutham Paḍṭai is the stem bark of *Terminalia arjuna* (Roxb.) W. & A. (Fam. Combretaceae), a large deciduous tree commonly found throughout the greater parts of the country, and also planted for shade and ornamental purpose.It grows in Marutham and Neythal thiṇai.

SYNONYMS

Tamil	:	Arccuṉam (அர்ச்சுனம்), Intiraṉ Pār (இந்திரன் பார்), Veḷḷai Marutamaram (வெள்ளை மருதமரம்)
Assamese	:	Arjun
Bengali	:	Arjuna
Gujrati	:	Sadad, Arjuna, Sajada
Hindi	:	Arjuna
Kannada	:	Matti, Bilimatti, Neermatti, Mathichakke, Kudare Kivimase
Malayalam	:	Nirmasuthu, Vellamaruthi, Kellemasuthu, Mattimora,
Marathi	:	Arjuna, Sadada
Oriya	:	Arjuna
Punjabi	:	Arjon
Sanskrit	:	Arjuna, Kakubha, Partha, Svetavaha
Telugu	:	Maddi
Urdu	:	Arjun

DESCRIPTION

a) Macroscopic

Bark available in pieces, flat, curved, channelled to half quilled, 0.2 to 1.5 cm. thick, market samples upto 10 cm. in length and up to 7 cm. in width, outer surface somewhat smooth and grey, inner surface somewhat fibrous and pinkish, transversely cut smoothened bark shows pinkish surface; fracture short in inner and laminated in outer part; taste bitter and astringent.

b) Microscopic

Stem Bark - Mature bark shows cork consisting of 9 to 10 layers of tangentially elongated cells, a few outer layers filled with brown colouring matter; cork cambium and secondary cortex not distinct and medullary rays observed traversing almost upto outer bark; secondary phloem occupies a wide zone, consisting of sieve tubes, companion cells, phloem parenchyma and phloem fibres, traversed by phloem rays, usually uniseriate but biseriate rays also occasionally seen; in the middle and outer phloem region, sieve tubes get collapsed and form ceratenchyma; phloem fibres distributed in rows and present in groups of 2 to 10; rosette crystals of calcium oxalate measuring

80 to 180 mm in dia., present in most of the phloem parenchyma, alternating with fibres; idioblasts consisting of large cells having aggregates of prismatic and rhomboidal crystals of calcium oxalate in row throughout the zone, measuring 260 to 600 mm in dia.; starch grains, mostly simple, compound of 2 or 3 components, sometimes upto 5 components, round to oval, elliptical, measuring 5 to 13 mm in dia., distributed throughout the tissue (absent in ***T.alata***); in a tangential section, uniseriate phloem rays 2 to 10 cells high and biseriate, 4 to 12 cells high; in longitudinal section rosette crystals of calcium oxalate found in the form of strands in phloem parenchyma.

Powder:

Reddish-brown; shows fragments of cork cells, uniseriate phloem rays, fibres, a number of rosette crystals of calcium oxalate, a few rhomboidal crystals; starch grains simple and compound, round to oval, elliptic, having 2 or 3 components with concentric striations measuring 5 to 13 mm in diameter with small narrow hilum; shows pinkish red fluorescence under near UV light when an extract of the powder with light petroleum (40 to 60°) is exposed.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	25	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	20	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of the Methanolic extract of the drug on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm thickness silica using Toluene: Ethyl acetate: Formic acid: Methanol (6:3:0.1:1.0) shows nine spots at Rf. 0.079 (grey), 0.19 (pinkish blue), 0.23 (dark blue), 0.30 (blue), 0.41 (dark blue), 0.45 (grey), 0.65 (grey), 0.71 (greyish blue) and 0.80 (dark pink). With Anisaldehyde- Sulphuric acid reagent and heating the plate at 105ºC for 5 minutes. Development with the solvent system Toluene: Ethyl formate: Formic acid (5:5:2) shows 6 spots at Rf. 0.17, 0.26, 0.34 0.43(ellagic acid marker), 0.52 and 0.55 (all greyish blue), derivatization being carried out with 5 per cent methanolic ferric chloride solution.

CONSTITUENTS

Friedelin, oleanolic acid, arjunolic acid, arjunic acid, terminic acid, terminoic acid, tomentosic acid, arjunetin, arjungenin, arjun glucoside I,II,III,arjunoletin, arjunin, arjunoside I,II,III,IV,arjunolone,casuarinin, glucotannic acid, catechol, epicatechol,(-)gallocatechol, pyrocatechol, ellagic acid, leucodelphinidin, oxalic acid and ß-sitosterol.

PROPERTIES AND ACTIONS

Cuvai : Tuvarppu (துவர்ப்பு)

Guṇam : Vaṟaḍci (வறட்சி)

Vīrium : Taḍpam (தட்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Tamaraka Veppamuṇḍākki (தமரக வெப்பமுண்டாக்கி), Tuvarppi (துவர்ப்பி), Uramākki (உரமாக்கி)

IMPORTANT FORMULATIONS

Kantaka Paṟpam (கந்தக பற்பம்), Marutampaṭṭai Cūraṇam (மருதம்பட்டை சூரணம்)

THERAPEUTIC USES

Curam/Kāyccal (சுரம்/காய்ச்சல்), Iraippirumal (இரைப்பிருமல்), Itayanōy (இதயநோய்), Kaẓiccal (கழிச்சல்), Nīriẓivu (நீரிழிவு), Puṇ (புண்), Veḷḷai (வெள்ளை), Vayiṟu Vali (வயிறு வலி)

DOSE - Powder 3 - 6 g

MĀVILIṄKAPPAḌṬAI (Stem bark) - மாவிலிங்கப்பட்டை

Māviliṅkappaḍṭai is the dried stem bark of ***Crateva magna*** (Lour.) DC. Syn.***C. nurvala*** Buch.-Ham., ***C.religiosa*** Auct. non Foster f. (Fam. Capparidaceae), a small wild or cultivated tree found throughout the year in India, often found along streams and also in dry, deep boulder formation in Sub-Himalayan tracts.It grows in Kuṟiñci , Mullai, Marutham and thiṇai.

SYNONYMS

Tamil	:	Kumārakam (குமாரகம்), Māvilaṅku (மாவிலங்கு), Vāraṇi (வாரணி)
Bengali	:	Varuna
English	:	Three leaved caper
Gujrati	:	Vayvarno, Varano
Hindi	:	Baruna, Barna
Kannada	:	Bipatri, Mattamavu, Neervalamara
Malayalam	:	Neermatalam
Marathi	:	Haravarna, Varun, Vayavarna
Oriya	:	Baryno
Punjabi	:	Barna, Barnahi
Sanskrit	:	Varuna, Varana
Telugu	:	Bilvarani

DESCRIPTION

a) Macroscopic

Thickness of bark varies, usually 1 to 1.5 cm. according to the age and portion of the plant from where the bark is removed; outer surface, greyish to greyish-brown with ash-grey patches; at places, surface rough due to a number of lenticels, shallow fissures and a few vertical or longitudinal ridges; inner surface smooth and cream white in colour; fracture tough and short; odour indistinct; taste slightly bitter.

b) Microscopic

Transverse section of mature stem bark shows an outer cork composed of thin-walled, rectangular and tangentially elongated cells; phellogen single layered with thin-walled, tangentially elongated cells, followed by a wide secondary cortex, consisting of thin-walled, polygonal to tangentially elongated cells with a number of starch grains; starch grains mostly simple, occasionally compound with 2 or 3 components also present; large number of stone cells in groups of two or more, found scattered in secondary cortex, single stone cells not very common, stone

cells vary in size and shape, being circular to rectangular or elongated with pits and striations on their walls; stone cells distributed somewhat in concentric bands in phloem region except in inner region of phloem which is devoid of stone cells; secondary phloem comparatively a wide zone, consisting of sieve tubes, companion cells, parenchyma and groups of stone cells, alternating with medullary rays; sieve elements found compressed forming ceratenchyma in outer phloem region, whereas in inner region of phloem, intact; medullary rays mostly multiseriate composed of thin-walled, radially elongated cells, tangentially elongated towards outer periphery; a number of starch grains similar to secondary cortex also present in phloem and ray cells; few rhomboidal crystals of calcium oxalate also found in this region.

Powder:

Cream in colour; shows fragments of cork cells; a few rhomboidal crystals of calcium oxalate; pieces of phloem parenchyma, lignified thick-walled stone cells; simple starch grains measuring 3.5 to 8.2 μm in diameter, rarely 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 13 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 1 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 aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using n-Butanol: Acetic Acid: water (5:1:4) v/v, and on exposure to iodine vapours three spots appear at Rf. 0.13, 0.88 and 0.92 (all yellow). With Anisaldehyde - Sulphuric acid reagent heating the plate at 105°C for five minutes five spots appear at Rf. 0.16, 0.26 (both grey), 0.74, 0.88 (both violet) and 0.92 (blackish violet), prominent spots at Rf. 0.88 (violet) and 0.92 (blackish violet).

CONSTITUENTS

Cadabacine, cadabacine diacetate, (-) -catechin, (-) - epicatechin-5- glucoside, (-)-epiafzelechin, isothicyanate glucoside, glucocapparin, taraxasterol, lupeol, 3-epilupeol, lupeol acetate, diosgenin, friedelin, betulinic acid, ceryl alcohol and spinasterol acetate.

PROPERTIES AND ACTIONS

Cuvai	:	Kaippu (கைப்பு)
Guṇam	:	Ilaku (இலகு), Vaṟaḍci (வறட்சி)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)

Ceykai : Kaṟkaraicci (கற்கரைச்சி), Malamiḷakki (மலமிளக்கி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Uramākki (உரமாக்கி), Veppakaṟṟi (வெப்பகற்றி)

IMPORTANT FORMULATIONS

Vātacurak Kuḍinīr (வாதசுரக் குடிநீர்)

THERAPEUTIC USES

Kallaḍaippu (கல்லடைப்பு), Kāṇākaḍi (காணாகடி), Puraiyōḍiya Puṇkaḷ (புரையோடிய புண்கள்), Vaḷi Nōykaḷ (வளி நோய்கள்)

DOSE - Decoction 30- 50 ml twice daily.

30- 50 g coarse powder in 200 ml of water for preparing decoction.

MIḶAKU (Fruit) - மிளகு

Miḷaku is the fully mature dried fruit of ***Piper nigrum*** L. (Fam. Piperaceae), a climber, cultivated from Konkan Southwards, especially in North Konkan Kerala, and also in Assam.; fruits ripen from December to March, depending upon climatic conditions; fruits harvested from December to April. It grows in Kuṟiñcithiṇai.

SYNONYMS

Tamil	:	Kaṟi (கறி), Kāyam (காயம்), Malaiyāḷi (மலையாளி), Mārīcam (மாரீசம்), Vallīcam (வல்லீசம்)
Bengali	:	Golmorich, Kalamorich, Morich
English	:	Black pepper
Gujrati	:	Kalimori
Hindi	:	Kalimirch
Kannada	:	Karimonaru, Menaru
Malayalam	:	Karumulaku
Marathi	:	Kalamiri
Punjabi	:	Galmirich, Kalimirch
Sanskrit	:	Marica, Vellaja, Usana
Telugu	:	Miriyalu, Marichamu
Urdu	:	Fulfil Siyah, Kalimirich

DESCRIPTION

a) Macroscopic

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

b) Microscopic

Fruit consists of a thick pericarp for about one third of fruit and an inner mass of perisperm, enclosing a small embryo; pericarp consists of epicarp, mesocarp and endocarp; epicarp composed of single layered, slightly sinuous, tabular cells forming epidermis, below which, are present 1 or 2 layers of radially elongated, lignified stone cells adjacent to group of cells of parenchyma; mesocarp wide, composed of band of tangentially elongated parenchymatous cells having a few isolated, tangentially elongated oil cells present in outer region and a few fibro-vascular bundles, a single row of oil cells in the inner region of mesocarp; endocarp composed of a row of beakershaped stone cells; testa single layered, yellow coloured, thick-walled sclerenchymatous cells; perisperm contains parenchymatous cells having a few oil globules and angular, polyhedral

cells packed with abundant, oval to round, simple and compound starch grains measuring 5.5 to 11.0 µm in dia.; having 2 or 3 components and a few minute aleurone grains.

Powder:

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

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	5	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	0.5	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	6	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	6	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'G' plate using Toluene: Ethyl acetate (7:3) shows in visible light four spots at Rf.0.05, 0.08 (both light green), 0.27 (light yellow) and 0.52 (yellow). Under UV (366 nm.) ten fluorescent zones are visible at Rf. 0.05, 0.08 (both light brown), 0.20 (light blue), 0.46 (blue), 0.52 (greenish yellow), 0.57 (bluish yellow), 0.66 (light blue), 0.74 (light pink), 0.82 and 0.97 (both blue). On exposure to iodine vapours eleven spots appear at Rf. 0.05, 0.08, 0.14, 0.20, 027, 0.34, 0.46, 0.57, 0.66, 0.74 and 0.97 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic- Sulphuric acid reagent nine spots appear at Rf. 0.05 (light orange), 0.14, 0.20, 0.27 (all orange), 0.46, 0.57 (both yellowish orange), 0.66, 0.74 (both orange) and 0.97 (light orange). On spraying with Vanillin- Sulphuric acid reagent and heating the plate for five minutes at 105º C twelve spots appear at Rf. 0.05, 0.08, 0.20, 0.27, 0.46, 0.52, 0.57, 0.66, 0.74, 0.82, 0.90 and 0.97 (all violet).

CONSTITUENTS

Chavicine, piperine, piperidine, piperitine, pipercide, isochavinic acid, methyl caffeic acid, pipericide, α and β- cic-bergamotene, guineensine, N- dtransferuloyltyramine, N-5- (4-hydroxy-phenyl) 2E, 4E-pentadienoyl piperidine, N- isobutyl-2E, 4E, 8Z-eicosatrienamide, N-isobutyl- 2E, 4E- octadecadienamide, pellitorine, N-trans-feruloyl piperidine, feruperine, dihydroferuperine, (E, E) -N- (2-methyl propyl) -2, 4-decadienamide, (E, E, E)-13- (1, 3-benzodioxol-5-yl) -N- (2- methyl propyl) -2, 4, 12- tridecatrienamide, (E, E, E) -11 - 1, 3 - Benzodioxol-5-yl) N- (2-methyl propyl) -2, 4, 10 - tridecatrienamde, piperonal, pioperoleine B, (2E, 4E)- N-isobutyl-2, 4- decadienamide (-) cubelin, (-) 3-4-dimethoxy-3, 4-desmethylene dioxycubalin, dihydrocarveol, caryophylleneoxide,cryptone, α and β- pinene,1-α-phellanthrene, β-caryophyllene, epoxydihydrocaryophyllene, m - mentha - 3 (8), 6-dione (isosylreterpinolene) delta -3- carene, limonene and pipwaqarine.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை), Va̲ṛaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvaka̲ṛṛi (அகட்டுவாய்வகற்றி), Kāraluṇḍākki (காரலுண்டாக்கி), Mu̲ṛaiveppaka̲ṛṛi (முறைவெப்பகற்றி), Naccaka̲ṛṛi (நச்சகற்றி), Vātamaḍakki (வாதமடக்கி), Veppamuṇḍākki (வெப்பமுண்டாக்கி), Vīkkaṅkaraicci (வீக்கங்கரைச்சி)

IMPORTANT FORMULATIONS

Aśḍāthic Cūraṇam (அஷ்டாதிச் சூரணம்), Civa̲ṉār Amirtam (சிவனார் அமிர்தம்), Cuvācakuḍōri (சுவாசகுடோரி), Ēlātic Cūraṇaṃ (ஏலாதிச் சூரணம்), Nilavākaic Cūraṇam (நிலவாகைச் சூரணம்), Pañcatīpākki̲ṉi Cūraṇam (பஞ்சதீபாக்கினி சூரணம்), Tāḷicāti Vaḍakam (தாளிசாதி வடகம்), Tirikaḍukuc Cūraṇam (திரிகடுகுச் சூரணம்)

THERAPEUTIC USES

A̲ẓal Nōykaḷ (அழல் நோய்கள்), Ceriyāmai (செரியாமை), Curam/Kāyccal (சுரம்/காய்ச்சல்), Cuvaiyi̲ṉmai (சுவையின்மை), Ka̲ẓalai (கழலை), Timir Vātam (திமிர் வாதம்), Vaḷi Nōykaḷ (வளி நோய்கள்)

DOSE - Powder 250 - 500 mg

Decoction 30- 50 ml twice daily.

15 - 30 g coarse powder in 200 ml of water for preparing decoction.

MŪKKIRAḌṬAI CAMŪLAM (Whole Plant) - மூக்கிரட்டை சமூலம்

Mūkkiraḍṭai Camūlam is the dried, whole plant of ***Boerhaavia diffusa*** L. (Fam. Nyctaginaceae), a trailing herb found throughout India and collected after rainy season; herb is diffusely branched with stout root stock and many long, slender, prostrate or ascending branches.It grows in Marutham thiṇai.

SYNONYMS

Tamil	:	Irattapuḍpikā (இரத்தபுட்பிகா), Mūkkuraḍḍai(Civappu) (மூக்குரட்டை(சிவப்பு)), Puḍpakam (புட்பகம்)
Assamese	:	Ranga punarnabha
Bengali	:	Rakta punarnava
English	:	Horse purslene, Hog weed
Gujrati	:	Dholisaturdi, Motosatodo
Hindi	:	Gadapurna, Lalpunarnava
Kannada	:	Sanadika, Kommeberu, Komma
Kashmiri	:	Vanjula Punarnava
Malayalam	:	Chuvanna Tazhutawa
Marathi	:	Ghetuli, Vasuchimuli, Satodimula, Punarnava, Khaparkhuti
Oriya	:	Lalapuiruni, Nalipuruni
Punjabi	:	Itcit (lal), Khattan
Sanskrit	:	Punarnava (Rakta), Kathilla, Sophagnni, Sothaghni
Telugu	:	Atikamaidi, Erra galijeru

DESCRIPTION

a) Macroscopic

Root-Well developed, fairly long, somewhat tortuous, cylindrical, 0.2 to 1.5 cm. in diameter; yellowish brown to brown coloured, surface rough due to minute longitudinal striations and root scars; fracture short; no distinct odour; taste slightly bitter.

Stem-Greenish purple, stiff, slender, cylindrical, swollen at nodes, minutely pubescent or nearly glabrous, prostrate, divaricately branched, branches from common stalk, often more than a metre long

Leaf- Opposite in unequal pairs, larger ones 25 to 37 mm. long and smaller ones 12 to 18 mm. long, ovate-oblong or suborbicular, apex rounded or slightly pointed, base subcordate or rounded,

green and glabrous above, whitish below, margin entire or sub-undulate, dorsal side pinkish in certain cases, thick in texture, petioles nearly as long as the blade, slender.

Flowers- Small clusters of 4 to 10 corymb, axillary and in terminal panicles; very small, pink coloured, nearly sessile or shortly stalked, 10 to 25 cm., umbels, arranged on slender long stalks, bracteoles small, acute, perianth tube constricted above the ovary, lower part greenish, ovoid, ribbed, upper part pink, funnel-shaped, 3 mm. long, tube 5 lobed, stamen 2 or 3.

Fruit-One seeded nut, 6 mm. long, clavate, rounded, broadly and bluntly 5 ribbed, viscidly glandular.

b) Microscopic

Root - Transverse section of mature root shows anomalous secondary growth; cork composed of thin-walled tangentially elongated cells with brown walls in the outer few layers; cork cambium of 1 or 2 layers of thin-walled cells; secondary cortex consists of 2 or 3 layers of parenchymatous cells followed by cortex composed of 5 to 12 layers of thin-walled, oval to polygonal cells; several concentric bands of xylem tissue alternating with wide zone of parenchymatous tissue present below cortical regions; number of bands vary according to thickness of root and composed of vessels, tracheids and fibres; vessels mostly found in groups of 2 to 8, in radial rows, having simple pits and reticulate thickening; tracheids small, thick-walled with simple pits; fibres aseptate, elongated, thick-walled, spindle shaped with pointed ends; phloem occurs as hemispherical or crescentic patches outside each group of xylem vessels and composed of sieve elements and parenchyma; broad zone of parenchymatous tissue, in between two successive rings of xylem elements composed of thin-walled more or less rectangular cells arranged in radial rows, central regions of root occupied by primary vascular bundles; numerous raphides of calcium oxalate, in single or in group present in cortical region and parenchymatous tissue in between xylem tissue; starch grains simple and compound having 2 to 4 components found in abundance in most of cells of cortex and in parenchymatous tissue between xylem elements, starch grains mostly rounded in shape and measure 2.75 to 11 μm in diameter.

Stem- Transverse section of young stem shows epidermal layer containing multicellular, uni seriate glandular trichomes consisting of 9 to 12 stalked cells and an ellipsoidal head, 150 to 220 μm long; cortex consists of 1 or 2 layers of parenchyma; endodermis indistinct; pericycle 1 or 2 layered, thick-walled often containing scattered isolated fibres; stele consists of two medullary bundles, a middle ring of 6 to 14 bundles and an outer ring of 15 to 20 or more small bundles; intra fascicular cambium present. Mature stem shows anomalous secondary thickening in the form of a succession of rings of vascular bundles; the secondary bundles exhibit a concentric or irregular arrangement embedded in parenchymatous conjunctive tissue, thin walled lignified groups of parenchymatous cells frequently associated with the phloem; the phloem groups and adjoining ground parenchyma occasionally appear as concentric annular or band shaped strips of tissue.

Leaf- Dorsiventral; epidermis single layered; in surface view, the upper epidermal cells have straight walls and lower epidermal cell walls slightly wavy, stomata anomocytic present on both lower and upper surface, but more in number on lower surface; multicellular glandular trichomes present on both the surfaces; palisade single layered, followed by 2 to 4 layered spongy parenchyma cells with small intercellular spaces; vascular bundle surrounded by an incomplete bundle sheath; idioblasts containing raphides; occasionally cluster crystal of calcium oxalate and orange-red resinous matter present in mesophyll; dorsal side of the midrib composed of 2 layered collenchyma, ground tissue parenchymatous; vascular bundle protected by 2 to 3 layered thick walled cells on the dorsal side; palisade ratio 3 to 7; stomatal index 11 to 16 for upper surface, 10 to 14 for lower surface; vein- islet number 9 to 15 per square mm.

Powder:

Brown; shows parenchyma cells; fragments of tracheids, vessels with reticulate thickening; fragments of unicellular hairs; numerous acicular and cluster crystals of calcium oxalate; simple, rounded starch grains measuring 2.75 to 11 µm in dia., compound having 2 to 4 components.

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 6 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 1 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 4.0 per cent, Appendix	2.2.7.

ASSAY

Contains not less than 0.1 per cent of total alkaloids, when assayed by the following methods:-

About 100 g of the drug (60 mesh powder) is taken and moistened with dilute solution of Ammonia. It is extracted continuously in a Soxhlet apparatus for 18 hours with 95 per cent Alcohol. The Alcohol is removed by distillation. The residue is extracted with five 25 ml portions of 1 N Hydrochloric acid till complete extraction of the alkaloid is effected. The mixed acid solutions is transferred into a separating funnel and washed with 25 ml of Chloroform and the Chloroform washings are rejected. The aqueous acid solution is made distinctly alkaline with Ammonia and shaken with five 25 ml portions of Chloroform till complete extraction of alkaloids is effected. The combined Chloroform extract is washed with two portions each of 25 ml of water. The Chloroform layer is filtered in tared flask and evaporated to dryness. The percentage of the total alkaloid is calculated.

T.L.C.

T.L.C. of Alcoholic extract on silica gel 'G' plate using Toluene: Ethyl Acetate: Acetone (2:4:4) v/v, under UV (366 nm.) four fluorescent zones visible at Rf. 0.45, 0.62, 0.69 and 0.75 (all red). On spraying with 4% Methanolic- Sulphuric acid reagent and heating the plate for five minutes at 105°C six spots appear at Rf. 0.31, 0.45, 0.62, 0.69, 0.80 & 0.96 (all grey).

CONSTITUENTS

Punarnavoside, boeravinones A, B, C, D & E, liridodendrin, syringaresinol mono - ß - D-glucoside, boeravine and hypoxanthine - 9-L-arabinofuranoside.

PROPERTIES AND ACTIONS

Cuvai	:	Kaippu (கைப்பு)
Guṇam	:	Vaṟaḍci (வறட்சி)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)

Ceykai : Ciṟunīrperukki (சிறுநீர்பெருக்கி), Kōzaiyakaṟṟi (கோழையகற்றி), Kuḷircciyuṇḍākki (குளிர்ச்சியுண்டாக்கி), Malamiḷakki (மலமிளக்கி), Puzuvakaṟṟi (புழுவகற்றி), Vāntiyuṇḍākki (வாந்தியுண்டாக்கி)

IMPORTANT FORMULATIONS

Tāḷakacentūram (தாளகசெந்தூரம்)

THERAPEUTIC USES

Azal Nōykaḷ (அழல் நோய்கள்), Iraippu (இரைப்பு), Kāmālai (காமாலை), Kīlvāyu (கீல்வாயு), Namaiccal (நமைச்சல்), Nīrkkaḍḍu (நீர்க்கட்டு), Peruvayiṟu (பெருவயிறு), Vaḷi Nōykaḷ (வளி நோய்கள்)

DOSE - Powder 1 - 3g

NANNĀRI (Root) - நன்னாரி

Nannāri is the root of ***Hemidesmus indicus*** (L.) R. Br. (Fam. Asclepiadaceae), a prostrate or semi-erect laticiferous herb, found throughout India from upper Gangetic plains east-wards to Assam, throughout Central, Western and Southern India upto an elevation of 600 m

SYNONYMS

Tamil : Aṅkāri Mūli (அங்காரி மூலி), Cāriyam (சாரியம்), Kāmavalli (காமவல்லி), Kiruṣṇavalli (கிருஷ்ணவல்லி), Pātāḷa Mūli (பாதாள மூலி)

Assamese : Vaga sariva

Bengali : Anantamul, Shvetashariva

English : Indian sarasa parilla

Gujrati : Kabri, Upalsari

Hindi : Anantamul

Kannada : Anantamool, Bili namadaberu, Namada veru, Sogadeberu, Namadaberu

Kashmiri : Anant mool

Malayalam : Nannari, Nannar, Naruneendi

Marathi : Upalsari, Anantamula

Oriya : Dralashvan lai, Anantamool

Punjabi : Anantmool, Ushbah

Sanskrit : Sveta sariva, Ananta, Gopasuta

Telugu : Sugandhi pala, Tella Sugandhi

Urdu : Ushba hindi

DESCRIPTION

a) Macroscopic

Roots occur in pieces, about 30 cm. long and 3 to 8 mm. in diameter, cylindrical, thick, hard, somewhat tortuous, sparsely branched, provided with a few thick rootlets and secondary roots; external appearance dark brown, sometimes with violet-grey tinge; center yellow, woody, surrounded by a mealy white cortical layer; bark brownish, corky, marked with transverse cracks and longitudinal fissures and easily detachable from the hard central core; odour characteristic; taste sweetish, slightly acrid and aromatic.

b) Microscopic

Transverse section of root shows periderm consisting of three layers of tissues, cork, cork cambium and secondary cortex; cork cells radially flattened and rectangular in appearance filled

with dark brown contents giving reactions of tannins; cork cambium, 2 or 3 layered, compressed, and filled with deep brown contents; secondary cortex, 3 or 4 layers of cells, similar to cork cells, with very little or no dark brown contents; secondary phloem consists of sieve elements, parenchyma, phloem ray cells alongwith several laticiferous ducts; parenchyma cells filled with starch grains, diameter 7 to 10 µm, occasional prismatic crystals of calcium oxalate; laticiferous ducts scattered in parenchymatous tissue; cambium very narrow; xylem traversed by narrow medullary rays; vessels and tracheids characterized by the presence of pitted markings; pith absent and central region occupied by woody tissues.

Powder:

Brown; shows parenchyma cells filled with oval or rounded starch grains 7 to19 µm in dia., having 2 to 8 or more components or prismatic calcium oxalate crystals; pieces of laticiferous ducts; vessels with spiral thickenings.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 4 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 15 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 13 per cent, Appendix	2.2.7.

T.L.C.

T.L.C of Chloroform soluble fraction of alcoholic extract on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Toluene: Ethyl acetate : Methanol (8:2:0.5), with Anisaldehyde- Sulphuric acid reagent and heating the plate, at 105ºC for five minutes shows six spots at Rf. 0.59 (bluish grey), 0.65 (blue), 0.72 (pinkish violet), 0.80 (bluish grey), 0.91 and 0.94 (both pinkish violet).

CONSTITUENTS

2-hydroxy, 4- methoxy-benzoic acid, essential oil containing mainly 2- hydroxy - 4- methoxy benzaldehyde, nerolidol, borneol, linalylacetate, dihydrocarvylacetate, salicylaldehyde, isocaryophyllene, á- terpinylacetate, 1, 8- cineol, lupeol acetate,oleanane, ursane and lupane derivatives, coumarino lignoids - hemidesminine, hemidesmin 1 and 2.

PROPERTIES AND ACTIONS

Cuvai : I**ṉ**ippu (இனிப்பு), Kaippu (கைப்பு)

Guṇam : Noymai (நொய்மை), Tiṇmai (திண்மை)

Vīrium : Taṭpam (தட்பம்)

Pirivu : I**ṉ**ippu (இனிப்பு)

Ceykai : Ci**ṟ**unīrperukki (சிறுநீர்பெருக்கி), U**ḷḷ**a**ẕ**alā**ṟṟ**i (உள்ளழலாற்றி), Uramākki (உரமாக்கி), Uṭda**ṟ**tē**ṟṟ**i (உடற்தேற்றி), Viyarvaiyuṇṭākki (வியர்வையுண்டாக்கி)

IMPORTANT FORMULATIONS

Maṇḍūrāti Aḍaikkuḍinīr (மண்டூராதி அடைக்குடிநீர்), Paṟaṅkippaḍḍai Iracāyaṉam (பறங்கிப்பட்டை இரசாயனம்), Pittacurak Kuḍinīr (பித்தசுரக் குடிநீர்)

THERAPEUTIC USES

Aẕal Nōykaḷ (அழல் நோய்கள்), Curavēḍkai (சுரவேட்கை), Nīrēṟṟam (நீரேற்றம்), Nīriẕivu (நீரிழிவு), Vaṇḍu Kaḍi (வண்டு கடி)

DOSE - Decoction 30- 50 ml twice daily.

30- 50 g coarse powder in 200 ml of water for preparing decoction.

NĀYURUVI CAMŪLAM (Whole Plant) - நாயுருவி சமூலம்

Nannāri is the root of ***Hemidesmus indicus*** (L.) R. Br. (Fam. Asclepiadaceae), a prostrate or semi-erect laticiferous herb, found throughout India from upper Gangetic plains east-wards to Assam, throughout Central, Western and Southern India upto an elevation of 600 m.It grows in Marutham thiṇai.

SYNONYMS

Tamil : Apamārkki (அபமார்க்கி), Allam (அல்லம்), Ciṟukaḍalāḍi (சிறுகடலாடி), Kāñcari (காஞ்சரி), Māmuṉi (மாமுனி)

Bengali : Apamg

English : Prickly chaff flower

Gujrati : Aghedo

Hindi : Chirchita, Latjira

Kannada : Uttarani

Malayalam : Katalati

Marathi : Aghada

Punjabi : Puthakanda

Sanskrit : Apamarga, Mayura, Pratyakpuspa, Kharamanjar, Sikhari

Telugu : Uttarenu

Urdu : Chirchita

DESCRIPTION

a) Macroscopic

Root - Cylindrical tap root, slightly ribbed, 0.1 to 1.0 cm. in thickness, gradually tapering, rough due to presence of some root scars; secondary and tertiary roots present, yellowish-brown; odour not distinct.

Stem - 0.3 to 0.5 cm. in cut pieces, yellowish-brown, erect, branched, cylindrical, hairy, solid but hollow when dry.

Leaf - Simple, sub sessile, exstipulate, opposite, decussate, wavy margin, obovate, slightly acuminate and pubescent.

Flower - Arranged in inflorescence of long spikes, greenish-white, numerous sessile, bracteate with two bracteoles, one spine lipped, bisexual, actinomorphic, hypogynous; perianth segments 5, free, membranous, contorted or quincuncial, stamens 5, opposite, the perianth lobes, connate forming a membranous tube-like structure, alternating with truncate and fimbriate staminodes, filament short;

anther, two celled, dorsifixed; gynoecium bicarpellary, syncarpous; ovary superior, unilocular with single ovule; style, single; stigma, capitate.

Fruit - An indehiscent dry utricle enclosed within persistent, perianth and bracteoles.

Seed - Sub-cylindric, truncate at the apex, round at the base, endospermic, brown.

b) Microscopic

Root - Mature root shows 3 to 8 layered, rectangular, tangentially elongated, thin-walled cork cells; secondary cortex consisting of 6 to 9 layers, oval to rectangular, thin-walled, parenchymatous cells having a few scattered single or groups of stone cells; followed by 4 to 6 discontinuous rings of anomalous secondary thickening composed of vascular tissues; small patches of sieve tubes distinct in phloem parenchyma, demarcating the xylem rings; xylem composed of usual elements; vessels simple pitted; medullary rays 1 to 3 cells wide; small prismatic crystals of calcium oxalate present in cortical region and numerous in medullary rays.

Stem - Young stem shows 6 to 10 prominent ridges; epidermis single layered, covered by thick cuticle having uniseriate, 2 to 5 celled, covering trichomes and glandular with globular head on a 3 to 4 celled stalk; cortex 6 to 10 layered, composed of parenchymatous cells, most of them containing rosette crystals of calcium oxalate; in the ridges cortex collenchymatous; vascular bundles lie facing each ridge capped by pericyclic fibres; transverse section of mature stem shows lignified, thin-walled cork cells; pericycle a discontinuous ring of lignified fibres; vascular tissues show anomalous secondary growth having 4 to 6 incomplete rings of xylem and phloem; secondary phloem consists of usual elements forming incomplete rings; cambial strip present between secondary xylem and phloem; vessels annular, spiral, scalariform and pitted, fibres pitted, elongated, lignified; pith wide consisting of oval to polygonal, parenchymatous cells; two medullary bundles; clustered crystals of calcium oxalate, microsphenoidal calcium oxalate crystals present in some epidermal, cortical and pith cells.

Leaf

Petiole - Shows crescent-shaped outline, having single-layered epidermis with thickcuticle; ground tissue consisting of thin-walled, parenchymatous cells containing rosette crystals of calcium oxalate; 4 or 5 vascular bundles situated in mid region.

Midrib - Shows a single layered epidermis on both surfaces; epidermis followed by 4 or 5 layered collenchyma on upper side and 2 or 3 layered on lower side; ground tissue consisting of thin-walled, parenchymatous cells having a number of vascular bundles; each vascular bundle shows below the xylem vessels, thin layers of cambium followed by phloem and a pericycle represented by 2 or 3 layers of thick-walled, non-lignified cell; rosette crystals of calcium oxalate found scattered in ground tissues.

Lamina - Dorsiventral; shows single layered, tangentially elongated epidermis cells covered with thick cuticle having covering trichomes which are similar to those of stem found on both surfaces; palisade 2 to 4 layered of thick parenchyma larger, slightly elongated in upper, while smaller and rectangular in lower surface; spongy parenchyma 3 to 5 layers thick, more or less isodiametric parenchymatous cells; idioblast containing large rosette crystals of calcium oxalate distributed in mesophyll; stomata anomocytic present on both surfaces; stomatal index 4.5 to 9.0 on upper surface, 9.0 to 20.0 on lower surface; palisade ratio 7.0 to 11; vein- islet number 7 to 13 per square mm.

Powder:

Light yellow; shows fragments of elongated, rectangular, thin-walled eipdermal cells; aseptate fibres, vessels with annular, spiral, scalariform and pitted thickening; uniseriate hair with bulbous base; rosette and prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 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 2 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 12 per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of the Methanolic extract of the drug on silica gel 'G' plate using n- Hexane: Ethyl Acetate: glacial Acetic Acid (10.0:5.0:0.1) shows 3 spots at Rf. 0.20 (light pink), 0.49 (dark pink, oleanolic acid marker), 0.55 (dark yellow), and two brown spots one of which stays on the base and the other running to the solvent front with a green chlorophyll spot below it, on spraying with 1:1 aqueous Sulphuric acid reagent and heating the plate at 105ºC for five minutes.

