

# THE AYURVEDIC PHARMACOPOEIA OF INDIA

## PART- I VOLUME – V



**GOVERNMENT OF INDIA**  
**MINISTRY OF HEALTH AND FAMILY WELFARE**  
**DEPARTMENT OF AYUSH**

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## LEGAL NOTICES

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

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

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

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

## GENERAL NOTICES

**Title** - The title of the book is "Ayurvedic Pharmacopoeia of

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

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

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

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

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

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

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

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

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

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

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

The term "Foreign Matter" is used to designate any matter, which does not form part of the drug as defined in the monograph. Vegetable drugs used as such or in formulations, should be duly identified and authenticated and be free from insects, pests, fungi, micro-organisms, pesticides, and other animal matter including animal excreta, be within the permitted and specified limits for lead, arsenic and heavy metals, and show no abnormal odour, colour, sliminess, mould or other evidence of deterioration.

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

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

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

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

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

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

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

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

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

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

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

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

**Percentage of alcohol** - All statements of percentage of alcohol (C<sub>2</sub>H<sub>5</sub>OH) refer to percentage by volume at 15.56 °C.

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

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

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

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

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

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

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

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

The following table indicates the meaning of such terms :-

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

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

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

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

The abbreviations commonly employed are as follows:

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

### Abbreviations used for Languages

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

### ABBREVIATIONS FOR PARTS OF PLANTS

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



## 1. Amra Haridra (Rz)

### ĀMRA HARIDRĀ (Rhizome)

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

#### SYNONYMS

Sanskrit	:	Āmrādrakam, Āmragandha-haridrā
Assamese	:	--
Bengali	:	Aamaa Aadaa
English	:	Mango-ginger
Gujrati	:	Aambaa haldhar
Hindi	:	Aamaa-haldi, Amiyaa haldi
Kannada	:	Ambarasini, Huli Arsin
Kashmiri	:	--
Malayalam	:	Mangayinji
Marathi	:	Aambe halad, Ambaa halad
Oriya	:	--
Punjabi	:	Ambiya haladi
Tamil	:	Mankayyinji
Telugu	:	Mamidi Allamu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

T.S. of rhizome circular in outline; epidermal cells rectangular-oval; cuticle thick, long unicellular trichomes present, storied suberized cork cells interrupted by lysigenous oil glands; a wide cortex having irregularly scattered vascular bundles, each vascular bundle with a prominent fibrous sheath; inner limit of cortex marked by endodermis followed by pericycle; vascular bundles devoid of sheath, arranged in a ring; schizogenous canals and abundant oil cells with suberized walls found in cortex and in

central region; most of the parenchymatous cells filled with starch grains, which are oval-ellipsoidal, sometimes polygonal in shape, 10 to 60  $\mu$  m, simple, hilum circular or a 2 to 5 rayed cleft, lamellae distinct and concentric; vascular bundles in the central cylinder are similar to those in the cortex, scattered, closed, collateral, surrounded by sheath of thick walled cells; secondary wall thickening reticulate; fibres thin walled lignified, lumen narrow.

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

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	12	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	9	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	14	per cent, Appendix	2.2.7.
Starch	Not less than	16	per cent, Appendix	2.2.13
Essential oil	Not less than	1	per cent, Appendix	2.2.10

### T.L.C.

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

**CONSTITUENTS** - Volatile oil ( $\alpha$ -pinene,  $\delta$ -camphor),  $\alpha$ -curcumene, 1- $\beta$  curcumene, phytosterol.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta
<b>Guna</b>	:	Laghu, Sara
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpanī, Kaphahara, Pittahara, Ruciprada, Vṛṣya

**IMPORTANT FORMULATIONS** - Asthisandhānaka Lepa

**THERAPEUTIC USES** - Kaṇḍu, Vrana, Kāsa, Śvāsa, Hikkā, Jvara, Abhighātaja Śoṭha, Karṇaśula, Sannipāta

**DOSE** - 2- 4 g.

## 2. Anishuna (Fr)

### ANISŪNA (Fruit)

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

#### SYNONYMS

Sanskrit	:	Śvetapuṣpā
Assamese	:	--
Bengali	:	Muhuri
English	:	Anise
Gujrati	:	--
Hindi	:	Badiyan Rume, Sauph, Anisoon
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Anisuna Shopa
Oriya	:	--
Punjabi	:	--
Tamil	:	Shombu
Telugu	:	--
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

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

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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	15	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	30	per cent, Appendix	2.2.7.

### ASSAY

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

### T.L.C.

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

**CONSTITUENTS** - Volatile oil, fixed oils and protein.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Laghu, Tikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaphahara, Vātānulomaka, Rakṣoghna, Ārtavajanana

**IMPORTANT FORMULATIONS** - Brāhmī Vaṭī

**THERAPEUTIC USES** - Śūla, Ādhmāna, Kaphavikāra, Mūtraghāta, Bālagraha

**DOSE** - 1-3 g.

Q. S. for dhūpanārtha [fumigation].

### 3. Ankolaha (Lf)

#### AÑKOLAH (Leaf)

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

#### SYNONYMS

Sanskrit	:	Ankola, Ankoṭa, Deerghakeela, Nikochaka, Tāmraphala, Gupta Sneha
Assamese	:	--
Bengali	:	Akarkanta, Baghankura, Aankod, Angkura, Dhalakura
English	:	Sage-leaved Alangium
Gujrati	:	Ankol, Onkla
Hindi	:	Ankol, Ankora, Dhera
Kannada	:	Ankolimara, Ansaroli, Arinjil, Ankol
Kashmiri	:	--
Malayalam	:	Ankolam, Velittanti, Irinjil, Chemmaram
Marathi	:	Ankola
Oriya	:	Ankul, Baghonokhiya, Dolanku, Konkonolo
Punjabi	:	--
Tamil	:	Alangi, Ankolum, Atikoevam
Telugu	:	Ankolamu, Udagu, Urgan
Urdu	:	Ankola

#### DESCRIPTION

##### a) Macroscopic

Leaves 8 to 13 cm in length and 3 to 5 cm in width, simple, petiolate, petiole 6 to 13 mm long, lanceolate, narrowly oblong or ovate, base rounded or acute, glabrous above, pubescent on the nerves, venation reticulate.

##### b) Microscopic

###### Leaf -

*Petiole* - Epidermis single layered, covered by cuticle; nonglandular, mostly unicellular, rarely bicellular, uniseriate trichomes, measuring upto 280 µ in length and upto 16 µ in width; 7 to 10 layered collenchyma present just beneath the epidermis, followed by parenchymatous tissue; collateral vascular bundles 3 to 10 in number arranged in an arch and surrounding parenchymatous pith; vascular bundles composed of xylem and phloem; xylem consists of fibres, tracheids and xylem parenchyma; abundant rosette crystals of

calcium oxalate present in the parenchyma tissue, measuring upto 45  $\mu$  in diam.; granulated pigments noticed in all tissues except in the vascular bundle.

*Midrib* - T.S. shows biconvex outline; epidermis on both surfaces covered by cuticle; abundant nonglandular, unicellular trichomes measuring upto 385  $\mu$  in length and upto 16  $\mu$  in width present on epidermis; 4 or 5 layered collenchyma situated just beneath the epidermis; collenchyma followed by 3 or 4 layered chlorenchyma; vascular bundle surrounded by sclerenchymatous tissue except on lateral sides; phloem located on the outer peripheral parts of xylem; xylem mainly consists of tracheids, vessels and fibres; central part of the midrib occupied by parenchyma cells, containing rosettes of calcium oxalate crystals, measuring upto 20  $\mu$  in diam.

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

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

## **IDENTITY, PURITY AND STRENGTH**

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

## **ASSAY -**

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

Soxlet extract coarsely crushed (25g) dried leaves of *A. salviifolium* with n-hexane (700 ml) for 15 hours. Leave the exhausted (defatted) plant material to dry at room temperature and then extract with methanol (500 ml) for 16 hours. Remove methanol under reduced pressure, acidify with 3 % acetic acid, wash with diethyl ether (3 x 100 ml) and make aqueous phase alkaline with 10 % aqueous sodium carbonate.

Extract the liberated (free) alkaloids first with dichloromethane (3 x 100 ml) and then with ethyl acetate (5 x 100 ml). Combine both the extracts, evaporate to dryness and weigh the residue as total alkaloids.

### T.L.C.

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

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

### PROPERTIES AND ACTION

**Rasa** : Kaṭu, Tikta, Kaṣāya  
**Guna** : Laghu, Sara, Snigdha, Ṭikṣṇa  
**Virya** : Uṣṇa  
**Vipaka** : Kaṭu  
**Karma** : Kaphahara, Vātahara, Vāmaka, Recaka, Vraṇaśodhaka, Mūtrala, Pārada Śodhra, Jvarghna

**IMPORTANT FORMULATIONS** - (No formulations)

**THERAPEUTIC USES** - Graha Bādhā, Jantuviṣa, Jvara, Kṛmi, Kukkuraviṣa, Lūtāviṣa, Raktavikāra, Sopha, Viṣrikāra, Visarpa, Matsyaviṣa, Amavāta, Kaṇtharoga, Sotha, Sūla, Muṣakaviṣa

**DOSE** - 2-10 g.

#### 4. Aragvadha (St.Bk)

### ĀRAGVĀDHA(Stem bark)

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

#### SYNONYMS

Sanskrit	:	Kṛtamāla, Vyādhigāta, Śampāka, Śamyāka, Nṛpadruma, Kṛtamālaka, Rājavarṅka.
Assamese	:	--
Bengali	:	Sondaalee, Sonaalu
English	:	Indian Laburnum, Purging Fistula, Pudding pipe tree
Gujrati	:	Garmaalo
Hindi	:	Amaltaas, Girimaal
Kannada	:	Kakke, Kakkemar
Kashmiri	:	--
Malayalam	:	Konna
Marathi	:	Baahvaa
Oriya	:	Sunaari
Punjabi	:	Amaltaas, Kaniyaar, Girdnalee
Tamil	:	Konnai
Telugu	:	Rela
Urdu	:	Amaltaas

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

Stem bark shows 5 to 8 layers of cork, composed of square to rectangular cells; cortex many layered, outer consisting of rectangular cells, middle tangentially elongated cells and inner of polygonal cells; groups of stone cells, oval to elongated arranged tangentially forming a continuous or discontinuous band; fibres present in groups in rest of the cortex; phloem shows sieve elements, phloem parenchyma and bast fibres in patches, traversed by uni to triseriate medullary rays of radially elongated oval cells;

phloem parenchyma of rectangular to polygonal thin walled cells; bast fibres moderately thick walled, lignified, in groups surrounded by crystal fibres; abundant isolated calcium oxalate prism crystals present also in cells of outer cortex and inner cortex; starch grains mostly simple, but a few with 2 or 3 components in phloem parenchyma.

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

### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	2	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	25	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	18	per cent, Appendix	2.2.7.

### **T.L.C.**

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

**CONSTITUENTS** - Anthraquinones, tannins, sterols.

### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Tikta
<b>Guna</b>	:	Guru
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Pittahara, Vātahara, Koṣṭhaśuddhikara

**IMPORTANT FORMULATIONS** - Avittoladi Bhasma Kṣāra, Mānasamitra Vaṭaka

**THERAPEUTIC USES** - Śūla, Aruci, Gulma, Jvara, Kṛmi, Raktapitta, Gaṇḍamālā, Upadaṃsa, Kuṣṭha, Vibandha, Kāmalā, Hṛdroga, Vātarakta, Śoṭha, Mūtrakṛcchra, Dāha, Udaravikāra, Prameha, Vraṇa, Kaṇḍu, Grahaṇī, Aśmarī.

**DOSE** - 50 - 100 ml kvātha.

## 5. Asphota (Rt)

### ĀSPHOTĀ (Root)

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

#### SYNONYMS

Sanskrit	:	Bhadravallī, Āsphoṭā
Assamese	:	--
Bengali	:	Haaparmaali
English	:	--
Gujrati	:	--
Hindi	:	Dudhibel
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	--
Oriya	:	Bonokonerinoi, Haporomoli
Punjabi	:	--
Tamil	:	--
Telugu	:	Nagamalle, Nityamalle
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

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

wood, occupying the major area of the root; odour slightly aromatic and irritant; taste, bitter.

### **b) Microscopic**

Cork many layered, outer one lignified, inner few layers suberised, cork cambium distinct 2 to 3 layered, cortex narrow in young root and compressed in old; parenchymatous, filled with cluster crystals of calcium oxalate and simple as well as compound starch grains; pericycle is characterised by the presence of isolated groups of small, thick walled, lignified fibres; phloem many layered, characterised by two distinct zones, cells of the outer one filled with yellowish brown contents, the inner narrow zone is devoid of this; medullary rays mostly uniseriate, rarely bi to fourseriate, narrow, almost running parallel to each other but becoming wavy in the outer phloem and abruptly getting broad at its extremities especially in case of old roots; sieve tubes, companion cells and phloem parenchyma distinct, all parenchymatous cells of the phloem including medullary ray cells are filled with abundant clusters and a few prisms of calcium oxalate crystals and starch grains, microclusters of calcium oxalates arranged in rows form the characteristic feature of the phloem; thick walled, circular latex cells, rectangular, tangentially elongated oil channels filled with oil globules traverse throughout the phloem; a few thick walled, lignified, pitted stone cells are located especially in the old roots; cambium distinct, continuous; xylem very wide, lignified consisting of mostly isolated xylem vessels and tracheids, both border - pitted; fibers thin walled; parenchyma and medullary rays pitted, containing starch grains.

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

### **IDENTITY, PURITY AND STRENGTH**

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

### **T.L.C.**

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

## CONSTITUENTS -

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Katu
<b>Karma</b>	:	Vātahara, Vraṇaśodhaka

### IMPORTANT FORMULATIONS - Vajraka Taila, Abhayā Lavaṇ

**THERAPEUTIC USES** - Śūla, Śvāsa, Kuṣṭha, Vraṇa, Aśmarī, Mūtrakrcchra, P  
ūtanāgrahavista (Bālaroga), Grahaṇī, Mūsaka Viṣavikāra,  
Arśa

**DOSE** - 3-6 g.

## 6. Bastantri (Rt.)

### BASTĀNTRĪ(Root)

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

#### SYNONYMS

Sanskrit	:	Vr̥ddhadāru, Antaha Koṭarapuṣpī, Chāgalāntrī
Assamese	:	--
Bengali	:	Bijataadaka, Bridhadarak
English	:	Elephant Creeper
Gujrati	:	Samudara Sosha, Varadhaaro, Shamadrasosh
Hindi	:	Samandar-kaa-paat, Samundarsosh, Ghaavapattaa, Vidhaaraa
Kannada	:	Samudrapala, Samudraballi
Kashmiri	:	--
Malayalam	:	Samudra Pacchha, Samudra-Pala, Marikkunn Marututari
Marathi	:	Samudrashok
Oriya	:	--
Punjabi	:	--
Tamil	:	Samudrappachai
Telugu	:	Samudrapaala
Urdu	:	Samandarotha

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

**Powder** - Creamish brown when fresh turning greyish brown on storage; shows under microscope, cortical cells parenchymatous filled with circular starch grain measuring between 3 to 16  $\mu$  in diameter; brown colouring matter and rosette crystals of calcium oxalate present; vessels, tracheids, xylem parenchyma, fibres and fibre tracheids present; vessels, drum shaped, pitted with large end perforations; tracheids, much longer than wide with bordered pits; fibres having pointed ends; fibre tracheids, having blunt ends and a few oblique pits.

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Sara
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Balya, Adhobhāgahara, Agnikara, Asthisandhāna Kārī, Āyurv ṛdhikara, Kāntikara, Kaṇṭhya, Kaphavātahara, Medhya, Rasāyana, Rucya, Svarya, Vṛṣya, Viṣaghna.

**IMPORTANT FORMULATIONS** - Miśraka Sneha

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

**DOSE** - 3-5 g.

## 7. Bhurjaha (St.Bk)

### BHURJAH (Stem Bark)

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

#### SYNONYMS

Sanskrit	:	Bhurja Patrah, Mṛducchada, Bahulavalkala, Bhūrjagranathi, Carmī,
Lekhyapatrakah		
Assamese	:	--
Bengali	:	Bhoojpatra, Bhujipatra
English	:	Himalayan Silver Birch
Gujrati	:	Bhojpatra
Hindi	:	Bhojapatra
Kannada	:	--
Kashmiri	:	--
Malayalam	:	Bhurjamaram
Marathi	:	Bhoorjapatra
Oriya	:	--
Punjabi	:	--
Tamil	:	Bhojapatram
Telugu	:	Bhurjapatri
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

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

## IDENTITY, PURITY AND STRENGTH

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

## T.L.C.

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

**CONSTITUENTS** - Betulin, lupeol and 3  $\beta$  - acetoxy - 12 - oleanen - 28 - oic acid.

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Kaṣāya
<b>Guna</b>	:	Laghu
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Tridoṣaśamana, Bhūtaraksākara, Viṣaghna, Balya, Śleṣmahara, Medohara

**IMPORTANT FORMULATIONS** - Ayaskrti

**THERAPEUTIC USES** - Bālagraha, Raktapitta, Vraṇa, Karṇaroga, Kuṣṭharoga, Rakṣoghnadhūpana, Aparāpātana, Garbhasaṅga, Granthivisarpa

**DOSE** - 1-3 g.

## 8. Canda (Rt)

### CANḌĀ (Root)

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

#### SYNONYMS

Sanskrit	:	Laghu Coraka
Assamese	:	--
Bengali	:	--
English	:	--
Gujrati	:	--
Hindi	:	Choraka bheda, Dudhachoraa
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	--
Oriya	:	--
Punjabi	:	--
Tamil	:	--
Telugu	:	--
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

brown substances present in this zone; cambium very distinct consisting of 4 to 8 layers; xylem consists of vessels and tracheids.

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

### **IDENTITY, PURITY AND STRENGTH**

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

### **T.L.C.**

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

**CONSTITUENTS** - Containing limonene,  $\alpha$ -phellandrene, pinene, p-cymene, terpinolene, myrcene, fenchone, linalool,  $\alpha$ -terpineol, cadinene, borneol,  $\alpha$ -caryophyllene, bisabolol, angelica lactone, and other mono and sesquiterpenes. Other constituents include selimone, archangelin, oxypeucedanin.

### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Kaṭu
<b>Guna</b>	:	Laghu, Tikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaphahara, Mūtrala, Vātahara, Viṣaghna, Śvāsahara, Varnāprasādaka, Svedaghna, Kaṇḍūghna, Daurgandhahara

**IMPORTANT FORMULATIONS** - Mañjishthādi Taila

**THERAPEUTIC USES** - Apasmāra, Śvāsa, Hikkā, Kaṇḍu, Arsa, Pidakā, Koṭha, Śoṭha

**DOSE** - 1-3 g.

## 9. Corakaha(Rt & Rt.Stock)

### CORAKAH (Root Sock)

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

#### SYNONYMS

Sanskrit	:	Taskarah, Ksemakah
Assamese	:	--
Bengali	:	Chorak
English	:	--
Gujrati	:	Chorak
Hindi	:	Choraa, Gandrayan, Rikha Choraa
Kannada	:	Choraka
Kashmiri	:	--
Malayalam	:	Choraka Pullu
Marathi	:	Corak
Oriya	:	--
Punjabi	:	Choraa, Churaa
Tamil	:	--
Telugu	:	Gaddi Davanam
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

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

## b) Microscopic

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

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

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

## IDENTITY, PURITY AND STRENGTH

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

**T.L.C.**

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

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

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

**PROPERTIES AND ACTION**

**Rasa** : Madhura, Kaṭu, Tikta  
**Guna** : Laghu, Rukṣa, Tikṣṇa  
**Virya** : Uṣṇa  
**Vipaka** : Kaṭu  
**Karma** : Kaphahara, Medohara, Vāmaka, Vātahara, Svedahara, Hṛdya, Sajñasthāpana, Dīpana, Pācana, Vranaprasādana

**IMPORTANT FORMULATIONS** - Gudūcyādi Modaka, Balāsvagandhalākṣādi Taila, Mahānārāyaṇa Taila.

**THERAPEUTIC USES** - Apasmāra, Śvāsa, Hikkā, Jvara, Kaṇḍu, Koṭha, Kuṣṭha, Unmāda, Vraṇa, Piṭikā, Viṣaroga, Raktadoṣa, Agnimāndya, Śirah Śūla, Pratiśyāya, Śītajvara, Bālaroga

**DOSE** - 3-6 g.

## 10. Darbha (Rt)

### DARBHA (Root)

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

#### SYNONYMS

Sanskrit	:	Yajñmūla, Ulu, Kutuka, Kharadarbha, Śvētadarbha
Assamese	:	--
Bengali	:	Ulu
English	:	Thatch grass, Cogon grass
Gujrati	:	Daabhdo, Darabh
Hindi	:	Daabha, Siru, Ulu
Kannada	:	Sanna dabbac hullu
Kashmiri	:	--
Malayalam	:	Vidulam
Marathi	:	Darsnaa, Dhub
Oriya	:	--
Punjabi	:	Daaba, Sil
Tamil	:	Darbhaipul, Nanal
Telugu	:	Darbalu, Darbha gaddi, Modewa gaddi
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

pith consisting of thin walled parenchymatous cells; the vessels are border pitted; tracheids exhibit bordered pits as well as reticulate thickening; parenchyma of vascular region are pitted and fibres are thick walled with pointed to tapering ends.

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

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Kaṣāya
<b>Guna</b>	:	Laghu, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Rasāyana, Vāmaka, Tridaṣahara, Mūtravirecanīya, Stanyajanana, Pipāsāhara, Kuṣthagha, Dāhpraśamana,

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

**THERAPEUTIC USES** - Aśmarī, Dāha, Jvara, Mūtraghāta, Mūtrakṛcchra, Raktapitta, Visarpa, Bastīśūla, Tṛṣā, Raktapradara, Raktārsa, Pradara, Pittabhiṣyanda

**DOSE** - 10-20 g for decoction.

## 11. Dhanvayasah (Wh/Pl)

### DHANVAYĀSAH (Whole Plant)

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

#### SYNONYMS

Sanskrit	:	Duhsparśā, Durālabhā, Dhanvyāsakah, Virupā, Durālabhā, Uṣṭrabhakṣyā
Assamese	:	--
Bengali	:	Duralabha
English	:	Khorasan thorn
Gujrati	:	Dhamaaso
Hindi	:	Damahan, Dhamaasa, Hinguaa, Dhanhare
Kannada	:	--
Kashmiri	:	--
Malayalam	:	Kodittuva
Marathi	:	Dhamaasaa
Oriya	:	--
Punjabi	:	Dama, Dhamah, Dhamaha
Tamil	:	Tulganari
Telugu	:	Chittigava, Gilaregati
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

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

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

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

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

#### **b) Microscopic**

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

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

**Leaf** - Isobilateral; single layered epidermis consisting of mostly tangentially elongated cells covered with thick cuticle. In surface view both upper and lower epidermii show anomocytic type of stomata, epidermal cells polygonal in shape; 2 or 3 layered palisade cells present on both the sides, adjacent to the epidermis; vascular bundles show xylem towards lower side and phloem towards upper side; sclerenchyma tissue occur as a bundle cap just above the phloem; small lateral vascular bundles also present in lamina; vein-islet number 11 to 14; stomatal index 16 to 17 on lower epidermis and 5 to 7 on upper epidermis; palisade ratio 2 or 3 on upper epidermis and 2 to 4 on lower epidermis.

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

## IDENTITY, PURITY AND STRENGTH

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

## T.L.C.

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

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

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Sara
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Kaphahara, Medohara, Pittahara, Vātahara

**IMPORTANT FORMULATIONS** - Durālabhādi Kvātha, Durālabhādi Kaṣāya, Rāsnādi Kvātha Cūrṇa (Mahā), Tiktaka Ghṛta, Usīrāsava, Kaṇṭakaryāvāleha, Mahāpancagavya Ghṛta, Daśam ūlāriṣṭa, Punarnavāsava

**THERAPEUTIC USES** - Dāha, Grahaṇī, Gulma, Jvara, Kāsa, Kuṣṭha, Prameha, Raktapitta, Vātarakta, Visarpa, Atisāra, Viṣamajvara, Tṛṣṇā, Moha, Murcchā, Madaroga, Raktavikāra, Bharama, Chrdi, Mūtrghata.

**DOSE** - 5-10 g powder,  
40-80 ml phāṇṭa.

## 12. Dravanti (Sd)

### DRAVANTĪ(Seed)

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

#### SYNONYMS

Sanskrit	:	Bṛhaddantī, Vyāghrairaṇḍa, Putraśreṇī
Assamese	:	--
Bengali	:	--
English	:	Purging nut
Gujrati	:	Ratanjota
Hindi	:	Laal Bagharend, Jangali erandi
Kannada	:	Erandane danti, Totla
Kashmiri	:	--
Malayalam	:	Katalaavanakku
Marathi	:	Thoradanti, Mogali eranda
Oriya	:	--
Punjabi	:	--
Tamil	:	Kattamanakku, Adalai
Telugu	:	Adavi Amadam, Vatti amudamu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

diameter, simple, hilum circular or indistinct, crescent shaped leucoplast at one side of the grains, lamellae indistinct.

**Powder** - Powder of seeds creamish-brown, mucilagenous in taste without any odour, shows the presence of parenchymatous patches; cells filled with starch, spherical to oval, 5 to 20  $\mu$ m in diameter, simple, hilum circular or indistinct; lamellae indistinct; sclereids upto 160  $\mu$  long and 30  $\mu$  broad, oil globules, laticifers, vessels, elongated thick walled palisade cell, malpighian cells, and aleurone grains are observed; the powder when treated with 1N HCl on a microscope slide, becomes pink when observed in day light and pinkish red under UV light 254 nm.

### **IDENTITY, PURITY AND STRENGTH**

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

### **T.L.C.**

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

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

### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Kaṭu
<b>Guna</b>	:	Laghu, Snigdha, Ṭikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpana, Kaphahara, Pittahara, Recaka, Viṣaghna, Viḍabhedana

**IMPORTANT FORMULATIONS** - Misraka Sneha

**THERAPEUTIC USES** - Ānāha, Gulma, Hṛdroga, Jvara, Kaṇḍu, Prameha, Raktavikāra, Sotha, Tṛṣṇā, Udāvarta, Udara, Kuṣṭa, Pāṇḍu, Ajīrṇa, Sula, Grahaṇīroga, Garaviṣa, Bhagandara, Āmavāta, Pakṣāghāta, Urustambha, Granthī, Pārsvsula, Plīhāroga, Duṣṭavraṇa, Duṣṭaapaci

**DOSE** - 250 - 500 mg after purification.

### 13. Dugdhika (Wh.Pl)

#### DUGDHIKĀ (Whole Plant)

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

#### SYNONYMS

Sanskrit	:	Svāduparṇi, Kṣīrinī, Laghudugdhikā, Nāgārjuni, Gorakṣadugdhī
Assamese	:	--
Bengali	:	Bara, Kharui, Kerai, Dudiya, Shwet Keruee
English	:	--
Gujrati	:	Raati Dudhelee, Naagalaa dudhelee
Hindi	:	Dudhi, Duddhi, Dudhdee, Chhotidudhi
Kannada	:	Kempu nene hakki
Kashmiri	:	--
Malayalam	:	Nilappal
Marathi	:	Lahaan naaytee, Naayeti, Lahaandudhi
Oriya	:	--
Punjabi	:	Dodhak, Hajardana, Baradodk, Hazardana
Tamil	:	Sittirappaladi, Sittirappaladi
Telugu	:	Peddivari manubaala
Urdu	:	Dudhi

#### DESCRIPTION

##### a) Macroscopic

Branched prostrate with many stems spreading from the roots, slender upto 20 cm long; leaves green but occasionally purplish red, opposite, 2.5 to 5 mm long and 2 to 4 mm broad, oblong or subquadrate, tip mucronate, base symmetric and more or less cordate, margin serrulate in upper portion, glabrous above, slightly pubescent beneath especially on the apex; petiole short, 1 mm or even less in length; tap root 1 to 3 mm in diameter; inflorescence cyathium in short axillary racemiform clusters, involucre lobes 5, deltoid ovate, ciliate; nectary gland 4, minute; ovary tricarpeal, suborbicular, stipitate, narrowly limbed long styles; stigma three branched, each bifid; capsule 1 to 1.5 mm long, densely hairy on ridges, hairs occasionally present on the surface; fruit subglobose trigamous, long stalked; seeds 0.6 to 0.8 mm long, oblong, 4 angled, smooth with 5 to 7 transverse ribs, reddish brown and bluntly pointed; smell oily; no characteristic taste.

## **b) Microscopic**

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

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

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

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

## **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	11	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	0.2	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	27	per cent, Appendix	2.2.7.

## T.L.C.

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

**CONSTITUENTS** - Glucoside, Galactoside,  $\beta$ -sitosterol, Campesterol, Stigmasterol, Cholesterol.

## PROPERTIES AND ACTION

**Rasa** : Madhura, Lavana, Kaṭu, Tikta  
**Guna** : Guru, Rukṣa, Ṭikṣṇa  
**Virya** : Uṣṇa  
**Vipaka** : Kaṭu  
**Karma** : Kaphahara, Mūtrala, Vṛṣya, Garbhakāraka, Viṣṭambhinī, Grāhī, Malastambhaka, Dhātuvṛddhikara, Hṛdya.

**IMPORTANT FORMULATIONS** - Gaganasundara Rasa

**THERAPEUTIC USES** - Śvāsa, Kṛmi, Kuṣṭa, Prameha, Raktapitta, Pravāhikā, Raktārśa, Palita, Danta-ghuna, Dadru, Sphoṭa

**DOSE** - 5-10 g.

#### 14. Elavalukam (Sd)

### ELAVĀLUKAM (Seed)

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

#### SYNONYMS

Sanskrit	:	Aileyah, Elavālūh, Elukākhyah
Assamese	:	--
Bengali	:	Elavaaluka
English	:	Sweet Cherry
Gujrati	:	--
Hindi	:	Aaluvaalu, Gilaas, Krusabala
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	--
Oriya	:	--
Punjabi	:	Aaluvaalu
Tamil	:	--
Telugu	:	Jeevakamu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

of cotyledon which are angular, thick walled, completely filled with protein granules and oil globules; provasculature can be seen in the cotyledon.

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

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 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 14 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 16 per cent, Appendix	2.2.7.

### T.L.C.

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

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaphahara, Viṣaghna., Yonidoṣahara, Varṇya, Stambhana, Śukraśodhaka, Vedanāsthāpana

**IMPORTANT FORMULATIONS** - Aśvagandhā Taila

**THERAPEUTIC USES** - Arśa, Aruci, Dāha, Jvara, Kāsa, Kaṇḍu, Kuṣṭha, Pāṇḍu, Raktapitta, Tṛṣṇā, Unmāda, Vraṇa, Chardi, Hrdroga, Kṛniroga, Mukharoga, Medroga

**DOSE** - 3 - 6 g.

## 15. Gandira (Rt)

### GAṆḌĪRA (Root)

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

#### SYNONYMS

Sanskrit	:	Gaṇḍīra (Sthalaja)
Assamese	:	--
Bengali	:	--
English	:	--
Gujrati	:	Garmar, Garmal
Hindi	:	Garmar
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	--
Oriya	:	--
Punjabi	:	--
Tamil	:	--
Telugu	:	Jeevakamu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

T.S. of root is irregular in outline, epidermal cells not discernible due to secondary growth; outermost multilayered storied cork of rectangular cork cells, below which is 1 or 2 layered cork cambium, followed by rectangular parenchymatous secondary cortical region in which oval stone cells with narrow lumen and walls with radiating canals and containing rhomboidal calcium-oxalate crystals present; vascular cambium in the form of continuous ring; phloem consists of sieve tubes, companion cells and phloem parenchyma; medullary rays well developed, radiating, varying in size, heterogenous as seen in tangential section; thin walled; in young root these are very broad as compared to the older ones; xylem represented by diffuse porous vessels,

mostly solitary; xylem parenchyma surrounding the tracheids and vessels, filled with starch grains of 20 to 60  $\mu$  m in diameter, hilum distinct, star-shaped central cleft, lamellae occasionally observed; xylem parenchyma well developed in the young root, however in the older one fibres abundant; central zone comprises of compactly arranged vessels, fibres and fibre tracheids, oil cells with oil globules present in cortical phloem and xylem regions.