CONSTITUENTS

Triterpenoid saponins A-D, possessing oleanolic acid as aglycone, ecdysone, ecdysterone, tritriacontane, pentatriacontane, hexatriacontane, 6- pentatria contanone, 4-tritria contanone, 10-tria cosanone,17 - pentatriacontanol, 27- cyclohexyl heptacosan- 7-ol, 16, hydroxy -26- methyl heptacosan - 2- one and 36, 47, dihydroxyhenpentacontan - 4 - one, betaine.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு), Kārppu (கார்ப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Acaivu (அசைவு), Kūrmai (கூர்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ciṟunīrperukki (சிறுநீர்பெருக்கி), Muṟaiveppakaṟṟi (முறைவெப்பகற்றி), Tuvarppi (துவர்ப்பி), Uḍaṟtēṟṟi (உடற்தேற்றி)

IMPORTANT FORMULATIONS

Nākaccentūram (நாகச்செந்தூரம்)

THERAPEUTIC USES

Cevinōy (செவிநோய்), Cūtakataḍai (சூதகதடை), Aiya Nōykaḷ (ஐய நோய்கள்), Irumal (இருமல்), Kāmālai (காமாலை), Kuṉmam (குன்மம்), Veḷḷai (வெள்ளை), Veḷuppu Nōy/Pāṇḍu (வெளுப்பு நோய்/பாண்டு), Vīkkam (வீக்கம்)

DOSE - Decoction 30- 50 ml twice daily.20 - 50 g coarse powder in 200 ml of water for preparing decoction.

NELLIKKĀY (Fresh Fruit) - நெல்லிக்காய்

Nellikkāy is the fresh fruit of ***Phyllanthus emblica*** L. Syn. ***Emblica officinalis*** Gaertn. (Fam. Euphorbiaceae), a small or medium sized tree, found in mixed deciduous forests, ascending to 1300 m. on hills and cultivated in gardens and homeyards.It grows in Kuṟiñciand Marutham thiṇai.

SYNONYMS

Tamil	:	Āmalakam (ஆமலகம்), Kōraṅkam (கோரங்கம்), Miṟutupalā (மிறுதுபலா), Nelli (நெல்லி), Tāttiri (தாத்திரி)
Bengali	:	Amla, Dhatri
English	:	Amlaku, Amlakhi, Amlakhu, Emblic myrobalan
Gujrati	:	Ambala, Amla
Hindi	:	Amla, Aonla
Kannada	:	Nellikayi
Kashmiri	:	Embali, Amli
Malayalam	:	Nellikka
Marathi	:	Anvala, Avalkathi
Oriya	:	Ainla, Anala
Punjabi	:	Amla, Aula
Sanskrit	:	Amalaki, Amrtaphala, Dhatriphala
Telugu	:	Usirika
Urdu	:	Amla, Amlaj

DESCRIPTION

a) Macroscopic

Fruit, globose, 2.5 to 3.5 cm. in diameter, fleshy, smooth with six prominent lines; greenish when tender, changing to light yellowish or pinkish colour when mature, with a few dark specks; taste sour and astringent followed by delicately sweet taste.

b) Microscopic

Transverse section of mature fruit shows an epicarp consisting of single layer of epidermis and 2 to 4 layers of hypodermis; epidermal cell, tabular in shape, covered externally with a thick cuticle and appear in surface view as polygonal; hypodermal cells tangentially elongated, thick-walled, smaller in dimension than epidermal cells; mesocarp forms bulk of fruit, consisting of thin-walled parenchymatous cells with intercellular spaces, peripheral 6 to 9 layers smaller, ovoid or

tangentially elongated while rest of cells larger in size, isodiametric with prominent corner thickenings; several collateral fibrovascular bundles scattered throughout mesocarp consisting of xylem and phloem; xylem composed of tracheal elements, fibre tracheids and xylem fibres; tracheal elements show reticulate, scalariform and spiral thickenings; xylem fibres elongated with narrow lumen and pointed end; mesocarp contains large aggregates of numerous irregular silica crystals.

IDENTITY, PURITY AND STRENGTH

Moisture content	Not less than 80 per cent, Appendix	2.2.9
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 40 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 50 per cent, Appendix	2.2.7.

T.L.C.

T.L.C of Dichloromethane- soluble fraction of Alcoholic extract of the drug on silica gel 'G' plate using Toluene: Ethyl Acetate : Formic Acid (5:4:1), on exposure to iodine vapours shows seven spots at Rf. 0.04, 0.12, 0.19, 0.32, 0.41, 0.48 and 0.61 (all yellow). On spraying with 5% Ferric chloride solution three spots appear at Rf. 0.04, 0.19 and 0.32 (all blackish violet).

CONSTITUENTS

Ascorbic acid, gallic acid, ellagic acid, L-malic acid-2-O-gallate, mucic acid-2-O-gallate, mucic acid-1,4-lactone, 2-O-gallate, 5-O-gallate, 3-O-gallate, 3,5-di-O-gallate and tannins.

PROPERTIES AND ACTIONS

Cuvai : I**ṉ**ippu (இனிப்பு), Pu**ḷ**ippu (புளிப்பு), Tuvarppu (துவர்ப்பு)

Guṇ**am** : Ilaku (இலகு), Va**ṟ**a**ḍ**ci (வறட்சி)

Vī**rium** : Ta**ḍ**pam (தட்பம்)

Pirivu : I**ṉ**ippu (இனிப்பு)

Ceykai : Ci**ṟ**unī**r**perukki (சிறுநீர்பெருக்கி), Kāyaka**ṟ**pamākki (காயகற்பமாக்கி), Ku**ḷ**ircciyu**ṇḍ**ākki (குளிர்ச்சியுண்டாக்கி), Malami**ḷ**akki (மலமிளக்கி)

IMPORTANT FORMULATIONS

Irunellik Ka**ṟ**pam (இருநெல்லிக் கற்பம்), Ki**ḷ**iñcal Me**ẕ**uku (கிளிஞ்சல் மெழுகு), Nelli I**ḷ**akam (நெல்லி இளகம்), Po**ṉṉ**ā**ṅ**kā**ṇ**it Tailam (பொன்னாங்காணித் தைலம்)

THERAPEUTIC USES

Aiya Nōykaḷ (ஐய நோய்கள்), Mayakkam (மயக்கம்), Pīṉicam (பீனிசம்), Piramēkam (பிரமேகம்), Vānti (வாந்தி), Veṟi Nōy (வெறி நோய்)

DOSE - Powder 10 - 20 g

Fresh juice 5 - 10 ml

NELLI VARRAL (Dried Fruit) - நெல்லி வற்றல்

Nelli Varral is the dried pericarp of mature fruit devoid of seeds, of ***Phyllanthus emblica*** L. Syn. ***Emblica officinalis*** Gaertn. (Fam. Euphorbiaceae), a small or medium sized tree, found in mixed deciduous forests, ascending to 1300 m. on hills and cultivated in gardens and homeyards.It grows in Kuriñciand Marutham thiṇai.

SYNONYMS

Tamil	:	Āmalakam (ஆமலகம்), Kōraṅkam (கோரங்கம்), Mirutupalā (மிறுதுபலா), Nelli (நெல்லி), Nellikkāy (நெல்லிக்காய்), Nellimuḷḷi (நெல்லிமுள்ளி), Tāttiri (தாத்திரி)
Assamese	:	Amlakhi, Amlaku, Amlakhu
Bengali	:	Amla, Dhatri
English	:	Emblic myrobalan
Gujrati	:	Ambala, Amla
Hindi	:	Amla, Aonla
Kannada	:	Nellikayi
Kashmiri	:	Amli, Embali
Malayalam	:	Nellikka
Marathi	:	Anvala, Avalkathi
Oriya	:	Ainla, Anala
Punjabi	:	Amla, Aula
Sanskrit	:	Amalaki, Amrtaphala, Dhatriphala
Telugu	:	Usirika
Urdu	:	Amla, Amlaj

DESCRIPTION

a) Macroscopic

Drug consists of curled pieces of pericarp of dried fruit occurring as separated segments; 1 to 2 cm. long or united with 3 or 4 segments; bulk colour grey to black, pieces showing a broad, highly shrivelled and wrinkled external convex surface to somewhat concave, transversely wrinkled lateral surface, external surface shows a few whitish specks, occasionally some pieces show a portion of stony testa; texture rough, cartilaginous, tough; taste sour and astringent.

b) Microscopic

Transverse section of fruit shows epicarp consisting of single layer of epidermis, cell appearing tabular and polygonal in surface view; cuticle present; mesocarp cells tangentially elongated parenchymatous and crushed, differentiated roughly into a peripheral 8 or 9 layers of tangentially elongated smaller cells, rest consisting of mostly isodiametric larger cells with walls showing irregular thickenings; ramified vascular elements occasionally present; occasionally stone cells may be present either isolated or in small groups towards endocarp; pitted vascular fibres, walls appearing serrated due to the pit canals leading into lumen.

Powder:

Black; shows epidermis with uniformly thickened straight walled, isodiametric parenchyma cells with irregular thickened walls; occasionally short fibres and tracheids.

IDENTITY, PURITY AND STRENGTH

Moisture content	Not less than	50 per cent, Appendix	2.2.9
Foreign matter	Not more than	3 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	40 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	50 per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of Dichloromethane- soluble fraction of Alcoholic extract on silica gel 'G' plate using Toluene: Ethyl Acetate : Formic Acid (5:4:1), on exposure to iodine vapours shows five spots at Rf.0.18, 0.32, 0.48,0.92 and 0.95 (all yellow). On spraying with 5% Ferric chloride solution two spots appear at Rf. 0.18 and 0.32 (both blackish violet).

CONSTITUENTS

Ascorbic acid, tannins gallic, ellagic, phyllemblic acid and emblicol.

PROPERTIES AND ACTIONS

Cuvai : I**ṉ**ippu (இனிப்பு), Pu**ḷ**ippu (புளிப்பு), Tuvarppu (துவர்ப்பு)

Guṇ**am** : Ilaku (இலகு), Va**ṟ**a**ḍ**ci (வறட்சி)

Vī**rium** : Ta**ḍ**pam (தட்பம்)

Pirivu : I**ṉ**ippu (இனிப்பு)

Ceykai : Ci**ṟ**unī**r**perukki (சிறுநீர்பெருக்கி), Ku**ḷ**ircciyu**ṇḍ**ākki (குளிர்ச்சியுண்டாக்கி), Malami**ḷ**akki (மலமிளக்கி)

IMPORTANT FORMULATIONS

Ā̲nanta Pairavam (ஆனந்த பைரவம்), Kantaka Iracāya̲nam (கந்தக இரசாயனம்), Nellikkāy Iḷakam (நெல்லிக்காய் இளகம்), Tiripalaic Cūraṇam (திரிபலைச் சூரணம்)

THERAPEUTIC USES

E̲npurukki Nōy (என்புருக்கி நோய்), Kuruti A̲zal (குருதி அழல்), Uḍcūḍu (உட்சூடு), Perumpāḍu (பெரும்பாடு), Veḷḷai (வெள்ளை)

DOSE - Powder 3 - 6 g

NERUÑCI MUḶ (Fruit) - நெருஞ்சி முள்

Neruñci Muḷ is the dried, ripe, entire fruit of ***Tribulus terrestris*** L.(Fam. Zygophyllaceae), an annual rarely perennial prostrate, common weed of the pasture lands, road sides and other waste places, chiefly in hot, dry and sandy regions; throughout India and upto 3,000 m. in Kashmir.It grows in Marutham , Neythal and Pālaithiṇai.

SYNONYMS

Tamil : Cutam (சுதம்), Kiṭṭiram (கிட்டிரம்), Kōkaṇṭam (கோகண்டம்), Neruñcil (நெருஞ்சில்), Tirikaṇṭam (திரிகண்டம்)

Assamese : Gokshura, Gokhurkata

Bengali : Gokshura, Gokhri

English : Caltrops fruit

Gujrati : Bethagokharu, Mithagokhru, Nanagokharu

Hindi : Gokhru

Kannada : Neggilamullu, Sannaneggilu, Neggilu

Kashmiri : Gokshura, Gokhurkata, Michirkand, Plakhada

Malayalam : Gokshura, Gokhri, Nerinjil

Marathi : Sarate, Gokharu

Oriya : Gukhura, Gokhyura

Punjabi : Bhakhra, Gokhru

Sanskrit : Goksura, Trikanta, Svadamstra, Traikantaka

Telugu : Palleru Kaya

Urdu : Khar-e-Khasak Khurd

DESCRIPTION

a) Macroscopic

Fruit stalked, light or greenish yellow, five ribbed or angled, more or less spherical in structure and covered with short stiff or pubescent hairs, 1 cm. in diameter with five pairs, of prominent short stiff spines, pointed downwards, about 0.5 cm. in length; tips of spines almost meet in pairs, whole together forming pentagonal frame-work around fruit; ripe fruit separates into five segments or cocci; coccus semi-lunar or plano-convex in structure, one chambered, armed with a pair of spines, starting from its middle containing four or more seeds; taste slightly astringent.

b) Microscopic

Transverse section of fruit shows rectangular epidermal cells of each coccus; unicellular trichomes in abundance; mesocarp 6 to 10 layers of large parenchymatous cells, rosette of calcium oxalate crystals abundantly present; mesocarp followed by 3 or 4 compact layers of small cells containing prismatic crystals of calcium oxalate.

Powder:

Creamish-brown; shows fragments of rectangular epidermal cells; unicellular trichomes with pointed tips; numerous rosette crystals of calcium oxalate and a few cells containing prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 15 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 2 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 6 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 10 per cent, Appendix	2.2.7

T.L.C.

T.L.C. of Alcoholic extract on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Toluene: Ethyl acetate (9:1), on exposure to iodine vapours shows ten spots at Rf. 0.09, 0.23, 0.29, 0.35, 0.43, 0.56, 0.61, 0.66, 0.93 and 0.97 (all yellow). With Anisaldehyde- Sulphuric acid reagent heating the plate for five minutes at 105ºC twelve spots appear at Rf. 0.09 (bluish grey), 0.23 (greenish grey), 0.29 (greenish grey), 0.35 (dark grey), 0.43 (greenish grey), 0.49 (blue), 0.56 (greenish grey), 0.61 (greenish grey), 0.66 (greenish grey), 0.86 (blue), 0.93 (dark greenish grey) and 0.97 (dark greenish grey).

CONSTITUENTS

Terrestrosins A, B, C, D and E, desgalactotigonin, F-gitonin, desglucolanatigonin, gitonin, hydrolysed products include diosgenin, hecogenin and neotigogenin; tribulusamides A and B, N-trans- feruloyl tyramine, terrestriamide, N- trans- coumaroyl tyramine, ß-sitosterol and steroidal saponins.

PROPERTIES AND ACTIONS

Cuvai	:	Iṉippu (இனிப்பு), Tuvarppu (துவர்ப்பு)
Guṇam	:	Noymai (நொய்மை), Tiṇmai (திண்மை)
Vīrium	:	Taḍpam (தட்பம்)
Pirivu	:	Iṉippu (இனிப்பு)

Ceykai : Āṇmaiperukki (ஆண்மைபெருக்கி), Ciṟunīrperukki (சிறுநீர்பெருக்கி), Kuḷircciyuṇḍākki (குளிர்ச்சியுண்டாக்கி), Tuvarppi (துவர்ப்பி), Uḷḷaẕalāṟṟi (உள்ளழலாற்றி), Uramākki (உரமாக்கி)

IMPORTANT FORMULATIONS

Kantaka Iracāyaṉam (கந்தக இரசாயனம்)

THERAPEUTIC USES

Cataiyaḍaippu (சதையடைப்பு), Ciṟunīr Ericcal (சிறுநீர் எரிச்சல்), Ciṟunīr Kaḍḍu (சிறுநீர் கட்டு), Kallaḍaippu (கல்லடைப்பு)

DOSE - Powder 3 - 6 g

Decoction 30- 50 ml twice daily.

40- 80 g coarse powder in 200 ml of water for preparing decoction.

NERUÑCI VĒR (Root) - நெருஞ்சி வேர்

Neruñci Vēr is the root of ***Tribulus terrestris*** L. (Fam. Zygophyllaceae), an annual prostrate herb, rarely perennial prostrate common weed of the pasture lands, road sides and other waste land, chiefly growing in hot, dry and sandy regions throughout India and upto 3,000 m. in Kashmir. It grows in Marutham , Neythal and Pālaithiṇai.

SYNONYMS

Tamil	:	Cutam (சுதம்), Kiḍḍiram (கிட்டிரம்), Kōkaṇḍam (கோகண்டம்), Neruñcil (நெருஞ்சில்), Tirikaṇḍam (திரிகண்டம்)
Assamese	:	Gokshura, Gukhurkata
Bengali	:	Gokshura, Gokhri
English	:	Caltrops root
Gujrati	:	Be tha gokharu, Nana gokharu, Mithogokharu
Hindi	:	Gokhru
Kannada	:	Neggilamullu, Neggilu, Sannanaggilu
Kashmiri	:	Michirkand, Pakhada
Malayalam	:	Nerinjil
Marathi	:	Gokharu, Sarate
Oriya	:	Gukhura, Gokhyura
Punjabi	:	Bhakhra, Gokhru
Sanskrit	:	Goksura, Svadamstra, Trikanta, Traikantaka
Telugu	:	Palleruveru
Urdu	:	Khar-e-Khasak Khurd

DESCRIPTION

a) Macroscopic

Drug consists of root, 7 to 18 cm. long and 0.3 to 07 cm. in diameter, slender, cylindrical, fibrous, frequently branched bearing a number of small rootlets, tough, woody and yellow to light brown in colour; surface becomes rough due to presence of small nodules; fracture fibrous; odour aromatic; taste sweetish and astringent.

b) Microscopic

Transverse section of primary roots show a layer of epidermis followed by 4 or 5 layers of thin-walled parenchymatous cortex, endodermis distinct; pericycle enclosing diarch stele, in mature

root, cork 4 to 6 layered, cork cambium single layered followed by 6 to 14 layers of thin-walled parenchymatous cells with groups of fibres, distributed throughout; some secondary cortex cells show secondary wall formation and reticulate thickening; secondary phloem divided into two zones, outer zone characterized by presence of numerous phloem fibres with a few sieve tubes slightly collapsed, inner zone frequently parenchymatous, devoid of fibres often showing sieve tubes and companion cells; phloem rays distinct, a few cells get converted into fibres in outer region; cambium 3 to 5 layered; wood composed of vessels, tracheids, parenchyma and fibres and traversed by medullary rays; vessels scattered, arranged in singles or doubles towards inner side, in groups of three to four on outer side having bordered pits; tracheids long, narrow with simple pits; xylem parenchyma rectangular or slightly elongated with simple pits and reticulate thickening; a few xylem fibres; medullary rays heterogenous, 1 to 4 cells wide; starch grains and rosette crystals of calcium oxalate present in secondary cortex, phloem and medullary ray cells; a few prismatic crystals also present in xylem ray cells.

Powder:

Creamish-brown; shows parenchyma cells; fragments of lignified xylem vessels with reticulate thickening, tracheids, single or groups of phloem fibres; scattered rosette crystal of calcium oxalate, a few prismatic crystal of calcium oxalate; small, oval to rounded starch grains measuring 2 to 7 µm in diameter.

IDENTITY, PURITY AND STRENGTH

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

T.L.C.

T.L.C. of Chloroform- soluble fraction of the Alcoholic extract of the drug on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Chloroform : Methanol (9:1) as the developing system, with Anisaldehyde - Sulphuric acid reagent and heating the plate for five minutes at 105ºC shows nine spots at Rf. 0.13, 0.26 (violet), 0.34, 0.38, 0.42 (grey), 0.54 (violet), 0.63(blue), 0.83 (grey) and 0.93 (pinkish grey).

CONSTITUENTS

Diosgenin, hecogenin, gitogenin, tigogenin, neotigogenin, stigmasterol, β-sitosterol and campesterol .

PROPERTIES AND ACTIONS

Cuvai : I**ṉ**ippu (இனிப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Noymai (நொய்மை), Tiṉmai (திண்மை)

Vīrium : Taḍpam (தட்பம்)

Pirivu : Iṉippu (இனிப்பு)

Ceykai : Āṇmaiperukki (ஆண்மைபெருக்கி), Ciṟunīrperukki (சிறுநீர்பெருக்கி), Kuḷircciyuṇḍākki (குளிர்ச்சியுண்டாக்கி), Tuvarppi (துவர்ப்பி), Uḷḷaẕalāṟṟi (உள்ளழலாற்றி), Uramākki (உரமாக்கி)

IMPORTANT FORMULATIONS

Tirāḍcāticcūraṇam (திராட்சாதிச்சூரணம்)

THERAPEUTIC USES

Nīrkaḍuppu (நீர்கடுப்பு), Veḷḷai (வெள்ளை)

DOSE - Decoction 30- 50 ml twice daily.

40- 80 g coarse powder in 200 ml of water for preparing decoction.

NĒRVĀḶAM (Seed) - நேர்வாளம்

Nērvāḷam is the dried seed of ***Croton tiglium*** L. (Fam. Euphorbiaceae), a small evergreen tree, 5 to 7 m high, found throughout tropical India. The seeds are subjected to purification process before use.

SYNONYMS

Tamil	:	Cōpi (சோபி), Nākaṇam (நாகணம்), Nēpāḷam (நேபாளம்), Tanti (தந்தி), Vāḷam (வாளம்)
Assamese	:	Kanibish
Bengali	:	Jaipala
English	:	Croton
Gujrati	:	Nepalo, Jamalagota
Hindi	:	Jamalgota
Kannada	:	Nepal, Japal beej, Japala, Nervala
Malayalam	:	Nervalam, Neervalam
Marathi	:	Jepal, Japal
Punjabi	:	Japolota
Sanskrit	:	Jayapala, Mukula, Tintidiphala
Telugu	:	Nepalamu
Urdu	:	Jamalgota

DESCRIPTION

a) Macroscopic

Seed ovate, oblong, slightly quadrangular, convex on dorsal and somewhat flattened on ventral surface, about 12 mm. in length and resemble castor seed in shape, dull cinnamon-brown, often mottled with black due to abrasion in testa, caruncle easily detatched and usually absent, hilum on ventral side less distinct than that of castor seed, raphe runs along ventral surface of seed, terminating in a dark chalaza at opposite extremity, kernel yellowish and oily, consisting of a large endosperm, enclosing papery cotyledons and a small radicle, no marked odour; kernel gives at first oily taste followed by an unpleasant acridity.

b) Microscopic

Seed - Shows a hard testa, consisting of an epidermal layer, covered externally with a thick cuticle and composed of oval and tangentially elongated cells, filled with brownish content; epidermis followed by a layer of radially elongated cells, slightly bent at middle, upper half portion filled with reddish-brown and lower half filled with yellow contents; inner most zone consists of tangentially

elongated, thin-walled cells; endosperm consists of polygonal parenchymatous cells filled with oil globules, a few cells having rosette crystals of calcium oxalate; central region of endosperm shows a dicotyledonous embryo consisting of thin-walled parenchymatous cells.

Powder:

White with black particles of testa; shows elongated cells containing reddish-brown and yellow contents; oil globules and a few rosette crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 3 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 0.5 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 15 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 n-Butanol: Acetic acid: Water (4:1:5) shows under UV (366 nm.) three spots at Rf. 0.34, 0.54 and 0.84 (all violet). On exposure to iodine vapours six spots appear at Rf.. 0.10, 0.29, 0.39, 0.49, 0.63 and 0.90 (all yellow). On spraying with 5 % Methanolic- Sulphuric acid reagent and heating the plate at 105° C for five minutes three spots appear at Rf. 0.34(grey), 0.54 (yellow), 0.84 (brown).

CONSTITUENTS

4-deoxy-4α-phorbol, phorbol esters, b -sitosterol, fixed oil and resins.

PROPERTIES AND ACTIONS

Cuvai	:	Kaippu (கைப்பு)
Guṇam	:	Noymai (நொய்மை), Tiṇmai (திண்மை)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)
Ceykai	:	Nīrmalampōkki (நீர்மலம்போக்கி), Taḍippuṇḍākki (தடிப்புண்டாக்கி)

IMPORTANT FORMULATIONS

Akattiyar Kuẕampu (அகத்தியர் குழம்பு), Aṣḍapairavam (அஷ்டபைரவம்), Cittāti Eṇṇey (சித்தாதி எண்ணெய்), Mēkanāta Kuḷikai (மேகநாத குளிகை), Tāẕampū Māttirai (தாழம்பூ மாத்திரை)

THERAPEUTIC USES

Aẕal/Pittam (அழல்/பித்தம்), Mēkam (மேகம்), Vayiṟṟu Nōy (வயிற்று நோய்), Vaḷi Nōykaḷ (வளி நோய்கள்)

DOSE - It cannot be administered as a single drug, it should be used only in combination.

PAṟAṅKI CAKKAI (Tuberous root) - பறங்கி சக்கை

Paṟaṅki Cakkai is the tuberous root of ***Smilax china*** L. (Fam. Liliaceae), a deciduous climber with sparsely prickled or unarmed stem. It is imported from China and Japan. The tuberous roots are subjected to purification process before use.

SYNONYMS

Tamil	:	Cīṉappaṭṭai (சீனப்பட்டை), Matusmīki (மதுஸ்மீகி), Paṟaṅkippaṭṭai (பறங்கிப்பட்டை)
Bengali	:	Chopcheenee, Kumarika, Shukchin
English	:	Chinna root
Gujrati	:	Chopcheenee
Hindi	:	Chopcheenee
Malayalam	:	China Pavu
Marathi	:	Chopcheenee
Sanskrit	:	Madhusnuhi, Dvipantara vaca
Telugu	:	Pirngichekka

DESCRIPTION

a) Macroscopic

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

b) Microscopic

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

Powder:

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

IDENTITY, PURITY AND STRENGTH

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

T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'G' plate using Toluene: Ethyl acetate: Methanol (5:5:2) as mobile phase shows on spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate at 105ºC until the colour develops , ten spots at Rf. 0.09 (dark green), 0.17 (violet), 0.21 (dirty yellow), 0.26 (grey), 0.32 (yellow), 0.48, 0.55 and 0.58 (all violet), 0.73 (greenish blue) and 0.77 (violet).

CONSTITUENTS

Sarsaponin, parallin, β-sitosterol, stigmasterol and their glucosides, daucosterol, isoseryl-S-methyl-cysteamine sulphoxide and dihydrokaempferol-5-O- β-D- glucoside.

PROPERTIES AND ACTIONS

Cuvai : I**ṉ**ippu (இனிப்பு)

Guṇam : Ilaku (இலகு), Va**ṟ**a**ḍ**ci (வறட்சி)

Vī**rium** : Ta**ḍ**pam (தட்பம்)

Pirivu : I**ṉ**ippu (இனிப்பு)

Ceykai : Kāmamperukki (காமம்பெருக்கி), Mēkappi**ṇ**ivilakki (மேகப்பிணிவிலக்கி), Tūymaiyākki (தூய்மையாக்கி), U**ḍ**a**ṟ**tē**ṟ**ṟi (உடற்தேற்றி)

IMPORTANT FORMULATIONS

Iracakanthi Me**ẕ**uku (இரசகந்தி மெழுகு), Pa**ṟ**a**ṅ**kippa**ḍḍ**ai Cūra**ṇ**am (பறங்கிப்பட்டை சூரணம்), Pa**ṟ**a**ṅ**kippa**ḍḍ**ai Iracāya**ṉ**am (பறங்கிப்பட்டை இரசாயனம்), Pa**ṟ**a**ṅ**kippa**ḍḍ**ai Pata**ṅ**kam (பறங்கிப்பட்டை பதங்கம்)

THERAPEUTIC USES

Atika**ẕ**iccal (அதிகழிச்சல்), Cūlai (சூலை), Karappā**ṉ** (கரப்பான்), Kirā**ṇ**i (கிராணி), Māntam (மாந்தம்), N**ī**ri**ẕ**ivu (நீரிழிவு), N**ī**rvē**ḍ**kai (நீர்வேட்கை), Pi**ḷ**avai (பிளவை), Pu**ṇ** (புண்), Uppicam (உப்பிசம்), Vayi**ṟ**ṟiraiccal (வயிற்றிரைச்சல்), Ve**ḍḍ**ai (வெட்டை)

DOSE - Powder 3 - 6 g

PĀTHIRI VĒR (Root) - பாதிரி வேர்

Pāthiri Vēr is the dried root of ***Stereospermum chelonoides*** (L.f.) DC. Syn. ***S. suaveolens***(Roxb.) DC. (Fam. Bignoniaceae), a large deciduous tree upto 18 m. high and 1.8 m. in girth with a clear bole of about 9 m., found throughout the moist parts of the country. It grows in Kuṟiñcithiṇai.

SYNONYMS

Tamil	:	Kaṉṉi (கன்னி), Pāḍalimaram (பாடலிமரம்), Pāḍalam (பாடலம்), Puṉkāli (புன்காலி)
Assamese	:	Parul
Bengali	:	Parul
English	:	Rose flower fragrant
Gujrati	:	Podal
Hindi	:	Padal
Kannada	:	Padramora
Malayalam	:	Padiri
Marathi	:	Padal
Oriya	:	Boro, Patulee
Punjabi	:	Padal
Sanskrit	:	Patalai, Amogha, Madhuduti, Krsnvnta, Tamrapuspi
Telugu	:	Kaligottu, Kokkesa, Podira

DESCRIPTION

a) Macroscopic

Root occurs in about 6 to 9 cm. long, 1 to 1.5 cm. thick cut pieces, cylindrical, externally brown to creamy, rough due to vertical fissures, cracks, ridges and transverse fine lenticels, internally dark brown, lamellation or stratification due to presence of concentric bands of fibres; fracture tough and fibrous; odour not distinct; taste bitter.

b) Microscopic

Root cork consists of 25 to 35 layers of rectangular cells with 3 to 5 stratified layers, lignification being more prominent where the stratification starts, arranged with 1 to 3 tangential rows of narrow cells alternating with 3 to 5 tangential rows of wider cells; cork cambium composed of 1 or 2 layers of tangentially elongated cells; secondary cortex arranged more or less radially, becomes polyhedral to isodiametric in inner region, a few cells getting converted into stone cells

which are regular in shape and show projection; secondary phloem wide, forms ceratenchyma between two obliquely running rays; some rays and phloem cells get converted into irregular, polygonal stone cells, measuring 10 to 150 µm in width, phloem parenchyma being intact; medullary rays multiseriate, being 3 or 4 cells wide, and 8 to 15 cells high; fibres tapering, pointed or slightly blunt, with a small peg-like projection at both ends; sieve tube gets collapsed in outer region forming strips of ceratenchyma; a few small microsphenoidal crystals of calcium oxalate present in phloem parenchyma and rays; secondary xylem wide having usual elements; vessels simple, pitted, lignified; fibres large, pointed, aseptate; rays multiseriate, 2 or 3 cells wide.

Powder:

Dark brown; shows fragments of rectangular cork and phloem parenchyma cells; groups of single, thick walled, cubical to rectangular, lignified stone cells having striations and wide lumen; a number of microsphenoidal crystals of calcium oxalate, intact and scattered outside.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 8 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 6 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 10 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 20 per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of Alcoholic extract on silica gel 'G' plate using n-Butanol: Acetic acid: Water (4:1:5) shows in visible light three spots at Rf. 0.62, 0.85 and 0.92 (all light yellow). Under UV (366 nm) five fluorescent zones are visible at Rf. 0.47, 0.53 (both light blue), 0.62 (bluish pink), 0.74 (blue) and 0.85 (light green). On exposure to iodine vapours seven spots appear at Rf. 0.14, 0.28, 0.45, 0.53, 0.74, 0.85 and 0.92 (all yellow). On spraying with 5% Methanolic-Phosphomolybdic acid reagent and heating the plate at 105ºC until the colour develops, the plate shows four spots at Rf. 0.47, 0.74, 0.85 and 0.92 (all bluish grey).

CONSTITUENTS

n-Triacontanol, β-sitosterol, lapachol, dehydro-α-lapachone, dehydrotectol, 6-0-glucosylscutellarein and stereolensin.

PROPERTIES AND ACTIONS

Cuvai	:	Tuvarppu (துவர்ப்பு)
Guṇam	:	Ilaku (இலகு), Vaṟaḍci (வறட்சி)
Vīrium	:	Taḍpam (தட்பம்)
Pirivu	:	Iṉippu (இனிப்பு)
Ceykai	:	Ciṟuṉīrperukki (சிறுநீர்பெருக்கி), Veppakaṟṟi (வெப்பகற்றி)

IMPORTANT FORMULATIONS

Maṇḍūrāti Aḍaikkuḍiṉīr (மண்டூராதி அடைக்குடிநீர்), Pittacurak Kuḍiṉīr (பித்தசுரக் குடிநீர்)

THERAPEUTIC USES

Coṟiciraṅku (சொறிசிரங்கு), Ericcal (எரிச்சல்), Eruvāy Muḷai (எருவாய் முளை), Karappāṉ (கரப்பான்), Nīriṟivu (நீரிழிவு), Puṇ (புண்)

DOSE - Powder 2 - 5g par Decoction 30- 50 ml twice daily.

15 - 30 g coarse powder in 200 ml of water for preparing decoction.

PĒRARATTAI (Rhizome) - பேரரத்தை

Pērarattai is the dried rhizome of *Alpinia galanga* Willd. (Fam. Zingiberaceae), a herb upto 2.5 m. in height, bearing perennial rhizome, growing in eastern Himalayas and southwest India and extensively cultivated all over India.

SYNONYMS

Tamil	:	Arattai (அரத்தை)
Bengali	:	Kulanjan, Kurachi Vach
English	:	Greater galangal, Java galangal
Gujrati	:	Kulinjan Jaanu, Kolinjan
Hindi	:	Kulanjan, Kulinjan
Kannada	:	Doddarasagadde, Dhoomraasmi
Malayalam	:	Aratta
Marathi	:	Kulinlan, Koshta Kulinjan, Mothe kolanjan
Oriya	:	Kulanjana, Sugandhamula, Malaya Vaca, Mahabhari Vaca, Rasna (South)
Punjabi	:	Dumparaastramu

DESCRIPTION

a) Macroscopic

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

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

b) Microscopic

Root - Transverse section of root circular in outline, single layered epidermis with barrel shaped cells having unicellular root hairs, hypodermis 3 or 4 cells deep and sclerenchymatous, cortex parenchymatous, many cells deep, with well developed intercellular spaces; endodermis showing prominent casparian strips and 'v' shaped thickening, followed by many celled sclerenchymatous pericycle; xylem and phloem in separate radial strands; centre occupied by a parenchymatous pith.

Rhizome - Transverse section of young rhizome circular in outline; epidermal cells small and angular, thick cuticle present, rhizome differentiated into a wide cortex and a central cylinder, both regions having irregularly scattered vascular bundles, each vascular bundle with a prominent fibrous sheath; inner limit of cortex marked by rectangular parenchymatous cells; stele with

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

Powder:

Orange brown; spicy and sweet in taste; shows parenchyma cells containing starch (as described under microscopy of rhizome), oil cells, schizogenous canals; vessels with scalariform and reticulate thickenings and tracheidal fibres.

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 2 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 6 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 13 per cent, Appendix	2.2.7.
Starch	Not less than 22 percent, Appendix	2.2.13
Essential oil	Not less than 0.4 percent, Appendix	2.2.10

T.L.C.

T.L.C. of the Methanolic extract on silica gel 'G' plate using Toluene: Ethyl acetate: Methanol (80:20:0.4) shows under UV (366 nm.) blue fluorescent zones of yellow, green and blue at Rf.0.15, 0.25, 0.69 respectively. On spraying with Anisaldehyde - Sulphuric acid reagent and heating the plate for five minutes at 105ºC, six spots appear at Rf.0.15 (greyish green), 0.35 (violet), 0.48 (greyish green), 0.63 (greyish green), 0.69 (green) and 0.91 (violet).