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

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

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

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Rukṣa, Sara, Tikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaphahara, Vātahara, Tridoṣahara, Vraṇaśodhana, Vidāhī

## IMPORTANT FORMULATIONS - Kṛmighna Kaṣāya Cūrṇa

**THERAPEUTIC USES** - Śūla, Śoṭha, Arśa, Gulma, Kāsa, Kṛmi, Kuṣṭha, Udara, Duṣṭa Vraṇa, Hutaviṣa, Pliihāroga, Mandāgni, Mūtrabandha, Malabandha

**DOSE** - 3-5 g.

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

## 16. Gavedhuka (Rt)

### GAVEDHUKA (Root)

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

#### SYNONYMS

Sanskrit	:	Gavedhu, Gavedhuka
Assamese	:	--
Bengali	:	Gadagad, Dedhaan, Devaan
English	:	Adlay, Jobs tears
Gujrati	:	Kasai
Hindi	:	Kasai, Garheduaa, Garahedu, Gargari
Kannada	:	Manjutti
Kashmiri	:	--
Malayalam	:	Kaatugotampu, Kaakkappalunku
Marathi	:	Kasai
Oriya	:	--
Punjabi	:	--
Tamil	:	Kaattukuntumani
Telugu	:	Adaviguruginja
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

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

### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	2	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	10	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	10	per cent, Appendix	2.2.7.

### **T.L.C.**

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

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

### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Madhura, Kaṭu
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaphahara, Mūtrala, Pittahara, Kārśniya

**IMPORTANT FORMULATIONS** - Viṣṇu Taila

**THERAPEUTIC USES** - Mūtrakrcchra, Netra-Masūrikā, Pittaja Chardi, Sthaulya

**DOSE** - 3-6 g.

## 17. Ghonta (Fr)

### GHOṆṬĀ (Fruit)

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

#### SYNONYMS

Sanskrit	:	Ghoṇṭī, Goṭikā
Assamese	:	--
Bengali	:	Kulphal
English	:	Jujab
Gujrati	:	Gatbadar, Gatabordi
Hindi	:	Ghunṭa, Kakora, Kaathabera
Kannada	:	Yeranu
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Ghoti, Bhorghoti
Oriya	:	--
Punjabi	:	--
Tamil	:	Kottai, Mulkottai
Telugu	:	Gotti, Got, Gotiki
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

A transverse section of the fruit reveals a thick cuticle followed by epidermis consisting of unevenly arranged rounded cells; scattered thick-walled, uniseriate, multicellular trichomes present on epidermis; mesocarp with three zones - narrow outer and inner zones of small, compactly arranged parenchyma cells; a third wide middle spongy zone composed of thin walled parenchyma cells, lacunated and containing

scattered vascular strands; endocarp consisting of thick walled stone cells, narrow fibres and a few lacunae, some stone cells containing prismatic crystals of calcium oxalate up to 12  $\mu$  in size; occasional inroads of mesocarp into the endocarp also seen; epidermis and a few outer layers of mesocarp adjacent to it contain abundant brown substances.

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

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

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

#### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	12	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	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 silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (95:5) as mobile phase shows on spraying with methanolic: sulphuric acid reagent and on heating the plate for ten minutes at 110°C spots at Rf. 0.24 (Pink), 0.39 (Pinkish orange), 0.48 (Yellow), 0.61 (Pink), 0.71 (Blue).

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

#### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Madhura, Kaṭu, Kaṣāya
<b>Guna</b>	:	Laghu
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Viśaghna, Vātakaphahara

**IMPORTANT FORMULATIONS** - Āragvadhādi Kvātha Cūrāṇa

**THERAPEUTIC USES** - Duṣṭavrāṇa, Jvara, Kaṇḍu, Kuṣṭha, Prameha, Raktavikāra, Vraṇa, Śvayathu, Nāḍīvrāṇa, Vamana

**DOSE** - 3-6 g.

## 18. Gundrah (Rz.&Rt)

### GUNDRĀH (Rhizome and Fruit)

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

#### SYNONYMS

Sanskrit	:	Guṇṭhah, Gunṭhah
Assamese	:	--
Bengali	:	Hogalap
English	:	Lesser Indian Reed-mace
Gujrati	:	Ghaabaajariyu
Hindi	:	Pater, Gondpater
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Ramban, Paankanis
Oriya	:	--
Punjabi	:	Gundra
Tamil	:	--
Telugu	:	Jammugaddi, Enugajamu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

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

##### b) Microscopic

**Rhizome** - T.S. shows circular outline; single layered epidermis consisting of tangentially elongated cells, covered with thin cuticle; cortex divided into two parts - outer cortex comprising of 7 to 11 layers of thin walled parenchymatous cells, oval to polygonal in shape, having intercellular spaces; patches consisting of 10 to 35 fibres distributed in the entire outer cortex; fibres thick walled with tapering tips, varying in

length from 160 to 930  $\mu$  and in width from 10 to 30  $\mu$ ; inner cortex consisting of aerenchyma; endodermis single layered; vascular bundles 35 to 42 in number, collateral, conjoint, vessels prominent; pith consisting of thin walled parenchymatous cells with intercellular spaces; starch grains in pith region, single or compound, spherical to oval and measuring from 5 to 25  $\mu$  in diam.; pith mucilagenous, as seen when mounted in Ruthenium red treated with a few drops of 10% lead acetate solution.

**Root** - T.S. shows epiblema followed by a 4 to 6 layered hypodermis of thin walled cells and a broad cortex consisting of radially elongated air spaces separated by trabeculae; a few layers of cells forming the innermost layer of cortex, in contact with endodermis; vascular bundles with xylem vessels forming a circle; fibres thick walled with tapering tips, varying in length from 260 to 1480  $\mu$  and in width from 10 to 24  $\mu$ .

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

#### **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	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.

#### **T.L.C.**

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

**CONSTITUENTS** - Flavonoids (Quercetin, isorhamnetin-3-O-rutinoside); sterols ( $\beta$ -sitosterol, lanosterol, cholesterol).

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Kaṣāya
<b>Guna</b>	:	Guru
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Mūtravirecanīya, Śukraśodhaka, Stanyajanana, Vātahara, Pittasaṃśamana, Stanyaśodhaka, Rajośodhaka, Mūtraśodhaka

**IMPORTANT FORMULATIONS** - Mūtravirecanīya Kaṣāya Cūrṇa, Stanyajanana Kaṣāya Cūrṇa

**THERAPEUTIC USES** - Aśmarī, Mūtrakṛcchra, Raktapitta, Śarkarā, Mūtrāghāta, Stanya Kṣaya

**DOSE** - 3-6 g.

## 19. Himsra (Rt)

### HIMSRĀ(Root)

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

#### SYNONYMS

Sanskrit	:	Ahimsrā, Kanthārī, Tīkṣṇa, Kanṭakā Tikṣṇagandhā
Assamese	:	--
Bengali	:	--
English	:	Ceper Plant
Gujrati	:	Kabaree
Hindi	:	Kabara, Hainsaa, Kanthara
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Kabar
Oriya	:	--
Punjabi	:	Barar, Kaur
Tamil	:	--
Telugu	:	Jeevakamu
Urdu	:	Kabar

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

rays of thin walled, mostly uniseriate, rectangular cells, often having granular contents; pith absent.

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

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpanī, Kaphahara, Vātahara, Rucya.

**IMPORTANT FORMULATIONS** - Amṛatādi Taila, Kutikhadi Vatika, Himśrādyā Ghr̥ta

**THERAPEUTIC USES** - Arśa, Gulma, Kāsa, Vātarakta, Vraṇa, Vātavikāra, Svāsa, Galagaṇḍa, Āmavāta, Gṛdhrasī, Raktagrān̥thi, Vātikayoniroga, Vātaśopha, Grān̥thi

**DOSE** - 1 - 3 g.

## 20. Hingupatri (Lf)

### HINGUPATRĪ (Leaf)

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

#### SYNONYMS

Sanskrit	:	Hinguparṇī, Hingupatrikā, Bāṣpikā
Assamese	:	--
Bengali	:	Hing, Desaj Hing
English	:	--
Gujrati	:	Hing, Hingro, Hinglavadharni, Hingupatri
Hindi	:	Hingupatri
Kannada	:	Doddahingina Balli
Kashmiri	:	--
Malayalam	:	Kayam, Penungayam, Perungkayam
Marathi	:	Hing Patree
Oriya	:	Hengu
Punjabi	:	Hinge, Hing
Tamil	:	Inguva, Perungayam
Telugu	:	Hingo Patramu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

above and phloem below; stomatal index 13 to 17; palisade ratio of 5 to 7 and vein-islet number 2 or 3.

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

#### **IDENTITY, PURITY AND STRENGTH**

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

#### **T.L.C.**

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

#### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Tikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Hṛdya, Pācana, Vātakaphahara, Rucikara

#### **IMPORTANT FORMULATIONS** - Kumāryāsava

**THERAPEUTIC USES** - Arśa, Bastiśūla, Hṛdroga, Kṛmi, Plīhāroga, Unmāda, Vibandha, Garbhñī, Gulmaroga, Apasnāra

**DOSE** - 3-6 g.

## 21. Itkata (Rt)

### ITKATA (Root)

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

#### SYNONYMS

Sanskrit	:	Utkāṭa, Vanajayantī
Assamese	:	--
Bengali	:	Dhanicha, Dhunsha
English	:	--
Gujrati	:	Sasee Ikad, Ikad
Hindi	:	Ikkada
Kannada	:	Mullu jinangi
Kashmiri	:	--
Malayalam	:	Kitamu
Marathi	:	Raanshevari, Chinchani
Oriya	:	Tentua
Punjabi	:	Jhanjhan
Tamil	:	Mudchembai, Nirchembai
Telugu	:	Ettejanga
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

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

### **IDENTITY, PURITY AND STRENGTH**

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

### **T.L.C.**

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

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

### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Guru, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Mūtravirecanīya, Pittahara, Stanyajanana, Vātahara

**IMPORTANT FORMULATIONS** - Mūtravirecanīya Cūrṇa, Stanyajanana, Kaṣāya Cūrṇa

**THERAPEUTIC USES** - Aśmarī, Śarkarā, Jvara, Kāsa, Mūtraghāta, Mūtrakṛcchra, Pratiśyāya, Netraroga, Pittāśmarī, Mūtraruḃjā

**DOSE** - 3-6 g.

## 22. Itkata (St)

### ITKAṬA(Stem)

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

#### SYNONYMS

Sanskrit	:	Utkāṭa, Vanajayantī
Assamese	:	--
Bengali	:	Dhanicha, Dhunsha
English	:	--
Gujrati	:	Ikad, Sasee Ikad
Hindi	:	Ikkada
Kannada	:	Mullu jinangi
Kashmiri	:	--
Malayalam	:	Kitamu
Marathi	:	Chinchani, Raanshevari
Oriya	:	Tentua
Punjabi	:	Jhanjhan
Tamil	:	Mudchembai, Nirchembai
Telugu	:	Ettejanga
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

T.S. shows wavy outline, epidermal cells tabular with moderately thick cuticle; some containing granular substances; cortex 5 to 7 cells deep, composed of thin walled cells; some of those present below the epidermis contain tannins; endodermis present; pericycle composed of 3 to 6 cell layers of discontinuous patches of sclerenchymatous fibres about 20 to 33  $\mu$  in diam.; towards the inner side of the sclerenchymatous fibre patches, tannin filled ducts of different sizes present; phloem 3 to 6 cells deep; cambium 3 to 5 cells deep, made up of compressed thin walled cells; xylem forms a closed ring around the central pith, showing secondary growth; the number of primary xylem equal

to the ridges present on the outer surface of the stem; xylem vessels range from 24 to 82  $\mu$  in diam.; towards the inner side of the primary xylem, a cavity filled with tannins is present similar to that beneath the phloem; ray cells show starch grains; pith parenchymatous.

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

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Guru, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Pittahara, Vātahara, Śleṣmaprakopaka, Stanyajanana Mūtravirecanīya

**IMPORTANT FORMULATIONS** - Candanādi Taila (Caraka)

**THERAPEUTIC USES** - Aśmarī, Jvara, Kāsa, Mūtraghāta, Mūtrakṛcchra, Netraroga, Pittāśmarī, Pratiśyāya, Śrkarā, Mūtrarujā.

**DOSE** - 3-6 g.

### 23. Jalapippali (Wh.Pl)

### JALAPIPPALĪ (Whole Plant)

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

#### SYNONYMS

Sanskrit	:	Jalapippalikā, Toyavallari, Śaradī, Matsyādani, Matsyagandhā
Assamese	:	--
Bengali	:	Bukkana, Kaanchadaa
English	:	Purple Lippia
Gujrati	:	Rataveliyo
Hindi	:	Jalpipali, Panisigaa, Bhuiokaraa
Kannada	:	Nelahippali
Kashmiri	:	--
Malayalam	:	Nirtippali, Podutalai (Siddha)
Marathi	:	Jalpippali, Ratavel
Oriya	:	--
Punjabi	:	--
Tamil	:	Potuttali
Telugu	:	Bokkena
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

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

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

**Flower** - Sessile, densely packed in long pedunculate axillary spikes, mature ones 1.0 to 2.0 cm long and 0.4 to 0.5 cm broad, flowering densely becoming oblong during fruiting;

peduncles 2.5 to 7.5 cm long, bracts about 2.5 mm long, broadly elliptic or obovate, cuneate at base, mucronate, glabrous; calyx 2.0 mm long, membranous, bilobed, compressed, mitre-shaped, pubescent underneath with ordinary trichomes closely covering the fruit, the acuminate lobes projecting beyond it; corolla 2.5 to 3.0 mm long, white or light pink, bilipped, upper lip erect and bifid, lower lip 3 lobed of which the middle lobe largest, falling off as a calyptra when fruits ripens; stamens 4, didynamous, anthers 2-celled, dehiscent 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 plano-convex pyrenes; seeds exalbuminous about 1 mm in size.

#### **b) Microscopic**

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

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

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

**Powder:** Greenish-brown, fibrous, free flowing, characterized by the presence of glandular hairs, 2 armed trichomes which are usually attached to a epidermal cell from

the slightly protruded stalk present in the middle, trichomes warty, leaf epidermis characterized by the presence of circular trichome scars, vessels and palisade cells.

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

**CONSTITUENTS** - Flavonoids namely nodiflorin A and nodiflorin B, nodifloretin, lippiflorins A and B.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Rukṣa, Tikṣṇa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpanī, Hṛdya, Kaphahara, Pittahara, Rucya, Viṣaghna., Mūtral, Jvaraghna, Śukarala, Mukhaśodhanī, Cakṣuṣya, Sangrāhi

**IMPORTANT FORMULATIONS** - Akīka, Piṣṭī, Akīka Bhasma

**THERAPEUTIC USES** - Śvāsa, Dāha, Jvara, Kṛmi, Raktadoṣa, Tṛṣṇā, Visarpa, Vrana, Raktaroga, Bhrama, Mūrchā, Pittātisāra

**DOSE** - 2 to 3 g powder,  
1/2 to 2 ml juice.

## 24. Jivakaha (Pseudo bulb)

### JĪVAKAH (Pseudo Bulb)

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

#### SYNONYMS

Sanskrit	:	JĪvya, Dīrghāyu, CirajĪvī
Assamese	:	--
Bengali	:	--
English	:	Jeevak
Gujrati	:	--
Hindi	:	Jeevak
Kannada	:	--
Kashmiri	:	--
Malayalam	:	Jeevakam
Marathi	:	--
Oriya	:	--
Punjabi	:	--
Tamil	:	Jeevakam
Telugu	:	Jeevakamu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

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

##### b) Microscopic

T.S. of pseudo bulb oval to circular in outline; section passing through scaly leaves which exfoliate, showing a single layered, thick walled, sclerified epidermis

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

**Powder** - Yellowish-brown in colour, pleasant smell, slightly bitter and astringent in taste, shows groups of mesophyll cells with reticulate thickenings inside; vessels with spiral, scalariform and reticulate thickening; fibre tracheids of about 600  $\mu\text{m}$  long upto 80  $\mu\text{m}$  broad, and tracheids (about 19  $\mu\text{m}$  long and 40  $\mu\text{m}$  broad); groups of parenchyma with accicular crystals of calcium oxalate, sieve plates, sieve tubes and angular parenchymatous cells. Powder when treated with conc.  $\text{HNO}_3$  on microscopic slide emits light green fluorescence under UV 365 nm.

#### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	3	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	0.5	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.
Starch	Not less than	19	per cent, Appendix	2.2.13

#### **T.L.C.**

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

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

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Picchila, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Balya, Pittahara, Rasāyana, Vātahara, Dhātuvardhaka, Śukrala, Bramhaṇa, Snehopaga, Jīvanīya

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

**THERAPEUTIC USES** - Śvāsa, Dāha, Kāsa, Kṣaya, Raktapitta, Raktavikāra, Kārśya, Śoṣa

**DOSE** - 5-10 g.

## 25. Kadara (Ht. Wd)

### KADARAH(Heart Wood)

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

#### SYNONYMS

Sanskrit	:	Somavalkh, Śvetakhadirah
Assamese	:	--
Bengali	:	Shvet Khadir
English	:	White Cutch tree, White Catechu
Gujrati	:	Gorada, Gordio baaval
Hindi	:	Safed Khair
Kannada	:	Kandarah
Kashmiri	:	--
Malayalam	:	Venkarinnali, Somarayattoli
Marathi	:	Paandharaa Khair
Oriya	:	--
Punjabi	:	--
Tamil	:	Kovil, Shilaiyunchai
Telugu	:	Tellatumma, Tellasundra, Tellachandra
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

A tangential section shows heterocellular, multiseriate; medullary rays 5 to 7 times higher than the breadth; that is upto or over 50 cells vertically and about 10 to 12 cells across at their widest level; medullary rays are surrounded by crystal sheath with prismatic crystals; fibres are aseptate pitted; compactly arranged narrow squarish

lignified tracheids; vessels with simple bordered pits; xylem parenchyma contain prismatic crystal of calcium oxalate; gums and tannins.

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

### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	4	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	8	per cent, Appendix	2.2.7.

### **T.L.C.**

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

**CONSTITUENTS** - An alkaloid diaboline,  $\beta$ -sitosterol, stigmasterol, oleanolic acid and its 3 $\beta$ -acetate, a saponin containing oleanolic acid, galactose, mannose.

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta
<b>Guna</b>	:	Vaśada
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaphahara, Pittahara, Varṇya, Raktaśodhaka

## IMPORTANT FORMULATIONS - Ayaskṛti

**THERAPEUTIC USES** - Kaṇḍu, Kuṣṭha, Mukharoga, Pāṇḍu, Raktadoṣa, Vraṇa, Madhumeha, Udarda, Medodoṣa, Śvitra

**DOSE** - 2-6 g.

## 26. Kakajangha (Sd)

### KĀKAJAṄGHĀ (Seed)

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

#### SYNONYMS

Sanskrit	:	Naḍīkāntā, Kākatiktā, Prācībala, Sulomaśā, Vāyasajaṅghā
Assamese	:	--
Bengali	:	Naaskaaga
English	:	--
Gujrati	:	Kaaliaghedi, Kariaghedi, Aghedi
Hindi	:	Atrilal, Masi, Kaakjanghaa
Kannada	:	Cibigid, Cibirsoppu
Kashmiri	:	--
Malayalam	:	Raankiraayat
Marathi	:	Ghaatipittaapapadaa, Raankiraayat
Oriya	:	--
Punjabi	:	--
Tamil	:	Chebira
Telugu	:	Chebira
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

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

## IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 per cent, Appendix	2.2.2.
Total Ash	Not more than	6 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	0.1 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 the alcoholic extract on silica gel 'G' (0.2 mm thick ness) plate using toluene : dichloromethane : ethanol : formic acid (10:3:3:1) shows under U.V. (366 nm) five greenish blue fluorescent bands at Rf. 0.14, 0.18, 0.22, 0.39, 0.54. On exposure to Iodine vapour six bands appear at Rf. 0.18 (greenish brown), 0.22, 0.37 (both light brown), 0.53, 0.68, 0.74 (all yellow). On spraying with 5% Ethanolic-sulphuric acid reagent and heating the plate for ten minutes at 105°C, eleven bands appear at Rf. 0.14, 0.22, 0.30, 0.37 (all light brown), 0.48 (greenish brown), 0.53 (yellowish brown), 0.56 (brown), 0.59 (pinkish brown), 0.68 (lower half blue and upper half pink), 0.74, 0.87 (both pinkish brown).

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta, Kaṣāya
<b>Guna</b>	:	Picchila, Sara
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Varṇya, Viṣaghna, Kaphapittanut, Kṛmighna, Vraṇahara

## IMPORTANT FORMULATIONS - Mahāviṣagarbha Taila

**THERAPEUTIC USES** - Ślīpada, Śoṣa, Bālagraha, Duṣṭavrāṇa, Grahaṇī, Jvara, Kaṇḍu, Pradara, Pratiśyāya, Raktapitta, Viṣamajvara, Bādhirya, Pāndu, Kṣata Kṣīṇa, Jantakṛmi, Sidhma, Sarpaviṣa, Śastrakṣata, Galagaṇḍa, Apacī

**DOSE** - 1- 3 g.

## 27. Kakanaja(Fr)

### KĀKANAJA (Fruit)

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

#### SYNONYMS

Sanskrit	:	Rajaputrika
Assamese	:	--
Bengali	:	Kakanaja
English	:	Winter cherry, Bladder cherry
Gujrati	:	Kakanaja
Hindi	:	Kakanaja
Kannada	:	Kakanaja
Kashmiri	:	--
Malayalam	:	Kakanaja
Marathi	:	Kakanaja
Oriya	:	--
Punjabi	:	Kaaknaj
Tamil	:	Sisayakkaali, Tottakkaali
Telugu	:	Kupante
Urdu	:	Kakanaj

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

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

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

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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	10	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	22	per cent, Appendix	2.2.7.

### T.L.C.

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

**CONSTITUENTS** - Auroxanthin, mutatoxanthin, phydalein, zeaxanthin,  $\beta$ -Cryptoxanthin from the calyx of the fruit; glycoalkaloids detected in the seeds but alkaloids were absent in the fruit.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta
<b>Guna</b>	:	Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Balya, Mūtrala, Vātahara, Dāhaśāmakā, Virecana, Śūlanāśinī, Raktavidrāvaṇī

**IMPORTANT FORMULATIONS** - Lauha Rasāyana

**THERAPEUTIC USES** - Śopha, Śvāsa, Jvara, Kāsa, Kaṇḍu, Visarpa, Vraṇa, Pūyameha, Tamakaśvāsa

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

## 28. Kaliyaka (Rt &St)

### KĀLĪYAKA (Root and Stem)

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

#### SYNONYMS

Sanskrit	:	Kalambaka, Kālīya, Kālīyākhyā, Kāleyaka
Assamese	:	--
Bengali	:	--
English	:	False Calumba
Gujrati	:	--
Hindi	:	Jhaar-ki-hald
Kannada	:	Mardaa arashinaa
Kashmiri	:	--
Malayalam	:	Maramanjā
Marathi	:	Venivel
Oriya	:	--
Punjabi	:	--
Tamil	:	Atturam, Kadari, Manjalkoid
Telugu	:	Manu pasupu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

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

##### b) Microscopic

**Root** - Transverse section circular in outline; cork cream coloured, 20 to 30 or more rows of uniform rectangular cells with 1 to 2 stone cells; outer cortical tissue characterized by the presence of very prominent yellowish band almost in the form of ring of thick

walled, pitted stone cells; prismatic crystals of calcium oxalate found in the thick walled cells; sieve tubes with simple perforation plate; evident in L.S.; narrow radiating wedge shaped xylem strips; alternating with wedge shaped, broad, multiseriate medullary rays with thick walled cells filled with rod shaped crystals of calcium oxalate and starch grains which are circular, appearing lenticular on edge view, simple, 30-45  $\mu\text{m}$  in diameter; hilum indistinct or dot-like, centrally placed if present, lamellae indistinct; vessels filled with tyloses and in mature root these tyloses become thick walled giving the appearance of stone cells; fibres long, lignified.

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

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

#### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	2	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	0.4	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	10	per cent, Appendix	2.2.7.
Total alkaloid as berberine chloride	Not less than	2	per cent, Appendix	2.2.18

**Stem -**

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

**T.L.C.**

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

**CONSTITUENTS** - Alkaloids-berberine, palmitine, jatrorrhizine, proto-berberine, N, N-dilindacarpine, thalifendine and columbamine.

**PROPERTIES AND ACTION**

<b>Rasa</b>	:	Stem : Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa, Stem : Laghu, Stem : Rukṣa
<b>Virya</b>	:	Śīta, Stem : Śīta
<b>Vipaka</b>	:	Kaṭu, Stem : Kaṭu
<b>Karma</b>	:	Dīpana, Pācana, Pittahara, Śleṣmasaṃśmana, Kaphamedohara, Anulomaka, Raktaśodhaka, Stem : Śleṣmasaṃśmana, Stem : Pittahara, Stem : Kaphamedohara, Stem : Dīpana, Stem : Pācana

**IMPORTANT FORMULATIONS** - (No Formulations)

**THERAPEUTIC USES** - Root :, Agnimāndya, Ajīrṇa, Kṛmi., Karṇaśūla, Prameha, Raktapitta, Vraṇa, Tikta-Usna, Jīrṇa Jvara, Adhmāna, Kāmalā, Stem :, Agnimāndya, Aśmarī, Ajīrṇa, Daha, Jvara, Kṛmi, Kuṣṭha, Pāṇduroga, Prameha, Upadaṃsa, Vraṇa, Adhamāna Yakrt Vikāna, Yuvānapidakā, Vyanga

## 29. Kapitana (St.Bk)

### KAPĪTANA (Stem Bark)

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

#### SYNONYMS

Sanskrit	:	Pāriṣah, Kandarala, Phalīśah, Gardabhāṇḍah
Assamese	:	--
Bengali	:	Gajashundi, Paraasapipula
English	:	Portia tree, Umbrella tree
Gujrati	:	Paaraspipalo
Hindi	:	Paaraspipal
Kannada	:	Huvarasi
Kashmiri	:	--
Malayalam	:	Punavasu, Pupparutti
Marathi	:	Parasa pimpala
Oriya	:	--
Punjabi	:	--
Tamil	:	Chilanti, Punarasu
Telugu	:	Ganyaraavi, Munigangaraavi
Urdu	:	--

#### 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 precoated silica gel 'G' plate (0.2 mm thick) using chloroform : methanol : formic acid (100:2.5:1) shows spots at Rf. 0.12 (brown), 0.18 (brown), 0.29 (brown) and 0.61 (reddish when hot turns yellowish on cooling) on spraying with vanillin-sulphuric acid reagent and heating the plate at 105°C for about ten minutes.

**CONSTITUENTS** - Flavonoids, steroids and sesquiterpenoidal quinines.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Śukrala, Kaphahara, Medohara, Pittahara, Stambhana, Vātahara, M ūtrasaṅgrahaṇīya, Sandhānīya, Saṅgrāhī, Bhagnasandhānakṛta, Pumsavanam

**IMPORTANT FORMULATIONS** - Nyagrodhādi Kvātha Cūrṇa

**THERAPEUTIC USES** - Śoṭha, Dāha, Dadru, Kaṇḍu, Prameha, Raktapitta, Raktavikāra, T  
ṛṣā, Vraṇa, Yoniroga, Medoroga, Tvakroga, Bālavisarpa, Pāmā

**DOSE** - 100 ml kvātha.

### 30. Karkasha(Rt.)

## KARKAŚĀ (Root)

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

### SYNONYMS

Sanskrit	:	Karkoṭakī, Vandhyā Karkoṭakī
Assamese	:	--
Bengali	:	Titkaankarol
English	:	--
Gujrati	:	Baanjhakartolaa, Kankodi
Hindi	:	Vanakakodaa, Baanja, Khekhasaa, Kakodaa
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Vaanjh-Kartoli, Kartole
Oriya	:	Kaankada
Punjabi	:	--
Tamil	:	Paluppakai
Telugu	:	Aagaakar
Urdu	:	--

### DESCRIPTION

#### a) Macroscopic

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

#### b) Microscopic

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

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

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

**CONSTITUENTS** -  $\alpha$ - eleostearic acid, 2-acetyl-5-chloropyrrole.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta
<b>Guna</b>	:	Laghu, Tikṣṇa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaphahara, Pittahara, Rasāyana, Rucikara, Vraṇaśodhaka

**IMPORTANT FORMULATIONS** - Hiraka Rasāyana, Visanāśaka Yoga (Ayurved Prakash), Kakadani Taila, Kālāgnīrudra Rasa, Sannīpāta Vidhvanisa Rasa, Candrarudra Rasa

**THERAPEUTIC USES** - Aśmarī, Arśa, Śvāsa, Hikkā, Jvara, Kāmalā, Kāsa, Kṣaya, Mūtrak ṛcchra, Madhumeha, Netraroga, Sarpaviṣa, Visarpa, Sarpaviṣavikāra, Raktārśa, Śīroroga

**DOSE** - 3-6 g.

### 31. Karnasphota (Sd)

### KARṆASPHOTĀ (Seed)

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

#### SYNONYMS

Sanskrit	:	Śakakralata (S.y.), Kākādanī, Kākamardanikā, Kākatiktā
Assamese	:	--
Bengali	:	Jyotishmati (of Bengal)
English	:	Ballon Vine, Heart's Pea
Gujrati	:	Bodha, Kapaalphodi, Nayaphatki, Shivajaala
Hindi	:	Kaanphuti, Lataaphataki
Kannada	:	Kanakayya
Kashmiri	:	--
Malayalam	:	Ulinna
Marathi	:	Fatphati, Kaanphuti, Khiljala
Oriya	:	--
Punjabi	:	--
Tamil	:	Modikkottan, Mudukkottan, Mudakkarutana(Siddha)
Telugu	:	Vek kudutiga
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

**Powder** - Powder light brown in colour, with black fragments of the seed coat and has the taste and odour of cucurbitaceous seed with a nutty flavour; shows surface view of

palisade layer with hexagonal outline and stellately lobed lumen, surface view of the much sinuous sclereid layer and oil globules.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 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	21 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	5 per cent, Appendix	2.2.7.
Fixed oil	Not less than	20 percent, Appendix	2.2.8.

### T.L.C.

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

**CONSTITUENTS** - Fixed oil.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Laghu, Rukṣa, Tīkṣṇa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Medhya, Vātahara, Viṣaghna, Mutrala, Keśya

**IMPORTANT FORMULATIONS** - Āmatisāranāśaka Yoga, Vāsādilepa, Nāgarādi Taila, Lauśunādi Kaṣāya

**THERAPEUTIC USES** - Śūla, Śopha, Jvara, Pāṇḍu, Vṛddhi, Sandhi-Vata, Graha Bādhā, Bhūtabādhā, Viṣabādhā

**DOSE** - 1-2 g.

### 32. Karnasphota (Rt)

## KARṆASPHOTĀ (Root)

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

### SYNONYMS

Sanskrit	:	Śakakralata (S.y.), Kākādanī, Kākamardanikā, Kākatiktā
Assamese	:	--
Bengali	:	Jyotishmati
English	:	Ballon Vine, Heart's Pea
Gujrati	:	Bodha, Kapaalphodi, Shivajaala, Nayaphataki
Hindi	:	Kaanphuti, Lataaphataki
Kannada	:	Kanakayya
Kashmiri	:	--
Malayalam	:	Ulinna
Marathi	:	Fatphati
Oriya	:	--
Punjabi	:	--
Tamil	:	Modikkottan, Mudakkarutana(Siddha), Mudukkottan
Telugu	:	Vekkudutiga
Urdu	:	--

### DESCRIPTION

#### a) Macroscopic

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

#### b) Microscopic

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

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

## IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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	9	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 methanolic extract on silica gel 'G' plate (0.2 mm thick) using phenol : water (3:1) shows spots at R<sub>f</sub> 0.06 (pinkish brown), 0.17 (pinkish brown), 0.22 (greyish green), 0.29 (brown), 0.34 (greyish green) and 0.46 (purple) after spraying with 10% ethanolic-sulphuric acid reagent.