CONSTITUENTS

Esential oil, containing a - pinene, ß - pinene, limonene, cineol, linalool, cedrol, eugenol, terpinen - 4 -ol and a - terpineol. Galanganal, galanganol B and C, 1'-S-1'-acetoxychavicol acetate, 1'S-1'-acetoxyeugenol acetate, trans-parahydroxy-cinnamaldehyde, trans-para-coumaryl alcohol, trans-para-coumaryl acetate, galanolacetone, and di (p-hydroxy-cis-styryl) methane.

PROPERTIES AND ACTIONS

Cuvai	:	Kārppu (கார்ப்பு)
Guṇam	:	Tiṇmai (திண்மை)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)

Ceykai : Kōz̲aiyaka̲r̲̲ri (கோழையகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Veppaka̲r̲̲ri (வெப்பகற்றி)

IMPORTANT FORMULATIONS

Kakkuvā̲n̲ Iḷakam (கக்குவான் இளகம்), Tippili Irācāya̲n̲am (திப்பிலி இராசாயனம்), Tūtuvēḷai Ney (தூதுவேளை நெய்), Uḷuntu Tailam (உளுந்து தைலம்), Vātacurak Kuḍinīr (வாதசுரக் குடிநீர்)

THERAPEUTIC USES

Cūtakavali (சூதகவலி), Aiyacuram (ஐயசுரம்), Muppiṇi (முப்பிணி), Nañcu (நஞ்சு), Nīrēr̲̲ram (நீரேற்றம்), Talaippuṇ (தலைப்புண்), Uḍal Vali (உடல் வலி), Vaḷi Nōykaḷ (வளி நோய்கள்)

DOSE - Powder 1 - 3 g

PERUṄKĀYAM (Oleo-gum-resin) - பெருங்காயம்

Peruṅkāyam is the oleo-gum-resin obtained from rhizome and root of ***Ferula foetida*** Regel., ***Ferula narthex*** Boiss, and other species of ***Ferula*** (Fam. Apiaceae), a perennial herb, occurring in Persia and Afghanistan. Incisions are made at the upper part of tap root of more than five year old plants and resin collected by scrapping in March, April, after one or two days or after a few weeks when it gets hardened; the process is repeated several times. It grows in Kuṟiñcithiṇai.

SYNONYMS

Tamil	:	Cantunācam (சந்துநாசம்), Iṅku (இங்கு), Kanti (கந்தி), Kāyam (காயம்), Vallīkam (வல்லீகம்)
Assamese	:	Hin
Bengali	:	Hing
English	:	Asfoetida
Gujrati	:	Hing, Vagharni
Hindi	:	Hing, Hingda
Kannada	:	Hingu, Ingu
Kashmiri	:	Eng
Malayalam	:	Kayam
Marathi	:	Hing, Hira, Hing
Oriya	:	Hengu, Hingu
Punjabi	:	Hing
Sanskrit	:	Hingu, Ramatha, Sahasravedhi
Telugu	:	Inguva
Urdu	:	Hitleet, Hing

DESCRIPTION

a) Macroscopic

Rounded, flattened or masses of agglutinated tears, greyish-white to dull yellow, mostly 12 to 25 mm. in diameter; freshly exposed surface, yellowish and translucent or milky white, opaque, slowly becoming pink, red, finally reddish brown; odour strong, characteristic and persistent; taste bitter and acrid.

b) Microscopic

Identification

1) Freshly broken surface when touched with sulphuric acid a bright red or reddish-brown colour is produced, changing to violet when acid is washed off with water.

2) Boil 0.2 g with 2 ml Hydrochloric acid for about 1 minute, cool, dilute with an equal volume of water, and filter into 3 ml of dilute solution of Ammonia; fluorescence is produced.

3) Triturate 1 g with 10 ml of light Petroleum (b.p. 40º to 60º) for 2 minutes, filter into a test tube and add to the filtrate 10 ml of a fresh 0.5 per cent w/v aqueous solution of copper acetate; shake well and allow the liquids to separate; petroleum layer does not show any green colour, indicating absence of colophony resin.

IDENTITY, PURITY AND STRENGTH

Alcohol-soluble extractive	Not less than	50	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	50	per cent, Appendix	2.2.7.
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	3	per cent, Appendix	2.2.4.

ASSAY

(Alcohol insoluble fraction)

About 5 g accurately weighed drug is placed in a small beaker furnished with a glass rod, and tared; 50 ml of Alcohol (90 per cent) is added and boiled gently. The hot solution is filtered through a tared filter paper the residue is boiled with further quantitòies of alcohol (90 per cent); until all soluble matter is removed, using the glass rod to disintegrate the insoluble matter. The filter paper is washed with hot alcohol (90 per cent) and the paper is transferred to the beaker, dried at 100ºC, and weighed. The residue weighs not more than 50 per cent of the original sample taken.

T.L.C.

T.L.C. of Alcoholic extract of the drug on silica gel 'G' plate using Toluene: Ethyl acetate (7:3) v/v, shows eleven spots under UV light (366 nm.) at Rf.0.12, 0.22, 0.34, 0.42, 0.51,0.55, 0.55, 0.60, 0.67, 0.77, 0.85 and 0.91 (all blue). On spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate, for five minutes at 105°C ten spots appear at Rf. 0.05 (violet), 0.12 (brown), 0.22(violet), 0.32 (brown), 0.42 (violet), 0.51 (pink), 0.60 (grey), 0.77 (pink), 0.85 (pink) and 0.94 (orange).

CONSTITUENTS

Dimethyl trisulphide, 2- butyl methyl disulphide, 2- butyl methyl trisulphide, di- 2-butyl disulphide, di- 2-butyl trisulphide, di-2- butyl - tetrasulphide, asadisulphide, asacoumarin A and B, R-2-butyl-1-propenyl disulphide, 1- (-1- methyl thio propenyl)-1-propenyl disulphide, ferulic acid, asaresinol ferulate, fenchone, linalool, foetidin, asafoetidin, ß- caryophyllene, ß- selinene, ferocolicin.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Kūrmai (கூர்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Icivakaṟṟi (இசிவகற்றி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Akattiyar Kuẕampu (அகத்தியர் குழம்பு), Aśḍāthic Cūraṇam (அஷ்டாதிச் சூரணம்), Kuṉmakuḍōri Meẕuku (குன்மகுடோரி மெழுகு), Mūcāmparappaṟṟu (மூசாம்பரப்பற்று), Tāḷicāthi Cūraṇam (தாளிசாதி சூரணம்)

THERAPEUTIC USES

Cūtakacūlai (சூதகசூலை), Ēppam (ஏப்பம்), Kuṉmam (குன்மம்), Māntam (மாந்தம்), Palladi Nōykaḷ (பல்லடி நோய்கள்), Peruvayiṟu (பெருவயிறு), Vaḷi Nōykaḷ (வளி நோய்கள்)

DOSE - Powder 16 - 650 mg

PIRAMMI VAZ̲UKKAI (Whole Plant) - பிரம்மி வழுக்கை

Pirammi Vaz̲ukkai is the dried whole plant of ***Bacopa monnieri*** (L.) Wettst., Syn. ***Herpestis monniera*** (L.) H.B. & K. (Fam. Scrophulariaceae), a glabrous, succulent, small, prostrate or creeping annual herb, found throughout India in wet and damp places.

SYNONYMS

Tamil	:	Captaḷai (சப்தளை), Nīrpirammi (நீர்பிரம்மி)
Assamese	:	Brahmi
English	:	Thyme leaved gratiola
Gujrati	:	Neerbrahmi, Bamanevari
Hindi	:	Manduka Parni, Brahmi
Kannada	:	Nirubrahmi, Valabrahmi, Ondelaga, Mandukaparni
Malayalam	:	Brahmi
Marathi	:	Jalnam, Brahmi, Birami
Oriya	:	Brahmi
Punjabi	:	Brahmibuti
Sanskrit	:	Brahmi, Saraswati, Kapotavamka
Telugu	:	Sambarenu, Sambarani
Urdu	:	Brahmi

DESCRIPTION

a) Macroscopic

Root - Thin, wiry, small, branched, creamish-yellow.

Stem - Thin, green or purplish green, about 1 to 2 mm. thick, soft, nodes and internodes prominent, glabrous; taste slightly bitter.

Leaf - Simple, opposite, decussate, green, sessile, 1 to 2 cm. long, obovate-oblong; taste slightly bitter.

Flower - Small, axillary and solitary, pedicels 6 to 30 mm. long, bracteoles shorter than pedicels.

Fruit - Capsules upto 5 mm. long, ovoid and glabrous.

b) Microscopic

Root - Shows a single layer of epidermis, cortex having large air cavities; endodermis single layered; pericycle not distinct; stele consists of phloem with a few sieve elements and isolated material from xylem shows vessels with reticulate thickenings.

Stem - Shows single layer of epidermis followed by a wide cortex of thin-walled cells with very large intercellular spaces; endodermis single layered; pericycle consisting of 1 or 2 layers; vascular ring continuous, composed of a narrow zone of phloem towards periphery and a wide ring of xylem towards centre; centre occupied by a small pith with distinct intercellular spaces; starch grains simple, round to oval, measuring 4 to 14 mm in dia. in cortical cells and 8.0 to 14.0 x 2.5 to 9.0 mm in dia., in a few cells of endodermis.

Leaf - Shows a single layer of upper and lower epidermis covered with thin cuticle; glandular hairs sessile, subsidiary cells present on both surface; a few prismatic crystals of calcium oxalate occasionally found distributed in mesophyll cells; mesophyll traversed by small veins surrounded by bundle sheath; no distinct midrib present. Stomatal index 13 to 18 for upper surface and 12 to 16 for lower surface; vein - islet number 6 to 13 per square mm.

Powder:

Yellowish-brown; shows xylem vessels with reticulate thickening; glandular hairs; simple, round and oval starch grains, measuring 4.14 mm in diameter.

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	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	15	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of the Methanolic extract of the drug on silica gel 'G' plate using Toluene: Ethyl Acetate: Methanol: glacial Acetic Acid (3:4:3:1) shows 3 spots at Rf. 0.38 (yellowish brown) ,0.68 (light brown) and 0.88 (dark pink, bacoside A marker) on spraying with 20% Sulphuric acid in Methanol and heating the plate at 105º C for five minutes.

CONSTITUENTS

Bacosides A, A3 & B, monnierin, bacopasaponins A - D and G, bacopasides I - V, hersaponin, betulinic acid, herpestine, brahmine, nicotin, luteolin and its 7- glucoside, 3-formyl - 4 - hydroxy - 2H - pyran, monnierasides I - III, plantainoside B, ß- sitosterol, stigmasterol and stigmastanol.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Acaivu (அசைவு), Ilaku (இலகு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ciṟunīrperukki (சிறுநீர்பெருக்கி), Kāmamperukki (காமம்பெருக்கி), Kōẕaiyakaṟṟi (கோழையகற்றி), Malamiḷakki (மலமிளக்கி), Aẕalakaṟṟi (அழலகற்றி)

IMPORTANT FORMULATIONS

Piramminey (பிரம்மிநெய்)

THERAPEUTIC USES

Aiya Nōykaḷ (ஐய நோய்கள்), Malakkaḍḍu (மலக்கட்டு), Nīrcurukku (நீர்சுருக்கு), Vīkkam (வீக்கம்), Pittātikkam (பித்தாதிக்கம்), Valippu Nōy (வலிப்பு நோய்)

DOSE - Powder 1 - 3 g

PONNĀṄKĀṆI (Whole Plant) - பொன்னாங்காணி

Ponnāṅkāṇi is the dried whole plant of *Alternanthera sessilis* (L.)R.Br.,ex DC. Syn. *A. triandra* Lam., *A. denticulata* R. Br., *A. nodiflora* R. Br., *A. repens* Gmel., non Link. (Fam. Amaranthaceae), a small prostrate or ascending herb with several spreading branches growing throughout the warmer parts of the country and frequently found in wet places especially around tanks and ponds.It grows in Marutham thiṇai.

SYNONYMS

Tamil	:	Cīrai (சீரை), Koḍuppai (கொடுப்பை)
Bengali	:	Sanchesak, Salincha Sak
Gujrati	:	Jalajambo
Hindi	:	Gudari Sag
Kannada	:	Honagonne soppu
Malayalam	:	Ponnankanni, Kozuppa
Marathi	:	Kanchari
Oriya	:	Matsagandha, Salincha Saaga
Sanskrit	:	Matsyaksi, Matsyagandha, Bahli, Gandali, Gartkalambuk
Telugu	:	Ponnaganti Koora

DESCRIPTION

a) Macroscopic

Root - Cylindrical, 0.1 to 0.6 cm. diameter, cream to grey, numerous roots arising from the main tap root as lateral rootlets; fracture short; no characteristic odour and taste.

Stem - Herbaceous, weak, mostly cylindrical occasionally sub-quadrangular at the apical region, with spreading branches from the base; yellowish-brown to light-brown; nodes and internodes distinct; internodes 0.5 to 5 cm. long, often rooting at lower nodes; fracture short; no characteristic odour and taste.

Leaf - 1.3 to 7.5 cm. long, 0.3 to 2 cm. wide, sometimes reaching 10 cm. long, 2.5 cm. wide, sessile, linear-oblong, or elliptic, obtuse or subacute; no characteristic odour and taste.

Flower - Flower in small axillary sessile heads, white often tinged with pink, bracteoles about a cm long, ovate, scarious; perianth 2.5 to 3 mm. long, sepals ovate, acute, thin, ovary obcordate, compressed, style very short, capitellate; no characteristic odour and taste.

Fruit - Utricle 1.5 mm. long, orbicular, compressed with thickened margins; no characteristic odour and taste.

b) Microscopic

Root - Shows circular outline consisting of 5 to 7 layered, thin-walled tangentially elongated and squarish, radially arranged cork cells; secondary cortex narrow, consisting of thin-walled, round or oval, parenchymatous cells, vascular bundles radially arranged, numerous, consisting of thin-walled cells; xylem tissues lignified; conjunctive tissue between bundles consisting of oval, thin-walled, parenchymatous cells; anomalous secondary growth occurs in the form of succession of rings of vascular bundles which are bicollateral, open and exarch; in the pith there are two large vascular bundles composed of xylem and phloem; pith consisting of thin-walled, round to oval, isodiametric, parenchymatous cells.

Stem - Shows single layered epidermis consisting of round or oval, thin-walled cells covered with striated cuticle; cortex 6 to 10 layered consisting of thin-walled oval to round, parenchymatous cells and rosette crystals of calcium oxalate measuring upto 80 mm in diameter; vascular bundles arranged in a ring, with anomalous secondary growth; which are conjoint, bicollateral, open and endarch; phloem narrow consisting of thin-walled cells traversed by phloem rays; xylem consisting of usual elements traversed by xylem rays; there are two vascular bundles situated in the peripheral region of pith, each bundle consisting of xylem and phloem; pith distinct, composed of thin-walled, round to oval parenchymatous cells with intercellular spaces, a few parenchymatous cells contain rosette crystals of calcium oxalate.

Leaf

Midrib - shows single layered epidermis on both surface, covered with striated cuticle; collenchymatous cells, 2 to 4 layered towards ventral side forming 1 or 2 small patches, 1 or 2 layered towards dorsal side; parenchymatous cells, thin-walled round or oval, isodiametric cells, a few of them containing rosette crystals of calcium oxalate; vascular bundles three, each consisting of xylem and phloem, present in the centre.

Lamina - Dorsiventral; shows single layered epidermis; stomata diacytic more on ventral side; upper epidermal cells with slightly wavy walls, lower with sinuous walls; palisade 2 or 3 layers; spongy parenchyma 3 or 4 layered of oval or irregular loosely arranged cells; a few of them containing rosette crystals of calcium oxalate; stomatal index 20 to 26 in lower surface and 12 to 20 upper surface; palisade ratio 3 to 5; vein -islet number 6 to 12 and veinlet termination number 8 to 10 per square mm.

Powder:

Olive green; shows fragments of parenchymatous cells, wavy or undulate irregular epidemal cells in surface view, diacytic stomata; palisade cells; xylem vessels with pitted and reticulate thickening and rosette crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	10	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 19 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 : Ethyl acetate (9:1) shows in visible light three spots at Rf. 0.16, 0.33 and 0.44 (all green). Under UV (366 nm.) five fluorescent zones are visible at Rf. 0.16, 0.33, 0.44, 0.54 and 0.68 (all red). On exposure to iodine vapours eight spots appear at Rf. 0.18, 0.25, 0.35, 0.44, 0.59, 0.81, 0.94 and 0.96 (all yellow).

CONSTITUENTS

a and b - spinasterols, stigmasterol, campesterol, ß-sitosterol, 5a- stigmast-7-en-3-ol, sterol palmitates, lupeol, 24-methylene cycloartanol,oeucalenol, oleanolic acid glycosides and robinetin-7-0-ß-glucopyranoside.

PROPERTIES AND ACTIONS

Cuvai : I**ṉ**ippu (இனிப்பு)

Guṇam : Ilaku (இலகு)

Vīrium : Taḍpam (தட்பம்)

Pirivu : I**ṉ**ippu (இனிப்பு)

Ceykai : Kāyaka**ṟ**pamākki (காயகற்பமாக்கி), Kuḷircciyuṇḍākki (குளிர்ச்சியுண்டாக்கி), Uḍa**ṟ**tē**ṟṟ**i (உடற்தேற்றி)

IMPORTANT FORMULATIONS

Kaṇattailam (கணத்தைலம்), Po**ṉṉ**āṅkāṇit Tailam (பொன்னாங்காணித் தைலம்), Puḷiyārai Ney (புளியாரை நெய்)

THERAPEUTIC USES

A**ẓ**al Nōykaḷ (அழல் நோய்கள்), Īral Nōy (ஈரல் நோய்), Kaṇkācam (கண்காசம்), Vāyvu (வாய்வு)

DOSE - Powder 2 - 3 g

POḌUTHALAI (Whole Plant) - பொடுதலை

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

SYNONYMS

Tamil	:	Nīrtippili (நீர்திப்பிலி), Poḍutilai (பொடுதிலை), Pūṟcātam (பூற்சாதம்)
Bengali	:	Bukkana, Kaanchadaa
English	:	Purple lippia
Gujrati	:	Rataveliyo
Hindi	:	Jalpipali, Panisigaa, Bhuiokaraa
Kannada	:	Nelahippali
Malayalam	:	Nirtippali, Podutalai
Marathi	:	Jalpippali, Ratavel
Oriya	:	Nili, Nila
Sanskrit	:	Jalapippali, Saradi, Matsyadani, Jalakana, Vashira
Telugu	:	Bokkena

DESCRIPTION

a) Macroscopic

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

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

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

Flower - Sessile, densely packed in long pedunculate axillary spikes, mature ones 1.0 to 2.0 cm long and 0.4 to 0.5 cm. broad, flowering densely becoming oblong during fruiting; peduncles 2.5 to 7.5 cm. long, bracts about 2.5 mm. long, broadly elliptic or obovate, cuneate at base, mucronate, glabrous; calyx 2.0 mm. long, membranous, bilobed, compressed, mitre-shaped, pubescent underneath with ordinary trichomes closely covering the fruit, the acuminate lobes projecting

beyond it; corolla 2.5 to 3.0 mm. long, white or light pink, bilipped, upper lip erect and bifid, lower lip 3 lobed of which the middle lobe largest, falling off as calyptra when fruit ripens; stamens 4, didynamous, anthers 2-celled, dehiscing longitudinally, dorsifixed; ovary superior, bicarpellary, ovules in each cell solitary; style short, stigma oblique, subcapitate.

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

b) Microscopic

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

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

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

Powder:

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

IDENTITY, PURITY AND STRENGTH

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

T.L.C.

T.L.C. of Methanol extract on silica gel 'G' plate using Chloroform: Methanol (19:1) shows five spots at Rf. 0.21, 0.26, 0.34, 0.40 and 0.79 on spraying with Vanillin- Sulphuric acid reagent and heating the plate for 5 minutes at 105ºC.

CONSTITUENTS

Nodiflorin - A and B, nodifloridine- A and B, calamene, β- caryophyllene, 1- octen-3-ol, phenylethyl alcohol, linalool, p- cymen-δ-ol, methyl salicylate, 6- hydroxy luteolin-7-O-apioside, luteolin-7-O- glucoside, 6- hydroxyluteolin, nepetin, nodifloeretin lactose, maltose, glucose, fructose, xylose, lippiflorin A and B.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Kūrmai (கூர்மை), Va̱ṛaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Ci̱runīrperukki (சிறுநீர்பெருக்கி), Kōẕaiyaka̱ṛṛi (கோழையகற்றி), Tuvarppi (துவர்ப்பி), Uḷḷaẕalā̱ṛṛi (உள்ளழலாற்றி), Uramākki (உரமாக்கி), Vīkkaṅkaraicci (வீக்கங்கரைச்சி)

IMPORTANT FORMULATIONS

Aṣḍapairavam (அஷ்டபைரவம்), Karicālai Iḷakam (கரிசாலை இளகம்), Pa̱ṛaṅkippaḍḍai Pataṅkam (பறங்கிப்பட்டை பதங்கம்)

THERAPEUTIC USES

Cītakkaẕiccal (சீதக்கழிச்சல்), Cūlai Nōy (சூலை நோய்), Irumal (இருமல்), Peruṅkaẕiccal (பெருங்கழிச்சல்), Vaḷi Nōykaḷ (வளி நோய்கள்), Veḷḷai (வெள்ளை)

DOSE - Decoction 30- 50 ml twice daily.

20- 40 g coarse powder in 200 ml of water for preparing decoction.

PUṄKAM VĒRPḌṬAI (Root bark) - புங்கம் வேர்ப்பட்டை

Puṅkam Vērpḍṭai is the dried root bark of *Pongamia pinnata* L. Syn. *P. glabra* Vent. *Derris indica* (Lam.) Bennett (Fam. Fabaceae), a glabrous tree, upto 18m. or sometimes more in height, found almost throughout the country upto an altitude of 1200 m.

SYNONYMS

Tamil	:	Amirtavalli (அமிர்தவல்லி), Puṅku (புங்கு)
Assamese	:	Korach
Bengali	:	Natakarnaja, Dahara Karanja
English	:	Smooth leaved pongamia
Gujrati	:	Kanaji
Hindi	:	Karanj
Kannada	:	Honge Beru
Malayalam	:	Pongu, Ungu
Marathi	:	Karanja
Oriya	:	Karanja
Punjabi	:	Karanj
Sanskrit	:	Karanja, Naktamala, Naktahva, Ghrtakaranja
Telugu	:	Ganuga, Kanuga
Urdu	:	Karanj

DESCRIPTION

a) Macroscopic

Drug occurs in pieces of varying sizes; reddish-brown externally and yellowish-white internally; external surface rough, due to peeling off of outer thin skin and presence of numerous irregularly scattered and transversely arranged rows of lenticels; fracture fibrous; taste very bitter.

b) Microscopic

Root Bark - Shows cork consisting of 5 to 15 rows of rectangular, tangentially elongated thin-walled cells; secondary cortex wide composed of polygonal, tangentially elongated cells, most of the cells containing both simple and compound starch grains having 2 to 5 components round to oval in shape, 3 to 11mm in dia., a few cells contain yellowish-brown contents and prismatic crystals of calcium oxalate; stone cells found scattered in this region in singles and groups, single cells of varying shape and size; secondary phloem very wide, composed of tangentially arranged fibres alternating with sieve tubes and phloem parenchyma, traversed by phloem rays; most of phloem parenchyma cells contain starch grains and crystals, similar to those present in secondary

cortex; phloem rays many, mostly straight, 1 or 2 seriate, consisting of thin-walled, radially elongated cells towards inner region and tangentially elongated towards periphery; most of ray cells contain starch grain, similar to those present in secondary cortex.

Powder:

Reddish brown; shows thin-walled, parenchymatous cells, cork cells; phloem fibres, stone cells and simple and compound starch grains measuring 3 to 11mm in diameter.

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	2 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	3.5 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 Toluene: Ethyl acetate (9:1) shows under UV light (366 nm.) eleven fluorescent zones at Rf. 0.04 (blue), 0.08 (greenish blue), 0.13(sky blue) 0.18 (blue) 0.25 (sky blue), 0.31 (sky blue), 0.37 (greenish yellow), 0.42 (sky blue), 0.47 (greenish yellow), 0.51 (light blue), 0.80 (light blue). On exposure to iodine vapours nine spots appear at Rf. 0.09, 0.18, 0.31, 0.37, 0.47, 0.47, 0.51, 0.80 and 0.98 (all yellow).

CONSTITUENTS

Ponganone I to XI, flavones, kanugin and demethoxy kanugin.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Kūrmai (கூர்மை)

Vīrium : Kārppu (கார்ப்பு)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Tūkkuṇippuẓukkolli (தூக்குணிப்புழுக்கொல்லி), Tuvarppi (துவர்ப்பி), Uḍaṟtēṟṟi (உடற்தேற்றி)

IMPORTANT FORMULATIONS

Puṅkat Tailam (புங்கத் தைலம்)

THERAPEUTIC USES

Īḷai (ஈளை), Irumal (இருமல்), Mūrccai (மூர்ச்சை), Puṇ (புண்), Va̲ra̲ḍcuram (வறட்சுரம்), Vāta Ku̲nmam (வாத குன்மம்), Vāyvu (வாய்வு)

DOSE - Decoction 30- 50 ml twice daily.

15 - 30 g coarse powder in 200 ml of water for preparing decoction.

60. Pungam vitthu

PUṄKAM VITHTHU (Seed) - புங்கம் வித்து

Puṅkam Viththu is the seed *Pongamia pinnata* L. Syn. *P. glabra* Vent. *Derris indica* (Lam.) Bennett (Fam.Fabaceae), a medium sized glabrous tree with a short bole and spreading crown and found almost throughout India upto an altitude of 1200 m.

SYNONYMS

Tamil	:	Amirtavalli (அமிர்தவல்லி), Puṅku (புங்கு)
Assamese	:	Korach
Bengali	:	Dahara Karanja, Nata Karanja
English	:	Smooth leaved pongamia
Gujrati	:	Kanaji, Kanajo
Hindi	:	Dithouri, Karuaini
Kannada	:	Honge, Hulagilu
Malayalam	:	Avittal, Ungu, Unu, Pungu
Marathi	:	Karanja
Oriya	:	Karnja
Punjabi	:	Karanj
Sanskrit	:	Naktahva, Naktamala, Karanjaka, Grtakaranja
Telugu	:	Kanuga, Lamiga
Urdu	:	Karanj

DESCRIPTION

a) Macroscopic

Seed usually one and rarely two per fruit, elliptic or reniform in shape, 1.7 to 2.0 cm. long and 1.2 to 1.8 cm. broad, wrinkled with reddish leathery testa; micropylar end of cotyledons slightly depressed while other side semicircular in shape.

b) Microscopic

Transverse section of seed shows layers of testa composed of palisade - like outer epidermis, filled with brown pigment, covered externally with a thick cuticle; this is followed by a layer of large, thin walled, somewhat rectangular cells, 2 to 4 layers of thick-walled parenchyma cells, and a few rows of cells with small intercellular spaces, a few layers of spongy parenchyma having large intercellular spaces and a number of parenchyma cells containing brown pigments; cotyledons composed of outer layer of epidermis with cylindrical cells, externally covered with thin cuticle; epidermis followed by rectangular to polygonal cells of mesophyll, filled with globules, also present scattered in this region.

Powder:

Creamish- brown, oily; shows fragments of palisade - like testa cells; parenchyma cells containing brownish content and oil globules.

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	0.1 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	23 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	13 per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of the Alcoholic extract on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Toluene: Ethyl acetate (70:30) v/v shows under UV (366 nm.) nine flurescent spots at Rf. 0.21 (blue), 0.31 (blue), 0.39 (blue), 0.42 (yellow), 0.46 (blue), 0.58 (sky blue), 0.67 (sky blue), 0.74 (yellow), 0.90 (yellow). With Anisaldehyde - Sulphuric acid reagent and heating the plate for about ten minutes at 110°C six spots appear at Rf. 0.39 (violet), 0.49 (violet), 0.58 (yellow), 0.70 (yellowish blue), 0.81 (violet) and 0.90(violet).

CONSTITUENTS

Glabrachromene, glabrachromene II, ß- sitosterol, karangin, pongamol, pongaglabrone, pongapin, kanjone, demethoxy kanugin, karanjachromene, 6- methoxy - 4-oxo- 2- phenylfuro (2,3- h) -1- benzopyran, pongol, glabrachalcone, isolonchocarpin gamatin, pinnatin, glabrin, lanceolatin- B pongarotene, isoponga flavone, isoponga chromene 2'- methoxy- furano (2", 3": 7, 8) flavone, 5'- methoxy-furano - (2"- 3": 7,8) flavone, 3' 4-dimethoxy - (2", 3": 7, 8) - furano flavone, 2'- methoxy - ß- hydroxyl (2" 3": 4' 3') furano chalcone, karangin, lanceolatin- B, pongaglabroic lipids, palmitic acid, oleic acid, linoleic acid, amino acids and fatty acids.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Kūrmai (கூர்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Tuvarppi (துவர்ப்பி), Uḍaṟtēṟṟi (உடற்தேற்றி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Kaṇkāca Māttirai (கண்காச மாத்திரை)

THERAPEUTIC USES

Ca̲n̲i (சன்னி), Kaṇ Nōy (கண் நோய்), Karappā̲n̲ (கரப்பான்), Paḍai (படை)

DOSE - Powder 250 mg

Decoction 30- 50 ml twice daily.

20- 40 g coarse powder in 200 ml of water for preparing decoction.

PŪVARACAM PAḌṬAI (Stem bark) - பூவரசம் பட்டை

Pūvaracam Paḍṭai is the stem bark of ***Thespesia populnea*** (L.) Soland. ex Correa Syn. ***Hibiscus populneus*** L. (Fam. Malvaceae), a fast growing, medium-sized evergreen tree, upto 10 m. tall with yellow, cup-shaped flowers having maroon centre and distributed throughout coastal forests of India and also largely grown as a roadside tree.It grows in Mullai , Marutham and Neythal thiṇai.

SYNONYMS

Tamil	:	Ammai (அம்மை), Pūḷam (பூளம்), Puvirācaṉ (புவிராசன்), Tarāpati (தராபதி)
Bengali	:	Gajashundi, Paraasapipula
English	:	Portia tree, Umbrella tree
Gujrati	:	Paaraspipalo
Hindi	:	Paaraspipal
Kannada	:	Huvarasi
Malayalam	:	Puvarasa, Pupparutti
Marathi	:	Parasa pimpala
Sanskrit	:	Kapitana, Parisah, Kandarala, Phalisah, Gardabhandah
Telugu	:	Ganyaraavi, Munigangaraavi

DESCRIPTION

a) Macroscopic

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

b) Microscopic

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

Powder:

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

IDENTITY, PURITY AND STRENGTH

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

T.L.C.

T.L.C. of the Alcoholic extract on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Chloroform: Methanol: Formic acid (100:2.5:1) shows spots at Rf. 0.12 (brown), 0.18 (brown), 0.29 (brown) and 0.61 (reddish when hot turns yellowish on cooling) with Vanillin- Sulphuric acid reagent and heating the plate at 105ºC for about five minutes.

CONSTITUENTS

(+) Gossypol, flavonoids, steroids and sesquiterpenoidal quinones.

PROPERTIES AND ACTIONS

Cuvai	:	Kaippu (கைப்பு), Tuvarppu (துவர்ப்பு)
Guṇam	:	Ilaku (இலகு), Vaṟaḍci (வறட்சி)
Vīrium	:	Veppam (வெப்பம்)
Pirivu	:	Kārppu (கார்ப்பு)
Ceykai	:	Puzukkolli (புழுக்கொல்லி), Tūymaiyākki (தூய்மையாக்கி)

IMPORTANT FORMULATIONS

Mēkanātat Tailam (மேகநாதத் தைலம்)

THERAPEUTIC USES

Kāṇākaḍi (காணாகடி), Nañcu (நஞ்சு), Peruvayiṟu (பெருவயிறு), Vīkkam (வீக்கம்)

DOSE - Decoction 30- 50 ml twice daily.

20 - 30 g coarse powder in 200 ml of water for preparing decoction.

TĀMARAI MALAR (Flower) - தாமரை மலர்

Tāmarai Malar is the dried flowers (devoid of stalk) of ***Nelumbo nucifera*** Gaertn. Syn. ***Nelumbium speciosum*** Willd. (Fam. Nymphaeaceae), a large, aquatic herb with creeping stem, occurring throughout warmer parts of the country upto an altitude of 1000 m. It grows in Marutham thiṇai (ponds and tanks).

SYNONYMS

Tamil : Aravintam (அரவிந்தம்), Cūriyanaḍpu (சூரியநட்பு), Kamalam (கமலம்), Muṇḍakam (முண்டகம்), Naḷiṉam (நளினம்), Ampu (அம்பு), Tāmaraippū (தாமரைப்பூ)

Assamese : Podum

Bengali : Padma phool, Salaphool

English : Lotus

Gujrati : Kamal

Hindi : Kamal, Kanwal

Kannada : Kamal, Tavare, Naidile, Tavaregedd

Malayalam : Tamara, Venthamara, Chenthamara, Senthamara

Marathi : Komala

Oriya : Padma

Punjabi : Kanwal, Pamposh

Sanskrit : Kamala, Abja, Aravinda, Padma, Kalhara, Sitotpala, Pankaja

Telugu : Kaluva, Tamarapuvow

Urdu : Kamal

DESCRIPTION

a) Macroscopic

Drug occurs as entire or pieces of flowers, comprising of calyx, corolla, androecium, gynoecium and thalamus; entire flower 10 to 15 cm. in dia., yellowish-brown; sepals leaf-like, crimpled, 3 to 5 cm. long, 1.3 to 2 cm. wide, dark brown, broken pieces also occur; petals numerous, crimpled, elliptic, obtuse, membranous, finely veined, 2 to 4 cm. long, 1.2 to 2 cm. wide yellowish-brown; anther, erect, linear 1.4 to 2 cm. long, extended into clavate appendages; gynoecium apocarpous; carpels many, free, embedded in a creamy, top- shaped fleshy thalamus (torus) 3 to 5 cm. long and 2.5 to 3 cm. wide; fruit an etaerio of achenes, becoming loose in their sockets when ripe; seed hard, black, starchy and large.

b) Microscopic

Petal - Shows single layered epidermis on both surfaces, consisting of rectangular cells covered with striated cuticle; ground tissue consisting of polygonal, parenchymatous cells with wide air sacs.

Stamen:

Filament- Filament appears circular in outline, consisting of single layered epidermis covered with striated cuticle; followed by ground tissue of oval, angular, parenchymatous cell; vascular bundle single, present in centre consisting of usual elements of xylem and phloem tissues.

Anther - Shows four chambered anther, two on either sides, connected by parenchymatous cells containing vascular bundle; anther consists of a single layer of epidermis, composed of thin walled, rectangular, parenchymatous cells followed by single layer of endothecium consisting of thin-walled, columnar, parenchymatous cells; spore sac contains yellow, spherical pollen grains with smooth exine and intine walls, measuring 50 to 61 mm in diameter.

Powder:

Dusty -brown; shows fragments of vessels with spiral thickening; spherical, yellow pollen grains, measuring 50 to 61 mm in diameter having smooth exine and intine.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 12 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 3 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 14 per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of the Methanolic extract of the drug on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Toluene: Ehtyl acetate: Formic acid (5:5:1) shows under UV light (254 nm.) four spots at Rf. 0.14, 0.34,0.46 and 0.55 (gallic acid marker). Under UV light (366 nm.) shows two spots at Rf. 0.46 (light black), 0.55 (black, gallic acid marker). After derivatization with Anisaldehyde -Sulphuric acid reagent and heating the plate at 100ºC until the colour develops, the plate shows four spots at Rf. 0.46 (light brown), 0.55 (light brown, gallic acid marker), 0.83 (violet) and 0.96 (light brown).

CONSTITUENTS

Nelumbine, 1,4-dimethoxy benzene, 1, 8-cineole terpinen-4-ol and linalool.