## CONSTITUENTS -

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Laghu, Rukṣa, Tīkṣṇa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Mūtrala, Kaphaśāma, Keśya, Medhya, Rasāyanana, Vāmaka, Vātahara, Viṣaghna., Virecaka

## IMPORTANT FORMULATIONS - Āragvadhādi Kvātha Cūrṇa

**THERAPEUTIC USES** - Śūla, Śopha, Jvara, Kuṣṭha, Pāṇḍu, Sarpaviṣa, Vṛddhi, Kāmala, Smṛti Kṣaya, Sandhivāta, Mūsikāviṣa, Jvarayukta-Kāsa, Indralupta, Sannipātodara, Aśmari, Bhūta-Bādhā, Grahabādhā

**DOSE** - 1-3 g.

### 33. *Katrina* (Wh.Pl)

#### KATTRNA (Whole Plant)

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

#### SYNONYMS

Sanskrit	:	Bhūtrṇah, Jambīratṇah, Guhybīja, Bhutīka
Assamese	:	--
Bengali	:	Gandhatrun, Gandhabenaa
English	:	Lemon grass
Gujrati	:	Lilichaa
Hindi	:	Gandhatrun, Harichaaya
Kannada	:	Majjigahullu
Kashmiri	:	--
Malayalam	:	Chennanampullu, Incippullu, Vasanaipullu
Marathi	:	Hirvaa Chahaa, Olaa Chahaa, Paaticahaa
Oriya	:	--
Punjabi	:	Gandhatrun, Sharbaan
Tamil	:	Vasanaipillu
Telugu	:	Nimmagaddi, Vasana gaddi
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

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

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

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

##### b) Microscopic

**Root** - Epiblema or piliferous layer uniseriate with compact tabular cells; unicellular root hairs present; beneath epidermis 1 to 3 layered exodermis of cells with thick walls

present; cortex cells with intercellular spaces; barrel shaped cells of endodermis and several layered sclerified pericycle; vascular tissue with alternating strands of xylem and phloem, xylem exarch; pith parenchymatous with intercellular spaces.

**Rhizome** - T.S. shows outer epidermal layer of rectangular parenchymatous cells followed by 5 to 7 layered sclerenchymatous hypodermis; lysigenous cavities present in the hypodermis; below the hypodermis, a broad zone of ground tissue consisting of thin walled parenchymatous cells with small intercellular spaces; vascular bundles scattered in the ground tissue; concentric, amphivasal, enclosed by sclerenchymatous sheath; rosette shaped calcium oxalate crystals present in the cortex.

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

#### **Leaf -**

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

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

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

## IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	11	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	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 essential oil extracted by Clevenger apparatus on silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate (93:7) shows under UV (254 nm) spots at Rf. 0.07 (light green) and 0.47 (dark green). After spraying with anisaldehyde-sulphuric acid reagent spots appear at Rf. 0.05 (blue), 0.08 (bluish yellow), 0.19 (dark blue), 0.47 (blue), 0.52 (pink), 0.60 (light pink), 0.70 (purple) and 0.74 (purple).

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

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Laghu, Rukṣa, Tīkṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Caḡṣuṣya, Dīpana, Kaphahara, Stanyajanana, Vātahara, Viṣaghna, Śītapraśamana, Recana, Mukhasodhana, Avṛṣya, Rūcīkāra, Vāmihara

**IMPORTANT FORMULATIONS** - Māṣabalādi Kvātha Cūrṇa

**THERAPEUTIC USES** - Śvāsa, Bhūtabādhā, Dāha, Dadru, Kāsa, Kṛmi, Kuṣṭha, Udara, Arocaka, Santāpa, Vami, Grahabādhā, Udarda.

**DOSE** - 3-6 g.

### 34. Kebuka (Rz.)

#### KEBUKA(Rhizome)

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

#### SYNONYMS

Sanskrit	:	Kemhuka, Kebuka, Kemuka, Kembu
Assamese	:	--
Bengali	:	Kevu
English	:	--
Gujrati	:	--
Hindi	:	Kebu, Kemuk, Kemuaa
Kannada	:	Chenglavaa-Koshtu, Changgalvakoshtu
Kashmiri	:	--
Malayalam	:	Channakkilannu, Channakkuvva
Marathi	:	Pevaa
Oriya	:	--
Punjabi	:	--
Tamil	:	Koshtam
Telugu	:	Chenglavaa-Koshtu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

fibrous sheath surrounds each of the vascular bundles; clusters of calcium oxalate found in some cells of the ground tissue.

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

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Pācana, Garbhāsāya Sankocaka, Grāhi, Hṛdya, Kṛmighna, Kaphahara, Pittahara, Raktaśodhaka, Dīpana

**IMPORTANT FORMULATIONS** - Kṛmighna Kvātha Cūrṇa

**THERAPEUTIC USES** - Agnimāndya, Ślīpada, Arśa, Grahani, Jvara, Kāmalā, Kāsa, Kuṣṭha, Prameha, Raktavikāra, Kaphapittaja Vikara, Kṛmiroga, Śvītra, Kaphaja, Mutrakṛcchra

**DOSE** - 3-6 g (after purification).

### 35. Khakhasa(Sd.)

#### KHAKHASA (Seed)

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

#### SYNONYMS

Sanskrit	:	Khasatilah, Āphūkam, Khākhasatilah, Khākhasah
Assamese	:	--
Bengali	:	Aaphim, Postadaanaa, Postabeej
English	:	Opium, Poppy Seeds
Gujrati	:	Khaskhas
Hindi	:	Apheem, Postadaanaa, Khaskhas, Khasabija
Kannada	:	Gasgase, Aapheen, Aphini
Kashmiri	:	--
Malayalam	:	Avin, Karappu, Kashkash, Aalan
Marathi	:	Khaskhas
Oriya	:	Aapu
Punjabi	:	--
Tamil	:	Kasakash, Posttakkaai, Avinee
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 inodorous and oily in taste.

##### b) Microscopic

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

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

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

#### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	1 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 silica gel 60 F 254 plate using Toluene : Acetone (93:07) shows five spots at Rf 0.25, 0.39, 0.50, 0.76 and 0.83 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110°C.

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

#### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Guru
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Balya, Stambhana, Vātahara, Vṛṣya, Vedanāsthāpana, Rūcyā, Varṇya

**IMPORTANT FORMULATIONS** - Abhyādi Gutika, Abhrakādi Vati, Asvani Kumār Rasa

**THERAPEUTIC USES** - Atisāra, Kāsa

**DOSE** - 5-10 g

### 36. Khatmi (Rt)

#### KHATMĪ(Root)

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

#### SYNONYMS

Sanskrit	:	Khatmī
Assamese	:	--
Bengali	:	--
English	:	Marsh Mallow
Gujrati	:	--
Hindi	:	Khatmi
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Khatmi
Oriya	:	--
Punjabi	:	--
Tamil	:	Khatmi
Telugu	:	Khatmi
Urdu	:	Aslua Khitmi, Reshah-e-Khatmi

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

to 20 µm, most grains less than 12 µm in diameter, simple, hilum circular or a 2 to 5 rayed cleft lamellae indistinct.

**Powder** - Powder white to light yellow, sweet in taste; under the microscope numerous fragments of parenchyma, the cells containing mucilage and starch grains polygonal to rounded, 5-20 µm, most grains less than 12 µm in diameter, simple, hilum circular or a 2-5 rayed cleft lamellae indistinct; occasionally small rosette crystals of calcium oxalate, group of sclerenchymatous cells, vessels measuring 113 to 262 µm long, fibres measuring 519 to 1038 µm long and 9 to 19 µm broad; mucilaginous canals; when treated with 50% HNO<sub>3</sub> turns yellowish-orange and emits yellow fluorescence under UV 254 nm; with 50% KOH, it emits light yellow fluorescence under UV 254 nm, while with 1 N-NaOH in methanol orangeish brown colour is seen in day light.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 per cent, Appendix	2.2.2.
Moisture content	Not more than	8 per cent, Appendix	2.2.9.
Total ash	Not more than	7 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	8 per cent, Appendix	2.2.6.
Water soluble extractive	Not less than	21 per cent, Appendix	2.2.7

### T.L.C.

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

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

### PROPERTIES AND ACTION

**Rasa** : Madhura  
**Guna** : Guru, Picchila, Snigdha  
**Virya** : Śīta  
**Vipaka** : Madhura  
**Karma** : Mūtrala, Pittahara, Vātahara, Vedanāsthāpana, Śleşmasāraka, Kaphaghna

**IMPORTANT FORMULATIONS** - Gojihvādi Kvātha Cūrṇa

**THERAPEUTIC USES** - Mūtradāha, Dāha, Kāsa, Mūtrakṛcchra, Pratiśyāya, Raktapitta, M  
ūtrāśayaśoṭha, Kaṇṭharoga, Āntraśoṭha

**DOSE** - 3 -6 g.

### 37. Khatmi (Seed)

### KHATMĪ(Seed)

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

#### SYNONYMS

Sanskrit	:	Khatmī
Assamese	:	--
Bengali	:	--
English	:	Marsh Mallow
Gujrati	:	--
Hindi	:	Khatmi bija
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Khatmi
Oriya	:	--
Punjabi	:	--
Tamil	:	Khatmi
Telugu	:	Khatmi
Urdu	:	Bajrul Khatmi, Khatmee, Tukhma-e-Khatmee

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

T.S. shows testa - an outer multicellular layer comprising of outer most thick walled epidermis with multicellular, 2 to 6 armed stellate and some unicellular hairs, longest being near the micropyle; this is followed by 4 to 10 layers of parenchymatous cells several with rosette crystals of calcium oxalate, interrupted by schizogenous mucilage canals; the inner epidermis of testa is also thick walled. Tegmen two layered; outer tegmen - 4 to 6 cells deep, lignified 2 to 6 armed stellate hairs present also on it, this easily detached from the inner tegmen; inner tegmen - 4 to 6 cells deep, the outer being a row of palisade-like malpighian cells followed by a slightly thick walled, non-lignified two layered hypodermis of cells with their inner periclinal walls concave (i); 2 to 3 layered parenchymatous mesophyll; the inner epidermis is a layer of thin walled cells with rod like lignified thickening scattered on the anticlinal walls; endosperm cells

filled with starch grains which are polygonal to rounded, 5 to 20  $\mu$  m in size, hilum circular or showing a 2 to 5 rayed cleft, lamellae indistinct; ovule campylotropous; seeds of *Althaea rosea* do not show the type of hairs present in *A. officinalis*, but have mostly unicellular hairs.

**Powder** - Powder brownish-black in colour, odourless, mucilaginous and sweetish in taste; shows elongated thick walled ridged malpighian cells; in surface view they are hexagonal showing wall thickenings; patches of parenchyma with mucilage and starch grains, polygonal to rounded, 5 to 20  $\mu$  m, hilum circular, or with a 2 to 5 rayed cleft, lamellae indistinct; rosette crystals of calcium oxalate and stellate hairs; a small amount of powder on microscopic slide turns maroon with 50 %  $H_2SO_4$  and black with 1N-NaOH in amyloacetate. When treated with 1% ruthenium red, powder becomes pink in colour showing the presence of mucilage.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 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	10 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	18 per cent, Appendix	2.2.7.

### T.L.C.

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

**CONSTITUENTS** - Glucose, sucrose, galactose & mannose, linoleic acid; isobutylalcohol, limonene, phellandrene,  $\gamma$ -toluenealdehyde, citral, terpineol,  $\beta$ -sitosterol.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Guru, Picchila, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Mūtrala, Pittahara, Vātahara, Vedanāsthāpana, Śleṣma Kalā Snehakara, Śleṣma Sāraka

**IMPORTANT FORMULATIONS** - Gojihvādi Kvātha Cūrṇa

**THERAPEUTIC USES** - Kāsa, Mūtrakṛcchra, Pratiśyāya, Mūtradāha, Kaṇtharoga.

**DOSE** - 3-6 g.

### 38. Khubkalan (Sd)

## KHŪBKALĀN (Seed)

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

### SYNONYMS

Sanskrit	:	--
Assamese	:	--
Bengali	:	--
English	:	Hedge-Mustard, London Rocket
Gujrati	:	--
Hindi	:	Khub Kalaan, Khaaksee
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Ranteekhee
Oriya	:	--
Punjabi	:	Janglisarson, Maktrusa, Maktaroosaa
Tamil	:	--
Telugu	:	Jeevakamu
Urdu	:	Khubakalan

### DESCRIPTION

#### a) Macroscopic

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

#### b) Microscopic

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

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

### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	2 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	22 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	14 per cent, Appendix	2.2.7.
Fixed oil	Not less than	20 per cent, Appendix	2.2.8.

### **T.L.C.**

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

**CONSTITUENTS** - Fixed oil and Isorhamnetin.

### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Kaṭu
<b>Guna</b>	:	Guru, Picchila, Snigdha
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Balya, Vātahara, Kaphahar, Svedakara, Śothahara

**IMPORTANT FORMULATIONS** - Gojihvādi Kvātha Curṇa

**THERAPEUTIC USES** - Śvāsa, Jvara, Kāsa, Vātajanya Vikāra, Svarabheda, Daurbalya, Kaphavikāra.

**DOSE** - 3-6 g.

### 39. Kodravah(Grain)

#### KODRAVAH (Grain)

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

#### SYNONYMS

Sanskrit	:	Koradūṣah, Koradūṣakah
Assamese	:	--
Bengali	:	Kodo aadhaan
English	:	Kodo Millet
Gujrati	:	Kodro, Kodaraa
Hindi	:	Kodon, Kodava, Kododhaam
Kannada	:	Harak, Harike
Kashmiri	:	--
Malayalam	:	Varaku
Marathi	:	Kodra, Harik, Kodru
Oriya	:	Kodua
Punjabi	:	Kodon, Kodra
Tamil	:	Varagu
Telugu	:	Arikelu, Kiraruga
Urdu	:	Kodon

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

T.S. shows thick pericarp composed of 6 to 10 layers of cells; outermost layer elongated with outer and inner walls lignified; below this, cells have thickened walls, and a much-reduced lumen; testa not well defined and composed of crushed cells; cells of scutellum irregular in shape and usually contain oil droplets; outer cells of endosperm

contain aleurone grains; endosperm cells thin walled, polygonal, large and fully packed with penta to hexagonal starch grains, usually 8 to 20  $\mu$ .

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

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

**CONSTITUENTS** - Hydrocarbons hentriacontanol, hentriacontanone; sterols such as  $\beta$ -sitosterol, campesterol.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Grāhi, Kaphahara, Pittahara, Lekhana, Viṣaghana

**IMPORTANT FORMULATIONS** - Nāḍīvraṇahara Āturyādi Lepa, Nāḍīvraṇahara turyādi Taila.

**THERAPEUTIC USES** - Nāḍīvraṇa, Prameha, Raktapitta, Vraṇa, Atisthauilya, Annadravaś ūla, Medovṛddhi, Jalodara

**DOSE** - 50-100 g.

#### 40. Kshirakakoli (Bulb)

### KṢĪRAKĀKOLĪ (Bulb)

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

#### SYNONYMS

Sanskrit	:	Śuklā, Kṣīrvallikā
Assamese	:	--
Bengali	:	--
English	:	Fritillary
Gujrati	:	--
Hindi	:	Kshira, Kakoli
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Kshira, Kakoli
Oriya	:	--
Punjabi	:	--
Tamil	:	Kshira, Kakoli
Telugu	:	Kshira, Kakoli
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

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

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than 2 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 4 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 on silica gel 'G' plate (0.2 mm thick) using butanol : acetic acid : water (6:1:2) shows under UV (366 nm) spots at Rf. 0.11, 0.18, 0.29, 0.33, 0.37, 0.45, 0.49, 0.62 and 0.93 (all fluorescent blue) under UV 254 nm spots at Rf. 0.33, 0.37, 0.62 and 0.93 (all green). After spraying with Dragendorff's reagent orange spots appear at Rf. 0.33 and 0.37.