PROPERTIES AND ACTIONS

Cuvai : I**ṉ**ippu (இனிப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Ilaku (இலகு)

Vīrium : Taḍpam (தட்பம்)

Pirivu : Inippu (இனிப்பு)

Ceykai : Kōzaiyakaṟṟi (கோழையகற்றி), Kuḷircciyuṇḍākki (குளிர்ச்சியுண்டாக்கி), Tuvarppi (துவர்ப்பி), Veppakaṟṟi (வெப்பகற்றி)

IMPORTANT FORMULATIONS

Makāvacanta Kucumākaram (மகாவசந்த குசுமாகரம்)

THERAPEUTIC USES

Curam/Kāyccal (சுரம்/காய்ச்சல்), Kaṇ Ericcal (கண் எரிச்சல்), Nīrvēḍkai (நீர்வேட்கை)

DOSE - Decoction 30- 50 ml twice daily.

25 - 50 g coarse powder in 200 ml of water for preparing decoction.

TĀMARAI KIZAṄKU (Rhizome) - தாமரை கிழங்கு

Tāmarai Kizaṅku is the dried rhizome with roots attached at nodes of *Nelumbo nucifera* Gaertn. Syn. *Nelumbium speciosum Willd.* (Fam. Nymphaeaceae), an aquatic herb, with stout creeping rhizome found in lakes and ponds throughout the warmer parts of the country, ascending upto 1000 m.This grows in Marutham thiṇai (ponds and tanks).

SYNONYMS

Tamil : Aravintam (அரவிந்தம்), Cūriyanaḍpu (சூரியநட்பு), Kamalam (கமலம்), Muṇḍakam (முண்டகம்), Naḷiṉam (நளினம்), Tāmarai Vaḷaiyam (தாமரை வளையம்)

Assamese : Kamal Kakdi

English : Lotus

Gujrati : Loda

Hindi : Kamal Kand, Kamal Kakdi

Kannada : Tavare Kanda

Malayalam : Tamara Kizangu

Marathi : Kamal Kand

Oriya : Padma

Punjabi : Kaul, Bhein

Sanskrit : Kamala, Padnakanda, Saluka, Ambhoruha

Telugu : Tamara Gadda

Urdu : Kanwal Kakdi

DESCRIPTION

a) Macroscopic

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

b) Microscopic

Rhizome - Shows a single layered epidermis followed internally by 2 to 4 layered lignified cells; cortex differentiated into three regions; outer cortex consisting of a wide zone of isodiametric thin-walled cells of which outer 5 or 6 layers collenchymatous and rest parenchymatous, having intercellular spaces and groups of fibres; middle cortex mostly composed of air cavities traversed by trabeculae of thin-walled small and nearly isodiametric cells; inner cortex forming central core,

consists of spherical cells enclosing large intercellular spaces; vascular strands consists of scattered closed vascular bundles surrounded by thin-walled, lignified sclerenchymatous fibres, resembling a monocotyledonous structure; vessels having spiral and spiro-reticulate thickening; phloem composed of sieve tubes and companion cells; air cavities large, elliptic or rounded, largest at middle cortex and smaller towards inner cortex; air cavities lined by thin-walled, elongated, parenchymatous epithelial cells; starch grains abundant, rounded to oval, mostly simple, rarely compound measuring 8 to 27 µm in dia., loaded in cells.

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

Powder:

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

IDENTITY, PURITY AND STRENGTH

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

T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'G' plate using Chloroform: Methanol (4:1) shows in visible light one spot at Rf. 0.97 (light yellow). Under UV (366 nm.) seven fluorescent zones are visible at Rf. 0.06 (blue), 0.13 (blue) 0.43 (blue) 0.55 (blue), 0.78 (blue) 0.91 (blue) and 0.98 (reddish). On exposure to iodine vapours eight spots appear at Rf. 0.13, 0.31, 0.45, 0.64, 0.76, 0.86, 0.93 and 0.96 (all yellow). On spraying with 5% Methanolic- Sulphuric acid and heating the plate at 105ºC until the colour develops, four spots appear at Rf. 0.10 (grey), 0.64 (brown), 0.76 (brown) and 0.96 (brown).

CONSTITUENTS

Linalool, nonadecane, phytol and raffinose.

PROPERTIES AND ACTIONS

Cuvai : I**ṉ**ippu (இனிப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Tiṇmai (திண்மை), Va**ṟ**aḍci (வறட்சி)

Vīrium : Taḍpam (தட்பம்)

Pirivu : I_nippu (இனிப்பு)

Ceykai : U_l_l_a_zalā_r_ri (உள்ளழலாற்றி)

IMPORTANT FORMULATIONS

Ilaku Canta_nāthi Tailam (இலகு சந்தனாதி தைலம்), Makā Ēlāthi Ku_l_ikai (மகா ஏலாதி குளிகை), Nācirōka Nācattailam (நாசிரோக நாசத்தைலம்), Pa_ra_ṅkippa_ḍ_ḍai Iracāya_nam (பறங்கிப்பட்டை இரசாயனம்), Tirā_ḍ_cāticcūra_ṇ_am (திராட்சாதிச்சூரணம்)

THERAPEUTIC USES

Irumal (இருமல்), Pārvai Ma_ṅ_kal (பார்வை மங்கல்), Tava_l_ai Co_r_i (தவளை சொறி), Vayi_r_rukka_ḍ_uppu (வயிற்றுக்கடுப்பு), Veppu Nōy (வெப்பு நோய்)

DOSE - Powder 3 - 5 g

TĀṈṚIKKĀY (Fruit) - தான்றிக்காய்

Tāṉṟikkāy is the pericarp of dried ripe fruit devoid of seeds, of ***Terminalia belerica*** (Gaertn.) Roxb. Syn.***T.puneta*** Roxb., ***Myrobalanus belerica*** B.Gaertn. (Fam. Combretaceae), a handsome tree, upto 40 m high, commonly found in plains and deciduous forests upto 900 m elevation; fruits ripen during November -February.It grows in Kuṟiñciand Marutham thiṇai.

SYNONYMS

Tamil : Akkantam (அக்கந்தம்), Amutam (அமுதம்), Erikaḍpalam (எரிகட்பலம்), Tāṉikkāy (தானிக்காய்)

Assamese : Bhomora, Bhomra, Bhaira

Bengali : Bayda, Baheda

English : Beleric myrobalan

Gujrati : Bahedan

Hindi : Bahera

Kannada : Tare kai, Shanti Kayi

Kashmiri : Babelo, Balali

Malayalam : Tannikka

Marathi : Baheda

Oriya : Baheda

Punjabi : Bahera

Sanskrit : Bibhitaka, Vibhita, Aksa, Aksaka

Telugu : Thanikkaya

Urdu : Bahera

DESCRIPTION

a) Macroscopic

Fruit nearly spherical to ovoid, 2.5 to 4.0 cm. in diameter. Ripe fruits slightly silvery or with whitish shiny pubescent surface; mature fruits grey or greyish-brown with slightly wrinkled appearance; rind of fruit shows variation in thickness from 3 to 5 mm.; taste astringent.

b) Microscopic

Transverse section of fruit shows an outer epicarp consisting of a layer of epidermis, most of epidermal cells elongate to form hair like protuberance with swollen base; composed of a zone of parenchymatous cells, slightly tangentially elongated and irregularly arranged, intermingled with

stone cells of varying shape and size; elongated stone cells found towards periphery and spherical in the inner zone of mesocarp in groups of 3 to 10; mesocarp traversed in various directions by numerous vascular strands; bundles collateral, endarch; simple starch grains and some stone cells found in most of mesocarp cells; a few peripheral layers devoid of starch grains; rosettes of calcium oxalate and stone cells present in parenchymatous cells; endosperm composed of stone cells running longitudinally as well as transversely.

Powder:

Yellowish-brown; shows fragments of epidermal cells of epicarp having hair-like projection; large, lignified pitted stone cells with wide lumen; cluster crystals of calcium oxalate; parenchyma cells with oil globules; numerous simple, oval to rounded starch grains, measuring 6 to 11 µm in diameter having 2 to 4 components.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	7	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	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	35	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of Diethyl ether extract of the drug on silica gel 'G' plate using Toluene: Ethyl acetate: Formic Acid (5:4:1) v/v, shows under UV light (254 nm.) five fluorescent zones at Rf. 0.20 (blue), 0.23 (blue), 0.33 (dark blackish blue), 0.39 (blue) and 0.60 (blue). On spraying with 5% Methanolic ferric chloride reagent four spots appear at Rf. 0.20 (blackish blue), 0.23 (blackish blue) and 0.33 (dark blackish blue).

CONSTITUENTS

Gallic acid, ellagic acid, ethyl gallate, galloyl glucose and chebullagic acid, belleric acid, belericoside, arjungenin and its glycoside, arjunglucoside, cannogenol - 3- 0- ß- D- galactopyranosyl- (1→4) -0 -á- L- rhamnopyranoside, bellericanin, phyllemblin, termilignan, thaninilignan, 7- hydroxy-3', 4' (methylenedioxy) flavan and anolignan B and ß- sitosterol.

PROPERTIES AND ACTIONS

Cuvai : Tuvarppu (துவர்ப்பு)

Guṇam : Ilaku (இலகு), Va̲ṛaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : I̲nippu (இனிப்பு)

Ceykai : Kō̲zaiyaka̲r̲ri (கோழையகற்றி), Malamiḷakki (மலமிளக்கி), Tuvarppi (துவர்ப்பி), Uramākki (உரமாக்கி)

IMPORTANT FORMULATIONS

Civataic Cūraṇam (சிவதைச் சூரணம்), Kantaka Iracāyaṉam (கந்தக இரசாயனம்), Tēṟṟāṉkoḍḍai Iḷakam (தேற்றான்கொட்டை இளகம்), Tippili Irācāyaṉam (திப்பிலி இராசாயனம்), Tiripalaic Cūraṇam (திரிபலைச் சூரணம்)

THERAPEUTIC USES

Āṇkuṟippuṇ (ஆண்குறிப்புண்), Cilantiñcu (சிலந்திநஞ்சு), Kuruti Aẕal (குருதி அழல்)

DOSE - Powder 2 - 4 g

THIPPILI (Fruit) - திப்பிலி

Thippili is the dried, immature, catkin-like fruits with bracts of ***Piper longum*** L. (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 evergreen forests of Western ghats as wild, and also cultivated in North East and many parts of the South. It grows in Kuṟiñcithiṇai.

SYNONYMS

Tamil	:	Ampu (அம்பு), Aricittippili (அரிசித்திப்பிலி), Ātimaruntu (ஆதிமருந்து), Kaṇai (கணை), Kōzaiyaṟukki (கோழையறுக்கி), Kuḍāri (குடாரி)
Assamese	:	Pipali
Bengali	:	Pipul
English	:	Long pepper
Gujrati	:	Lindi Peeper, Pipali
Hindi	:	Pipar
Kannada	:	Hippali
Malayalam	:	Pippali
Marathi	:	Pimpali, Lendi pimpali
Oriya	:	Pipali, Pippali
Punjabi	:	Magh, Magh Pipali
Sanskrit	:	Pippali, Kana, Magadhi, Magadha, Krsna, Saundi.
Telugu	:	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 the endocarp cells filled with starch grains, round to oval measuring 3 to 8 μm in dia.

Powder:

Deep moss green; shows fragments of parenchyma cells, oval to elongated stone cells; oil globules and round to oval starch grains, measuring 3 to 8 μm in diameter.

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.

ASSAY

High performance thin layer chromatographic (HPTLC) assay of piperine.

Solvent system

Toluene: Diethyl ether: Dioxane (62.5 : 21.5 : 16).

TLC Plates

Aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness.

Standard Solution

10 mg of piperine is dissolved in 10 ml of Methanol in a volumetric flask. From this stock solution standard solutions of 100 -1000 μg/ml are prepared by taking aliquots (0.1 to 1.0 ml) of stock solution and adjusting the volume to 1.0 ml with Methanol.

Sample preparation

20 g of powdered drug is extracted with 150 ml of n-Hexane in a Soxhlet apparatus to defat the material. Further the drug is extracted with Methanol for 8 to 10 hr. The solvent is removed under reduced pressure. 20 mg of Methanolic extract is dissolved in 1 ml of Methanol.

Calibration curve

10 μl of each of the standard solutions is applied on a TLC plate. The plate is developed in twin trough chamber to a distance of 8 cm. and scanned densitometrically at 366 nm. The peak areas are recorded and the calibration curve is obtained by plotting peak area vs concentration of piperine applied.

Estimation of piperine in the drug

10 µl of the sample solution in triplicate is applied on a TLC plate. The plate is developed in the solvent system and the peak area of piperine is recorded as described above for calibration curve. The amount of piperine present in the sample is calculated from the calibration curve of piperine.

The percentage of piperine ranges from 0.29 to 0.38.

T.L.C.

T.L.C. of the Alcoholic extract of the drug on silica gel 'G' plate using Toluene: Ethyl acetate (9:1) as mobile phase, under UV (366 nm.) shows six fluorescent zones at Rf.. 0.15, 0.26, 0.34, 0.39, 0.50 and 0.80. On exposure to iodine vapours, 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 105ºC for five minutes five spots appear at Rf. 0.04, 0.22, 0.35, 0.43 and 0.82. On spraying with Dragendorff reagent three red orange spots appear at Rf. 0.15, 0.26 and 0.34 (all orange).

CONSTITUENTS

β-caryophyllene; piperine, pipernonaline, piperundecalidine, piperlatine, sesamine, dihydriostifransterol, piplasterol and futoamide.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு), Tuvarppu (துவர்ப்பு)

Guṇam : Ilaku (இலகு), Noymai (நொய்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Iṉippu (இனிப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Aśḍāthic Cūraṇam (அஷ்டாதிச் சூரணம்), Civaṉār Amirtam (சிவனார் அமிர்தம்), Kakkuvāṉ Iḷakam (கக்குவான் இளகம்), Kuṉmakuḍōri Meẕuku (குன்மகுடோரி மெழுகு), Pālacañcīvi Māttirai (பாலசஞ்சீவி மாத்திரை), Tippili Irācāyaṉam (திப்பிலி இராசாயனம்)

THERAPEUTIC USES

Cuvaiyiṉmai (சுவையின்மை), Iraippu (இரைப்பு), Irumal (இருமல்), Aiyappiṇi (ஐயப்பிணி), Kaṇ Kātu Mūkku Nōykaḷ (கண் காது மூக்கு நோய்கள்), Kuṉmam (குன்மம்)

DOSE - Powder 500 mg - 1g

VĀYVIḌAṄKAM (Fruit) - வாய்விடங்கம்

Vāyviḍaṅkam is the dried mature fruit of ***Embelia ribes*** Burm. f. (Fam. Myrsinaceae), large scandent shrub with long, slender, flexible branches, distributed throughout hilly parts of India upto 1600 m.It grows in Kuṟiñci , Mullai Marutham thiṇai.

SYNONYMS

Tamil	:	Kēraḷam (கேரளம்), Varaṉai (வரனை), Varṉaṉai (வர்னனை), Vāyuviḷaṅkam (வாயுவிளங்கம்)
Assamese	:	Vidang
Bengali	:	Vidang
Gujrati	:	Vavading, Vavding, Vayavadang
Hindi	:	Baberang, Bhabhiranga, Vayavidanga
Kannada	:	Vayuvidanga, Vayuvilanga
Kashmiri	:	Babading
Malayalam	:	Vizhalari, Vizalari
Marathi	:	Vavading, Vavding
Oriya	:	Bidanga, Vidanga
Punjabi	:	Babrung, Vavaring
Sanskrit	:	Vidanga, Jantughna, Krmighna, Vella, Krmihara, Krmiripu
Telugu	:	Vayuvidangalu
Urdu	:	Baobarang, Babrang

DESCRIPTION

a) Macroscopic

Fruit brownish-black, globular, 2 to 4 mm. in diameter, warty surface with a beak like projection at apex, often short, thin pedicel and persistant calyx with usually 3 or 5 sepals present; pericarp brittle enclosing a single seed covered by a thin membrane; entire seed reddish and covered with yellowish spots, odour slightly aromatic; taste astringent.

b) Microscopic

Transverse section of fruit shows epicarp consisting of single row of tabular cells of epidermis, usually obliterated; in surface view cells rounded with wrinkled cuticle; mesocarp consists of a number of layers of reddish-brown coloured cells and numerous fibrovascular bundles and rarely a few prismatic crystals of calcium oxalate; inner part of mesocarp and endocarp composed of stone cells; endocarp consisting of single layered, thick-walled, large, palisade-like

stone cells; seed coat composed of 2 or 3 layered reddish-brown coloured cells; endosperm cells irregular in shape, thick-walled, containing fixed oil and proteinous masses; embryo small when present otherwise most of the seeds sterile.

Powder:

Reddish; shows reddish parenchyma cells and stone cells.

Identification:-

(1) 1 g of the powdered seeds is shaken with 20 ml of solvent Ether for five minutes and filtered. To a portion of the filtrate 5 per cent v/v solution of Sodium Hydroxide is added and a deep violet colour is developed in the aqueous layer. To the other portion 2 drops of dilute Ammonia solution is added and a bluish violet precipitate is obtained.

(2) 5 g of the powdered seeds is boiled with 25 ml Alcohol and filtered. The deep red coloured filtrate is divided into two portions. To one portion, solution of Lead Acetate is added, a dirty green precipitate is produced. To the other portion, solution of Ferric Chloride is added a reddish-brown precipitate is produced.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 6 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 1.5 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 10 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 9 per cent, Appendix	2.2.7.

ASSAY

Contains not less than 2 per cent w/w of embelin (limits 1.85 to 2.15) when assayed as follows:-

About 10 g of powder (40 mesh) is accurately weighed and transfered to a 500 ml glass stoppered flask. It is shaken occasionally for thirty minutes with 150 ml of solvent Diethyl ether. The whole mass is packed in a percolator and macerated for thirty minutes and extracted with solvent Diethyl ether, till the ethereal solution ceases to give a pink colour with a drop of Ammonia Solution. The Ether is distilled off, and the residue is treated with small quantity of light Petroleum (b.p. 40º to 60º) and cooled in ice. The precipitate is filtered under suction and the filtrate is rejected. The residue is washed with further small quantities of cooled light Petroleum. The residue is transfered to a tared beaker with sufficient quantity of the solvent light Petroleum and dried, to constant weight at 80º. The melting range of embelin is 142º to 144º.

T.L.C.

T.L.C. of Alcoholic extract on silica gel 'G' plate using Toluene: Ethyl acetate (7:3) v/v, on exposure to iodine vapours shows eight spots at Rf. 0.06, 0.14, 0.51, 0.58, 0.76, 0.82, 0.86 and 0.95 (all yellow). On spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate

for five minutes at 105°C six spots appear at Rf. 0.06,0.14,0.51, 0.58, 0.76 (all grey), and 0.95 (violet).

CONSTITUENTS

Embelin, quercitol, tannin, christembine, embelic acid and vilangin.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை), Vaṟaḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Pacittīṭūṇḍi (பசித்தீதூண்டி), Tūkkuṇippuzukkolli (தூக்குணிப்புழுக்கொல்லி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Karuḍaṉkizaṅku Eṇṇey (கருடன்கிழங்கு எண்ணெய்), Makāvallāti Iḷakam (மகாவல்லாதி இளகம்), Nākkuppūcci(Kolli) Kuḍinīr (நாக்குப்பூச்சி(கொல்லி) குடிநீர்), Nilavākaic Cūraṇam (நிலவாகைச் சூரணம்), Piraṇḍai Vaḍakam (பிரண்டை வடகம்)

THERAPEUTIC USES

Kuṉmam (குன்மம்), Nañcu (நஞ்சு), Nuṇpuzukkaḷ (நுண்புழுக்கள்), Vāyvu (வாய்வு), Veḷuppu Nōy/Pāṇḍu (வெளுப்பு நோய்/பாண்டு)

DOSE - Powder 5 - 10 g

VĀLMIḶAKU (Fruit) - வால்மிளகு

Vālmiḷaku is the mature, dried fruit of ***Piper cubeba*** L. f. (Fam. Piperaceae), woody, climbing, dioeceous perennial; female spike with small flowers, often curved; cultivated to a small extent in India, specially in the Karnataka state; fruits collected when mature but still unripe and carefully dried.It grows in Kuṟiñcithiṇai.

SYNONYMS

Tamil	:	Kaṇḍamiḷaku (கண்டமிளகு), Laṅkēcam (லங்கேசம்)
Assamese	:	Kakkol, Kababcheni
Bengali	:	Kababchini, Sugandhamaricha
English	:	Cubebs, Tailed pepper
Gujrati	:	Chanakabab, Chinikabab
Hindi	:	Seetalchini, Kababchini
Kannada	:	Gandhamenasu, Balamenasu
Kashmiri	:	Kushfal, Kababchini
Malayalam	:	Cheenamulaku, Takkolam, Valmulaku
Marathi	:	Kankol
Oriya	:	Kababchini
Punjabi	:	Kababchini, Sardchini
Sanskrit	:	Kankola, Lankesa, Cinatiksna, Kakkola, Kankolika
Telugu	:	Chalavamiriyalu, Tokamiriyalu
Urdu	:	Kababchini

DESCRIPTION

a) Macroscopic

Fruit wrinkled, rounded, 5 to 7 mm. in diameter, light brown to dark brown, about 7 mm. long stalk attached; pericarp red to slightly brown, testa fused with pericarp; fruit hard and stony; albumin white and oily; odour aromatic and characteristic; taste pungent and slightly bitter.

b) Microscopic

Transverse section of fruit shows an outer layer of epidermis, externally covered with thick cuticle, a row of 2 to 5 small, crushed, brown and thick-walled cells below; mesocarp composed of large, thin-walled parenchymatous cells, oil cells and vascular bundles; endocarp of multi-layered sclereids heavily lignified with narrow lumen; testa and tegmen composed of elongated cells, tegmen cells hyaline and kernel cells greyish in colour.

Powder:

Dark brown, oily; shows fragments of parenchyma cells, elongated testa cells, sclereids; starch grains numerous, rounded with centric hilum measuring 3 to 15 µm in diameter 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	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	14	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 Petroleum ether (40- 60°) extract of the drug on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using Toluene: Ethyl acetate (7:3), on exposure to iodine vapours six spots appear at Rf. 0.53, 0.66, 0.75, 0.82, 0.92 and 0.96 (all yellow). With Anisaldehyde- Sulphuric acid reagent and heating the plate, for five minutes at 105°C six spots appear at Rf. 0.53, 0.66, 0.75 (all violet),0.82, 0.92 (both pink) and 0.96 (red).

CONSTITUENTS

Sesqirterpenehydrocarbons-quiphellandrane,1-epibicyclosequiphellandrene, cyclohexane, piperenol A & B and zeylenol.

PROPERTIES AND ACTIONS

Cuvai : Kārppu (கார்ப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Ciṟunīrperukki (சிறுநீர்பெருக்கி), Kōzaiyakaṟṟi (கோழையகற்றி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Cāmpirāṇippū Paṭaṅkam (சாம்பிராணிப்பூ பதங்கம்), Impūṟal Iḷakam (இம்பூறல் இளகம்), Kaẓaṟcit Tailam (கழற்சித் தைலம்), Kuṅkumappū Māttirai (குங்குமப்பூ மாத்திரை), Makā Ēlāthi Kuḷikai (மகா ஏலாதி குளிகை), Nārathtai Iḷakam (நாரத்தை இளகம்), Tūtuvēḷai Ney (தூதுவேளை நெய்)

THERAPEUTIC USES

Aẕal Nōykaḷ (அழல் நோய்கள்), Aiya Nōykaḷ (ஐய நோய்கள்), Kuṉmam (குன்மம்), Nīrvēḍkai (நீர்வேட்கை), Vaḷi Nōykaḷ (வளி நோய்கள்), Veḷḷai (வெள்ளை)

DOSE - Powder 1 - 2 g

VĀLUZUVAI (Seed) - வாலுழுவை

Vāluzuvai is the dried, brownish-orange, ripe seeds, deviod of capsule wall of ***Celastrus paniculatus*** Willd. (Fam. Celastraceae), a large climbing shrub, mostly found all over the hilly parts of the country upto an altitude of 1200 m.It grows in Kuriñciand Mullai thiṇai.

SYNONYMS

Tamil	:	Atipariccam (அதிபரிச்சம்)
Assamese	:	Kapalphotla
English	:	Staff tree
Gujrati	:	Malkangani
Hindi	:	Malkangani
Kannada	:	Dodaganugae, Gangunge Beeja, Kangondiballi
Malayalam	:	Ceruppunnari, Uzhinja
Marathi	:	Malkangoni
Oriya	:	Malkanguni, Jyotishmati
Punjabi	:	Malkangoni
Sanskrit	:	Jyotismati
Telugu	:	Malkangani, Peddamaveru
Urdu	:	Malkangani.

DESCRIPTION

a) Macroscopic

Dried ripe seeds more or less covered by orange-red crusty aril, seed without aril also present, measuring 5 to 6 mm. in length and 2.5 to 3.35 mm. in breadth, a few roughly three sided being convex on the sides, and a few two sided with one convex and other more or less flat side; one edge of many seeds show a faint ridge or raphe on the entire margin; surface generally smooth and hard; colour light to dark brown; odour unpleasant; taste bitter.

b) Microscopic

Seed - Shows single layered epidermis covered externally with thick cuticle and filled with tannin, followed by 4 to 6 layers of thin-walled, collapsed, parenchymatous cells and layer of radially elongated stone cells; parenchyma of top one or two layers longer than of the below with triangular intercellular spaces; inner most layer of parenchyma containing prismatic crystals of calcium oxalate; beneath stone cells layer quadrangular to octagonal, tangentially elongated cells filled with brownish contents; endosperm composed of polygonal, thin-walled, parenchymatous cells having

oil globules and aleurone grians; embryo spathulate in fleshy endosperm containing oil globules and aleurone grains.

Powder:

Oily, dark brown; shows groups of endospermic parenchyma, stone cells; oil globules and aleurone grains.

IDENTITY, PURITY AND STRENGTH

Oil contents	Not less than	45 per cent, Appendix	2.2.8.
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	20 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 of the drug on silica gel 'G' plate using Toluene : Ethyl acetate (9:1) shows two spots at Rf. 0.82 (pink) & 0.94 (yellow) in visible light. Under UV (366 nm.) four fluorescent zones visible at Rf. 0.54, 0.82 0.89, (all blue) and 0.94 (yellow). On exposure to iodine vapours eight spots appear at Rf. 0.04, 0.15, 0.20, 0.35, 0.54, 0.63, 0.82 and 0.89 (all yellow). On spraying with Vanillin- Sulphuric acid reagent and heating the plate at 105° C for five minutes four spots appear at Rf. 0.35, 0.54 (both blue), 0.82, 0.89 (both greenish blue).

CONSTITUENTS

Malkangunin, celapanin, celapanigin, celapagin, pristimerin, zeylasterone & zeylasteral, fatty oil with palmitic, oleic, linoleic and linolenic acids.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Kūrmai (கூர்மை), Vemmai (வெம்மை)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Kāmamperukki (காமம்பெருக்கி), Narampu Uramākki (நரம்பு உரமாக்கி), Uḍalveppakaṟṟi (உடல்வெப்பகற்றி), Veppamuṇḍākki (வெப்பமுண்டாக்கி), Viyarvaiyuṇḍākki (வியர்வையுண்டாக்கி)

IMPORTANT FORMULATIONS

Civaṉār Vēmpu Kuḷittailam (சிவனார் வேம்பு குளித்தைலம்), Iḍivallāthi Meẕuku (இடிவல்லாதி மெழுகு), Karuḍaṉkiẕaṅku Eṇṇey (கருடன்கிழங்கு எண்ணெய்)

THERAPEUTIC USES

Cūtakanōykaḷ (சூதகநோய்கள்), Irumal (இருமல்), Aiya Nōykaḷ (ஐய நோய்கள்), Kīḻvāyu (கீல்வாயு), Kurutikkaẓiccal (குருதிக்கழிச்சல்), Puṇ (புண்), Perumpāḍu (பெரும்பாடு)

DOSE - Powder 1 - 2 g

VENTHAYAM (Seed) - வெந்தயம்

Venthayam is the seed of *Trigonella foenum-graecum* L. (Fam. Fabaceae), an aromatic, 30 to 60 cm. tall, annual herb, cultivated throughout the country.

SYNONYMS

Tamil	:	Mentiyam (மெந்தியம்), Mēti (மேதி)
English	:	Fenugreek
Gujrati	:	Methi
Hindi	:	Methi
Kannada	:	Mente, Menthe
Malayalam	:	Uluva
Marathi	:	Methi
Punjabi	:	Methi
Sanskrit	:	Methi, Methini
Telugu	:	Mentulu
Urdu	:	Methi

DESCRIPTION

a) Macroscopic

Seed oblong, rhomboidal with a deep furrow running obliquely from one side dividing seed into a larger and smaller part, 0.2 to 0.5 cm. long, 0.15 to 0.35 cm. broad, smooth, very hard; dull yellow; seed becomes mucilaginous when soaked in water; odour pleasant; taste bitter.

b) Microscopic

Seed - Seed shows a layer of thick-walled, columnar palisade, covered externally with thick cuticle; cells flat at base, mostly pointed but a few flattened at apex, supported internally by a tangentially wide bearer cells having radial rib-like thickenings; followed by 4 or 5 layers of tangentially elongated, thin-walled parenchymatous cells; endosperm consists of a layer of thick-walled cells containing aleurone grains, several layers of thin-walled, mucilaginous cells, varying in size, long axis radially elongated in outer region and tangentially elongated in inner region present; cotyledons consists of 3 or 4 layers of palisade cells varying in size with long axis and a few layers of rudimentary spongy tissue; rudimentary vascular tissue situated in spongy mesophyll; cells of cotyledon contain aleurone grains and oil globules.

Powder:

Yellow; shows groups of palisade parenchyma cells; aleurone grains, oil globules; endosperm and epidermal cells of testa.

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.
Alcohol-soluble extractive	Not less than	5	per cent, Appendix	2.2.6.

T.L.C.

T.L.C. of the Methanolic extract of the drug on aluminium plate precoated with silica gel 60 F_{254} (E. Merck) 0.2 mm. thickness using n-Hexane: Ethyl acetate (4:1) shows four spots at Rf. 0.36 (greenish brown, diosgenin marker), 0.41(blue), 0.58(blue) and 0.91 (dark blue) after spraying with Anisaldehyde- Sulphuric acid reagent and heating the plate at 100 - 105ºC until the colour develops.

CONSTITUENTS

Diosgenin, tigogenin, neotigogenin, yamogenin, gitogenin, neogitogenin, sonilagenin, sarsasaposanin, vitexin, isovitexin, vicenin 1 and 2, trigonellin, kaempferol, luteolin, quercetin, ß-sitosterol, furostanol glycosides, tetrosides B and C, fenugini B, trigoneosides - Xa, Xb, XIb, XIIa, XIIb, XIIIa , methyl protodioscin, methyl protodeltonin and 4- hydroxy- isoleucine.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Noymai (நொய்மை)

Vīrium : Taḍpam (தட்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Akaḍḍuvāyvakaṟṟi (அகட்டுவாய்வகற்றி), Ciṟunīrperukki (சிறுநீர்பெருக்கி), Kāmamperukki (காமம்பெருக்கி), Tuvarppi (துவர்ப்பி), Uḷḷaẕalāṟṟi (உள்ளழலாற்றி), Uramākki (உரமாக்கி), Vaṟaḍciyakaṟṟi (வறட்சியகற்றி)

IMPORTANT FORMULATIONS

Cuṇḍaivaṟṟal Cūraṇam (சுண்டைவற்றல் சூரணம்), Kaṇattailam (கணத்தைலம்), Kapāḍa Māṭthirai (கபாட மாத்திரை), Kōrōcaṉaittukaḷ (கோரோசனைத்துகள்)

THERAPEUTIC USES

Iḷaippu Nōy (இளைப்பு நோய்), Cītakkaẕiccal (சீதக்கழிச்சல்), Kuruti Aẕal (குருதி அழல்), Nīriẕivu (நீரிழிவு), Nīrvēḍkai (நீர்வேட்கை), Uḍal Ericcal (உடல் எரிச்சல்), Veḷḷai (வெள்ளை)

DOSE - Powder 3 - 6 g

VĒPPAMPAZ̲AM (Fruit) - வேப்பம்பழம்

Vēppampaz̲am is the whole dried fruit including seeds of *Azadirachta indica* A. Juss. Syn. *Melia azadirachta* L. (Fam. Meliaceae), a medium to large evergreen tree attaining a height of 15 to 20 m. or more under favourable conditions and found throughout the plains of India upto an altitude of 900 m. and also cultivated as avenue trees.

SYNONYMS

Tamil	:	Ariṭṭam (அரிட்டம்), Nimpam (நிம்பம்), Tuṭṭai (துட்டை), Vātāri (வாதாரி), Vēmpu (வேம்பு)
Bengali	:	Nim, Nimgach
English	:	Margosa tree, Neem tree, Indian lilac
Gujrati	:	Leemade
Hindi	:	Neem
Kannada	:	Turakbevu, Huchchabevu, Chikkabevu
Malayalam	:	Veppu, Ariveppu
Marathi	:	Kaduninba, Nimb
Oriya	:	Neemo, Nimba
Punjabi	:	Nimb, Nim
Sanskrit	:	Nimba, Picumaradah, Aristah, Picumandah, Prabhadrah
Telugu	:	Vemu, Vepa
Urdu	:	Neem

DESCRIPTION

a) Macroscopic

Fruit - Glabrous, dark reddish-brown, ovoid to ellipsoid drupes. 0.5 to 2 cm. long, over one cm wide; indehiscent, deeply wrinkled, enclosing a single seed in a brownish leathery pulp; odour strong; taste bitter.

Seed - Brownish, dorsally convex; upto 1.5 cm. long and 0.6 cm. wide; seed coat thin, brownish, shell-like, cracks to touch, inside of cracked pieces golden yellow; seed kernel, light brown, oily; odour strong; taste bitter.

b) Microscopic

Fruit - Pericarp well differentiated into epicarp, mesocarp and endocarp; epidermis more than one layered; squarish to rectangular cells containing yellowish-brown contents and oil droplets; mesocarp, many layered of loosely packed cells with large elongated sclereids scattered in outer

layers; endocarp of two distinct layers, outer of closely packed lignified stone cells, inner fibrous, loosely packed, lignified.

Seed - Seed kernel shows a thin brown testa of isodiametric stone cells overlying integument of loosely packed parenchymatous cells; cotyledon consisting of parenchymatous cells containing abundant oil droplets.

Powder:

Dark brown; shows abundant brachysclereids, columnar sclereids and pitted stone cells with wide lumen and distinct wall striations; groups of lignified fibres, thin-walled, arranged in network of loose strands; parenchymatous cells of cotyledon containing aleurone grains and oil globules; fragments of testa showing distinctly striated isodiametric stone cells; a few scattered rosette crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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	16	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	19	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'G'plate using Chloroform: Acetone (18.5:1.5) on spraying with 1% Vanillin- Sulphuric acid reagent and heating the plate at 105ºC for about five minutes shows ten spots at Rf. 0.11 (greyish violet), 0.16 (yellow), 0.19 (green), 0.24 (violet), 0.29 (grey), 0.33 (mustard yellow), 0.42 (pink), 0.49 (greyish black), 0.57 (violet) and 0.76 (light purple).

CONSTITUENTS

Nimbin, gedunin, azadirachtin; nimbidin, salanin. 6-0- acetylnimbandiol, 3-dasacetylsalannin, azadirachtol, nimolinone, nimolicinol, azadirachtin-A, 11α- H azadirachtin, H, 11 β- H azadirachtin H, salimuzzalin, azadirolic acid, azadiradionol, azadironol nimbochalcin and nimbocetin.

PROPERTIES AND ACTIONS

Cuvai : Ciṟuiṉippu (சிறுஇனிப்பு), Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு), Kūrmai (கூர்மை), Noymai (நொய்மை)

Vīrium : Taḍpam (தட்பம்)

Pirivu : Iṉippu (இனிப்பு)

Ceykai : Muṟaiveppakaṟṟi (முறைவெப்பகற்றி), Uramākki (உரமாக்கி)

IMPORTANT FORMULATIONS

Viṣṇucakkara Māttirai (விஷ்ணுசக்கர மாத்திரை)

THERAPEUTIC USES

Tōl Nōykaḷ (தோல் நோய்கள்)

DOSE - Powder 1 - 2 g , Oil 5 - 10 drops.