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Guru, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Pittahara, Rasāyana, Vātahara, Vṛṣya, Bṛmhaṇa, Śukravardhaka, Stanyajanna, Kaphakara, Tṛṣāhara, Basti Viśodhanī, Viśaghna

**IMPORTANT FORMULATIONS** - Daśamūlariṣṭa, Śivāgutikā, Bṛhataphala, Ghr̥ta, Bṛhat-Guḍucī Taila, Bṛhatmāṣa Taila, Mānasamitra Vaṭika, Rasarāja Rasa

**THERAPEUTIC USES** - Śoṣa, Dāha, Hṛdroga, Jvara, Kāsa, Kṣaya, Raktadoṣa, Raktapitta, Raktaroga, Śvasā, Vāatarakta, Yoni Vyāpad, Vātavyādhi, Vatapittarujā

**DOSE** - 3-5 g in the powder form.

#### 41. Kshiravidari (Bulb)

### KṢHĪRAVIDĀRĪ (Root)

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

#### SYNONYMS

Sanskrit	:	Ikṣugandhā, Ikṣuvallī, Payasvini, Dirghakandā
Assamese	:	--
Bengali	:	Bhuh Kumdaa, Bhooi Kumhdaa
English	:	Giant potato
Gujrati	:	Vidaaree Kand
Hindi	:	Vidaaree Kanda, Bhuh Kumdaa, Bhui Kumbhadaa
Kannada	:	Nelkumbal, Naadakumbala
Kashmiri	:	--
Malayalam	:	Paalmutakku
Marathi	:	Bhui Kohalaa
Oriya	:	Bhuin Kakhaaru
Punjabi	:	--
Tamil	:	Nilappuchani, Paalmudamgi
Telugu	:	Paalagummudu, Nelagummudu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

**Root-** Root shows 6 to 9 layers of thin walled cork cells, externally covered by rhytidoma; phelloderm composed of 8 to 10 layers of cells, thin walled and filled with starch grains, individual starch grain rounded to irregular in shape, variable in size measuring about 13 to 24 μm, with distinct centric hilum; rosettes of calcium oxalate present; secondary phloem consists of companion cells, sieve tube elements and phloem parenchyma, traversed by uni- or biseriate medullary ray; numerous resin ducts and starch grains occur in the secondary phloem; secondary xylem consists of xylem

parenchyma, xylem vessels, xylem fibres and tracheids; vessels large in size and numerous.

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

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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	20	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	8	per cent, Appendix	2.2.7.

### T.L.C.

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

**CONSTITUENTS** - Glycosides, steroids, tannins and fixed oil.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Guru, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Bṝmhaṇa, Balya, Rasāyana, Svarya, Vātahara, Vṝṣya, Varṇya, Atimūtrala, Stanyajanana, Jīvanīya

**IMPORTANT FORMULATIONS** - Śīvāgutikā

**THERAPEUTIC USES** - Raktavikāra, Vraṇa, Stanyavikāra, Pittaja Śūla, Mahāvātavyādhi, Mūtraroga, Bhagna

**DOSE** - 5 - 10 g.

## 42. Kulanjan(Rz)

### KULANJANA (Rhizome)

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

#### SYNONYMS

Sanskrit	:	Sugandhmūla, Malaya, Vacā, Sthūlagranthih, Mahābharī Vacā, Rāsnā (South)
Assamese	:	Khulanjaana
Bengali	:	Kulanjan, Kurachi Vach
English	:	Greater galangal, Javagalangal
Gujrati	:	Kulinjan Jaanu, Kolinjan
Hindi	:	Kulanjan, Kulinjan
Kannada	:	Doddarasagadde, Dhoomraasmi
Kashmiri	:	--
Malayalam	:	Aratta, Ciffaratta
Marathi	:	Kulinlan, Koshta Kulinjan, Mothe Kolanjan
Oriya	:	--
Punjabi	:	--
Tamil	:	Arattai, Sittarattai
Telugu	:	Dumparaastramu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

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

##### b) Microscopic

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

sclerenchymatous pericycle; xylem and phloem in separate radial strands; centre occupied with a parenchymatous pith.

**Rhizome** - T.S. of young rhizome circular in outline; epidermal cells small and angular, thick cuticle present, rhizome differentiated into a wide cortex and a central cylinder, both regions having irregularly scattered vascular bundles, each vascular bundle with a prominent fibrous sheath; inner limit of cortex marked by rectangular parenchymatous cells; stele with irregular, closely placed vascular bundles towards periphery, root traces present, schizogenous canals and oil cells with suberized walls found in cortex and in central region; most of the parenchymatous cells filled with starch grains which are ellipsoidal to ovoid, sometimes beaked, simple, 10 to 64  $\mu\text{m}$ , 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  $\mu\text{m}$  long and 19 to 190  $\mu\text{m}$  broad, tracheidal fibres 68 to 920  $\mu\text{m}$  long and 19 to 30  $\mu\text{m}$  broad.

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

#### **IDENTIFICATION TEST -**

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

#### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	2	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	per cent, Appendix	2.2.13.
Essential oil	Not less than	0.4	per cent, Appendix	2.2.10.

#### **T.L.C.**

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

at 120°C, spots appear at Rf. 0.15 (greyish green), 0.35 (violet), 0.48 (greyish green), 0.63 (greyish green), 0.69 (green) and 0.91 (violet).

**CONSTITUENTS** - Essential oil, containing  $\alpha$  - pinene,  $\beta$  - pinene, limonene, cineol, terpinen - 4 - ol and  $\alpha$  - terpineol.

### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Guru
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Hṛdya, Kaṇṭhya, Kaphahara, Rūcyā, Svarya, Vātahara, Viṣaghna, Pācanī, Mukha Śodhaka

**IMPORTANT FORMULATIONS** - Brāhmī Vaṭī, Rāsnādikaṣāya, Rāsnādārvādi Kaṣāya, Rāsnāpañcakam, Rāsnā Saptakam, Rāsnāśunṭhyādi Kaṣāya, Rāsnairāṇḍādi Kaṣāya

**THERAPEUTIC USES** - Śopha, Śvāsa, Hikkā, Pratiśyāya, Vātavyādhi, Udararoga, Kampa, Viṣmajvara, Kaphajakāsa, Aṣṭi, Mahākuṣṭha., Vātaja Śūla

**DOSE** - 1-3 g powder.

### 43. Kumbhika(Sd)

### KUMBHĪKAH(Seed)

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

#### SYNONYMS

Sanskrit	:	Svādupuṣpa, Viṭapī, Sthala Kumbhī, Romaśā
Assamese	:	--
Bengali	:	Kumbhi
English	:	Kumbi
Gujrati	:	--
Hindi	:	Sthala Kumbhi
Kannada	:	Daddala, Gudda, Daddippe
Kashmiri	:	--
Malayalam	:	Pezuntol
Marathi	:	Kumbhaa
Oriya	:	--
Punjabi	:	--
Tamil	:	Kumbi
Telugu	:	Dudippi
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

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

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

## T.L.C.

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

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

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Kaṣāya
<b>Guna</b>	:	Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Grāhī, Kaphahara, Vātahara, Vraṇa Ropana

**IMPORTANT FORMULATIONS** - Marma Guṭikā

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

**DOSE** - 2-6 g powder.

#### 44. Latakarnja (Sd)

### LATĀKARĀŃJA (Seed)

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

#### SYNONYMS

Sanskrit	:	Kuberākṣa, Kaṇṭakī Karañja
Assamese	:	--
Bengali	:	Kaantaa Karanjaa, Naataa, Naataa Karanjaa
English	:	Bonduc Nut, Fever Nut
Gujrati	:	Kaanchakaa, Kaanka
Hindi	:	Karanja, Karanjuaa, Kaantaa Karanj
Kannada	:	Gajjike Kaayi, Gajkai
Kashmiri	:	--
Malayalam	:	Kalamchikuru, Kaalanchi, Kazhinch - Kai
Marathi	:	Saagar gotaa, Gajarghota, Gaajagaa
Oriya	:	Kotokolejaa
Punjabi	:	--
Tamil	:	Kajha shikke, Kalichchikkaai
Telugu	:	Gachchakaay
Urdu	:	Akitmakit

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

Testa shows an outer single row of radially elongated, very narrow, translucent, compactly arranged cells forming a palisade layer (Malpighian layer) passing through which is the 'linea lucida'. These cells appear hexagonal in surface view and possess thick walls (rich in pectin as evident from Chloro-zinc Iodine Test); a sub-epidermal zone of 2 or 3 layers of thick walled bearer cells present, followed by multiple rows of osteosclereids, which progressively increase in size, elongate laterally and have more

intercellular spaces towards the inner side; the outer few layers of these osteosclereids contain a brown substance; laterally elongated vascular tissues present in the lower region of this zone. The cells inner to vascular elements gradually compacted and rounded towards the inner margin; cotyledons show an outer single layer of epidermis made of small, isodiametric cells, and inner parenchymatous ground tissue cells rich in fixed oil, and having empty cavities uniformly distributed in them.

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

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

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

**CONSTITUENTS** - Seeds contain bitter substance phytosterenin, bonducin, saponin, phytosterol, fixed oil, starch and sucrose. Seeds also contain  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$  and  $\zeta$  caesalpins.

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpana, Ārtavajanana, Kaphahara, Pittahara, Vātahara, Vedanāsthāpaka, Vraṇaropana

**IMPORTANT FORMULATIONS** - Āragvadhādi Kvātha Cūrṇa, Kuberākṣdi Vaṭī

**THERAPEUTIC USES** - Śūla, Śoṭha, Arśa, Śvāsa, Chardi, Āmavāta, Gulma, Kāsa, Kuṣṭha, Meha, Sandhivāta, Tvakroga, Vātavikāra, Viṣamajvara, Vraṇa, S ūtikājvara, Udarasūla, Raktātisāra, Agnimāndya, Pravāhika, Yak ṛtplīhāroga, Kṛmi.

**DOSE** - 1-3 g.

#### 45. Lavaliphala(Fr)

### LAVALĪPHALA (Fruit)

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

#### SYNONYMS

Sanskrit	:	Sugandhamūlā, Lavalī, Pāṇḍuh, Komala Valkalā
Assamese	:	--
Bengali	:	Noyaal, Harphal
English	:	Star gooseberry, Country gooseberry
Gujrati	:	Khaati Aawala, Raay aamali
Hindi	:	Harfaarevadi, Lavali
Kannada	:	Karinelli
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Raaya-aawal
Oriya	:	--
Punjabi	:	--
Tamil	:	Arinelli
Telugu	:	Raachayusarike
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

contain yellow pigments; ramified vascular bundles scattered throughout the mesocarp consist of xylem and phloem, xylem composed of tracheids and fibres; testa have palisade like epidermis composed of tightly packed sclereids with pits.

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

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

**CONSTITUENTS** - Triterpenoids ( $\beta$ - amyrin, Phyllanthol) and Gallic acid.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Amla, Kaṣāya
<b>Guna</b>	:	Guru, Rukṣa, Vaśada
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Grāhī, Hṛdya, Kaphahara, Pittahara, Vātakara, Rakta Stambhana, Rucikara

**IMPORTANT FORMULATIONS** - Drākṣāsava

**THERAPEUTIC USES** - Aśmarī, Arśa, Aruci

**DOSE** - 10-20 g.

## 46. Madhulika (Rt)

### MADHŪLIKĀ (Root)

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

#### SYNONYMS

Sanskrit	:	Rāgī, Madhūli, Markaṭahastatrṇa
Assamese	:	--
Bengali	:	Marua
English	:	Finger Millet, Ragi
Gujrati	:	Naagali-Baavato
Hindi	:	Manduaa, Makaraa, Raagi
Kannada	:	Raagi
Kashmiri	:	--
Malayalam	:	Muttari, Raagi
Marathi	:	Naachnee
Oriya	:	--
Punjabi	:	Kodra, Madua, Koda
Tamil	:	Raagi, Kejhavaragu(siddha)
Telugu	:	Raagulu, Tagidelu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

**Powder** - Shows under the microscope, tracheids measuring between 115 and 285  $\mu$  in length and between 13 and 40  $\mu$  in breadth, circular pits present on the surface; vessels

elongated, cross wall perforation plates simple; elongated pits present on the walls of vessel; thin walled parenchymatous cells and circular stone cells present.

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

**CONSTITUENTS** - Flavonoids, orientin, isoorientin, vitexin, isovitexin, violanthin, lucenin-1, tricin, keto acids; polysaccharide and the free sugars,  $\beta$ -sitosterol glucoside.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Pittahara, Vṛṣya, Tridoṣaśāmaka, Raktadoṣahara, Rasāyana

**IMPORTANT FORMULATIONS** - Amlapittāntaka Modaka, Amṛta Guggulu, Aśvagandhādi Leha, Kuṣṭhādi Kvātha, Kaṭutumbbyādi Taila

**THERAPEUTIC USES** - Śvāsa, Kāsa, Tṛṣṇā, Karapāda Dāha, Vṛkkāśmarī, Jvaropdrava

**DOSE** - 5-10 g.

#### 47. Mahameda (Rz & Rt.)

### MAHĀMEDĀ (Rhizome and Root)

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

#### SYNONYMS

Sanskrit	:	Mahāmeda, Vasucchidrā, Tridanti, Devamaṇī
Assamese	:	--
Bengali	:	--
English	:	Mahameda
Gujrati	:	--
Hindi	:	Mahameda, Devarigaala
Kannada	:	Mahamedha
Kashmiri	:	--
Malayalam	:	Mahameda
Marathi	:	--
Oriya	:	--
Punjabi	:	--
Tamil	:	Mahameda
Telugu	:	Mahameda
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

**Root :** T.S. shows a single layered epiblema, cells polygonal, bearing simple unicellular root hairs; a single layered hypodermis, cells larger, hexagonal, slightly thick walled; a

broad cortex, cells thin walled and of varying shapes and sizes with very small intercellular spaces, and containing circular starch grains measuring between 10 to 40  $\mu$  in diameter; idioblasts with raphides present; endodermis single layered, characterized by the presence of casparian strips on their radial walls; pericycle single layered; stele exarch, polyarch, xylem consist of tracheids, vessels with simple perforation plate and reticulate thickenings, and xylem parenchyma; phloem consist of sieve tubes, companion cells and phloem parenchyma; small pith present in centre with parenchymatous cells.

**Powder :** Dark brown; under microscope shows epidermal cells with actinocytic stomata and cortical cells in surface view; starch grains ovoid with concentric striation, either singly or in groups; raphides and druses present; tracheids elongated with pointed ends, wall slightly wavy towards tips, thickenings reticulate; vessels with simple, cross wall perforation, thickenings reticulate.

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

**CONSTITUENTS** - Glucose, Sucrose

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Guru, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Śukravardhaka, Bṛ̥ṃhaṇa, Jīvaniya, Pittahara, Stanyajanna, Vātahara, Vṛ̥ṣya, Kaphavardhaka, Rucya

**IMPORTANT FORMULATIONS** - Aśoka Ghṛta, Śivāgutikā, Amṛtaprāśa Ghṛta, Daśam  
ūlāriṣṭa, Dhānvantara Taila, Bṛhatmāsa Taila,  
Mahānārāyana Taila, Vāsācandanādi Taila

**THERAPEUTIC USES** - Bālaroga, Dāha, Jvara, Kāmalā, Kṣaya, Raktapitta, Raktavikāra,  
Kṣata kṣīṇa

**DOSE** - 3-6 g.

#### 48. Madhusnuhi (Tub.Rt)

### MADHUSNUHĪ (Tuberous Root)

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

#### SYNONYMS

Sanskrit	:	Dvīpāntara Vacā
Assamese	:	--
Bengali	:	Chopcheenee, Kumarika, Shukchin
English	:	China root
Gujrati	:	Chopcheenee
Hindi	:	Chopcheenee
Kannada	:	--
Kashmiri	:	--
Malayalam	:	China Pairu
Marathi	:	Chopcheenee
Oriya	:	--
Punjabi	:	--
Tamil	:	Parangichekkai
Telugu	:	Pirngichekka
Urdu	:	--

#### 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  $\mu$  in dia. with 2 to more than 9 components mostly spherical to ovoid, having hilum in centre.

**Powder** : Shows light brown, fragments of mucilaginous parenchymatous cells of cortex fibres and vessels with reticulate thickening; a few scattered needles of calcium oxalate from raphides; numerous simple and compound starch grains measuring 16 to 38  $\mu$  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	0.006per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	0.8 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	5 per cent, Appendix	2.2.7.

### T.L.C.

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

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Śothahara, Śukraśodhaka, Dīpana, Mūtrala, Raktaśodhaka, Rasāyana, Tridoṣahara, Vṛṣya, Vedanāsthāpana, Nadībalya, Anulomana, Śvedajanana

**IMPORTANT FORMULATIONS** - Madhusnuhī Rasāyana, Copacinyādi Cūrṇa

**THERAPEUTIC USES** - Śūla, Apasmāra, Ādhmāna, Gaṇḍamālā, Kṛmi, Kuṣṭha, Pūyameha, Sandhivāta, Unmāda, Vibandha, Śukravikāra, Vātavyādi, Phiranga, Kampavāta

**DOSE** - 3-6 g powder.

#### 49. Medasaka(St.Bk.)

### MEDĀSAKAH (Stem Bark)

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

#### SYNONYMS

Sanskrit	:	Medāsakah
Assamese	:	--
Bengali	:	Kukurchite
English	:	--
Gujrati	:	Meda Lakdee
Hindi	:	Maida Lakdee
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Meda Lakdee
Oriya	:	--
Punjabi	:	Medasaka
Tamil	:	Medalakavi
Telugu	:	Meda
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Pieces of bark 1.5 to 1.6 cm in length; 0.1 to 0.5 cm in width; external surface rough, corky, greenish - yellow to yellowish - brown; internal surface smooth, longitudinally striated, dark brown to black; fracture, short and uneven.

##### b) Microscopic

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

**Powder** - Light brown in colour, odour strong, bitter and mucilaginous showing cork tissue, starch grains, sclereids, fibres, cells containing tannins and mucilage; sclereids

round to oblong, laterally compressed, with narrow lumen, and showing radiating pit canals.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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.

### T.L.C.

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

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Snigdha
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpana, Kaphahara, Stambhana, Vātahara, Bhagnaprasādhaka

**IMPORTANT FORMULATIONS** - Asthisandhānaka Lepa

**THERAPEUTIC USES** - Śūla, Agnimāndya, Śoṭha, Atisāra, Vātavikāra, Raktasrāva, Asthibhanga

**DOSE** - 5-10 g powder.

## 50. Medasaka(Wd)

### MEDĀSAKAH (Wood)

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

#### SYNONYMS

Sanskrit	:	Medāsakah
Assamese	:	--
Bengali	:	Kukurchite
English	:	--
Gujrati	:	Meda Lakadee
Hindi	:	Meda Lakadee
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Meda Lakadee, --
Oriya	:	--
Punjabi	:	Medalakavi
Tamil	:	Meda
Telugu	:	Jeevakamu

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

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

### **IDENTITY, PURITY AND STRENGTH**

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

### **T.L.C.**

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

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

### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Snigdha
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpana, Kaphahara, Vātahara, Stambhana

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

**THERAPEUTIC USES** - Śūla, Agnimāndya, Śoṭha, Atisāra, Raktasrāva, Vātavikāra

**DOSE** - 1 to 3 g powder.

## 51. Meshashringi (Lf)

### MEṢAŚRNGĪ (Leaf)

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

#### SYNONYMS

Sanskrit	:	Madhunāśinī, Ajāśrngī
Assamese	:	--
Bengali	:	Medhasingi
English	:	Periploca of the wood
Gujrati	:	Kaavalee, Medhasinge
Hindi	:	Gudmaar, Medhaa Singee
Kannada	:	Kadhasige
Kashmiri	:	--
Malayalam	:	Cakkarakkolli, Madhunaashini
Marathi	:	Kaavalee, Medhaashingi
Oriya	:	--
Punjabi	:	--
Tamil	:	Shirukurum Kaay, ShakkaraiKKolli
Telugu	:	Podapatro
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

###### Leaf -

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

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

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

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

#### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	12	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	28	per cent, Appendix	2.2.7.

#### **T.L.C.**

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

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

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Caḡṣuṣya, Dīpana, Kaphahara, Vātahara, Viṣaghna, Sraṃasāna

**IMPORTANT FORMULATIONS** - Mahāviṣagarbha Taila, Ayaskrtī, Nyagrodhādi Cūrṇa, Mṛtasanji Vanī Surā

**THERAPEUTIC USES** - Śūla, Śopha, Arśa, Śvāsa, Hṛdroga, Kāsa, Kṛmi, Kuṣṭha, Netraroga, Prameha, Vrana, Dantakṛmi

**DOSE** - 3-6 g.

## 52. Meshashringi (Lrt)

### MEṢAŚṚNGĪ (Root)

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

#### SYNONYMS

Sanskrit	:	Madhunāśinī, Ajaśṛngī
Assamese	:	--
Bengali	:	Medhasingi
English	:	Periploca of the woods
Gujrati	:	Kaavalee, Medhasinge
Hindi	:	Gudmaar, Medhaasingee
Kannada	:	Kadhasige
Kashmiri	:	--
Malayalam	:	Cakkarakkolli, Madhunaashini
Marathi	:	Kaavalee, Medhaashingi
Oriya	:	--
Punjabi	:	--
Tamil	:	Shakkaraikkolli, Shirukurumkaay
Telugu	:	Podapatro
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

**Root** - Shows 5 to 20 rows of tangentially elongated and radially arranged cork cells; secondary cortex a wide zone consisting of oval to polygonal cells somewhat irregular in shape and moderately thick walled, filled with rosette crystals of calcium oxalate and a few simple or compound starch grains; secondary phloem composed of sieve tubes, companion cells and phloem parenchyma, with mostly large and a few small rosette crystals and starch grains; medullary rays prominent, uni or multi seriate, generally tetra seriate, extending from primary xylem to secondary phloem; groups of oval to elongated, thick walled, lignified sclereids with clear striations and narrow lumen present in cortex

and phloem region; secondary xylem consists of usual lignified elements; vessels simple pitted, single or 2 to 7 in radial groups and dispersed throughout the xylem region; fibres long with tapering ends and wide lumen; primary xylem present diarch.

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

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 per cent, Appendix	2.2.2.
Total Ash	Not more than	6 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	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 (10:10:4) as mobile phase shows on spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate at 110°C for ten minutes eight spots at Rf. 0.17 (brown), 0.25 (violet), 0.48 (grey), 0.57 (pink), 0.68, 0.80, 0.87 (violet) and 0.95 (pink).

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpana, Kaphahara, Mūtrala, Vātahara, Śirovirecaka, Sraṃśana

**IMPORTANT FORMULATIONS** - Nyagrodhādi Cūrṇa, Mahā Viṣagarbha Taila, Mṛtasanjīvanīsurā

**THERAPEUTIC USES** - Śvāsa, Dāha, Hṛdroga, Kāsa, Kṛmiroga, Kuṣṭha, Mūtrakṛcchra, Prameha, Raktavikāra, Vraṇa, Viṣavikāra, Akṣiśūla, Vidrdhi, Vātahara.

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

### 53. Nandi (Rt)

### NANDĪ (Root)

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

#### SYNONYMS

Sanskrit	:	Pārśvapippala, Prarohī, Gardhabhāṇḍa, Gajapādapa, Sthālīdruma, Nandīvrkṣa
Assamese	:	--
Bengali	:	Kamru
English	:	--
Gujrati	:	Naandrukheevad
Hindi	:	Beliya Peepal
Kannada	:	Kadarasu, Kallarase
Kashmiri	:	--
Malayalam	:	Kallarayal
Marathi	:	Nandee vruksh, Naandruk
Oriya	:	Plokhyo
Punjabi	:	--
Tamil	:	Kagoli, Kodiarasu, Kallarasu
Telugu	:	Kallaravi, Kondaravi
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

Transverse section of root shows thick cuticle, single layered epidermis, cells rectangular followed by 3 or 4 layers of cork cells; cork cambium 2 to 4 layered; secondary cortex wide consisting of rectangular to polygonal thin walled pitted cells, some filled with reddish-brown substance; circular to elongated, lignified, elliptical stone cells, a few showing concentric striations present in this region; a few prismatic crystals of calcium oxalate and abundant round to oval starch grains upto about 12  $\mu$  in dia. present in cortical cells; endodermis and pericycle not distinct; secondary phloem shows a wide zone consisting of sieve tubes, companion cells, fibres and ray cells;

phloem parenchyma contains prismatic crystals of calcium oxalate and round to oval starch grains, laticiferous cells also present in this region; fibres non-lignified, thick walled with narrow lumen; secondary xylem elements thick walled and lignified; vessels and tracheids show bordered pits; medullary rays uni to multiseriate, wide towards peripheral region.

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

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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	4	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	8	per cent, Appendix	2.2.7.

### T.L.C.

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Grāhī, Kaphahara, Medohara, Pittahara, Bhagnasandhāna

### IMPORTANT FORMULATIONS - Nyagrodhādi Kvātha Cūrṇa

**THERAPEUTIC USES** - Bhagna, Dāha, Kaphavikāra, Raktapitta, Raktavikāra, Viṣavikāra, Vraṇa, Yonidoṣa

**DOSE** - 10 - 20 g powder.  
30 - 50 g decoction.

## 54. Nilajhinti (Rt)

### NĪLAJHINTĪ (Root)

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

#### SYNONYMS

Sanskrit	:	Dāsī, Bāṇa, Kṛṣṇa, Saireyakah, Nīlasaireyakah
Assamese	:	--
Bengali	:	Jhaati, Kaaraajaati
English	:	--
Gujrati	:	Kaataseriyo
Hindi	:	Nili, Katsaraiya
Kannada	:	--
Kashmiri	:	--
Malayalam	:	Nilakurnni
Marathi	:	Koraanti, Wahiti
Oriya	:	--
Punjabi	:	--
Tamil	:	Shemmuli
Telugu	:	Mullugorant, Nilambaramu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

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

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta
<b>Guna</b>	:	Snigdha
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Keśya, Mūtrala, Vātakaphahara, Viṣaghna, Keśarañjana, Garbhav rddhi Kara

### IMPORTANT FORMULATIONS - Māṇikyā Rasa

**THERAPEUTIC USES** - Śoṭha, Kāsa, Kaṇḍu, Kuṣṭha, Mūsikāviṣa, Mūtrakṛcchra, Raktavikāra, Vātarakta, Vātajanyakṣaya, Śīrāgranthī, Dantaroga

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

## 55. Nimba (Rt.Bk)

### NIMBA (Root Bark)

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

#### SYNONYMS

Sanskrit	:	Picumaradah, Ariṣṭah, Picumandah, Prabhadrāh
Assamese	:	--
Bengali	:	Nim, Nimgaachh
English	:	Margosa Tree, Neem Tree, Indian Lilac
Gujrati	:	Leemado
Hindi	:	Neem
Kannada	:	Turakbevu, Huchchabevu, Chikkabevu
Kashmiri	:	--
Malayalam	:	Veppu, Aryaveppu, Aaruveppu
Marathi	:	Kadunimba, Nimb
Oriya	:	Neemo, Nimba
Punjabi	:	Nimb, Nim
Tamil	:	Vempu, Veppu
Telugu	:	Vemu, Vepa
Urdu	:	Neem

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

Root bark shows cork, cortex and phloem; cork generally 6 or 7 layers of polygonal and thin walled cells with reddish-brown contents; outer cortex of tangentially elongated large rectangular cells with tangentially elongated sclereids, singly or in groups in isolated patches; sclereids vary in size and wall thickness, distinctly striated, pitted and often associated with cells containing crystal; inner cortex of polygonal parenchymatous cells with bundles of sclerenchymatous fibres, thick walled with irregular lumen; secondary phloem composed of alternating tangential bands of bast

fibres and parenchymatous tissues intercepted by uni to biseriate phloem rays; abundant starch grains present in parenchymatous cells of cortex and phloem; starch grains simple, or more usually, compound with 2 or 3 components, hilum cleft or radiate, individual grain 5 to 20  $\mu$ ; abundant prismatic crystals of calcium oxalate in cortex, of 10 to 15  $\mu$ , also associated with phloem fibres; idioblasts with reddish-brown contents seen in cortex; cells with fat droplets seen in inner cortex and phloem.

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

### IDENTITY, PURITY AND STRENGTH

Alcohol-soluble extractive	Not less than	6	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	7	per cent, Appendix	2.2.7.
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.

### T.L.C.

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

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

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta
<b>Guna</b>	:	Laghu
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaṇḍūghna, Śītagrāhī, Ahṛdya, Kaphahara, Pittahara, Rucya Dīpana, Viṣaghna, Vraṇśodhana

**IMPORTANT FORMULATIONS** - Amṛtaṣṭaka, Aṣṭāngadasānga Lanha

**THERAPEUTIC USES** - Śoṭha, Aruci, Śvāsa, Chardi, Dāha, Duṣṭa Vraṇa, Grahaṇī, Jvara, Kāsa, Kṛmiroga, Kaphavikāra, Kuṣṭha, Prameha, Raktapitta, Tṛṣṇā, Hṛllāsa, Yakṛtvikāra, Hrḍayavidāha, Vāmana

**DOSE** - 3 - 6 g.

## 56. Nimba (Fl)

### NIMBA (Flower)

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

### SYNONYMS

Sanskrit	:	Ariṣṭah, Picumandah, Picumaradah, Prabhadrāh
Assamese	:	--
Bengali	:	Nim, Nimgaachh
English	:	Indian Lilac, Margosa Tree, Neem tree
Gujrati	:	Leemado
Hindi	:	Neem
Kannada	:	Chikkabevu, Huchchabevu, Turakbevu
Kashmiri	:	--
Malayalam	:	Aaruveppu, Aryaveppu, Veppu
Marathi	:	Nimb, Kadunimb
Oriya	:	Neemo, Nimba
Punjabi	:	Nim, Nimba
Tamil	:	Vempu, Veppu
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  $\mu$  long, tubular and hyaline; glandular trichomes of about 20  $\mu$ , 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  $\mu$  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 precoated silica gel 'G' plate (0.2 mm thick) using chloroform : acetone (20:1) shows spots at Rf 0.12 (violet), 0.17 (light pink), 0.33 (violet), 0.51 (purple), 0.64 (dark purple), 0.80 (light purple), 0.85 (light purple), 0.92 (purple) on spraying with 1% Vanillin-Sulphuric acid reagent followed by heating the plate at 105°C for about ten minutes.

**CONSTITUENTS** - 15-Acetoxy-7-deacetoxydihydroazadirone (neeflone), nonacosane (saturated hydrocarbon)

#### PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta
<b>Guna</b>	:	Laghu
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Caḡṣuṣya, Kṛmighna, Kaphahara, Pittahara, Vātakara, Viṣaghna, Kuṣṭhaghna, Grāhī.

**IMPORTANT FORMULATIONS** - Kuṣṭhakālāmla Rasa, Kuṣṭha Śailendra Rasa, Kṛm  
īvināśana Rasa

**THERAPEUTIC USES** - Śoṭha, Aruci, Chardi, Dāha, Hṛllāsa, Jvara, Kāsa, Kṛmi, Kaṇḍu,  
Kuṣṭha, Netraroga, Phiranga, Prameha, Raktavikāra, Tṛṣṇā,  
Viṣamajvara, Vraṇa, Kaphapittaja Vikāra, Śrama, Hṛdayavidāha

**DOSE** - 2 - 4 g puśpa cūrṇa.  
10 - 20 ml puśpa svarasa.

## 57. Nimba (Fr)

### NIMBA (Fruit)

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

#### SYNONYMS

Sanskrit	:	Ariṣṭah, Picumandah, Picumaradah, Prabhadrāh
Assamese	:	--
Bengali	:	Nim, Nimgaachh
English	:	Indian Lilac, Neem tree, Margosa tree
Gujrati	:	Leemado
Hindi	:	Neem
Kannada	:	Chikkabevu, Huchchabevu, Turakbevu
Kashmiri	:	--
Malayalam	:	Aaruveppu, Aryaveppu, Veppu
Marathi	:	Kadunimb, Nimb
Oriya	:	Neemo
Punjabi	:	Nim, Nimb
Tamil	:	Vempu, Vembu
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 precoated silica gel 'G' plate (0.2 mm thick) using chloroform : acetone (18.5:1.5) shows spots at Rf 0.11 (greyish violet), 0.16 (yellow), 0.19 (green), 0.24 (violet), 0.29 (grey), 0.33 (mustard yellow), 0.42 (pink), 0.49 (greyish black), 0.57 (violet) and 0.76 (light purple) on spraying with 1% Vanillin-Sulphuric acid reagent and heating the plate at 105°C for about ten minutes.