VĒPPAM PAḌṬAI (Stem bark) - வேப்பம் பட்டை

Vēppam Paḍṭai is the stem bark of *Azadirachta indica* A. Juss. Syn. *Melia azadirachta* L. (Fam. Meliaceae), a medium to large evergreen tree attaining a height of 15 to 20 m. or more under favourable conditions and found throughout the plains of India upto an altitude of 900 m., and also cultivated as avenue trees.

SYNONYMS

Tamil	:	Ariḍḍam (அரிட்டம்), Nimpam (நிம்பம்), Tuḍḍai (துட்டை), Vātāri (வாதாரி), Vēmpu (வேம்பு)
Bengali	:	Nim, Nimgacha
English	:	Indian lilac, Margosa tree, Neem tree
Gujrati	:	Kadvo Limbdo
Hindi	:	Nim, Nimb
Kannada	:	Nimba, Bevu, Oilevevu, Kahibevu
Malayalam	:	Ariveppu, Veppu
Marathi	:	Balantanimba, Limba, Kadunimb
Oriya	:	Nimba
Punjabi	:	Nim, Nimba
Sanskrit	:	Nimba, Arista, Picumarda
Telugu	:	Vemu, Vepa
Urdu	:	Neem

DESCRIPTION

a) Macroscopic

Bark varies much in thickness according to age and parts of tree from where it is taken; external surface rough, fissured and rusty-grey; laminated inner surface yellowish and foliaceous; fracture fibrous; odour characteristic; taste bitter.

b) Microscopic

Stem Bark - Shows outer exfoliating pieces hard, woody, considerably thick in older barks; almost entirely dead elements of secondary phloem, alternating with discontinuous tangential bands of compressed cork tissue, former composed of several layers of stone cells occurring in regularly arranged groups together with collapsed phloem elements filled with brown contents; in between the successive zones of cork tissue 3 to 5 layers of fibre groups with intervening thin-walled and often collapsed phloem elements present; each zone of cork tissue consists of several layers of

regular, thin-walled cells occasionally with a few compressed rows of thick-walled cells towards outer surface; within exfoliating portion a number of layers of newly formed cork composed of thin-walled, rectangular cells and one or two layers of cork cambium, below which a wide zone of secondary phloem present; secondary cortex absent in most cases; secondary phloem commonly composed of well-developed fibre bundles traversed by 2 to 4 seriate phloem rays and transversely separated by bands of parenchymatous tissue of phloem; phloem elements of outer bark mostly collapsed; a few fairly large secretory cavities also occur in phloem; most of phloem parenchyma contain starch grains and prismatic crystals of calcium oxalate; starch grains, simple, round with central hilum, measuring 2.75 to 5 µm; structure of bark varies considerably according to gradual formation of secondary cork bands.

Powder :

Reddish-brown; shows numerous prismatic crystals of calcium oxalate; phloem fibres with narrow lumen and pointed ends; cork cells, stone cells mostly in groups, lignified rectangular to polygonal, having wide lumen and distinct striations; simple starch grains, measuring 2.75 to 5 µm in diameter.

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	6	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 Alcoholic extract of the drug on silica gel 'G' plate using Chloroform: Ethyl acetate; Formic acid (5:4:1) shows under UV (366 nm.) three fluorescent zones at Rf. 0.72 (blue), 0.86 (blue), and 0.90 (green). On spraying with 5% Methanolic- Phosphomolybdic acid reagent and heating the plate until the colour develops , the plate shows four spots at Rf. 0.20, 0.45, 0.63 and 0.90 (all blue).

CONSTITUENTS

Nimbin, nimbinin, nimbidin, sugiol, essential oil, β-sitosterol and tannin.

PROPERTIES AND ACTIONS

Cuvai : Cir̲utuvarppu (சிறுதுவர்ப்பு), Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு), Var̲aḍci (வறட்சி)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Mur̲aiveppakar̲̲ri (முறைவெப்பகற்றி), Uramākki (உரமாக்கி), Tuvarppi (துவர்ப்பி)

IMPORTANT FORMULATIONS

Cīnthil Ney (சீந்தில் நெய்), Cīrakac Cūraṇam (சீரகச் சூரணம்), Maṇḍūrāti Aḍaikkuḍinīr (மண்டூராதி அடைக்குடிநீர்)

THERAPEUTIC USES

Curam/Kāyccal (சுரம்/காய்ச்சல்), Curattāl Uṇḍākum Uḍal Thaḷarcci (சுரத்தால் உண்டாகும் உடல் தளர்ச்சி), Kuṉmam (குன்மம்), Māntam (மாந்தம்), Mūlam (மூலம்), Tōl Nōykaḷ (தோல் நோய்கள்), Vaḷi Nōykaḷ (வளி நோய்கள்)

DOSE - Powder 2 - 4 g

VĒPPAM PŪ (Flower) - வேப்பம் பூ

Vēppam Pū is the dried flower and flower bud of *Azadirachta indica* A. Juss. Syn. *Melia azadirachta* L. (Fam. Meliaceae), a medium to large evergreen tree attaining a height of 15 to 20 m. or more under favourable conditions and found throughout the plains of India upto an altitude of 900 m. and also cultivated as avenue trees.

SYNONYMS

Tamil	:	Ariṭṭam (அரிட்டம்), Nimpam (நிம்பம்), Tuṭṭai (துட்டை), Vātāri (வாதாரி), Vēmpu (வேம்பு)
Bengali	:	Nim, Nimgach
English	:	Indian lilac, Margosa tree, Neem tree
Gujrati	:	Kohumba, Limba, Limbado, Limado
Hindi	:	Nim, Nimba
Kannada	:	Bevu, Nimba, Oilevevu, Kahibevu, Bevinama
Malayalam	:	Ariveppu, Veppu
Marathi	:	Balantanimba, Limba, Kadunimb, Nim
Oriya	:	Nimba
Punjabi	:	Nim, Nimb
Sanskrit	:	Nimba, Picumarda, Arista
Telugu	:	Vemu, Vepa
Urdu	:	Neem

DESCRIPTION

a) Macroscopic

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

b) Microscopic

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

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

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

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

Pollen Grain - Porous, 4-colporate, spherical 105 to 161 µm in dia., with a smooth exine.

Powder:

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

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	14	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	5	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	12	per cent, Appendix	2.2.7.

T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'G' plate using Chloroform: Acetone (20:1) on spraying with 1% Vanillin- Sulphuric acid reagent followed by heating the plate at 105ºC for about five minutes shows eight spots at Rf. 0.12 (violet), 0.17 (light pink), 0.33 (violet), 0.51 (purple), 0.64 (dark purple), 0.80 (light purple), 0.85 (light purple), 0.92 (purple).

CONSTITUENTS

Nonacosane, neeflone, azharone.

PROPERTIES AND ACTIONS

Cuvai : Kaippu (கைப்பு)

Guṇam : Ilaku (இலகு)

Vīrium : Veppam (வெப்பம்)

Pirivu : Kārppu (கார்ப்பு)

Ceykai : Nīrizivu Pōkki (நீரிழிவு போக்கி), Pacittītūṇḍi (பசித்தீதூண்டி), Uramākki (உரமாக்கி), Veppamuṇḍākki (வெப்பமுண்டாக்கி)

IMPORTANT FORMULATIONS

Tāmpiraccentūram (தாம்பிரச்செந்தூரம்)

THERAPEUTIC USES

Aẕal Nōykaḷ (அழல் நோய்கள்), Cuvaiyiṉmai (சுவையின்மை), Kuḍaṟpuẕu (குடற்புழு), Mūrccai (மூர்ச்சை), Nāvaṟaḍci (நாவறட்சி), Nīḍitta Vaḷinōy (நீடித்த வளிநோய்), Vānti (வாந்தி)

DOSE - Powder 1 - 2 g

VILVA VĒR (Root) - வில்வ வேர்

Vilva Vēr is the dried root of ***Aegle marmelos*** (L.) 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 grooves. It grows in Marutham thiṇai.

SYNONYMS

Tamil	:	Civatturumam (சிவத்துருமம்), Kūviḷam (கூவிளம்), Māluram (மாலுரம்), Niṉmali (நின்மலி)
Assamese	:	Bael, Vael
Bengali	:	Bela, Bilva
English	:	Bael root, Bengal quince
Gujrati	:	Bilivaphal, Bill, Bilum
Hindi	:	Bel, Bela, Sriphal
Kannada	:	Bilva
Malayalam	:	Koovalam
Marathi	:	Baela, Bel
Oriya	:	Bela
Punjabi	:	Bil
Sanskrit	:	Bilva, Sriphala
Telugu	:	Maredu
Urdu	:	Bel

DESCRIPTION

a) Macroscopic

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

b) Microscopic

Root - Shows lignified and stratified cork consisting of 3 or 4 alternating bands of 4 to 14 layers of smaller cells and a few layers of larger cells having golden yellow contents; secondary cortex, a wide zone, consisting of large, polyhedral, parenchymatous cells and stone cells of varying shapes and sizes, thick-walled, lignified, scattered throughout region; secondary phloem consists of sieve

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

Powder:

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

IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 1 per cent, Appendix	2.2.2.
Total Ash	Not more than 6 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 1 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 7 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 7 per cent, Appendix	2.2.7.

T.L.C.

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

CONSTITUENTS

Lupeol, 1-phenyl-7-hydroxy-tetrahydro-quinazolin-4-one, skimmianine, marmin and marmelide.

PROPERTIES AND ACTIONS

Cuvai	:	Kaippu (கைப்பு), Tuvarppu (துவர்ப்பு)
Guṇam	:	Ilaku (இலகு)
Vīrium	:	Taḍpam (தட்பம்)
Pirivu	:	Kārppu (கார்ப்பு)
Ceykai	:	Kāmamperukki (காமம்பெருக்கி)

IMPORTANT FORMULATIONS

Carapuṅka Vilvāti Iḷakam (சரபுங்க வில்வாதி இளகம்), Pittacurak Kuḍinīr (பித்தசுரக் குடிநீர்), Vilvāti Iḷakam (வில்வாதி இளகம்)

THERAPEUTIC USES

Curam/Kāyccal (சுரம்/காய்ச்சல்), Kuṉmam (குன்மம்), Mayakkam (மயக்கம்), Mukkuṟṟakēḍu (முக்குற்றகேடு), Nīrvēḍkai (நீர்வேட்கை), Uḍal Kaḍuppu (உடல் கடுப்பு)

DOSE - Decoction 30- 50 ml twice daily.

10 - 15 g coarse powder in 200 ml of water for preparing decoction.

THE SIDDHA PHARMACOPOEIA OF INDIA

PART – I
VOLUME – I
First Edition

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

APPENDICES
1 - 4

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.)

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* 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 thermometer 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. Volumetric apparatus must be suitably designed to assure accuracy. The design, construction and capacity of volumetric glassware should be in

accordance with those laid down by the Indian Standards Institution. The tolerances on capacity for volumetric flasks, pipettes and burettes, as laid down in the relevant Indian Standards, are set out in the following table.

Volumetric Flask : I.S. 915-1975							
Nominal capacity, ml.	5	10	25	50	100	250	500	1000
Tolerance, ± ml.	0.02	0.02	0.03	0.04	0.06	0.1	0.15	0.2
One Mark Pipettes: I.S. 1117-1975								
Nominal capacity, ml.	1	2	5	10	20	25	50	100
Tolerance, ± ml.	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.06
Graduated Pipettes: I.S.4162-1967								
Nominal capacity, ml.		1	2	5	10	25		
Subdivision, ml.		0.01	0.02	0.05	0.10	0.2		
Tolerance, ± ml.		0.006	0.01	0.03	0.05	0.1		
Burettes: I.S. 1997-1967								
Nominal capacity, ml.		10	25	50	10			
Subdivision, ml.		0.05	0.05	0.1	0.1			
Tolerance, ± ml.		0.01	0.03	0.05	0.1			

1.1.5 Weights and Balances

Pharmacopoeial tests and assays require the use of analytical balances that vary in capacity, sensitivity and reproducibility. The accuracy needed for a weighing should dictate the type of balance. Where substances are to be "accurately weighed", the weighing is to be performed so as to limit the error to not more than 0.1 per cent. For example, a quantity of 50 mg is to be weighed to the nearest 0.05 mg.; a quantity of 0.1 g is to be weighed to the nearest 0.1 mg; and a quantity of 10 g. is to be weighed to the nearest 10 mg. A balance should be chosen such that the value of three times the standard deviation of the reproducibility of the balance, divided by the amount to be weighed, does not exceed 0.001.

APPENDIX-2

2.1 TESTING OF DRUGS

2.1.1.-Systematic Study of Crude Drugs

In the Indian Systems of Medicine comprising of Ayurveda, Unani and Siddha, drugs of plant, animal and mineral origin, are used in their natural or so called "Crude" forms singly or in their mixture or in combination, to make a compound preparation of formulation. Nearly 90 per cent of the Crude Drugs are obtained from the plant sources while about 10 per cent of the drugs are derived from animal and mineral sources. The drugs of plant origin especially of herbaceous nature are frequently used as whole plant; otherwise their parts such as root, stem, leaf, flower, seed, fruit, modifications of stem and root, bark of a stem or root, wood, and their exudates or gums etc. constitute single drugs in the Indian Systems of Medicine. These vegetable drugs are either used in dried forms or some times as whole fresh or their juice. The study of these crude drugs made with a view to recognise them is called Pharmacognosy (Pharmakon = Drug; Gignosco = to acquire knowledge of), meaning the knowledge or science of Drugs. In Pharmacognosy a complete and systematic study of a drug is done, which comprises of (i) origin, common names, scientific nomenclature and family, (ii) geographical source (and history), (iii) cultivation, collection, preservation and storage, (iv) macroscopical, microscopical and sensory (organoleptic) characters, (v) Chemical composition wherever possible, (vi) identity, purity, strength and assay, (vii) substitute and adulterants etc. Such systematic study of a drug as complete as possible, is claimed to be the scientific or pharmacognostical 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-wall 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 Chromatography 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 (T.L.C.).

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 of 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 steam 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 x 0.5 x 1.5 cm. 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 or 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 defatted and clarified as follows:

Place 0.5- 1 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 water 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 safranine, 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 III, 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.

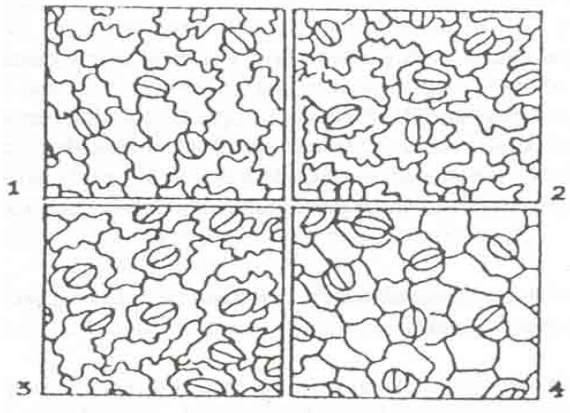


Fig.1 Various types of stomata

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 x 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.

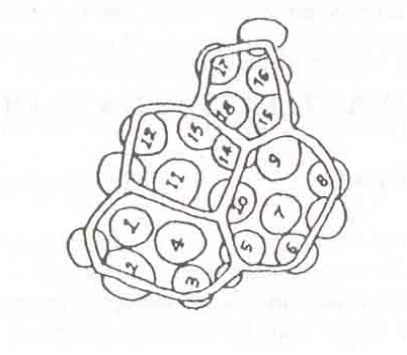
For each sample of leaf make not fewer than ten determinations and calculate the average index.

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 x 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.



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 microscropical 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 10 x objective and a 6 x 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 millimeter. Carry out the rest of the procedure as stated above. The result obtained is the number of vein-islets in 1 square millimeter. For each sample of leaf make not 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 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 6 x 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 millimeter for each surface of the leaf.

2.2. DETERMINATIONS 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 of 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 tarred platinum or silica dish at a temperature not exceeding 450˚ until free from carbon, cool and weigh. If a carbon free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the residue on an ashless filter paper, incinerate the residue and filter paper, add the filtrate, evaporate to dryness, and ignite at a temperature not exceeding 450˚. Calculate the percentage of ash with reference to the air-dried drug.

2.2.4. – Determination of Acid Insoluble Ash

Boil the ash obtained in (2.2.3) for 5 minutes with 25 ml. of dilute hydrochloric acid; collect the insoluble matter in a Gooch crucible or on an ashless filter paper, wash with hot water and ignite to constant weight. Calculate the percentage of acid-insoluble ash with reference to the air dried drug.

2.2.5. – Determination of Water Soluble Ash

Boil the ash for 5 minutes with 25 ml. of water; collect insoluble matter in a Gooch crucible, or on an ashless filter paper, wash with hot water, and ignite for 15 minutes at a temperature not exceeding 450˚. Substract the weight of the insoluble matter from the weight of the ash; the difference in weight represents the water-soluble ash. Calculate the percentage of water-soluble ash with reference to the air-dried drug.

2.2.6. – Determination of Alcohol Soluble Extractive

Macerate 5 g. of the air dried drug, coarsely powdered, with 100 ml. of Alcohol of the specified strength in a closed flask for twenty-four hours, shaking frequently during six hours and allowing to stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml. of the filtrate to dryness in a tarred 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 tarred 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 weighted to within 0.01 g.) it in a tarred evaporating dish. For example, for underground or unpowdered 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 tarred 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.

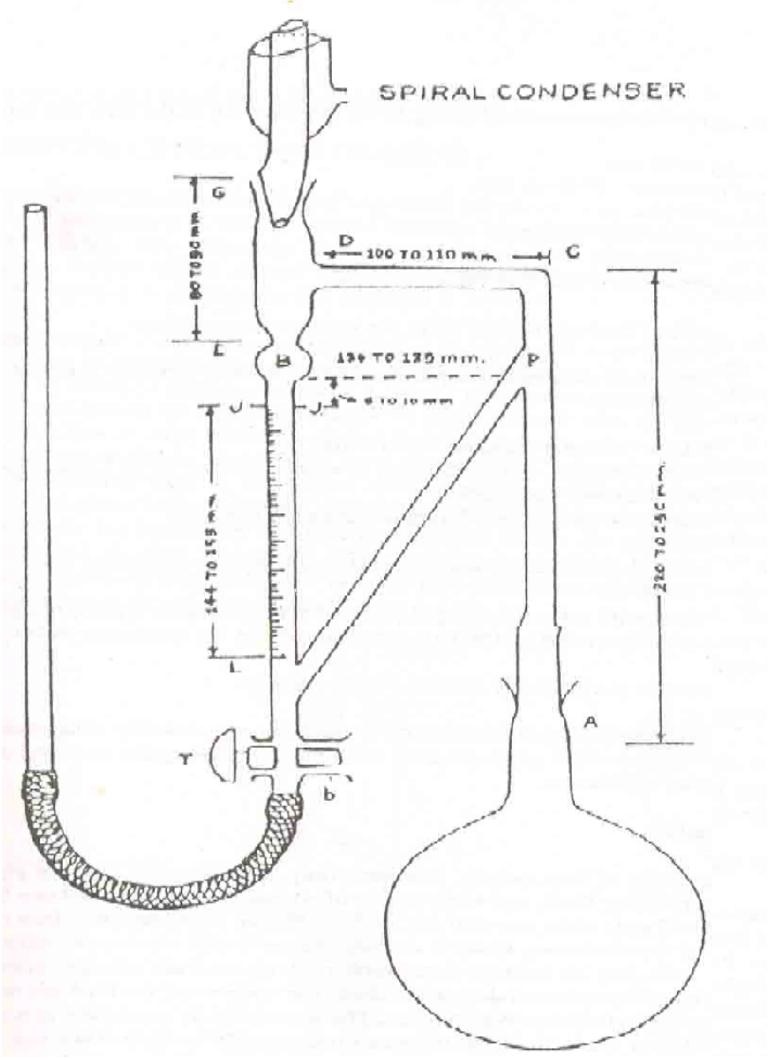


Fig. 3 Apparatus for volatile oil determination

(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 millitre.

Tube PL – return flow tube – Internal diameter – 7 to 8 mm.
Levelling tube 1, 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 m. 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 abullition commences. The distillation is continued at a rate which

keeps the lower end of the condensor 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 illustration. A is an outer tuber 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 and 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).

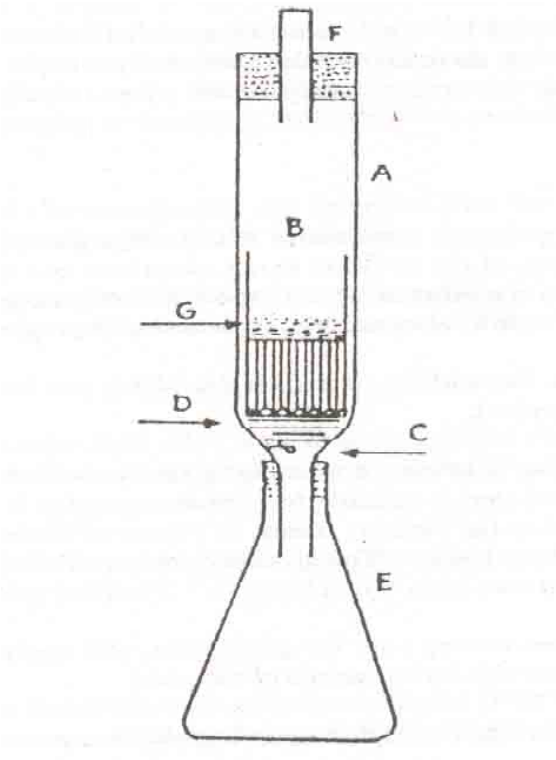


Fig. 4 Apparatus for the continuous extraction of Drugs

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 mercuriciodide 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 opalescence is produced.

2.2.12 Thin-Layer Chromatograph (T.L.C.)

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. form, 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 m. (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, coll, 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 stannous 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 employed 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	1 ml.
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 evolution 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 – Dissolves 2.5ml. 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 iron, 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 iron. 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 additional 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 m. 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 monograph, 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 surface; 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 . 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 . of water, or use 10 ml. of the solution prescribed 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 diethyidithiocarbamate 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 ammonia solution. Cool the solution if necessary, and add 2 ml. of potassium cyanide solution Sp. Immediately extract the solution with several quantities each of 5 ml., of dithizone extraction solution, draining off each extract into another separating funnel, until the dithizone extraction solution retains its green colour. Shake the combine dithizone solutions for 30 seconds with 30 ml. of a 1 per cent w/v solution of nitric acid and discrad the chloroform layer. Add to the solution exactly 5 ml. of standard dithizone solution and 4 ml. of ammonia-cyanide solution Sp. and shake for 30 seconds; the colour of the chloroform layer is of no deeper shade of violet than that of a control made with a volume of dilute standard lead solution equivalent to the amount of lead permitted in the sample under examination.

2.3.6 Sulphated Ash

Heat a silica or platinum crucible to redness for 10 minutes, allow to cool in a desiccator and weigh. Put 1 to 2 g. of the substance, accurately weighed, into the crucible, ignite gently at first, until the substance is thoroughly charred. Cool, moisten the residue with 1 ml. of sulphuric acid, heat gently until white fumes are no longer evolved and ignite at 800° ± 25° until all black particles have disappeared. Conduct the ignition in a place protected from air currents. Allow the crucible to cool, add a few drops of sulphuric acid and heat. Ignite as before, allow to cool and weigh. Repeat the operation until two successive weighings do not differ by more than 0.5 mg.

2.3.7 – Limit Test for Sulphates

Reagents –

Barium sulphate reagent – Mix 15 ml. of 0.5 M barium chloride, 55 ml. of water, and 20 ml. of sulphate free alcohol, add 5 ml. of a 0.0181 per cent w/v solution of potassium sulphate, dilute to 100 ml. with water, and mix. Barium sulphate reagent must be freshly prepared.

0.5 M barium chloride – Barium chloride dissolved in water to contain in 1000 ml. 122.1 g. of $BaC1_2$, $2H_2O$.

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 powder:

Coarse powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 1.70 mm. and not more than 40.0 per cent through a sieve with a nominal mesh aperture of 355 μm.

Moderately coarse powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 710 μm and not more than 40.0 per cent through a sieve with a nominal mesh aperture of 250 μm.

Moderately fine powder – A powder, all the particles of which pass through a sieve with a nominal mesh aperture of 355 μm and not more than 40.0 per cent through a sieve with a nominal mesh aperture 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 powder – 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 (λ=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^{20° D	Temperature Co-efficient Δn/Δt
Carbon tetrachloride	1.4603	-0.00057
Toluene	1.4969	-0.00056
a-Methylnaphthalene	1.6176	-0.00048

*Reference index value for the D line of sodium measured at 20˚

The cleanliness of the instrument should be checked frequently by determining the refractive index of distilled water which at 25˚is 1.3325.

3.1.3 Weight Per Millilitre and Specific Gravity

Weight per millilitre – The weight per millilitre of a liquid is the weight in g of 1 ml of a liquid when weighed in air at 25˚, unless otherwise specified.

Method

Select a thoroughly clean and dry pycnometer. Calibrate the pycnometer by filling it with recently boiled and cooled Water at 25˚and weighing the contents. Assuming that the weight of 1 ml. of water at 25˚ when weighed in air of density 0.0012 g. per ml, is 0.99602 g. Calculate the capacity of the pycnometer. (Ordinary deviations in the density of air from the value given do not affect the result of a determination significantly). Adjust the temperature of the substance to be examined, to about 20˚ and fill the pycnometer with it. Adjust the temperature of the filled pycnometer to 25˚, remove any excess of the substance and weigh. Substract the tare weight of the pycnometer from the filled weight of the pycnometer. Determine the weight per milliliter dividing the weight in air, expressed in g, of the quantity of liquid which fills the pycnometer at the specified temperature, by the capacity expressed in ml, of the pycnometer at the same temperature.

Specific gravity – The specific gravity of a liquid is the weight of a given volume of the liquid at 25˚ (unless otherwise specified) compared with the weight of an equal volume of water at the same temperature, all weighings being taken in air.

Method

Proceed as described under wt. per ml. Obtain the specific gravity of the liquid by dividing the weight of the liquid contained in the pycnometer by the weight of water contained, both determined at 25˚ unless otherwise directed in the individual monograph.

APPENDIX – 4

4.1 REAGENTS AND SOLUTIONS

Acetic Acid – Contains approximately 33 per cent w/v of $C_2H_4O_2$. Dilute 315 ml. of glacial acetic acid to 1000 ml. with water.

Acetic Acid, x N – Solutions of any normality xN may be prepared by diluting 60x ml. of glacial acetic acid to 1000 ml. with water.

Acetic Acid, Dilute – Contains approximately 6 per cent w/w of $C_2H_4O_2$. Dilutes 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 O.N sodium thiosulphate is required.

Odorous impurities – Neutralise 1.5 ml. with sodium hydroxide solution; the solution has no odour other than a faint acetous odour.

Readily oxidisable impurities – To 5 ml. of the solution prepared for the test for Formic Acid and Oxidisable Impurities, add 20 ml. of water and 0.5 ml. of 0.1 N potassium permanganate; the pink colour does not entirely disappear within half a minute.

Non-volatile matter – Leaves not more than 0.01 per cent w/w of residue when evaporated to dryness and dried to constant weight at 105˚.

Assay – Weigh accurately about 1 g. into a stoppered flask containing 50 ml. of water and titrate with N sodium hydroxide, using phenolphthalein solution as indicator. Each ml. of sodium hydroxide is equivalent to 0.06005 g of $C_2H_4O_2$.

Acetic Acid, Lead-Free-Acetic acid which complies with following additional test, boil 25 ml. until the volume is reduced to about 15 ml., cool make alkaline with lead-free ammonia solution, add 1 ml. of lead free potassium cyanide solution, dilute to 50 ml. with water, add 2 drops of sodium sulphide solution; no darkening is produced.

Acetone – Propan 2-one; $(CH_3)_2CO$=58.08

Description – Clear, colourless, mobile and volatile liquid; taste, pungent and sweetish; odour characteristic; flammable.

Solubility-Miscible with water, with alcohol, with solvent ether, and with chloroform, forming clear solutions.

Distillation range – Not less than 96.0 per cent distils between 55.5˚ and 57˚.

Acidity – 10 ml. diluted with 10 ml. of freshly boiled and cooled water; does not require for neutralisation more than 0.2 ml. of 0.1 N sodium hydroxide, using phenolphthalein solution as indicator.

Alkalinity – 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 phosporic 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 0.1N sodium hydroxide to produce a pink colour.

Specific gravity – Between 0.8084 abd 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 drop 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 drop wise, 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 tarred dish on a water-bath and dry the residue at 105˚for one hour; the weight of the residue does not exceed 1 mg.

Storage – Store in tightly-closed containers, away from fire.

Labelling– The label on the container states "Flammable".

Dilute Alcohols: Alcohol diluted with water to produce dilute alcohols. They are prepared as described below:

Alcohol (90 per cent)
Dilute 947 ml. of alcohol to 1000 ml. with water.
Specific Gravity – At 15.56˚/15.56˚, 0.832 to 0.835.

Alcohol (80 per cent)
Dilute 842 ml. of alcohol to 1000 ml. with water.
Specific Gravity – At 15.56˚/15.56˚, 0.863 to 0.865.

Alcohol (60 per cent)
Dilute 623 ml. of alcohol to 1000 ml. with water.
Specific Gravity – At 15.56˚/15.56˚, 0.913 to 0.914.

Alcohol (50 per cent)
Dilute 526 ml. of alcohol to 1000 ml. with water
Specific Gravity – At 15.56˚/15.56˚, 0.934 to 0.935.

Alcohol (25 per cent)
Dilute 263 ml. of alcohol to 1000 ml. with water.
Specific Gravity – At 15.56˚/15.56˚, 0.9705 to 0.9713.

Alcohol (20 per cent)
Dilute 210 ml. of alcohol to 1000 ml. with water.
Specific Gravity – At 15.56˚/15.56˚, 0.975 to 0976.

Alcohol, Aldehyde-free. – Alcohol which complies with the following additional test:

Aldehyde – To 25 ml., contained in 300 ml. flask, add 75 ml. of dinitrophenyl hydrazine solution, heat on a water bath under a reflux condenser for twenty four hours, remove the alcohol by distillation, dilute to 200 ml. with a 2 per cent v/v solution of sulphuric acid, and set aside for twenty four hours; no crystals are produced.

Alcohol, Sulphate-free. – Shake alcohol with an excess of anion exchange resin for thirty minutes and filter.

Ammonia, xN. – Solutions of any normality xN may be prepared by diluting 75 x ml. of strong ammonia solution to 1000 ml. with water.

Ammonia-Ammonium Chloride Solution, Strong, - Dissolve 67.5 g. of ammonium chloride in 710 ml. of strong ammonia solution and add sufficient water to produce 1000 ml.

Ammonia Solution, Dilute. – Contains approximately 10 per cent w/w of NH_3.

Dilute 425 ml. of strong ammonia solution to 1000 ml. with water.

Wt. per ml – At 25˚, about 0.960 g.

Storage – Dilute ammonia solution should be kept in a well-closed container, in a cool place.

Ammonia Solution 2 per cent – Ammonia solution 2 per cent is the ammonia solution strong diluted with purified water to contain 2 per cent v/v of Ammonia solution strong.

Ammonia Solution, Strong – Contains 25.0 per cent w/w of NH_3 (limit, 24.5 to 25.5). About 13.5 N in strength.

Description – Clear, colourless liquid; odour, strongly pungent and characteristic.

Solubility-Miscible with water in all proportions.

Wt. per ml – At 25˚, about 0.91 g.

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 tarred 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 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 1 ml. 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 water; 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 4 ml. 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 1000 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 solution; 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 0.1 N 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 – Dissoslve 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. Effloresces 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 – 1 g. 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 $Na_2B_4O_7$. $10H_2O$.

Storage – Preserve Borax in well – closed container.

Boric Acid – H_3BO_3 = 61.83.

Description – Colourless plates or white crystals or white crystalline powder, greasy to touch; odourless; taste, slightly acid and bitter with a sweetish after taste.

Solubility – Soluble in water and in alcohol; freely soluble in boiling water, in boiling alcohol and in glycerin.

Sulphate – Boil 3 g. with 30 ml. of water and 1 ml. of hydrochloric acid, cool, and filter; 25 ml. of the filtrate complies with the limit test for sulphates, Appendix 2.3.7.

Arsenic – Not more than 10 parts per million, Appendix 2.3.1.

Heavy metals – Not more than 20 parts per million, determined by Method A on a solution obtained by dissolving 1.0 g. in 2 ml. of dilute acetic acid and sufficient water to produce 25 ml., Appendix 2.3.3.

Assay – Weigh accurately about 2 g., and dissolve in a mixture of 50 ml. of water and 100 ml. of glycerine, previously neutralised to phenolphthalein solution. Titrate with N sodium hydroxide, using phenolphthalein solution as indicator. Each ml. of N sodium hydroxide is equivalent to 0.06183 g. of H_3BO_3.

Storage – Store in well-closed containers.

Labelling – The label on the container states "Not for internal use".

Boric Acid Solution – Dissolve 5 g. of boric acid in a mixture of 20 ml.of water and 20 ml. of absolute ethanol and dilute with absolute ethanol to 250 ml.

Bromine – Br_2 = 159.80.

Description – Reddish – brown, fuming, corrosive liquid.

Solubility – Slightly soluble in water, soluble in most organic solvents.

Iodine – Boil 0.2 ml. with 20 ml. of water, 0.2 ml. of N sulphuric acid and a small piece of marble until the liquid is almost colourless. Cool, add one drop of liquified phenol, allow to stand for two minutes, and then add 0.2 g. of potassium iodide and 1 ml. of starch solution; no blue colour is produced.

Sulphate – Shake 3 ml. with 30 ml. of dilute ammonia solution and evaporate to dryness on a water bath, the residue complies with the limit test for sulphates, Appendix 2.3.7.

Bromine Solution - Dissolve 9.6 ml. of bromine and 30 g. of potassium bromide in sufficient water to produce 100 ml.

Bromocresol Purple – 4,4' – (3H-2, 1-Benzoxathiol-3-ylidene) bis-(2,6-dibromo-o-cresol) SS-dioxide; $C_{21}H_{14}Br_2O_4S$=540.2.

Gives a yellow colour in weakly acid solutions and a bluish-violet colour in alkaline, neutral and extremely weakly acid solutions (pH range, 5.2 to 6.8).

Bromocresol Purple Solution – Warm 0.1 g. of bromocresol purple with 5 ml. of ethanol (90 per cent) until dissolved, add 100 ml. of ethanol (20 per cent), 3.7 ml. of 0.05 M sodium hydroxide, and sufficient ethanol (20 per cent) to produce 250 ml.

Complies with the following test:

Sensitivity - A mixture of 0.2 ml. of the solution and 100 ml. of carbon dioxide-free water to which 0.05 ml. of 0.02 M sodium hydroxide has been added is bluish-violet. Not more than 0.20 ml. of 0.02 M hydrochloric acid is required to change the colour to yellow.

Bromophenol Blue -4, 4', - (3H-2, 1-Benzoxathiol-3-ylidene) bis-(2-6-dibromophenol) SS-dioxide $C_{19}H_{19}Br_4O_5S$ = 670.

Gives a yellow colour in moderately acid solutions, and a bluish-violet colour in weakly acid and alkaline solutions (pH range, 2.8 to 4.6).

Bromophenol Blue Solution - Warm 0.1 g. of bromophenol blue with 3.0 ml. of 0.05 N sodium hydroxide and 5 ml. of alcohol (90 per cent); after solution is effected, add sufficient alcohol (20 per cent) to produce 250 ml.

Complies with the following test:

Sensitivity – A mixture of 0.05 ml. of the solution and 20 ml. of carbon dioxide-free water to which 0.05 ml. of 0.1N 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, and 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 – Cdl_2=366.23

Description -Pearly white flakes or a crystalline powder.

Solubility – Freely soluble in water.

Iodate –Dissolve 0.2 g. in 10 ml. of water, and add 0.5 g. of citric acid and 1 ml. of starch solution, no blue colour is produced.

Cadmium Iodide solution – A 5.0 per cent w/v solution of cadmium iodide in water.

Calcium Carbonate – $CaCO_3 = 100.1$

Analytical reagent grade of commerce.

Calcium Chloride – $CaCl_2 H_2O = 147.0$

Analytical reagent grade of commerce.

Calcium Chloride Solution – A 10 per cent w/v solution of calcium chloride in water.

Calcium Hydroxide – $Ca (OH)_2 = 74.09$.

Analytical reagent grade of commerce.

Calcium Hydroxide Solution - Shake 10 g. of calcium hydroxide repeatedly with 1000 ml. of water and allow to stand until clear.

Calcium Sulphate – $CaSO_4$, $2H_2O$ = 172.17.

Description – White powder.

Solubility – Slightly soluble in water.

Chloride – Boil 5 g. with 50 ml. of water and filter while hot. The filtrate, after cooling complies with the limit test for chlorides. Appendix 2.3.2.

Acid-insoluble matter - Boil 2 g. with 100 ml. of N hydrochloric acid; and then with water, dry, ignite, and weigh, the residue weighs not more than 2 mg.

Alkalinity - Boil 1 g. with 50 ml. of water, cool, and titrate with 0.1 N hydrochloric acid, using bromo thymol blue solution as indicator; not more than 0.3 ml. of 0.1 N hydrochloric acid is required.

Carbonate – Boil 1 g. with 10 ml. of water and 1 ml. of hydrochloric acid, no carbon dioxide is evolved.

Residue on ignition - When ignited, leaves not less than 78.5 per cent and not more than 80.0 per cent of residue.

Camphor - $C_{10}H_{16}O$ = 152.23.

Camphor is a ketone, obtained from Cinnamomum camphora (L..) 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 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 tarred Gooch crucible, and wash the precipitate with successive quantities of 10 ml. of cold water until the washings are neutral to litmus paper. Dry to constant weight at 80˚and weigh. Each g. of precipitate is equivalent to 0.458 g. of $C_{10}H_{16}O$.

Storage – Preserve Camphor in a well-closed container in a cool place.

Canada Balsam Reagent – General reagent grade of commerce.

Carbon Di oxide - $CO_2 = 44.01$.

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 – $CC1_4$=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.

Decolourishing 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 figures 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 4g., 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 – Colourless, 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. and the remainder distils between 50 to 62.

Boiling range – A variable fraction, not exceeding 5 per cent v/v, distils below 60˚and the remainder distils between 50º to 62º.

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. Dissolve 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 -3 g. complies with the limit test for chlorides, Appendix 2.3.2.

Sulphate -3 g. 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 soluble 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 – A 10.0 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 bismuth 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 –diooxide; C12H18O5S=382.4.

Gives a red colour in very strongly acid solutions, a yellow colour in less strongly acid and neutral solutions, and a red colour in moderately alkaline solutions (pH ranges, 0.2 to 1.8 and 7.2 to 8.8).

Cresol Red Solution – Warm 50 ml. of cresol red with 2.65 ml. of 0.05 M sodium hydroxide and 5 ml. of ethanol (90 per cent); after solution is effected, add sufficient ethanol (20 per cent) to produce 250 ml.

Sensitivity –A mixture of 0.1 ml. of the solution and 100 ml. of carbon dioxide-free water to which 0.15 ml. of 0.02 M sodium hydroxide has been added is purplish-red. Not more than 0.15 ml. of 0.02 M hydrochloric acid is required to change the colour to yellow.

Dimethyl Yellow – 4-Dimethyl aminoazobenzene: $C_{14}H_{15}N_3$=225.3

Gives a red colour in moderately acid alcoholic solutions, and a yellow colour in weakly acid and alkaline solution (pH range, 2.8 to 4.0).

Dimethyl Yellow Solution – A 0.2 per cent w/v solution of dimethyl yellow in alcohol (90 per cent).

Sensitivity - A solution containing 2 g. of ammonium chloride in 25 ml. of carbon dioxide-free water, to which is added 0.1 ml. of the dimethyl yellow solution, is yellow. Not more than 0.10 ml. of 0.1 N hydrochloric acid is required to change the colour to red.

Dinitrophenylhydrazine -2, 4 –Dinitrophenylhydrazine; $(NO_2)_2C_6H_3$, NH, NH_3 = 198.14.

Description – Orange-red crystals or a crystalline powder.

Solubility – Practically insoluble in water, slightly soluble in alcohol.

Clarity and colour of solution -0.5 g. yields a clear yellow solution on heating with a mixture of 25 ml. of water and 25 ml. of hydrochloric 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 g. of dinitrophenylhydrazine in 20 ml. of sulphuric acid (50 per cent v/v). Dilute to 100 ml. with water and filter.

Dinitrophenlhydrazine 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 : $(C_6H_5NH.NH)_2CO$=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 volume 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 – Souble in water and in alcohol.

Chloride – Dissolve 50 mg. in 25 ml. of water, add 1 ml of nitric acid, and filter, the filtrate complies with the limit test for chlorides, Appendix 2.3.2.

Sulphated ash – Not more than 24.0 per cent, calculated with reference to the substance dried at 110˚ for two hours, Appendix 2.3.6.

Eosin Solution –A 0.5 per cent w/v solution of eosin in water.

Eriochrome Black T –Mordant Black 11; Sodium 2 (1-hydroxy-2-naphthylazo) 5-nitro-2-naphtol-4-sulphonate; $C_{20}H_{12}N_3NaO_7S$ = 461.38.

Brownish black powder having a faint, metallic sheen, soluble in alcohol, in methyl alcohol and in hot water.

Ether, Diethyl Ether – $(C_2H_5)_2$ O = 74.12.

Analytical reagent grade.

A volatile, highly flammable, colourless liquid, boiling point, about 34˚; weight per ml. about 0.71 g.

WARNING- It is dangerous to distil or evaporate ether to dryness unless precautions have been taken to remove peroxides.

Ethyl Acetate – CH_3. $CO_2C_2H_5$=88.11.

Analytical reagent grade.

A colourless liquid with a fruity odour; boiling point, about 77˚; weight per ml. about 0.90g.

Ethyl Alcohol – C_2H_5OH = 46.07.

Absolute Alcohol; Dehydrated Alcohol.

Description –Clear, colourless, mobile, volatile liquid; odour, characteristic and spirituous; taste, burning; hygroscopic. Readily volatilisable even at low temperature and boils at 78˚ and is flammable.

Solubility – Miscible with water, with solvent ether and with chloroform.

Contains not less than 99.5 per cent w/w or 99.7 per cent v/v of C_2H_5OH.

Identification – Acidity or Alkalinity: Clarity of Solution; Methanol; Foreign organic substances; Isopropyl alcohol and butyl alcohol; Aldehydes and ketones; fusel oil constituents; Non-volatile matter; complies with the requirements described under Alcohol.

Specific gravity – Between 0.7871 and 0.7902, at 25˚.

Storage – Store in tightly closed containers in a cool place away from fire and protected from moisture.

Labelling – The label on the container states "Flammable".

Ferric Ammonium Sulphate – Ferric Alum, Fe (NH_4) $(SO_4)_2$, $12H_2O$ = 482.18.

Contains not less than 99.0 per cent and not more than the equivalent of 101.0 per cent of Fe (NH_4) $(SO_4)_2$, 12 H_2O.

Description – Pale violet crystals, or a nearly colourless crystalline powder.

Solubility – Soluble in water, yielding a clear yellow or brown solution.

Ferrous iron – Dissolve 1 g. in 50 ml. of water, add 1 ml. of dilute hydrochloric acid and 1 ml. of potassium ferriccyanide 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 0.1 N - Fe NH_4 $(SO_4)_2$, $12H_2O$. = 482.18; 42,22 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 0.1 N sodium thiosulphate, 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 $Fe\ NH_4\ (SO_4)_2,\ 12H_2O$.

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 produced on a starch iodide paper exposed to the vapours.

Ferric Chloride Solution – Contains not less than 14.25 per cent and not more than 15.75 per cent w/v of $FeCl_3$.

Description –Clear, Yellowish-brown liquid.

Assay –Dilute 2 ml. with 20 ml. of water, add 1 ml. of sulphuric acid and 0.1 N potassium permanganate drop by drop until a pink colour persists for five seconds. Add 15 ml. of hydrochloric acid and 2 g. of potassium iodide, allow to stand for three minutes, and titrate with 0.1 N sodium thiosulphate, using starch solution as indicator added towards the end of titration. Each ml. of 0.1 N sodium thiosulphate is equivalent to 0.01622 g. of $FeCl_3$.

Ferrous Sulphate – $FeSO_4.\ 7H_2O$ = 278.0

Description –Transparent, green crystals, or a pale bluish-green, crystalline powder; odourless; taste, metallic and astringent, Efflorescent in dry air. On exposure to moist air, the crystals rapidly oxidise and become coated with brownish yellow basic ferrous sulphate.

Solubility –Freely soluble in water, very soluble in boiling water, practically insoluble in alcohol.

pH-Between 3.0 and 4.0, determined in a 5.0 per cent w/v solution.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Copper –Dissolve 2 g. in 50 ml of water, acidify with 1 ml. of dilute sulphuric acid, saturate with solution of hydrogen sulphide; no darkening or precipitate is produced.

Ferrous Sulphate Solution –A 2.0 per cent w/v solution of ferrous sulphate in freshly boiled and cooled water.

Ferrous sulphate solution must be freshly prepared.

Ferrous Sulphate Solution, Acid –A 0.45 per cent w/v solution of ferrous sulphate in freshly boiled and cooled water containing 0.5 ml. of hydrochloric acid.

Formaldehyde Solution –Formalin; HCHO = 30.03.

Formaldehyde Solution is a solution of formaldehyde in water with methyl alcohol added to prevent polymerisation. It contains not less than 34.0 per cent w/w and not more than 38.0 per cent w/w of CH_2O.

Description –Colourless liquid; odour, characteristic, pungent and irritating; taste, burning. A slight white cloudy deposit is formed on long standing, especially in the cold, due to the separation of paraformaldehyde. This white deposit disappears on warming the solution.

Solubility –Miscible with water, and with alcohol.

Acidity –To 10 ml. add 10 ml. of carbon dioxide free water and titrate with 0.1 N sodium hydroxide using bromothymol blue solution as indicator; not more than 5 ml. of 0.1 N sodium hydroxide is required.

Wt. per ml – At 20˚, 1.079 to 1.094 g.

Assay – Weigh accurately about 3 g. and add to a mixture of 50 ml. of hydrogen peroxide solution and 50 ml. of N sodium hydroxide, warm on a water-bath until effervescence ceases and titrate the excess of alkali with N sulphuric acid using phenolphthalein solution as indicator. Repeat the experiment with the same quantities of the same reagents in the same manner omitting the formaldehyde solution. The difference between the titrations represents the sodium hydroxide required to neutralise the formic acid produced by the oxidation of the formaldehyde. Each ml. of N sodium hydroxide is equivalent to 0.03003 g. of CH_2O.

Storage – Preserve formaldehyde Solution in well-closed container preferably at a temperature not below 15˚.

Formaldehyde Solution, Dilute –

Dilute 34 ml. of formaldehyde solution with sufficient water to produce 100 ml.

Glycerin –$C_3H_8O_3$ = 82.09.

Description – Clear, colourless liquid of syrupy consistency; odourless, taste sweet followed by a sensation of warmth. It is hygroscopic.

Solubility – Miscible with water and with alcohol; practically insoluble in chloroform, in solvent ether and in fixed oils.

Acidity –To 50 ml. of a 50 per cent w/v solution add 0.2 ml. of dilute phenolphthalein solution; not more than 0.2 ml. of 0.1 N sodium hydroxide is required to produce a pink colour.

Wt. per ml –Between 1.252 g. and 1.257 g., corresponding to between 98.0 per cent and 100.0 per cent w/w of $C_3H_8O_3$.

Refractive index –Between 1.470 and 1.475 determined at 20˚.

Arsenic –Not more than 2 parts per million, Appendix 2.3.1.

Copper –To 10 ml. add 30ml. 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 –HC1 – 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 titrate 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 bromide 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 – HC1 = 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 additional 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, HC1 = 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, Appendix 2.3.6.

Assay – Weigh accurately about 0.1 g. and dissolve in 20 ml. of water, add 5 g. of ferric ammonium sulphate dissolve in 20 ml. of water, and 15 ml. of dilute sulphuric acid, boil for five minutes, dilute with 200 ml. of water, and titrate with 0.1 N potassium permanganate. Each ml. of 0.1 N potassium permanganate is equivalent to 0.003475 g. of NH_2OH, HCL.

Hydroxylamine Hydrochloride Solution – Dissolve 1 g. of hydroxylamine hydrochloride in 50 ml. of water and add 50 ml. of alcohol. 1 ml. of bromophenol blue solution and 0.1 N sodium hydroxide until the solution becomes green.

***Indigo Carmine** – $C_{16}H_8N_2Na_2O_8S_2$ = 466.4

Analytical reagent grade.

A deep blue powder, or blue granules with a coppery lustre.

Indigo Carmine Solution –To a mixture of 10 ml. of hydrochloric acid and 990 ml. of a 20 per cent w/v solution of sulphuric acid in water add sufficient indigo carmine to produce a solution which complies with the following test.

Add 10 ml. to a solution of 1.0 mg. of potassium nitrate in 10 ml. of water, add, rapidly, 20 ml. of sulphuric acid and heat to boiling; the blue colour is just discharged in one minute.

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*INDIAN INK –General purpose grade.

Iodine - I_2 = 253.8

Description –Heavy, bluish-black, brittle, rhombic prisms or plates with a metallic lustre; odour characteristic; volatile at ordinary temperatures.

Solubility – Very slightly soluble in water; soluble in alcohol, freely soluble in carbon disulphide and in chloroform, in solvent ether, in carbon tetrachloride and in concentrated aqueous solutions of iodides.

Chloride and Bromide –Triturate 3.5 g. thoroughly with 35 ml. of water, filter and decolorise the filtrate by the addition of a little zinc powder. To 25 ml. of the filtrate so

obtained, add 5 ml. of dilute ammonia solution, and then 5 ml. of silver nitrate solution added gradually, filter, dilute the filtrate to 50 ml., and acidify gradually with 4 ml. of nitric acid; the opalescence in the limit test for chloride, Appendix 2.3.1.

Cyanides – To 5 ml. of the filtrate obtained in the test for chloride and bromide add a few drops of ferrous sulphate solution and 1 ml. of sodium hydroxide solution, warm gently and acidify with hydrochloric acid, no blue or green colour is produced.

Non-volatile matter – Leaves not more than 0.1 per cent as residue when volatilised on a water-bath.

Assay – Weigh accurately about 0.5 g. and dissolve in a solution of 1 g. of potassium iodide in 5 ml. of water. Dilute to 250 ml. with water, add 1 ml. of dilute acetic acid, and titrate with 0.1 N sodium thiosulphate, using starch solution as indicator. Each ml. of 0.1 N sodium thiosulphate is equivalent to 0.01269 g. of I.

Storage – Store in glass-stoppered bottles or in glass or earthen-ware containers with well waxed bungs.

Iodine, 0.1 N- 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 $C_4H_6O_4Pb, 3H_2O$.

Description –Small, white, transparent, monoclinic prisms, or heavy, crystalline masses; odour, acetous, taste, sweet and astringent. Efflorescent in warm air. Becomes basic when heated.

Solubility –Freely soluble in water, and in glycerin; sparingly soluble in alcohol.

Water-insoluble matter –Dissolve 1 g. in 10 ml. of recently boiled and cooled water; a solution is produced which is, at most, faintly opalescent and becomes clear on the addition of one drop of acetic acid.

Chloride -1 g. complies with the limit test for chlorides, Appendix 2.3.1.

Copper, iron, silver, and zinc –Dissolve 0.5 g. in 10 ml. of water, add 2 ml. of dilute sulphuric acid, allow to stand for thirty minutes, and filter; to the filtrate add an excess of potassium ferrocyanide solution; no precipitate or colour is produced.

Assay – Weigh accurately about 0.8 g. and dissolve in a mixture of 100 ml. of water and 2 ml. of acetic acid, add 5 g. of hexamine, titrate with 0.05M disodium ethylenediaminetetraacetate, using 0.2 ml. of xylenol orange solution as indicator, until the solution becomes pale bright yellow.Each ml. of 0.05M disodium ethylenediaminetetraacetate is equivalent 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 coarsely 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 0.02M 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 2N 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 0.002N 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 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 luster.

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 modification 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 2M hydrochloric acid, boil to remove carbon dioxide, and dilute with water to 95 ml. Add 5 ml. of 5M 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 2M hydrochloric acid and 2 ml. of 5M 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 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 ammoniaammonium chloride solution, and titrate with 0.05M 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 0.05M 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 5M 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 0.1N iodine. Shake continuously for about ten minutes, or until the prescipitated mercury is completely redissolved, and titrate the excess of iodine with 0.1N sodium thiosulphate. Each ml. of 0.1N iodine is equivalent to 0.01357 g. of $HgCl_2$.

Mercuric Chloride, 0.2M –

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 0.1N ammonium thiocyanate, using ferric ammonium sulphate solution as indicator. Carry out the titration at temperature not above 20˚. Each ml. of 0.1N 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.

Acetone – 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 0.1N 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 cent 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 0.1N sodium hydroxide and 20 ml. of water.

Methyl Orange –Sodium-p-dimenthylamineazobenzene 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 0.1N hydrochloric acid is required to change the colour to red.

Colour change – pH 3.0 (red) to pH 4.4 (yellow).

Methyl Red –p-Dimethyl aminoazobenzene-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 0.1N 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 0.02N hydrochloric acid has been added is red.

Not more than 0.01 ml. of 0.02N 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:

(ɑ) 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 6M acetic acid and dilute to 150 ml. with water.

Solution B-Dissolve 0.15 g. of 1 naphthylamine in 30 ml. of 6M acetic acid and dilute to 150 ml. with water.

Ninhydrin Reagent – 30 mg. ninhydrin is dissolved in 10 ml. n-butanol, followed by 0.3 ml. of 98% acetic acid.

Nitric Acid – Contains 70.0 per cent w/w of HNO_3 (limits, 69.0 to 71.0). About 16N 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. 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 63 x 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 – O-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 phenolphthalein 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 5 ml. 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 0.1N 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 0.1N 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 0.1N 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 0.1N 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 0.02N 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 0.02N 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.

Hypophosphorous and phosphorous acid – To 0.5 ml. add 10 ml. of water and 2 ml. of silver nitrate solution and heat on a water bath 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.l.

Heavy metals – Not more than 10 parts per million, determined by Method A on a solution prepared by diluting 1.2 ml. with 10 ml. of water, neutralising with dilute ammonia solution, adding sufficient dilute acetic acid to render the solution acidic and finally diluting to 25 ml. with water, Appendix 2.3.3.

Iron – 0.1 ml. complies with the limit test for iron, Appendix 2.3.4.

Aluminium and calcium – To 1 ml. add 10 ml. of water and 8 ml. of dilute ammonia solution the solution remains clear.

Assay – Weigh accurately about 1 g. and mix with a solution of 10 g. of sodium chloride in 30 ml. of water. Titrate with N sodium hydroxide, using phenolphthalein solution as indicator. Each ml. of N sodium hydroxide is equivalent to 0.049 g of H_3PO_4.

Storage – Store in a well-closed glass containers.

Phosphoric Acid, xN –

Solutions of any normality, xN may be prepared by diluting 49 x g. of phosphoric acid with water to 1000 ml.

Phosphoric Acid, Dilute –

Contains approximately 10 per cent w/v of H_3PO_4.

Dilute 69 ml. of phosphoric acid to 1000 ml. with water.

Piperazine Hydrate –$C_4H_{10}N_2$, $6H_2O$ = 194.2.

General reagent grade of commerce.

Colourless, glossy, deliquescent crystals, melting point about 44˚.

Potassium Antimonate –KbO_3, $3H_2O$ = 262.90.

Contains not less than 40.0 per cent of Sb.

Description –White, crystalline powder.

Solubility –Sparingly soluble in water, very slowly soluble in cold but rapidly soluble on boiling.

Assay – Weigh accurately about 0.3 g. and dissolve in 100 ml. of water, add 2 ml. of dilute hydrochloric acid and pass in hydrogen sulphide until the antimony is completely precipitated. Add 2 ml. of hydrochloric acid and again pass in hydrogen sulphide. Boil, filter, wash the precipitate with hot water saturated with hydrogen sulphide and dissolve the precipitate in 25 ml. of hydrochloric acid. Boil to remove hydrogen sulphide and dilute to 50 ml. with water. Add 2 g. of sodium potassium tartrate, neutralise carefully with sodium carbonate, add 2 g. sodium bicarbonate and titrate with 0.1N iodine, using starch solution as indicator. Each ml. of 0.1N 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 sufficient water to produce 150 ml.

Sensitivity to sodium – To 10 ml. add 7 ml. of 0.1M 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 0.1N 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 0.1N sodium thiosulphate, using starch solution as indicator. Each ml. of 0.1N sodium thiosulphate is equivalent 0.002783 g. of $KBrO_3$.

Potassium Bromide –KBr = 119.0

Analytical reagent grade.

Potassium Bromide, 0.001M –

Dissolve 0.1190 g. of potassium bromide in sufficient water to produce 1000 ml.

Potassium Carbonate – K_2CO_3 = 138.21

Contains not less than 98.0 per cent of K_2CO_3.

Description – White, granular powder, hygroscopic.

Solubility – Very soluble in water, forming a clear solution.

Iron – 1 g., with the addition of 1.5 ml. of hydrochloric acid, complies with the limit test for iron, Appendix 2.3.4.

Chloride – 1 g., 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 K_2CO_3.

Potassium Carbonate, Anhydrous. –Potassium carbonate dried at 135˚ for two hours spread in a thin layer and then cooled in a dessicator.

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 0.1M silver nitrate, filter,

wash with water, and titrate the filtrate and washings with 0.1M ammonium thiocyanate, using ferric ammonium sulphate solution as indicator. Each ml. of 0.1M silver nitrate is equivalent to 0.01226 g. of $KClO_3$.

Potassium Chloride –KCl = 74.55

Analytical reagent grade

Potassium Chromote – 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 Cupric-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 volume 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 0.1N silver nitrate until a faint permanent turbidity appears. Each ml. of 0.1N 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 0.1N 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 0.1M – $K_2Cr_2O_7$ = 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 0.1N sodium thiosulphate, using starch solution, added towards the end of the titration, as indicator. Each ml of 0.1N 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 1 g. and dissolve in 200 ml. of water, add 10 ml. of sulphuric acid and titrate with 0.1M potassium permanganate. Each ml. of 0.1N 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 M sodium hydroxide using phenolphthalein solution as indicator. Each ml. of M Sodium hydroxide is equivalent to 0.2042 g. of $C_8H_5O_4K$.

Potassium Hydrogen Phthalate, 0.02M –

Dissolve 4.084 g. of potassium hydrogen phthalate in sufficient water to produce 1000 ml.

Potassium Hydrogen Phthalate, 0.2M –

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 addition 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, x N –

Solution of any normality, x N, may be prepared by dissolving 56.11 x 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 sufficient water to produce 1000 ml.

Potassium Iodide – KI = 166.00

Description – Colourless crystals or white powder, odourless, taste, saline and slightly bitter.

Solubility – Very soluble in water and in glycerin; soluble in alcohol.

Arsenic – Not more than 2 parts per million, Appendix 2.3.1.

Heavy metals – Not more than 10 parts per million, determined on 2.0 g. by Method A, Appendix 2.3.3.

Barium –Dissolve 0.5 g. in 10 ml of water and add 1 ml. of dilute sulphuric acid; no turbidity develops within one minute.

Cyanides –Dissolve 0.5 g. in 5 ml. of warm water, add one drop of ferrous sulphate solution and 0.5 ml. of sodium hydroxide solution and acidify with hydrochloric acid; no blue colour is produced.

Iodates –Dissolve 0.5 g. in 10 ml. of freshly boiled and cooled water, and add 2 drops of dilute sulphuric acid and a drop of starch solution; no blue colour is produced within two minutes.

Assay – Weigh accurately about 0.5 g., dissolve in about 10 ml. of water and add 35 ml. of hydrochloric acid and 5 ml. of chloroform. Titrate with 0.05 M potassium iodate until the purple colour of iodine disappears from the chloroform. Add the last portion of the iodate solution drop-wise and agitate vigorously and continuously. Allow to stand for five minutes. If any colour develops in the chloroform layer continue the titration. Each ml. of 0.05 M potassium iodate is equivalent to 0.0166 mg. of KI.

Storage – Store in well-closed containers.

Potassium Iodide, M –Dissolve 166.00 g. of potassium iodide in sufficient water to produce 1000 ml.

Potassium Iodide and Starch Solution –Dissolve 10 g. of potassium iodide in sufficient 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 Mercuric-Iodide Solution, Alkaline (Nessler's Reagent)

To 3.5 g. of potassium iodide and 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 prepared from potable water by distillation, ion-exchange treatment, reverse osmosis or any other suitable process. It contains no added substances.

pH – 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 naphthlamine-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.

Refractive index – At 40˚, 1:4650 to 1.4665.

Wt. Per ml – At 25˚, 0.916 to 0.921 g.

Storage – Preserve sesame oil in well-closed container protected from light, and avoid exposure to excessive heat.

Silver Carbonate – $Ag_2 CO_3 = 214$.

Prepared from silver nitrate and soluble carbonate solution. Light yellow powder when freshly precipitated, but becomes darker on drying and on exposure to light.

Silica Gel –

Partially dehydrated, polymerised, colloidal silicic acid containing cobalt chloride as an indicator.

Description –Blue granules, becoming pink when the moisture absorption capacity is exhausted. Silica gel absorbs about 30 per cent of its weight of water at 20˚. Its absorptive capacity may be regenerated by heating at 150˚ for two hours.

Silver Nitrate – $AgNO_3$ = 169.87

Description – Colourless crystals or white crystalline powder, odourless; taste, bitter and metallic.

Solubility – Very soluble in water, sparingly soluble in alcohol; slightly soluble in solvent ether.

Clarity and colour of solution – A solution of 2 g. in 20 ml. of water is clear and colourless.

Bismuth, Copper and Lead – To a solution of 1 g. in 5 ml. of water, add a slight excess of dilute ammonia solution; the mixture 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 – Weight 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 sulplhuric 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 cent w/v solution of sodium bicarbonate in water.

Sodium Bisulphite –Consists of sodium bisulphite ($NaHSO_3$) and sodium metabisulphite ($Na_2S_2O_3$) in varying proportions. It yields not less than 58.5 per cent and not more than 67.4 per cent of SO_2.

Description – White or yellowish-white crystals or granular powder; odour of sulphur dioxide. It is unstable in air.

Solubility – Freely soluble in water, slightly soluble in alcohol.

Assay – Weigh accurately about 0.2 g. and transfer to a glass-stoppered flask, add 50 ml. of 0.1 N iodine and insert the stopper of the flask. Allow to stand for five minutes, add 1 ml. of hydrochloric acid and titrate the excess of iodine with 0.1 N sodium thiosulphate, using starch solution as indicator added towards the end of the titration. Each ml of 0.1 N iodine is equivalent to 0.003203 g. of SO_2.

Storage – Preserve sodium bisulphite in tightly-closed containers in a cool place.

Sodium Bisulphite Solution – Dissolve 10 g. of sodium bisulphite in sufficient water to make 30 ml.

Sodium bisulphite solution must be freshly prepared.

Sodium Carbonate – Na_2CO_3. $10\ H_2O = 286.2$

Analytical reagent grade.

Sodium Chloride – Nacl = 58.44

Analytical reagent grade.

Sodium Cobaltnitrite – $Na_3CO(NO_2)_6 = 403.94$

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 Cobaltnitrite 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 precipitate 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 $Na_2 CO_3$.

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- Dissolves 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 produced; 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.

Aresenic –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 faintly 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 –H_2SO_4 = 98.08.

When no molarity is indicated use analytical reagent grade of commerce containing about 98 per cent w/w of sulphuric acid. An oily, corrosive liquid weighing about 1.84 g. per ml. and about 18 M in strength.

When solutions of molarity xM are required, they should be prepared by 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 unpleasant.

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, l Benzoxathil -3 –ylidene) dithymol SS = dioxide; $C_{27}H_{30}O_5$ = 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 $TiCl_3$.

Weight per ml, about 1.2 g.

Dull purplish liquid with a strongly acid reaction.

Titanous Chloride 0.1 N – $TiCl_3$=154.26; 15.43 g. in 1000 ml.

Add 103 ml. of titanous chloride solution to 100 ml. of hydrochloric acid, dilute to 1000 ml. with recently boiled and cooled water, and mix, standardise, immediately before use, as follows:

Place an accurately measured volume of about 30 ml. of standardised 0.1 N ferric ammonium sulphate in a flask and pass in a rapid stream of carbon dioxide until all the air has been removed. Add the titanous chloride solution from a burette and in an atmosphere of carbon dioxide until near the calculated end point then add 5 ml. of ammonium thiocyanate solution, and continue the titration until the solution is colourless. Each ml. of 0.1 N ferric ammonium sulphate is equivalent to 0.01543 g. of $TiCl_3$.

Vanillin-Sulphuric Acid Reagent – 5% Ethanolic sulphuric acid (Solution I)

1% Ethanolic vanillin (Solution II)

The plate is sprayed vigorously with 10 ml. Solution I, followed immediately by 5-10 ml. of Solution II.

Water –See purified water.

Water, Ammonia-free –Water which has been boiled vigorously for a few minutes and protected from the atomosphere during cooling and storage.

Xylenol Orange –[3H-2, 1-Benzoxathiol- 3-Ylidene bis –(6-hydroxy-5-methyl-m-phenylene) methylenenitrilo] tetra acetic acid SS-dioxide or its tetra sodium salt.

Gives a reddish-purple colour with mercury, lead, zinc and contain other metal ions in acid solution. When metal ions are absent, for example, in the presence of an excess of disodium ethylenediamine tetraacetate, this solution is yellow.

Xylenol Orange Solution –Shake 0.1 g. of xylenol orange with 100 ml. of water and filter, if necessary.

Zinc, Granulated –Zn=65.38.

Analytical reagent grade of commerce.

Zinc Powder –Zn = 65.38.

Analytical reagent grade of commerce.

Zinc Sulphate –$ZnSO_4$, $7H_2O$ = 287.6.

Analytical reagent grade of commerce.

THE SIDDHA PHARMACOPOEIA OF INDIA

PART – I
VOLUME – I
First Edition

APPENDICES 5-6

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

NEW DELHI

APPENDIX -5

5.1 - Definition and Methods of preparing Cūraṇam (சூரணம்), Kuḍinīr (குடிநீர்) and Kaṟkam (கற்கம்).

(i) Cūraṇam (சூரணம்) or Powder

Cūraṇam (சூரணம்) are fine dry powders of a single drug or a mixture of two or more drugs, which are powdered separately prior to their being, mixed to homogeneity. The Cūraṇam (சூரணம்) should be fine and should be never damp. The fineness of the sieve should be 100 mesh or still finer. C ūraṇam (சூரணம்) retain their potency for 3 months.

(ii) Kaṟkam (கற்கம்) or Medicinal paste

The fresh green drugs or dried drugs are ground with water or butter milk and made into paste. Kaṟkam (கற்கம்) retain their potency for 3 hours.

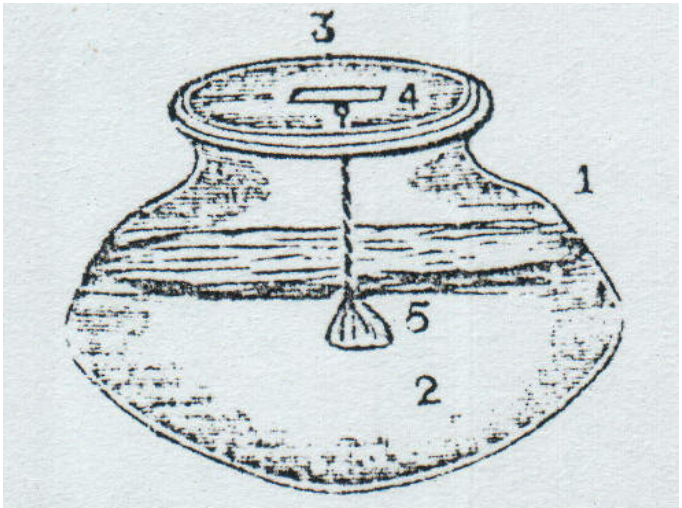
(iii) Kuḍinīr (குடிநீர்) or Decoction

Kuḍinīr (குடிநீர்) is the decoction prepared by boiling the fresh green drugs or dried drugs in proportion of 4,8 or 16 times of water reduced to ṟ and filtered. Kuḍinīr (குடிநீர்) retain their potency for 3 hours.

5.2 Cutti (சுத்தி-Purification) of Crude drugs

The various Siddha technical terms used under Cutti (சுத்தி-Purification) are as follows:

Tulāyantiram (துலாயந்திரம்)



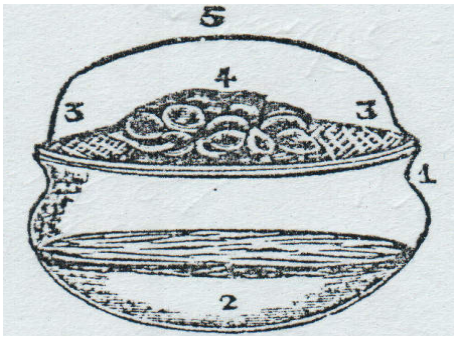
1. Earthern pot
2. Liquid in the earthern pot
3. Earthern lid
4. The hole at the centre of the earthern lid through which a rope is inserted with the upper end tied with the wooden stick.
5. The drugs bundled in a cotton cloth, tied at the lower end of the rope and suspended in the liquid.

This device consists of a mud pot with large mouth across which a wooden stick is placed. The raw drugs to be purified are tied in a clean cotton cloth and allowed to hang into the pot so as to be immersed in the liquid (Kuḍinīr - குடிநீர்) usually of tender coconut water, cow dung water etc.

Eg: Cēṟāṅkoḍḍai (சேராங்கொட்டை)
Nēṟvāḷam (நேர்வாளம்)
Pūram (பூரம்)

Soluble raw drugs are kept suspended above the liquid surface so as to receive the steam only from the Kuḍinīr (குடிநீர்)
Eg. Vīram (வீரம்)

Aviyantiram (அவியந்திரம்)



1. Bottom vessel
2. Liquid in the bottom vessel
3. The mouth of the bottom vessel tied with cotton cloth
4. The Drugs piled upon the cotton cloth
5. Upper vessel

Take water in an earthern vessel and cover it with a cloth and keep the drug which has to be boiled in it. Place another earthern vessel or lid over it and cover the edges with wet cloth in order to prevent the steam escaping. The plate or the covering vessel had multiple holes to facilitate steaming. The drug is spread over a clean wet cotton cloth which is spread over this perforated vessel. The top of this perforated plate is covered with a suitable lid - just like baking Iḍli (இட்லி) or Puṭṭu (புட்டு). Boil the water over mild fire until $^{3}/_{4}$ of the liquid is reduced.

Eg: Amukkarā (அமுக்கரா), Paṟaṅkiccakkai (பறங்கிச்சக்கை).

Pāvaṉam (பாவனம்)

The drug is soaked in water or lime water or buffaloʾs, cowʾs, or goatʾs milk , buffaloʾs, cowʾs, or goatʾs butter milk, cow dung water, goatʾs or cowʾs urine, rice water etc.

Eg: Karuñcīrakam (கருஞ்சீரகம்)
Kārpōkarici (கார்போகரிசி)
Tippili (திப்பிலி)
Ventayam (வெந்தயம்)

Vaṟuttal (வறுத்தல்)

Roast the drug in a pan over mild fire till it becomes crisp or till the odour is produced.

Eg: Miḷaku(மிளகு)
Cīrakam(சீரகம்)
Cātikkāy(சாதிக்காய்)
Kottumalli(கொத்துமல்லி)
Peruṅkāyam(பெருங்காயம்)

5.3 Cutti Muṟaikaḷ (சுத்தி முறைகள் -Purification Methods of Drugs)

ĀṟṟuttumaṭṭI (ஆற்றுத்துமட்டி):

Cover the ĀṟṟuttumaṭṭI fruits with straws. Set fire. While the fruits are about to burst remove them from the fire, take out the fleshy portion and squeeze them for juice.

Cērāṅkoṭṭai (சேராங்கொட்டை):

Boil it separately in cowdung water ; decoction made of tamarind leaves and aloes juice.

Kañcā (கஞ்சா):

Soak in water for a day. Drain the water. Clean it with fresh water. Repeat the process for 7 to 10 times and dry it in sun light. After drying, fry it in Cow's ghee.

Kuṉṟimaṇi (குன்றிமணி):

Remove the seed coat and plumule.

Nērvāḷam (நேர்வாளம்):

Boil it separately in cow's urine; cowdung water and lime juice. Dry it and fry it in cow's ghee after removing the plumule.

Peruṅkāyam (பெருங்காயம்):

Fry it in cow's ghee.

APPENDIX- 6

WEIGHTS AND MEASURES

6.1 METRIC SYSTEM

Measure of Mass (Weights)

1 Kilogram (Kg.) - is the mass of the International Prototype Kilogram.

1 Gram (g.) - the 1000^{th} part of 1 Kilogram.

1 Milligram (mg.) - the 1000^{th} part of 1 gram.

1 Microgram (ñg) - 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 to Weight (Metric)

One litre of water at 20° weighs 997.18 grams when weighed in air of density 0.0012 gram per millilitre against brass weights of density 84 grams per millilitre.

Measures of Length

1 Metre (m.) is the length of the International Prototype Metre at Oō longitude at Paris.

1 Centimetre (cm.) - the 100^{th} part of 1 metre.

1 Millimetre (mm.) - the 1000^{th} part of 1 metre.

1 Micron (ñ) - the 1000^{th} part of 1 millimetre

1 Milliimicron (mñ) - the 1000^{th} part of micron.

6.2 METRIC EQUIVALENTS OF CLASSICAL WEIGHTS AND MEASURES AND TAMIL NUMERICALS

Table of Weights and Measures described in Siddha Classics and their approximate metric equivalents adopted by the Siddha Pharmacopoeia Committee.

1.Weights and Measures:

Uḷuntu (உளுந்து) = 1 grain (approx) = 65 mg.

4 Yavam (யவம்)	= 1 Kuṉṟi (குன்றி)	= 2 grains (approx)	= 130 mg.
1 Mañcāḍi (மஞ்சாடி)	= 4 grains (approx		= 260 mg.
6 Kuṉṟi (குன்றி)	= 1 Māṣam (மாஷம்)		= 780 mg.
3.75 Kuṉṟi (குன்றி)	= 1 Paṇa Eḍai (பண எடை)		= 488 mg.
32 Kuṉṟi (குன்றி)	= 1 Varākaṉ Eḍai (வராகன் எடை 1 dram)		= 4.16 g.
40 Kuṉṟi (குன்றி)	= 1 Kaẓañcu (கழஞ்சு)		= 5.12 g.
10 Varākaṉ Eḍai (வராகன் எடை)	= 1 Palam(Pakkā) / (பலம்(பக்கா))		= 41.6 g.
0.25 Palam (பலம்)	= 1 Kaḥcu or a Kaicā (கஃசு or கைசா)		= 10.4 g.
1 Tōlā (தோலா)	= 180 Grains		= 11.7 g.
3 Tōlā (தோலா)	= 1 Palam (பலம்)		= 35 g.
8 Palam (பலம்)	= 1 Cēr (சேர்)		= 280 g.
40 Palam (பலம்)	= 1 Vīcai (வீசை) / (3 lb 2 oz.)		= 1.4 Kg.
50 Palam (பலம்)	= 1 Tūkku (தூக்கு)		= 1.750 Kg.
2 Tūkku (தூக்கு)	= 1 Tulām (துலாம்)		= 3.500 Kg.

II. (a) Volume :

360 Nel (நெல்-Paddy)	= 1 Cōḍu (சோடு)		= 33.6 ml.
5 Cōḍu (சோடு)	= 1 Āẕākku (ஆழாக்கு)		= 168 ml.
2 Āẕākku (ஆழாக்கு)	= 1 Uẕakku (உழக்கு)		= 336 ml.
2 Uẕakku (உழக்கு)	= 1 Uri (உரி)		= 672 ml.
2 Uri (உரி)	= 1 Nāẕi/ Paḍi (நாழி/ படி)		= 1.34 l.
4 Nāẕi (நாழி)	= 1 Kuruṇi/Marakkāl (குருணி/மரக்கால்)		= 5.37 l.
2 Kuruṇi (குருணி)	= 1 Patakku (பதக்கு)		= 10.7 l.
3 Kuruṇi (குருணி)	= 1 Mukkuruṇi (முக்குருணி)		= 16.1 l.
2 Patakku (பதக்கு)	= 1 Tūṇi (தூணி)		= 21.5 l.
3 Tūṇi (தூணி)	=1 Kalam (கலம்)		= 64.5 l.

II (b) Volume (domestic):

1 Tēkkaraṇḍi (தேக்கரண்டி)	= 1 dram (approxmately)	=4 ml.
1 Kuppikaraṇḍi (குப்பிகரண்டி)	= 24 onuces (approxmately)	= 700 ml.
1 T̄irttakkaraṇḍi (தீர்த்தக்கரண்டி)	= 1.33 ml.	
1 Ney Karaṇḍi (நெய் கரண்டி)	= 4.0 ml.	
1 Uccikkaraṇḍi (உச்சிக்கரண்டி)	= 1.6 ml.	
1 Pālāḍai (பாலாடை)	= 30 ml.	
1 Enṇeykkaraṇḍi (எண்ணெய்க்கரண்டி)	= 240 ml.	

III. Measurement of Time :

1 Noḍi (நொடி)	=	1 Second
60 Noḍi (நொடி)	=	1 Minute
1 Nāz̲ikai (நாழிகை)	=	24 Minutes
2.5 Nāz̲ikai (நாழிகை)	=	60 Minutes
1 Mukūrttam (முகூர்த்தம்)	=	90 Minutes (1½ Hours)

Ci̲rupoz̲utu (சிறுபொழுது) :

Vaika̲rai (வைகறை)

Kālai (காலை)

Pakal (பகல்)

E̲rpāḍu (எற்பாடு)

Mālai (மாலை)

Yāmam (Cāmam)/(யாமம்(சாமம்))

1 Yāmam	=	3Hours (also called as Cāmam)		
8 Yāmam	=	24 Hours	=	1 Day

1 Pakṣam (பக்ஷம்)	=	15 Days
1 Mātam (மாதம்)	=	30 Days
1 Maṇḍalam (மண்டலம்)	=	45 Days
1 Kālam (காலம்)	=	2 Months (Perumpoẕutu - பெரும்பொழுது)
1 Ayaṉam (அயனம்)	=	6 Months
2 Ayaṉam (அயனம்)	=	1 Year

IV. Linear Measures :

1 Viṟaṟkaḍai (விறற்கடை)	=	¾ ″	=	1.95 cm
1 Cāṇ (சாண்)	=	9 ″	=	22.86 cm
1 Muẕam (முழம்)	=	18 ″	=	45.72 cm
1 Pākam (பாகம்)	=	72 ″	=	182.88 cm

Note: The Maṇḍalam (மண்டலம்) variously as described in 40 days, 45 days and 48 days. In practice we can take 45 days.

* Traditional weighing beakers made by iron or bronze or tin or wood.

THE SIDDHA PHARMACOPOEIA OF INDIA

PART – I
VOLUME – I
First Edition

APPENDICES 7-10

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

APPENDIX - 7

Classical Siddha References

அமுக்கரா

கொஞ்சந் துவர்ப்பாங் கொடியகயம் சூலையரி
மிஞ்சுகரப் பான்பாண்டு வெப்பதப்பு–விஞ்சி
முசுவுறு தோடமும்போ மோகம்அன லுண்டாம்
அசுவகந் திக்கென் றறி. ... அ.கு. குண. பக். 22

அதிமதுரம்

கத்தியரி முப்பிணியால் வருபுண் தாகங்
கண்ணோய்உன் மாதம்விக்கல் விலவெண் குட்டம்
பித்தமெலும் புருக்கி கிரிச்சரம் ஆவர்த்த
பித்தமத மூர்ச்சை விட பாகம் வெப்பந்

தத்திவரு வாதசோ ணிதங்கா மாலை
சருவலிடங் காமியநோய் தாது நட்டங்
குத்திருமல் ஆசியங்கம் இதழ்நோய் இந்து
குயப்புணும்போம் மதுராகமெனக் கூறுங் காலே. ... தே.கு. குண. பக். 10

அதிவிடயம்

அதிவி டயம்சர்க்க ராற்புதநோய் வெப்பு
கொதிமருவு பேதியொடு கோழை–எதிர்வாந்தி
என்றுரைக்கும் நோய்க்கூட்டம் இல்லா தகற்றிவிடும்
குன்றை நிகர்முலையாய்! கூறு. ... அ.கு. குண. பக். 12

அத்திப்பட்டை

வீறு கடுப்பிரத்தம் வெண்சீத ரத்தமொடு
நாறுவிர ணங்களெலாம் நாடாவாம்–கூறுங்கால்
அத்திதரு மேகம்போம் ஆயிழையே! எஞ்ஞான்றும்
அத்திப்பாற் பட்டைக் கறி. ... அ.கு. குண. பக். 15

அவுரி வேர்

எல்லா விடங்களுக்கும் ஏற்ற முறிப்பாகும்
பொல்லாச் சுர மூர்ச்சை பொங்கு வெட்டை–நில்லாப்
பவுரிதருங் குன்ம முதல் ப்னனோ யொழியும்
அவுரிதரும் வேருக் கறி. ... அ.கு. குண. பக். 36

ஆற்றுத்துமட்டிக்காய்

கிடையெங்கே சோம்பலெங்கே கேடுறச்செய் வாதக்
கடையெங்கே யாற்றுக் கலிங்க–மடைதிறக்கின்
அண்டை யடைச்சலெங்கே யாயிழையார் சூதகத்தின்
உண்டை யுடைச்சலெங்கே யோது. ... தே.கு. குண. பக். 68

ஆடா தொடை இலை

ஆடாதோ டைப்பன்ன மையறுக்கும் வாதமுதற்
கோடாகோ டிச்சசுரத்தின் கோதொழிக்கும்–நாடின்
மிகுத்தெழுந்த சந்நிபதின் மூன்றும் விலக்கும்
அகத்துநோய் போக்கு மறி. ... அ.கு. குண. பக். 47

ஆடா தொடை வேர்
காசமொடு மந்தங் கதித்தபித் தங்கொடுஞ்சு
வாசங் கழுத்து வலிமுதனோய்–கூசியே
ஓடாதி ராதிங் கொருநாளு மொண்டொடியே
ஆடாதோடைத்தூருக் கஞ்சி. ... அ.கு. குண. பக். 48

சரக்கொன்றை புளி
வன்னனில மேகமலக் கட்டு குடலவலி
துன்மலி னம்வெப்புத் தோன்றுங்கால்–இன்பம்
தருதமா லப்பரிம ளத்தனத்தாய்! இந்தக்
கிருதமா லப்புளியைக் கேள். ... அ.கு.கு.பா.மூலிகை பக். 322

சடாமாஞ்சில்
குட்டஞ் சிலந்திவிடம் கோர புராண சுரம்
உட்னங்கால் பேதிகண்ணொய் ஓட்டிருமல்–சொட்டிரத்த
பித்தமிரைப் போகும் பெருங்கோரை என்றுரைக்குஞ்
சுத்தசடா மாஞ்சிலை சொல். ... அ.கு. குண. பக். 336

சாதிக்காய்
தாதுநட்டம் பேதி சருவாசி யஞ்சிரநோ
போதுசுவா சங்காச முயட்யமெர்கிரணி–வேதோ
டிலக்காய் வரும்பிணிபோ மேற்றமயல் பித்தங்
குலக்கா யருந்துவர்க்குக் கூறு. ... ப.கு.வி. பக். 326

சீந்தில்
மேகமெனு மாதபத்தால் வெந்த வுயிர்ப்பயிரைத்
தாக மடங்கத் தணித்தலால்–ஆகம்
அமர ரெனவிருக்க வாதரித்த லாலே
அமுதவல்லி சஞ்சீவி யாம். ... தே.வெ. பக். 112

சீந்திற் கிழங்கருந்த தீபனமா மேகவகை
போந்த வுதிரபித்தம் பொங்குசுர–மாந்த
மதிசாரம் வெய்யகண மாம்பல நோயோடே
கதிவிஷமுங் கெட்டுவிடுங் காண். ... ப.கு.வி. பக். 143

சீரகம்
வாந்தி யருசிகுன்மம் வாய்நோய்பி லீகமிரைப்
பேற்திருமல் கல்லடைப்பி லாஞ்சனமும்–சேர்ந்தகம்மல்
ஆசனகு டாரியெனும் அந்தக் கிரகணியும்
போசனகு டாரியுண்ணப் போம்.

வாயுவொடு நாசிநோய் வன்பித்தஞ் சேராது
காயம் நெகிழாது கண்குளிருந்–தூயமலாக்
காரளகப் பெண்மயிலே! கைகண்ட தித்தனையுஞ்
சீரகத்தை நீதினமுந் தின்.

போசன குடாரியைப் புசுக்கில்நோ யெலாமறுங்
காசமி ராதக் காரத்தி லுண்டிட ... தே.கு., அ.கு.,தே.வெ. குண. பக். 369, 370

பித்தமெனு மந்திரியைப் பின்னப் படுத்தியவன்
சத்துருவை யுந்துரந்து சாதித்து–மத்தனெனும்
ராசனையு மீவென்று நண்பைப் பலப்படுத்திப்
போசனகு டாரிசெயும் போர். ... தே.வெ. பக். 110

சிறுகுறிஞ்சான் வேர்
சிறுகுறிஞ்சா வேர்விஷத்தைத் தீர்க்கு மானிலத்

துறுசுரங் கள்வாத மொழிக்குந்–தெறிபாணக்
கண்ணா யிருமன்முதற் காசந் தணிக்கும்
விண்ணா டருக்குமிதை விள். ... ப.கு.சீ. பக். 157

சிறுபீளை

பாண்டுபெரும் பாடு பகர்மூத்தி ரக்கிரிச்சம்
பூண்டதிரி தோடமிவை போகுங்காண்–தாண்டிப்
பறியவே ளைத்துரத்தும் பார்வையின்கண் மாதே!
சிறியபீ ளைக்குச் சிதைந்து.

நீரடைப்பு கல்லடைப்பு நீங்காக் குடற்சூலை
போரடரி ரத்தகணம் போக்குங்காண்–வாரிறுக்கும்,
பூண்முலையே! கேளாய் பெருந்துஞ் சிறுபீளை
யாமிதுகற் பேதி யறி. ... அ.கு. குண. பக். 539

சோம்பு

யோனிநோய் குன்மம் உரூட்சைமந் தம்பொருமல்
பேமுறு காசம் பிலீகமரைப் பீனஉரை
சேர்க்கின்ற வாதமுபோஞ் சீர்பெரிய சீரகத்தால்
மூக்குநோ யில்லை மொழி. ... அ.கு. குண. பக். 376

சுக்கு

சூலைமந்தம் நெஞ்செரிப்பு தோடமேப் பம்மழலை
மூலம் இரைச்பிபருமல் மூக்குநீர்–வாலகப
தோடமி சாரந் தொடர்வாத குன்மநீர்த்
தோடம்ஆ மம்போக்குஞ் சுக்கு. ... அ.கு. குண. பக். 378

வாதப் பிணவயி றுாதற் செவிவாய்
வலிதலை வலிகுலை வலியிரு விழிநீர்
சீதத் தொடுவரு பேதிப் பலரோ
சிகமலி முகமுக முகமிடி கபமார்
சீதச் சுரம்விரி பேதச் சுரநோய்
தெறிபடுமெனமொழி குவர்புவி தனிலே
ஈதுக் குதவுமி தீதுக் குதவா
தெனும்விதி யிலைநவ சுறுகுண முனவே. ... தே.கு. குண. பக். 378

இலவங்கம்

பித்த மயக்கம் பேதியொடு வாந்தியும்போம்
சுத்தவிரத் தக்கடுப்புந் தோன்றுமோ–மெத்த
இலவங்கங் கொண்டவருக் கேற் சுகமாகும்
மலமங்கே கட்டுமென வாழ்த்து.

சுக்கிலநட் டங்கர்ண சூர்வியங்க லாஞ்சனந்தாட்
சிக்கல்விடாச் சர்வா சியப்பிணியு–மக்கிக்குட்
டங்கப் பூவோடு தரிபடருந் தோன்றிலில்
வங்கப்பூ வோடுரைத்து வா. ... அ.கு. குண. பக். 86

இலவங்கப்பட்டை

தாதுநட்டம் பேதி சருவவிஷம் ஆகியநோய்
பூதகிர கஞ்சிலந்திப் பூச்சிவிடஞ்–சாதிவிடம்
ஆட்டுமரைப் போடிருமல் ஆகியநோய்க் கூட்டமற
ஓட்டுமில வங்கத் துரி.
சன்னலவங் கப்பட்டை தான்குளிர்ச்சி யுண்டாக்கும்
இன்னுமிரத் தக்கடுப்பை யீர்க்குங்காண்–முன்னமுறும்
உந்திக் கடுப்பகற்றும் உண்மூலப் புண்போக்கும்

கந்தமிரு பூங்குழலே! காண். ... அ.கு. குண. பக். 88

இலவங்கப்பத்திரி

மேகசுரம் சீதசுரம் வெட்டைசுவா சங்காசம்
தாகபித்தம் வாந்திசர் வாசியநோய்–மேகத்தின்
கட்டியொடு தாதுநட்டங் கைப்பருசி போக்கிவிடும்
இட்டஇல வங்கத் திலை. ... அ.கு. குண. பக். 88

இஞ்சி

இஞ்சிக் கிழங்குக் கிருமல்ஐயம் ஒக்காளம்
வஞ்சிக்குஞ் சந்நிசுரம் வன்பேதி–விஞ்சுகின்ற
சூலையறும் வாதம்போந் தூண்டாத தீபனமாம்
வேலையுறுங் கண்ணாய் விளம்பு ... தே.வெ. குண. பக். 76

இருந்தே னலங்கார மெய்தயின்று மீறி
யிருந்தே னலங்கார மெய்தி–இருந்தேன்
நீவி ரகசியமா நென்மா வுடன்கலந்து
நீவி ரகசியமா நெய். ... அ.கு. குண. பக். 76

விட்டுப் பிரிவார் வெறிகொண்டா ரானாலும்
கெட்டுப் படாதகி லேசத்தால் – துட்டனெனும்
பொல்லாத சேட்டப் புலையனது புன்மையடும்
அல்லரச நல்லமுதை யார். ... தே.வெ. பக். 101

கசகசா

கிருமி நசைச்சல் கிராணி யதிசாரஞ்
சிரநீர் நித்திரைபோஞ் செப்பி–லுருவழகுங்
காந்தியு முண்டாகுங் கசகசாவின் குணத்தை
தேர்ந்தவர்க்கு விந்துவுமாந் தேர். ... ப.கு.சீ. பக். 299

காக்கண வேர்

மாதரால் வந்தவெட்டை வன் மேகஞ் சென்னி வலி
ஓது சுரம் விழிநோயோடுங்காண்–பேதியோடு
மாக்காட்டாஞ் சீதமறு மாமூலி யாம் வெள்ளைக்
காக்கட்டான் வேரைக் கருது.

மாந்தங் கிருமியடல் வாதங் கபவினமுஞ்
சேர்ந்தமலக் கட்டுஞ் சிதையுங்காண்–சூழ்ந்த
அருங்காக் குவடுகளி லண்டா மயிலே!
கருங்காக்கட் டான்வேரைக் கண்டு. ... அ.கு. குண. பக். 219

கஞ்சா

நிட்டை யுடையார் நிகழ்த்தியசொற் கேட்டுமிகு
சட்டை யகத்தியநெஞ் சத்திற்கு – வட்டமுறை
ஆர வமுதா யயிலவரு கற்பமெனக்
கோரகையி னாலடங்குங் கூன். ... தே.வெ. பக். 69

கண்டங்கத்திரி

காச சுவாசங் கதித்தக்ஷய மந்தமனல்
வீசுசுரஞ் சந்நி விளைதோடம்–ஆசுறுங்கால்
இத்தரையு ணிற்கா எரிகாரஞ் சேர்க்கண்டங்
கத்திரியுண் டாமாகிற் காண். ... அ.கு. குண. பக். 167

கார்போகரிசி

கார்போக மாமரிசி கண்டாற் கரப்பான்புண்
பீர்சருவ நஞ்சிவைபோம் பித்தமுண்டாம்–பார்மீதில்
வாத கபநமைச்சல் வன்சொறிசி ரங்குமறுஞ்
சீத மலர்க்குழலாய் செப்பு. ... ப.கு.வி. பக். 241

கருஞ்செம்பையிலை

விப்புருதிப் புண்ணாறும் வீறுகரப் பானும்போந்
தப்பாமல் மேகந் தணியுங்காண்–வெப்பார்
கபரோக மேகுஞ் கருஞ்செம்பை யொன்றுக்
கிபமா முலைமாதே! எண். ... அ.கு.கு.பா.மூலிகை பக். 388

கருஞ்சீரகம்

கருஞ்சீ ரகத்தான் கரப்பனொடு புண்ணும்
வருஞ்சிராய்ப் பீநசமு மாற்றும்–அருந்தினால்
காய்ச்சல் தலைவலியுங் கண்வலியும் போமுலகில்
வாய்ச்ச மருந்தெனவே வை. ... அ.கு. குண. பக். 372

கடுகுரோகணி

மாந்தஞ் சுரமையம் வாயுகரப் பானாமஞ்
சேர்ந்தமலக் கட்டடு திரிதோடம்–பேர்ந்தபொட்டுப்
புண்வயிறு நோயிவைபோம் பொற்கொடியே–பேதியுண்டாம்
திண்கடுகுரோகணிக்குத் தேர். ... அ.கு. குண. பக். 155

காட்டுச்சீரகம்

கைகறுப்பு மாறுங் கடியமேகம் போகு
மெய்க்குத் தண்ணாயபித்தம் வீறாவாங்–கைக்கரிமாக்
கோட்டுப் பணமுலையாய் குன்ம வாதந்தொலையு
காட்டுநற் சீரகத்தைக் காண். ... ப.கு.சீ. பக். 302

கடுக்காய்

கடுக்காயுந் தாயுங் கருதிலொன்றென் றாலும்
கடுக்காயத் தாய்க்கதிகங் காண்நீ–கடுக்காய்நோய்
ஒட்டி யுடற்றேற்றும் உற்றவன்னை யோசுவைகள்
ஊட்டியுடற் றேற்று முவந்து ... அ.கு. குண. பக். 162

வனதுர்க்கிச் சேய்க்கு மணித்தயிலம் பூசி
அனலிற் பொரித்தாங் கருந்தத்–தினமுமலச்
சிக்கலக்க டுப்பநின்ற சீதமறுங். காற்றுகைத்த
முகக்கலக்க டுப்பிருக்கு மோ! ... தே.வெ. குண. பக். 164

சொல்லு மரிதகிமேற் றோலை மதுவுடனே
யல்லும் பகலு மயிலவே–கல்லுங்
கரைய வரமெழுப்புங் காயசித்தி யுண்டாம்
நரையுந் திரையுமிலை நை. ... அ.கு. குண. பக். 165

மன்னவனை மந்திரியை மாறாம லாட்கொண்டு
பின்னவனை யுங்கடிது பேர்க்குமே – மன்னி
அரிதகிக்கு மாபோ லரணியத்தை மீறி
அரிதகிநோய் கட்கிகலே யாம். ... தே.வெ. பக். 9

கீழ்க்காய் நெல்லி
சீதமதி பித்ததிவிடஞ் செவ்விழியின் னோய்க் கூட்டம்
பூதமொடு பேயிரத்தப் போக்குகளும் – பூதலத்துள்
தாழ்வாய்ப் பணிந்தேகுந் தப்பாது பொய்யலவே
கீழ்வா யெனுநெல்லிக் கே.

கீழாநெல் லிக்குணந்தான் கேளாய் மதுமேகந்
தாழாக்கா மாலைகளைச் சண்ணுந்தா – தேழனலுந்
தொக்கினன லுந்தொலைக்குந் தொன்மேகம் போக்கிவிடுந்
தக்கவிர ணங்கெடுக்குந் தான். ... அ.கு. குண. பக். 279

கொள்ளு
குடல்வாதங் குன்மமுண்டாங் கொள்மருந்தோ நாசம்
அடலேறு பித்தமிக ஆகுங்–கடுகடுத்த
வாதநீ ரேற்றமொடு மனனுகுளிர் காய்ச்சலும்போஞ்
சாதிநறுங் கொள்ளுக்குத் தான். ... அ.கு. குண. பக். 317

கோட்டம்
நாட்டிலுறு வெட்டை நடுக்கம் எனுநோய்கள்
கோட்டமெனச் சொன்னால் குலையுங்காண்–கூட்டிற்
சுரதோடந்தொணடைநோய் தோலாத பித்தம்
பரதேசம் போமே பறந்து. ... அ.கு. குண. பக். 327

கொத்துமல்லி விதை
கொத்துமல்லி வெப்பங் குளிர்காய்ச்சல் பித்தமந்தஞ்
சர்த்திவிக்கல் தாகமொடு தாதுநட்டங்–கத்தியெழும்
வாத விகாரமடர் வன்கர்த் தபிவிரணம்
பூதலத்தில் லாதகற்றும் போற்று. ... ப.கு.வி. பக். 285

சேனாப தியமைச்சர் சேவிக்க நன்முறைமை
ஆனா திடலா லனுதினமும் – ஊனிலையை
நல்ல வலியுடைத்தாய் நாட்டுதலால் நாட்டில்வளர்
மல்லி யரசனுடை மை. ... தே.வெ. பக். 90

குன்றி மணி
நேத்திரநோய் பித்தம் நிறமழுங்கல் காமாலை
வியர்த்திடுதா பச்சோப வெப்புடனே–கோத்திட்ட
ஐயமுதல் யாவும்போம் ஆயிழையே! காட்டிலுறை
செய்யகுன்றி யின்விதையைச் சேர். ... அ.கு. குண. பக். 301

குரோசானி ஓமம்
வெகுமூத்திர வாதம் வீரியநட் டம்புண்
ணுகுபேதி யுட்கடுப்பி னோடே–மிகுகரப்பான்
தீறாக் கபமிவைபோஞ் செய்யகுரோ சானியென்றால்
வாரா மயக்கமுறு மால். ... ப.கு.சீ. பக். 304

மஞ்சள்
பொன்னிறமாம் மேனி புலானாற்ற மும்போகும்
மன்னு புருட வசியமாம்–பின்னியெழும்
வாந்திபித்த தோடமையம் வாதம்போந் தீபனமாங்
கூர்ந்தமஞ்ச ளின்கிழங்குக் கு.

தலைவலிநீ ரேற்றஞ் சளையாத மேகம்
உலைவுதரு பீநசத்தி னுாடே–வலிசுரப்பு
விஞ்சு கடிவிடமும் வீறுவிர ணங்களும்போம்
மஞ்சள் கிழங்குக்கு மால். ... அ.கு. குண. பக். 565

வாதத் தையுமையா மலபிணியை யுங்சாடி
வீதத்தை யீயும் வெடியோமஞ் – சீதை
கரிசலாங் கண்ணியெண்ணெய்க் கண்கலந்த தாடில்
அரிசனம்பித் தப்பிணியை யண். ... தே.வெ. பக். 102

மரமஞ்சள்
அழன்றகண மூலம் அருசி யுடனே
உழன்ற கணச்சுரமும் ஓடுஞ்–சுழன்றுள்ளே
வீறுசுர முந்தணியும் வீசுமர மஞ்சளுக்குத்
தேறு மொழியனமே! செப்பு. ... அ.கு. குண. பக். 567

மருதம் பட்டை
ஓதமெனு நீரிழிவை யோட்டும் பிரமேகங்
காதமென வோடக் கடத்தலுங்காண்–போத
மயக்க மொடுதாக மாறாச் சுரத்தின்
தயக்கமறுக் கும் மருதஞ் சாற்று.

குட்டரோ கங்கிருமி கோர வயிற்று வலி
துட்டவறட் சூலை தொலையுங்காண்–கிட்டிப்
பொருதம்பா மென்னு விழிப் பூவையரே! நாளு
மருதம்பா ரென்றளவில் மாய்ந்து. ... அ.கு. குண. பக். 575

மாவிளங்கம்
சுரங்கடியின் றோடந் தொலையாத வாதம்
உரம்பெறு விடங்க ளொழியும்–அரமுங்
கருமா வடுவயிலுங் கண்டஞ்சுங் கண்ணாய்
ஒருமாவி லிங்குக் குரை. ... அ.கு. குண. பக். 591

மிளகு
சீதசுரம் பாண்டு சிலேத்மங் கிராணிகுன்மம்
வாதம் அருசிபித்தம் மாமூலம்–ஓதுசந்தி
யாச்மபஸ் மாரம் அடன்மேகம் காசமிவை
நாசங் கறிமிளகினால் ... அ.கு. குண. பக். 596

கோணுகின்ற பங்கவலி குய்யவுரோ கம்வாத
சோணிதங்க ழுத்திற்குள் தோன்றுநோய்–காணரிய
காதுநோய் மாதர்குன்மங் காமாலை மந்தமென்றீர்
எதுநோய் காயிருக்கில் ஈங்கு. ... தே.கு. குண. பக். 596

தீயாகி யெங்கும் திரியுமதை யாவத்து
மோயாம வெப்படியு முண்டாக்காற்–பாயாது
போந்திமிர்வா தங்கிரந்தி புண்ணீரும் மண்ணவர்க்கும்
காந்திமெய்வா தச்சலுப்பைக் காய். ... தே.வெ. குண. பக். 576
மூவருக்கு முன்னிகலாய் முன்னுறவாய் மற்றபிணி

யாவருக்கு மேலா யிருக்குமே – தேவருக்கும்
எண்ணப்ப தார்த்த மெனமும்மூர்த் திக்கிரிகை
தண்ணப்பிர தாபமரி சம். ... தே.வெ. பக். 14

திரிமூர்த் திகளிற் றிடமாக முன்னே
அரிமூர்த்தி போலுவமை யாக – முறைமை
தருமுற் றிரிகடுகிற் றானேமுன் னாகும்
மரிசந் தனையாக மம். ... தே.வெ. பக். 80

வாதத்தை யும்மதனால் வந்தமைந்த வெம்மையையுஞ்
சீதத்தை யும்முறிவு செய்திடலால் – ஓது
வழக்கா யுலகிலெரி :வன்மை யெனினும்
அழற்காயை விட்டவரி யார். ... தே.வெ. பக். 81

மூக்கிரட்டை
சீத மகற்றுந் தினவடக்குங் காந்திதரும்
வாத வினையை மடிக்குங்காண்–பேதி
கொடுக்குமதை உண்டாக்காற் கோமளமே! பித்தம்
அடுக்குமே மூக்குறட்டையாய் ... அ.கு. குண. பக். 610

மூக்கிரட்டையினலை முறையுண வாத நோ
யாக்கையிற் பெட்டி யரவென் வடங்குமே. ... தே.வெ. குண. பக். 610

நன்னாரி
சலதோடம் பித்தமதி தாகம் உழலை
சலமேறு சீதமின்னார் தஞ்சூ–டுலகமதிற்
சொன்னமது மேகம் புண் சுரமிவையெ லாமொழிக்கும்
மென்னமதுர நன்னாரி வேர். ... தே.கு. குண. பக். 447

அங்கா ரிகைமூலி யர்ச்சியத்தோ டுண்ணநித்தி
யங்கா ரிகைமூலி யாளுமே–யங்காரி
பற்றாது. ... தே.வெ. குண. பக். 447

மாறா மருந்தீடு மாறும் பயித்தியம்போம்
ஆறா ரணங்களெல்லா மாறுமே – நீறாகத்
தாமரைநீர் போலுடலிற் றட்டாது நோய்களெல்லாங்
காமவல்லி யென்றுரைத்தக் கால். ... தே.வெ. பக். 45

நாயுருவி
மலிகாரங் கைப்புள்ள அபமாக்கி யின்வேரால் வசிய முண்டாம்
இலைமூல உதிரமந்தம் பேதிகபம் வியர்வுதந்தி யிறங்கு மேகம்
மலையேறும் படிபுரியு முள்ளாரிசி பசிமாற்றும் வனச மூலம்
பலமாதர்க் குளளழுக்கை நீக்குவங்கச் சிந்தூரம் பண்ணுமாதோ ... அ.கு. குண. பக். 453
ஓதமுறு சோபை யுயர்பாண்டு வைப்போக்குந்
தீதறுகா மாலைநோய் தீர்க்குமினார்–சூதகநீர்
பொய்ப்புறுகா லத்தனைப் பொங்குவிக்குங் காரமொடு
கைப்புறுசெந் நாயுருவி காண். ... தே.கு. குண. பக். 453

நெல்லிக்காய்
பித்தமன லையம் பீநசம்வாய் நீர் வாந்தி
மத்தமலக் காடும் மயக்கமுமில்–ஒத்தவரு
வில்லிக்கா யம்மருங்கா மென்னாட்கா லந்தோந்தே
நெல்லிக்கா யம்மருந்து ணீ.

நெல்லிக்காய்க் குப்பித்தம் நீங்கு மதன்புளிப்பால்
செல்லுமே வாதமதிற் சேர்துவரால்-சொலலுமையம்
ஓடுமிதைச் சித்தத்தில் உன்ன அனலுடனே
கூடுபிற மேகமும் போங் கூறு. ... தே.கு. குண. பக். 491

அமைச்சனெனு மந்திரியை யாளாக்கிக் கொண்டு
கமைப்பை யுயிர்நிலைக்குக் காட்டி – அமைப்புடைமை
நேம மிகமெய் நிறுத்திவைகு மெஞ்ஞான்றும்
ஆமலக நெல்லியை யா. ... தே.வெ. பக். 65

நெல்லி வற்றல்

ஆகவன லஞ்சசிஅ சிர்க்கென்பு ருக்கிகண்ணோய்
தாக முதிரபித்தந் தாது நஷ்டம்-மேகனத்தின்
இல்லிமுள்ளி போலருகல் எண்கா மியிவியங்கம்
நெல்லிமுள்ளிள யாற்போ நினை.

நல்லநெல்லி முள்ளியது நாக்குக் குருசி தரும்
அ்லலல்விரி பித்தம் அகற்றுமதை-மெல்லத்
தலை முழுகக் கண்குளிருந் தாவுபித்த வாந்தி
இலையிழிமே கங்களும் போம் எண். ... தே.கு. குண. பக். 491

நெருஞ்சில் முள்

சொல்லவொண்ணா நீர்க்கட்டு துன்மா மிசமருகல்
கல்லடைப்பெ னும்பிணிகள் கண்டக்கால்-வல்லக்
கடுஞ்சினவேற் கண்மாதே காசினியற் றோன்று
நெருஞ்சினறும் வித்தை நினை.

மேக வழலாற்றும் மேவுநீர்க் கட்டறுக்கும்
போகமதி லன்பமுமே பூரிக்கும்-போகமிக
உண்டாக்கும் மெல்லியர்பால் ஓது நெருஞ்சின்முன்
கொண்டார்க்கிங் கிக்குணத்தைக் கூறு. ... ப.கு.வி. பக். 442

நெருஞ்சில் வேர்

நல்ல நெருஞ்சிலது நாளுங்கி ரிச்சாரத்தை
வல்ல சுரமனலை மாற்றுங்காண்- மெல்லியலே!
மாநிலத்தில் கல்லடைப்பும் வாங்காத நீர்க்கட்டும்
கூனுறுமெய் வாதமும்போக் கும்.

மேகவெட்டை நீர்ச்சுறுக்கு வீறுதிரி தோடம்புண்
வேகாசுர தாகவெப்பம் விட்டொழியும்- போகந்
தருஞ்சின் மதலைமொழித் தையலே! நல்ல
நெருஞ்சி லதனை நினை.

அ.கு. குண. பக். 473.

நேர்வாளம்

ஓதி லுதரத் துறுமலப்பன் னோய்விலகும்
பேதி மருந்திற் பெரிதாகும்-வாதமறுங்
கூர்வாளை யொத்தவிழிக் கொம்பனையே பண்டிதர்சொன்
னேர்வாளக் கொட்டைதனை நீ. ... ப.கு.வி. பக். 478

எந்த வியாதி யினங்களையுஞ் சாடிமல
பந்த வினையைப் பரிகரித்து – வந்தவெப்பைப்
பாபியென மாட்டுதலால் பாடாண வெம்மையினுஞ்

சோபிமகா சோபியென்று சொல். ... தே.வெ. பக். 16

பரங்கிச்சக்கை

தாகம் பலவாதந் தாதுநட்டம் புண்பிளவை
மேகங் கடிகிரந்தி வீழ்மூலந்-தேகமுடன்
குட்டை பகந்தரமேற் கொள்வமனம் போம்பறங்கிப்
பட்டையினை யுச்சரித்துப் பார். ... ப.கு.சீ. பக். 293

பாதிரி வேர்

பாதிரியின் வேர்குணந்தான் பார்க்கில் மதுமேகம்
ஓதகரப் பானுழலை யோடிவிடும்-மாதேகேள்!
கண்ணெரிவு காதெரிவு கையெரிவு காலெரிவும்
நிண்ணயமாய்ப் போகும் நிசம்.

மேகத்தால் வந்த மிகுபிளவை மாவிரணம்
போகத்தால் வந்த பொருமூலம்-ஆகத்தில்
வந்தசொறி யோடுகப வாதமந்த மும்போகும்
கொந்தடரும் பாடலத்தாறு கூறு. ... அ.கு. குண. பக். 524

பெருங்காயம்

தந்தவேதந்த மூலத்தெழும்பிணி
சருவகாளம் விருச்சிகங்கீடம்மா
மந்தம்வாதம் உதாவர்த்தம் அல்குல்நோய்
மார்பணங்கட்ட குன்மம்மகோதரம்
உந்துகெர்ப்பத்தின் வித்திரஞ்சூலைச்சூர்
உதிரப்பூச்சி சிலேத்துமத்துறும்வள
வந்தமெய்க்கடுப் போடிவைமுற்றுமே
மாயுநாறுநற் காயங்கிடைக்கினே. ... தே.கு. குண. பக். 557

முன்னுரைக்குஞ் சன்னி முரணடங்கச் சாடிமடி
தன்னை யடிக்கத் தணலாகிப் - பன்னுகறி
தங்கு மணமாகிச் சாதகமா யாளுமென்று
இங்கு மகிமைமுறை யில். ... தே.வெ. பக். 81

பிரம்மி வழுக்கை

கீலின் பசையாற் கிளைத்த வலிவீக்கங்
காலின் பிடிப்பொடுகை காலெரிவு-மேலிலெழு
வாதத்தா நோவு மலக்கட்டுஞ் சோபையும் போஞ்
சீதத்தாஞ் சப்தளைக்குச் சேர். ... அ.கு. குண. பக். 534

பொன்னாங்காணி

காசம் புகைச்சல் கருவிழிநோய் வாதமனற்
கூசும்பி லீகங்கு தாங்குரநோய்-பேசிவையா
லென்னாங்கா ணிப்படிவ மேமமாஞ் செப்பலென்னைப்
பொன்னாங்கா ணிக்கொடியைப் போற் ... ப.கு.வி. பக். 563

காசத்தைப் போக்கிக் கபத்தை வழிப்படுத்தி
ராசற்குத் தன்னரசு நல்குதலால் - மாசற்ற
போது மதனைப் புறப்படுத்தித் தானுறலால்
சீதையொளி வேநேத் திரம். ... தே.வெ. பக். 86

பொடுதலை

பொடுதலையின் பேருரைத்தால் போராமப் போக்கும்
அடுதலைசெய் காசம் அடங்கும்-கடுகிவரு
பேதியொடு சூலைநோய் பேசரிய வெண்மேகம்

வாதமும்போ மெய்யுரக்கும் வாழ்த்து. ... அ.கு. குண. பக். 559

புங்கம் வித்து
புங்கின்விதை காற்கிரந்தி புண்கரப்பான் காதெழுச்சி
அங்கசந்தி கண்ணோய்க்கும் ஆம்பேதி–யுங்கட்டும்
காட்டுப்புங் கின் விதைக்கு கண்டதே மற்சொறிமேய்ப்
பூட்டுப்பங் கின்வாய்வும் போம். ... அ.கு. குண. பக். 543

புங்கம் வேர்
வாதக் கடுப்பு மகாமூர்ச்சை தாபசுரம்
வாதகுன்மம் ரத்தத்தால் வந்திடுநோய்–ஓதுகின்ற
பண்புரையும் வல்விடமும் போகும்திரண்டருண்டே
பண்புறுபுங் கம்வேர்க்குப் பார் ... ப.கு.வி. பக். 528

பூவரசம்பட்டை
நூறாண்டு சென்றதொரு நூண்பூ வரசம்வேர்
தூறாண்ட குஷ்டைத் தொலைக்குங்காண்–வீறிப்
பழுத்தயிலை விதைமேற் பட்டை யிவைகண்டாற்
புழுத்தபுண் விரோசனமும் போம். ... ப.கு.சீ. பக். 131

சேத்துமத்தை மாட்டித் தினமு மிறையாகி
யாத்துமத்தை யோம்பி யடரலால் – நீத்த
விரேதிசைப்பந் தித்திடலா லெப்படிப்பார்த் தாலும்
தராபதிசூ தாகியபித் தம். ... தே.வெ. பக். 22.

பேரரத்தை
சந்நி யுபட்சிரணஞ் சரர்ந்தசீ தச்சுரம்போம்
வன்ன மிகுந்து வளருங்காண்– கன்னியர்கள்
மாதவிடாய்க் காகும்வலி வாதக் கடுப்பகலும்
பேதமிலை பேரரத்தைப் பேனு.

வாத மிசிவு வலிசந்தி பித்தையஞ்
சீதசுரந் தாவிரணஞ் சொன்னநீ– ரோதுபல
வாங்கடுப் பூப்படறு மாறு மொளியாகு
மீங்கடரும் பேரரத்தை யால்.

அ.கு. குண. பக். 28

தாமரை மலர்
பருத்தநற் றாமரைப்பூ பல்வாந்தி நோயைத்
துரத்திவிடும் இன்னுஞ் சொல்வோ–கரத்தில்
எடுத்தணைக்கக் கண்குளிரும் ஏகுஞ் சுரமும்
எடுத்தவி தாகமும்போம் எண். ... அ.கு. குண. பக். 405

தாமரைக் கிழங்கு
கண்ணுக் கொளிகொடுக்குங் காசபித்தம்போக்கும்
எண்ணுங் குளிர்ச்சிதரும் ஏந்திழையே!–புண்ணுகளில்
தூமரைப்புண்ணும் போக்குந் தொந்திக்க டுப்பகற்றுந்
தாமரைக் கந்தமது தான். ... அ.கு. குண. பக். 405

தான்றிக்காய்
சிலந்திவிடம் காமியப்புண் சீழான மேகங்
கலந்துவரும் வாதபித்தங் காலோ–டலர்ந்துடலில்
ஊன்றிக்காய் வெப்ப முதர பித் துங்கரக்குந்
தான்றிற்காய் கையிலெடுத் தால்.

ஆணிப்பொன் மேனிக் கழகும் ஒளியுமிகும்
கோணிக்கொள் வாதபித்தக்கொள்கைபோம்-தானிக்காய்
கொண்டவர்க்கு மேகமறும் கூறா அனற்றணியும்
கண்டவர்க்கு வாதம் போம் காண். ... அ.கு. குண. பக். 410

திப்பிலி
கட்டி யெதிர்நின்று கடுநோயெல் லாம்பணியும்
திட்டி வினையகலும் தேகமெத்த-புட்டியாம்
மாமனுக்கு மாமனென மற்றவர்க்கு மற்றவனாங்
காமனெனுந் திப்பிலிக்கும் கை. ... தே.வெ. குண. பக். 411

வாய்விடங்கம்
பாண்டுகுட்டங் குன்மம் பருந்துால நோய்வாதந்
தீண்டு திரிவிடஞ்சி ரந்துண்ட-நீண்டமடி
நோய்விளங்கக் காட்டாத நுண்கிருமி யாசனப்புண்
வாய்விளங்கங் காட்டவிடு மால் ... ப.கு.வி. பக். 640

வாதகுரு வாயுடம்பு வாதமறுத் தப்படியே
வேதையுலோ கங்களிலே வேண்டினாற் - பாத
விரதமுதற் கையாட வென்றா லிசையும்
வரனனையை நீமனதில் வை. ... தே.வெ. பக். 13

வால்மிளகு
வாதபித்த வையம் வயிற்று வலிதாகஞ்
சீதம் பலநோய் சிதையுங்காண்-போத
வதிதீ பனமா மணங்கரசே நாளுந்
துதிவான் மிளகருந்தச் சொல் ... ப.கு.வி. பக். 643

வாலுழுவை
வயிற்றுக் கடுப்புவலி மாறாக் கிராணி
பயித்தியங் காசமல பந்தஞ்-சயிக்கவொணாச்
சூதிகா வாதமும் போந் தொல்வா லுழுவைவிதைக்
காதிநவ சித்தர் மொழி யாம். ... அ.கு. குண. பக். 630

வேப்பம் பட்டை
ஓதரிய வேம்பை யுறைக்கிற் சுரமுடனே
வாதமறு மூலகண மாந்தம்போந்-தீதாய்
உதிருமெரி பூச்சிகுன்ம மோதா தொழியுஞ்
சிதறுமலம் போகுமெனத் தேர் ... அ.கு. குண. பக். 670

வேப்பம் பூ
பித்தத் தெழுந்த பெருமூர்ச்சை நாத்தோடம்
சத்தத் தெடுவமனம் தங்கருசி-முற்றியகால்
ஏப்பம் மசகீட மிவையேகு நாட்சென்ற
வேப்பமல ருக்கு வெருண்டு. ... அ.கு. குண. பக். 668

வெந்தயம்
பிள்ளை கணக்காய்ச்சல் பேதிசீ தக்கழிச்சல்
தொள்ளைசெய்யும் மேகம் தொலையுங்காண்-உள்ளபடி
வெச்சென்ற மேனி மிகவுங் குளிர்ச்சியதாம்
அச்சமிலை வெந்தயத்திற்காய். ... அ.கு. குண. பக். 656

பித்தவுதி ரம்போகும் பேராக் கணங்களும்போம்
அத்திசுரந் தாகம் அகலுங்காண-தத்துமதி

வேக இருமலொடு வீறு கயம்தணியும்
போகமுறும் வெந்தயத்தைப் போற்று. ... தே.கு. குண. பக். 656

வில்வ வேர்

வில்லலுவத்தின் வேருக்கு வீறுகுன்ம வாயுகபம்
சொல்வொணா பித்தந் தொடாசோபை–வலகப
தாகசுரம் நீரேற்றஞ் சந்நியொடு மெய்வலியும்
வேகமொடு நீங்குமே.

அக்கினி மந்தம் அரோசிந்தி சாரம் விக்கல்
நிற்கரிய பித்தசுரம் நீள்வாந்தி–சுட்கநோய்
ஆதிய நோய் ஏகும் அழகோடு புஷ்டியுண்டாம்
கோதில்வில்வ வேரதனைக் கொள். ... அ.கு. குண. பக். 640

கொண்டமைச்சு தந்திரிகொ ணர்ந்தகொடுங் கோலைக்
கண்டித்து மெய்யுறுதி காட்டுவார் – பண்டிதர்கள்
பூவுலகி லாயுள்விதி பொய்யா முறையாக்கக்
கூவிளத்தின் செங்கோலைக் கொண்டு. ... தே.வெ. பக். 62

APPENDIX-8

APROXIMATE ENGLISH EQUIVALENTS OF SIDDHA CLINICAL CONDITIONS AND DISEASES

S.No	நோய்கள்	Diacritic (Nōykal)	Diseases
1	அழல்/பித்தம்	Az̲al/Pittam	Heat/ Pitta humour
2	அழல் நோய்கள்	Az̲al Nōykaḷ	Diseases due to heat/ Pitta humour
3	ஆண்குறிப்புண்	Āṇkuṟippuṇ	Penile sore
4	ஆண்மைக்குறைவு	Āṇmaikkuṟaivu	Diminished sexual potency
5	ஆரம்ப பைத்தியம்	Ārampa Paittiyam	Early mental illness
6	அதிகழிச்சல்	Atikaz̲iccal	Diarrhoea
7	சன்னி	Can̲n̲i	Simultaneous extreme derangement of three humours
8	சப்ததாது சுரம்	Captatāthu Curam	Fever due to the derangement of seven constituents of the body
9	சாராயவெறி	Cārāyaveṟi	Alcoholic delirium
10	சர்வவிடம்	Carvaviḍam	All types of poisons and toxins
11	சதையடைப்பு	Cataiyaḍaippu	Prostatic obstruction of urethra
12	செரியாக்கழிச்சல்	Ceriyākkaz̲iccal	Diarrhoea due to indigestion
13	செரியாமை	Ceriyāmai	Indigestion
14	சீதக்கழிச்சல்	Cītakkaz̲iccal	Mucous diarrhoea
15	செவிநோய்	Cevinōy	Ear disease
16	சிலந்திநஞ்சு	Cilantinañcu	Spider poison
17	சிரங்கு	Ciraṅku	Scabies/Skin ulcers
18	சிறுநீர் எரிச்சல்	Ciṟunīr Ericcal	Burning micturition
19	சிறுநீர் கட்டு	Ciṟunīr Kaḍḍu	Retention of urine
20	சிறுநீர் பெருக்கம்	Ciṟunīr Perukkam	Diuresis
21	சொறி	Coṟi	Pruritus
22	சொறிசிரங்கு	Coṟiciraṅku	Scabies
23	சூலை நோய்	Cūlai Nōy	Painful disease
24	சூலை	Cūlai	Lancinating pain
25	சுரம்/காய்ச்சல்	Curam/Kāyccal	Fever
26	சுரத்தால் உண்டாகும் உடல் தளர்ச்சி	Curattāl Uṇḍākum Uḍal Thaḷarcci	Pyrexial fatigue and malaise
27	சுரத்தோடுகூடிய இருமல்	Curattōḍukūḍiya Irumal	Cough with fever
28	சுரவேட்கை	Curavēḍkai	Pyrexial polydipsia
29	சூதகசூலை	Cūtakacūlai	Dysmenorrhoea

30	சூதகதடை	Cūtakataḍai	Secondary amenorrhoea
31	சூதகவலி	Cūtakavali	Dysmenorrhoea
32	சூதகவாயு	Cūtakavāyu	Dysmenorrhoea
33	சூதகநோய்கள்	Cūtakanōykaḷ	Diseases of female genital organ
34	சூதகதடையை நீக்கும்	Cūtakataḍaiyai Nīkkum	Emmenagogue
35	சுவாசகாசம்	Cuvācakācam	Bronchial asthma
36	சுவையின்மை	Cuvaiyiṉmai	Loss of taste
37	சுவாசம்	Cuvācam	Bronchial asthma
38	எலும்பு நோய்கள்	Elumpu Nōykaḷ	Osteopathy/Bone diseases
39	என்புருக்கி நோய்	Eṉpurukki Nōy	Tuberculosis
40	ஏப்பம்	Ēppam	Eructation / Belching
41	எரிச்சல்	Ericcal	Burning
42	எருவாய் முளை	Eruvāy Muḷai	Sentinel pile and anorectal growth
43	ஈளை	Īḷai	Tuberculosis/Bronchitis
44	இளைப்பு நோய்	Iḷaippu Nōy	Tuberculosis
45	இரைப்பிருமல்	Iraippirumal	Bronchial asthma
46	இரைப்பு	Iraippu	Wheezing
47	ஈரல் நோய்	Īral Nōy	Liver disease
48	இரத்தக்கடுப்பு	Irattakkaḍuppu	Dysentery
49	இரத்தக்கொதிப்பு	Irattakkotippu	Hypertensive disease
50	இருமல்	Irumal	Cough
51	இதயநோய்	Itayanōy	Cardiac disease
52	ஐயநோய்கள்	Aiyanōykaḷ	Diseases due to Seetham/Taṭpam/Kapam humour
53	ஐயசுரம்	Aiyacuram	Curam due to kapam
54	கபநோய்	Kapanōy	Diseases due to iyam
55	கக்கிருமல்/கக்குவான் இருமல்	Kakkirumal/Kakkuvāṉ Irumal	Whooping cough
56	கால் வீக்கம்	Kāl Vīkkam	Pedal oedema/Leg oedema
57	கழலை	Kaẕalai	Cyst/Benign growth/Enlarged nodes
58	கழிச்சல்	Kaẕiccal	Diarrhoea
59	கல்லடைப்பு	Kalladaippu	Renal obstruction due to stones/Renal calculi
60	காமாலை	Kāmālai	Jaundice
61	கண் எரிச்சல்	Kaṇ Ericcal	Burning eyes
62	கண் காது மூக்கு நோய்கள்	Kaṇ Kātu Mūkku Nōykaḷ	Eye, ear and nose diseases
63	கண் நோய்கள்	Kaṇ Nōykaḷ	Eye diseases
64	காணாசுரம்	Kāṇācuram	Fever associated with tabes mesenterica

65	காணாகடி	Kāṇākaḍi	Urticaria
66	கணம்	Kaṇam	Tabes mesenterica
67	கண்காசம்	Kaṇkācam	Cataract
68	கரப்பான்	Karappāṉ	Eczema
69	கயநோய்	Kayanōy	Tuberculosis
70	கயம்	Kayam	Tuberculosis
71	கீல்வாயு	Kīlvāyu	Arthritis/ Arthralgia
72	கிராணி	Kirāṇi	Chronic diarrhoea
73	கோழை	Kōẕai	Phlegm
74	கொழுப்பைக் குறைக்கும்	Koẕuppaik Kuṟaikkum	Hypolipidemic
75	குளிர்ச்சி	Kuḷircci	Coolth
76	குளிர்காய்ச்சல்	Kuḷirkāyccal	Fever with rigor
77	குன்மம்	Kuṉmam	Painful gastro intestinal disorders with indigestion
78	குரல் கம்மல்	Kural Kammal	Hoarseness of voice
79	குருதிப்போக்கு	Kurutippōkku	Haemorrhage/Bleeding
80	குருதி அழல்	Kuruti Aẕal	Bleeding disorders
81	குருதி வாந்தி	Kuruti Vānti	Haematemesis
82	குருதிக்கக்கல்	Kurutikkakkal	Haemoptysis
83	குருதிக்கழிச்சல்	Kurutikkaẕiccal	Dysentery
84	குடல் வலி	Kuḍal Vali	Intestinal colic
85	குட்டம்	Kuḍḍam	Leprosy/Hansen’s disease/Skin diseases
86	மலக்கட்டு	Malakkaḍḍu	Constipation
87	மலமிளக்கி	Malamiḷakki	Laxative
88	மண்டைக்கரப்பான்	Maṇḍaikkarappāṉ	Scalp eczema
89	மாந்தம்	Māntam	Indigestion associated in children upto 3 years of age
90	மந்தார இரைப்பு	Mantāra Iraippu	Asthma occurring during rainy or cloudy season
91	மதுமேகம்	Matumēkam	Diabetes mellitus
92	மயக்கம்	Mayakkam	Semi - consciousness/Drowsiness
93	மேகசுரம்	Mēkacuram	Fever due to venereal diseases
94	மேகக்கட்டி	Mēkakkaḍḍi	Abscess due to venereal diseases/Diabetes mellitus
95	மேகம்	Mēkam	Genital discharging diseases
96	மிகுபசி	Mikupaci	Excessive appetite
97	மூக்குநீர் பாய்ச்சல்	Mūkkunīr Pāyccal	Coryza
98	முக்குற்றநோய்	Mukkuṟṟanōy	Diseases due to derangement of three humours
99	முக்குற்றகேடு சுரம்	Mukkuṟṟakēḍu Curam	Fever due to derangement of three humours

100	முக்குற்றகேடு	Mukkuṟṟakēḍu	Derangement of three thathu.
101	மூல நோய்	Mūla Nōy	Ano-rectal diseases/Disorders
102	மூலம்	Mūlam	Haemorrhoids
103	முப்பிணி	Muppiṇi	Diseases caused by the derangement of three humours
104	முறைசுரம்	Muṟaicuram	Periodic fever
105	மூர்ச்சை	Mūrccai	Coma/Syncope
106	நாள்பட்ட கழிச்சல்	Nāḷpaḍḍa Kaẓiccal	Chronic diarrhoea/sprue
107	நமைச்சல்	Namaiccal	Itching
108	நஞ்சு நீக்கும்	Nañcu Nīkkum	Antidote
109	நஞ்சு	Nañcu	Poison/Toxin
110	நரம்பு வலி	Narampu Vali	Neurodynia/neuralgia
111	நாவறட்சி	Nāvaṟaḍci	Dryness of mouth
112	நெஞ்செரிப்பு	Neñcerippu	Heart burn
113	நினைவு தடுமாற்றம்	Niṉaivu Taḍumāṟṟam	Fluctuation of consciousness
114	நீர்சுருக்கு	Nīrcurukku	Painful micturition/Dysuria
115	நீரேற்றம்	Nīrēṟṟam	Sinusitis
116	நீரிழிவு	Nīriẓivu	Diabetes mellitus
117	நீர்கடுப்பு	Nīrkaḍuppu	Burning & painful micturition
118	நீர்க்கட்டு	Nīrkkaḍḍu	Oliguria/Anuria
119	நீர்கோவை	Nīrkōvai	Coryza
120	நீர்வேட்கை	Nīrvēḍkai	Excessive thirst
121	நீடித்த வளிநோய்	Nīḍitta Vaḷinōy	Chronic vāta disease
122	நுண்புழுக்கள்	Nuṇpuẓukkaḷ	Worms/parasites
123	ஒற்றைத்தலைவலி	Oṟṟaittalaivali	Hemicrania/Migraine
124	பசித்தீக்கேடு	Pacittīkkēḍu	Anorexia
125	பசித்தீக்குறைவு	Pacittīkkuṟaivu	Dyspepsia
126	பக்கசூலை	Pakkacūlai	Pleurisy
127	பல் வலி	Pal Vali	Tooth ache
128	பல்லடி நோய்கள்	Palladi Nōykaḷ	Gum diseases
129	பாம்பு நஞ்சு	Pāmpu Nañcu	Snake poison
130	பார்வை மங்கல்	Pārvai Maṅkal	Low visual acuity
131	படை	Paḍai	Tinea like skin diseases/Fungal skin diseases
132	பெருவயிறு	Peruvayiṟu	Ascites
133	பெரும்பாடு	Perumpāḍu	Menorrhagia
134	பெருங்கழிச்சல்	Peruṅkaẓiccal	Severe diarrhoea

135	பிளவை	Piḷavai	Carbuncle
136	பீனிசம்	Pīṉicam	Sinusitis
137	பிரமேகம்	Piramēkam	Gonorrhoea like venereal diseases
138	பித்தாதிக்கம்	Pittātikkam	Nervous debility
139	பித்தமயக்கம்	Pittamayakkam	Giddiness due to increased heat /Pittam humour
140	பொருமல்	Porumal	Flatulence
141	புழுக்கொல்லி	Puẕukkolli	Vermicide
142	புண்கள்	Puṇkaḷ	Ulcers
143	புரையோடிய புண்கள்	Puraiyōḍiya Puṇkaḷ	Ulcer with sinuses
144	புராண சுரம்	Purāṇa Curam	Chronic fever
145	தாகம்	Tākam	Thirst
146	தலைக்கனம்	Talaikkaṉam	Heaviness of the head
147	தலைப்புண்	Talaippuṇ	Scalp ulcer
148	தலைவலி	Talaivali	Headache
149	தமரக தடிப்பு	Tamaraka Taḍippu	Cardiomegaly
150	தவளை சொறி	Tavaḷai Coṟi	Phrynoderm/Dermatitis
151	திமிர் வாதம்	Timir Vātam	Spasm resulting from numbness
152	தினவு	Tiṉavu	Pruritus
153	தோல் நோய்கள்	Tōl Nōykaḷ	Skin diseases
154	தோடம்	Tōḍam	Disordered humour
155	தூக்கமின்மை	Tūkkamiṉmai	Insomnia
156	ஊழி நோய்	Ūẕi Nōy	Cholera
157	உப்பிசம்	Uppicam	Flatulence
158	உடல் சூடு	Uḍal Cūḍu	Body heat
159	உடல் எரிச்சல்	Uḍal Ericcal	Burning sensation of the body
160	உடல் கடுப்பு	Uḍal Kaḍuppu	Body ache
161	உடல் வலி	Uḍal Vali	Body ache
162	உடல் நலிவு	Uḍal Nalivu	Body weakness
163	உடல் வன்மைக்குறைவு	Uḍal Vaṉmaikkuṟaivu	Loss of body strength
164	உட்சுரம்	Uḍcuram	Internal fever
165	உட்சூடு	Uḍcūḍu	Internal heat
166	வாய்ப்புண்	Vāyppuṇ	Mouth ulcer
167	வயிற்றிரைச்சல்	Vayiṟṟiraiccal	Borborygmi/Abdominal gurgling
168	வயிற்று நோய்	Vayiṟṟu Nōy	Abdominal diseases
169	வயிற்றுப்பொருமல்	Vayiṟṟupporumal	Flatulence

170	வலி குன்மம்	Vali Kuṉmam	Peptic ulcer/ Painful upper gastro intestinal disorder
171	வலி நோய்	Vali Nōy	Convulsions/Seizure/Fits
172	வலிப்பு நோய்	Valippu Nōy	Poor memory
173	வளி நோய்கள்	Vaḷi Nōykaḷ	Diseases due to vāta humour
174	வலி	Vali	Pain
175	வளிச்சுரம்	Vaḷiccuram	Fever due to vāta humour
176	வாந்தி	Vānti	Emesis
177	வாந்தி பேதி	Vānti Pēti	Vomiting and diarrhoea
178	வண்டு கடி	Vaṇḍu Kaḍi	Beetle sting causing urticaria
179	வறட்சுரம்	Vaṟaḍcuram	Fever
180	வாத குன்மம்	Vāta Kuṉmam	Painful gastro intestinal disorder due to vāta/Vaḷi
181	வாத குடைச்சல்	Vāta Kuḍaiccal	Rheumatic pain
182	வாய் வேக்காடு	Vāy Vēkkāḍu	Stomatitis
183	வயிற்றுக்கடுப்பு	Vayiṟṟukkaḍuppu	Dysentery
184	வயிற்றுப்புண்	Vayiṟṟuppuṇ	Peptic ulcer
185	வயிறு மந்தம்	Vayiṟu Mantam	Indigestion
186	வாய்வு	Vāyvu	Flatus
187	வெள்ளை	Veḷḷai	Leucorrhea
188	வெளுப்பு நோய்/பாண்டு	Veḷuppu Nōy/Pāṇḍu	Anaemia
189	வெளுப்பு நோய்கள்	Veḷuppu Nōykaḷ	Anaemia
190	வெண் குட்டம்	Veṇ Kuḍḍam	Leucoderma
191	வெண் படை	Veṇ Paḍai	Leucoderma
192	வெண் புள்ளி	Veṇ Puḷḷi	Vitiligo
193	வெப்பு நோய்	Veppu Nōy	Fever
194	வெறி நோய்	Veṟi Nōy	Mental illness/Delirium/Organic br
195	வெட்டை	Veḍḍai	Venereal diseases
196	விக்கல்	Vikkal	Hiccup
197	வீக்கம்	Vīkkam	Oedema /Swelling
198	விந்துக்குறைவு	Vintukkuṟaivu	Oligospermia
199	விடம்	Viḍam	Poison
200	வியர்வையோடுகூடிய முறைச்சுரம்	Viyarvaiyōḍukūḍiya Muṟaiccuram	Malarial encephalitic fever

APPENDIX-9

ENGLISH EQUIVALENTS OF CEYKAI (THERAPEUTIC ACTIONS)

S.No	செய்கைகள்	Diacritic	Actions
1	அகட்டுவாய்வகற்றி	Akaḍḍuvāyvakaṟṟi	Carminative
2	அழலகற்றி	Aẕalakaṟṟi	Anti biliousness
3	அமைதியூட்டி	Amaitiyūḍḍi	Tranquillizer
4	ஆண்மைபெருக்கி	Āṇmaiperukki	Virility enhancer
5	செரிப்புண்டாக்கி	Cerippuṇḍākki	Digestive
6	சிறுநீர்பெருக்கி	Ciṟunīrperukki	Diuretic
7	சிறுநீர் குறைபடபெருக்கி	Ciṟunīr Kuṟaipaḍaperukki	Mild diuretic
8	இசிவகற்றி	Icivakaṟṟi	Anti-spasmodic
9	ஈரல் தேற்றி	Īral Tēṟṟi	Hepato tonic
10	கழிச்சலடக்கி	Kaẕiccalaḍakki	Anti diarrhoel
11	காயகற்பமாக்கி	Kāyakaṟpamākki	Rejuvenator
12	காமம்பெருக்கி	Kāmamperukki	Aphrodisiac
13	காரலுண்டாக்கி	Kāraluṇḍākki	Acrid
14	கற்கரைச்சி	Kaṟkaraicci	Stone dissolver
15	கோழையகற்றி	Kōẕaiyakaṟṟi	Expectorant
16	குளிர்ச்சியுண்டாக்கி	Kuḷircciyuṇḍākki	Coolant
17	குடற்புழுவகற்றி	Kuḍaṟpuẕuvakaṟṟi	Vermifuge
18	குடற்புரட்டி	Kuḍaṟpuraḍḍi	Gastro-intestinal irritant
19	மலமிளக்கி	Malamiḷakki	Laxative
20	மலம்நீராக்கி	Malamnīrākki	Purgative
21	மணமூட்டி	Maṇamūḍḍi	Aromatic
22	மேகப்பிணிவிலக்கி	Mēkappiṇivilakki	Anti-syphilitic
23	முறைவெப்பகற்றி	Muṟaiveppakaṟṟi	Periodic febrifuge
24	மூர்ச்சையுண்டாக்கி	Mūrccaiyuṇḍākki	Narcotic
25	நச்சகற்றி	Naccakaṟṟi	Antidote
26	நமைச்சலுண்டாக்கி	Namaiccaluṇḍākki	Pruritic
27	நரம்பு உரமாக்கி	Narampu Uramākki	Nervine tonic
28	நீரிழிவு போக்கி	Nīriẕivu Pōkki	Anti-diabetic
29	நீர்மலம்போக்கி	Nīrmalampōkki	Hydrogogue
30	நுண்புழுக்கொல்லி	Nuṇpuẕukkolli	Germicide

31	பசித்தீதூண்டி	Pacittīt̤ūṇ̣di	Appetiser
32	பாற்பெருக்கி	Pā̲rperukki	Lactogogue
33	பெருங்கழிச்சலுண்டாக்கி	Peruṅkaz̲iccaluṇ̣d̤ākki	Strong purgative
34	பெருவலியுண்டாக்கி	Peruvaliyuṇ̣d̤ākki	Parturient
35	பித்தமகற்றி	Pittamaka̲r̲i	Antibilious
36	புழுவகற்றி	Puz̲uvaka̲r̲i	Anthelmintic
37	புழுக்கொல்லி	Puz̲ukkolli	Anthelmintic
38	ருதுவுண்டாக்கி	Rutuvuṇ̣d̤ākki	Menarche inducer
39	தமரக வெப்பமுண்டாக்கி	Tamaraka Veppamuṇ̣d̤ākki	Cardiac stimulant
40	தடிப்புண்டாக்கி	Taḍippuṇ̣d̤ākki	Urticariant
41	தாதுவெப்பகற்றி	Tātuveppaka̲r̲i	Sedative
42	தூக்குணிப்புழுக்கொல்லி	Tūkkuṇippuz̲ukkolli	Parasiticide
43	துவர்ப்பி	Tuvarppi	Astringent
44	துயரடக்கி	Tuyaraḍakki	Anti depressant
45	துயிலாக்கி	Tuyilākki	Narcotic
46	தூய்மையாக்கி	Tūymaiyākki	Purifier
47	உள்ளழலாற்றி	Ul̤laz̲alā̲r̲i	Demulcent
48	உமிழ்நீர்பெருக்கி	Umiz̲nīrperukki	Sialogogue
49	உறக்கமெழுப்பி	U̲rakkame̲z̲uppi	Awakening consciousness
50	உறக்கமுண்டாக்கி	U̲rakkamuṇ̣d̤ākki	Hypnotic
51	உரமாக்கி	Uramākki	Tonic
52	உடல்வெப்பகற்றி	Uḍalveppaka̲r̲i	Febrifuge
53	உடலுரமாக்கி	Uḍaluramākki	Nutrient
54	உடற்தேற்றி	Uḍa̲r̲tē̲r̲i	Restorative
55	வாந்தியுண்டாக்கி	Vāntiyuṇ̣d̤ākki	Emetic
56	வறட்சியகற்றி	Va̲r̲aḍciyaka̲r̲i	Emollient
57	வாதமடக்கி	Vātamaḍakki	Anti-vata
58	வெப்பகற்றி	Veppaka̲r̲i	Febrifuge
59	வெப்பமுண்டாக்கி	Veppamuṇ̣d̤ākki	Heat enhancer
60	வீக்கமுருக்கி	Vīkkamurukki	Swelling resolver
61	வீக்கங்கரைச்சி	Vīkkaṅkaraicci	Swelling resolver
62	வியர்வையுண்டாக்கி	Viyarvaiyuṇ̣d̤ākki	Diaphoretic

APPENDIX – 10

Properties and Actions

There are five simple pharmacological parameters to which the therapeutic actions of the drugs are ascribed. They are Cuvai (taste), Vīrium (potency), Guṇam or Taṉmai (quality or property), Pirivu (stage after digestive or metabolic changes) and Ceykai (specific actions of the drug).

Cuvai:

Six tastes have been recognised in Siddha system of medicine. They are Iṉippu, Puḷippu, Uppu, Kaippu, Kārppu and Tuvarppu and these tastes have direct bearing in producing the therapeutic efficacy on the human body. These tastes have been classified, based on the 5 elemental theory.

1.Iṉippu (Sweet)	-	Maṇ + Nīr (Earth) (Liquid)
2.Puḷippu (Sour)	-	Maṇ + Tī (Earth) (Fire)
3.Uppu (Salty)	-	Nīr + Tī (Liquid) (Fire)
4.Kaippu (Bitter)	-	Vaḷi + Viṇ (Air) (Ether)
5.Kārppu (Pungent)	-	Vaḷi + Tī (Air) (Fire)
6. Tuvarppu (Astringent)	-	Maṇ + Vaḷi (Earth) (Air)

Vīrium:

This is the potency of the active principle of a particular drug which produces the therapeutic efficacy. There are two types of vīrium namely veppam and taṭpam. Puḷippu, uppu, kārppu are veppavīrium and iṉippu, tuvarppu, kaippu are taṭpavīrium.

The veppavīrium is responsible for the activities like cleavage, conversion of energy, digestion, perspiration etc.The taṭpavīrium is responsible for the conservation of energy by promoting growth, stamina, protection and health promoting activities.

Guṉam:

It is the physical, physiological and the pharmacological properties of a particular drug. Twenty types of taṉmaikaḷ are described in the classical Siddha literature. Among them, following nine are the main taṉmaikaḷ, 1. Tiṇmai (Heavyness). 2. Taṉmai (Coldness), 3. Veppam (Heat), 4. Noymai (Fineness),

5. K̄ūrmai (Sharpness), 6.Vaṟaṭci (Dryness), 7. Meṉmai (Softness), 8. Vemmai (Hot), 9. Ilaku (Lightness), 10. Acaivu (Mobility), 11. Maṁ kal (Dimness).

Pirivu:

When any drug is consumed the taste first recognised will undergo a drastic change after the interactions with the gastric or salivary juice or after the metabolic changes. There are 3 varieties of pirivu, namely puḷippu, karppu, iṉippu which are responsible to promote the 3 humours i.e. *Vaḷi, Aḻal* and *Iyam* respectively. The saline and sweety taste fall under iṉippu pirivu inturn promote the iyyam humour. The astringent and bitter, undergo the metabolic changes and ultimately get classified into kārppu pirivu inturn promotes the aḷal humour. The pungent or sour taste is also recognised as the promoter of *vaḷi* humour.

Ceykai:

This term indicates the therapeutical actions of the herb/drug.