**CONSTITUENTS** - Fixed oil containing diterpenoids and triterpenoids (limonoids); nimbin, gedunin, azadirachtin, nimbidinin, salanin.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta
<b>Guna</b>	:	Laghu, Snigdha, Tikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaphahara, Rasāyana, Vātahara, Viṣaghna, Bhedanīya, Hṛdayadāhahara, Pācana

**IMPORTANT FORMULATIONS** - Arśoghniṭī (Seed), Palāśabījādi Cūrṇa (Seed)

**THERAPEUTIC USES** - Śīroroga, Śoṭha, Arśa, Aruci, Chardi, Dāha, Gulma, Hṛllāsa, Jvara, Kṛmi, Kuṣṭha, Prameha, Raktapitta, Viṣavikāra, Vibandha, Vraṇa, Pālitya, Netrarujā, Kṣata Kṣaya, Khālitya, Gaṇḍamāla

**DOSE** - 1 - 2 g cūrṇa.  
5 - 10 drops of oil.

## 58. Palasha (Sd)

### PALĀŚAH (Seed)

Palāśah consists of seed of *Butea monosperma* (Lam.) Kuntze, syn. *B. frondosa* Roxb. (Fam. Fabaceae), a moderate sized deciduous tree, commonly called "Flame of the Forest", found throughout India upto a height of 1250 m, except in the arid zones.

#### SYNONYMS

Sanskrit	:	Palāśah, Kiṃśukah, Raktapuṣpakah, Vātapotha
Assamese	:	--
Bengali	:	Palaash
English	:	Butea seed, Flame of the Forest, Bastard teak
Gujrati	:	Khakharo
Hindi	:	Dhak, Palash, Tesoo
Kannada	:	Muttagamara, Muttug
Kashmiri	:	--
Malayalam	:	Plashu
Marathi	:	Palas, Palash paapada
Oriya	:	--
Punjabi	:	--
Tamil	:	Purasu
Telugu	:	Moduga
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Seeds reddish-brown, thin, flat, reniform, longer axis from 3 to 4 cm and shorter from 2 to 2.5 cm, raphe equal to antiraphe, micropyle inconspicuous; seed coat reddish brown, waxy; faint odour; taste, slightly acrid bitter; weight of 100 seeds 80 to 115 g.

##### b) Microscopic

Single layered epidermis of testa interrupted by balloon shaped cells; malpighian cells palisade like, thick-walled, red, unlignified, lumen large but not uniform; discontinuous transparent Linea lucida in upper half of Malpighian layer; osteosclereids irregular, nonlignified, highly thick walled, columnar, compressed and superposed; mesophyll occupies major portion of testa, upper and lower mesophyll cells small, isodiametric to elliptic, middle layers large, angular, condensed with small intercellular spaces; inner epidermis reddish brown, distinct with small thick walled elongated cells externally covered by thin cuticle.

The transection of cotyledon shows single layered, thick-walled epidermis having angular cells, followed by beaded parenchymatous cells containing starch and protein in form of spiral, as revealed by freshly prepared Millons Reagent; starch grains, rod shaped or ovoid, simple, 20 to 40  $\mu\text{m}$ , hilum indistinct, lamellae distinct. Embryo is straight having a radicle with well-marked hypocotyl, epicotyl with a plumule and a pair of thick cotyledons.

**Powder** - Powder yellowish-brown; acrid and bitter with oily flavour and pleasant smell; small fragments of testa, broken and intact malpighian cells, osteosclereids, mesophyll cells isolated or in groups, cotyledonary parenchyma containing a few starch grains, abundant spiral protein bodies, mucilage and oil globules; when treated with 50%  $\text{H}_2\text{SO}_4$ , emits yellow fluorescence under UV-254 nm.

### 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	0.5	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	25	per cent, Appendix	2.2.7.
Protein	Not less than	18	per cent, Appendix	2.2.17
Fatty oil	Not less than	6	per cent, Appendix	2.2.15

### T.L.C.

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene : ethylacetate : methanol (85 : 15 : 0.5) as solvent system shows after spraying with anisaldehyde-sulphuric acid and heating the plate for ten minutes at  $120^\circ\text{C}$ , at Rf. 0.26 (magenta), 0.38 (greying green) and 0.56 (greyish green).

**CONSTITUENTS** - Fatty oil; amino acids.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Sara, Snigdha
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpana, Rasāyana, Tridoṣahara, Vṛṣya, Bhedana, Bhagnasandhānakara, Garbhanirodhaka

**IMPORTANT FORMULATIONS** - Ayaskṛti, Kṛmimudgara Rasa

**THERAPEUTIC USES** - Aśmarī, Śūla, Arśa, Atisāra, Dāha, Dadru, Gulma, Kāsa, Kṛmi, Kaṇḍu, Kuṣṭha, Mūtrakṛcchra, Medoroga, Pāmā, Prameha, Raktavikāra, Tvakroga, Udararoga, Vātarakta, Vraṇa, Yonidoṣa, Gudajaroga, Sukradoṣa, Plīharoga, Netraśukra, Paṇḍu, Vṛścikaviṣa

**DOSE** - 0.5 to 1 g.

## 59. Palasha (Fl)

### PALĀŚAH (Dried Flower)

Palāśah consists of dried flower of *Butea monosperma* (Lam.) Kuntze syn. *B. frondosa* Roxb. (Fam. Fabaceae), a moderate sized deciduous tree, commonly called Flame of the Forest", flowering in March - May found throughout India upto a height of 1250 m, except in the arid zones.

#### SYNONYMS

Sanskrit	:	Kimśuka, Raktapuṣpaka, Kṣārśreṣṭha
Assamese	:	--
Bengali	:	Palash
English	:	Bastard teak, Flame of the Forest, Butea Seed
Gujrati	:	Khaakharo
Hindi	:	Dhaak, Tesu, Palaash
Kannada	:	Muttug, Muttulu
Kashmiri	:	--
Malayalam	:	Plashu
Marathi	:	Palas, Palash paapda
Oriya	:	Porasu, Kijuko
Punjabi	:	Tesh
Tamil	:	Purasu
Telugu	:	Moduga
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Inflorescence raceme; flowers large, 4 to 6 cm long, alternate, with pubescent long, velvety, olive green peduncle; bright yellowish-red to orange red pedicels, 1.5 cm long, twisted, bracteate, bracts and bracteoles small, linear, velvety, orange green, deciduous; calyx campanulate, 5-partite, oblique, about 1 cm long, dark olive green, densely velvety outside, clothed with silky hairs within, two upper teeth connate, large, three lower ones unequal, the lowest being much shorter than the lateral ones; corolla 4 to 6 cm. long, orange red, covered outside with silky white hairs, papilionaceous; stamen diadelphous; anthers linear, yellow; ovary stipitate, silky, pubescent, style incurved, longer than the stamens.

## b) Microscopic

*Pedicel*: T.S. of pedicel circular in outline, bearing numerous 2 to 4 celled uniseriate hairs; cortex collenchymatous, differentiated in two zones- outer formed of smaller cells with some contents and inner zone of larger cells; cortex and stele separated by endodermis of barrel shaped cells containing starch grains; phloem parenchyma containing tannin; pith parenchymatous; vascular bundles separated by broad medullary rays and arranged in a ring; rhomboidal crystals of calcium oxalate present in cortex.

*Sepals*: Sepals on upper surface have one type of trichome 3 to 5 celled, with prominent basal cell; on lower surface two types of trichomes, (i) multicellular, uniseriate, long, thick walled with circular basal cell; (ii) a few multicellular, club-shaped, trichomes glandular in nature; stomata anomocytic type.

*Petals*: Upper surface of wing petal with profuse 2 to 6 celled hairs on its basal part and multicellular trichomes at the tip; lower surface of wing petal covered with multicellular uniseriate trichomes; papillate epidermal cells in the middle region of wing petal, in surface view shows striations radiating from the base of papilla; cells in apical region of wing petal without papillate, but narrow with random striation; upper surface of standard petal glabrous but margins hairy; multicellular, club shaped appendages and uniseriate 2 to 5 celled trichomes present at the apex. In the middle portion cells longer than broad, drawn out into papillae with striations radiating out from this; upper surface of keel petal cells polygonal, with irregular striations, trichomes profuse except at apical region.

*Stamens* diadelphous; pollen grain 3 pored, oblate, spheroidal; about 28  $\mu$  long and 30  $\mu$  m broad, pore circular to elongate, 8 to 12.5  $\mu$  m, exine wall surface foveolate.

*Ovary* with two types of trichomes, (i) thin walled having dense contents (ii) 2 to 3 celled trichome, placentation marginal; epidermal cells of style long, narrow in surface view, trichomes uniseriate multicellular and thick walled in styler region.

**Powder** - Brownish-yellow, slightly bitter in taste, no characteristic odour; shows pieces of various types of trichomes, vascular tissue, epidermal cells with characteristic papillae, polygonal cells with linear striations, pollen grains, and styloid crystals of calcium oxalate; powder treated with 1N HCl followed by one drop of nitrocellulose in amylacetate becomes orange yellow under UV 365 nm and with 1N NaOH in methanol becomes, yellowish-black under UV 254 nm.

## IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	10	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	15	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	32	per cent, Appendix	2.2.7.

## T.L.C.

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using ethyl acetate : methanol : water (100 : 15 : 5) shows under UV (366 nm) fluorescent zones at Rf. 0.17 (yellow), 0.26 (yellow), 0.53 (light brown), 0.58 (greenish yellow) and 0.63 (greenish yellow). On spraying with 5% KOH reagent spots at Rf. 0.17 (yellow), 0.26 (yellow), 0.58 (green) and 0.63 (green).

**CONSTITUENTS** - Coumarins and glycosides, cumaranone glycosides, butrin, isobutrin, monospermoside, isomonospermoside, carbomethoxy-3, 6-dioxo-5-hydro-1, 2, 4-triazine, coreopsin, isocoreopsin.

## PROPERTIES AND ACTION

**Rasa** : Madhura, Kaṭu, Tikta, Kaṣāya  
**Guna** : Laghu, Rukṣa, Sara  
**Virya** : Śīta  
**Vipaka** : Madhura  
**Karma** : Dīpana, Kaphahara, Kuṣṭhaghna, Mūtrala, Pittahara, Rakta Stambhana, Sandhānīya, Trsnāsāmaka, Dāhaprasāmana, Grāhī

**IMPORTANT FORMULATIONS** - Kunkumādi Taila, Vaṅa Bhasma (Jāraṇa (b))

**THERAPEUTIC USES** - Arśa, Dāha, Grahaṇī, Gulma, Kaṇḍu, Kuṣṭha, Mūtrakrcchra, Netraśukra, Plīhāroga, Raktapitta, Raktavikāra, Vātarakta, Trṣṇā, Krmi, Pittābhiṣyanda

**DOSE** - 3-6 g.

## 60. Parasika yavani (Sd)

### PĀRASĪKAYAVĀNĪ (Seed)

Pārasīkayavānī consists of the seed of *Hyoscyamus niger* Linn. (Fam. Solanaceae), an annual or biennial herb, native to the Mediterranean region and temperate Asia, occurring in Western Himalayas from Kashmir to Kumaon at an altitude of 1600 to 4000 m, imported into India.

#### SYNONYMS

Sanskrit	:	Khurāsānī Yavānī, Yavanī, Turuṣakā, Madakāriṇī
Assamese	:	--
Bengali	:	Khorasani ajwan
English	:	Henbane
Gujrati	:	Khurasanee ajma, Khurasanee ajmo
Hindi	:	Khurasanee ajvayan,
Kannada	:	Khurasanee, Ajawaana
Kashmiri	:	--
Malayalam	:	Khurasaanee, Paarasika, Yavaani
Marathi	:	Khurasanee ova
Oriya	:	--
Punjabi	:	Khurasanee ajvain, Bangidewana
Tamil	:	Kuraasanee Yomam
Telugu	:	Kurasanee vamu, Khurasanee omam
Urdu	:	Ajvayanee Khurasanee

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

**Powder** - Dark brown aromatic smell, bitter mucilagenous taste and an oily texture; a number of flask-shaped or dumb-bell shaped osteosclereids seen; fragments of testa in surface view, showing cells with sinuous walls; powder when treated with Sudan IV and

mounted in glycerine shows the presence of oil globules which turn orange red; powder cleared with dilute nitric acid shows surface view of sculpturing on testa.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 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.

### T.L.C.

T.L.C. of the methanolic extract on silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate : diethyl amine (70:20:10) shows under UV (366 nm) one fluorescent spot at Rf. 0.49 (blue). After spraying with anisaldehyde-sulphuric acid reagent and heating the plate at 105°C for ten minutes spots appear at Rf. 0.09 (Brown), 0.49 (brown), 0.69 (greenish brown). After spraying with modified Dragendorff's reagent spots appear at Rf. 0.90, 0.77, 0.61, 0.23 and 0.10.

**CONSTITUENTS** - Tropane alkaloids hyoscyamine, (its racemic mixture and atropine) and hyoscyne.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Guru, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Pittakara, Dīpana, Grāhī, Kaphahara, Vātahara, Vedanāsthāpana, Mādaka, Pācaka, Nidrākara

**IMPORTANT FORMULATIONS** - Sarpagandhāghna Vaṭī

**THERAPEUTIC USES** - Ānāha, Aśmarī, Śūla, Śvāsa, Gulma, Kāsa, Kṛmi, Unmāda, Rajahkr̥cchra, Śīghrapātana, Svpanadoṣa, Udaraśūla, Anidrā, Sandhiśūla

**DOSE** - 125 - 500 mg.

## 61. Pattura(Wh.Pl)

### PAṬṬŪRA (Whole Plant)

Paṭṭūra consists of whole plant of *Aerva lanata* (Linn.) Juss. (Fam. Amaranthaceae), an erect or prostrate branched herb, 30 to 60 cm in height, found throughout India in waste lands.

#### SYNONYMS

Sanskrit	:	Gorakṣagañja, Bhadrā
Assamese	:	--
Bengali	:	Chaya
English	:	--
Gujrati	:	Gorakhganjo
Hindi	:	Gorakhaganja
Kannada	:	Bilihindisoppu
Kashmiri	:	--
Malayalam	:	Cherula
Marathi	:	Kapurphutee, Kumrapindee
Oriya	:	--
Punjabi	:	Bhuikallan
Tamil	:	Cherupoolai
Telugu	:	Pindichettu, Kanda pindi
Urdu	:	--

#### 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 and kidney shaped; taste, pungent.

#### **b) Microscopic**

**Root** - Shows 5 to 7 layers of cork cells, upper 2 or 3 layers filled with brownish content; secondary cortex a wide zone consisting of circular to oval, elongated, thin walled parenchymatous cells, most of the cells containing rosette crystals of calcium oxalate; endodermis not distinct; pericycle present in the form of interrupted ring of pericyclic fibres; 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; under microscope shows straight walled epidermal cells, multicellular trichomes and anomocytic stomata in surface view; simple pitted vessels, cork cells, tracheids, fibres and rosette crystals of calcium oxalate.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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 gel 'G' plate using Toluene: Ethylacetate : Methanol (50: 50: 20) as mobile phase shows under UV (366 nm) ten fluorescent zones at Rf. 0.11 (sky blue), 0.27 (red), 0.47 (red), 0.51 (sky blue), 0.73 (sky blue), 0.82 (pink), 0.87 (sky blue), 0.91 (red), 0.94 (red) and 0.97 (dark red). On spraying with Anisaldehyde-Sulphuric acid reagent and heating the plate for about ten minutes at 105°C ten spots appear at Rf. 0.11, 0.23, 0.37, 0.51, 0.61, 0.73, 0.85, 0.92 and 0.94 (all violet) and 0.97 (dark violet).

**CONSTITUENTS** -  $\alpha$ - Amyrin and  $\beta$  - sitosterol,  $\beta$  - sitosterol palmitate, compesterol, chrysin, flavonoid glycosides and tannins.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Tikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Katu
<b>Karma</b>	:	Kṛmighna, Kaphahara, Vātahara, Mūtravirecana

**IMPORTANT FORMULATIONS** - Śatāvaryādi Ghṛta

**THERAPEUTIC USES** - Aśmarī, Mūtrakṛcchra

**DOSE** - 50-100 ml in the form of decoction.

## 62. Pilu(Fr)

### PĪLŪH (Fruit)

Pīlūh consists of fruit of *Salvadora persica* Linn. var. *wightiana* (Planch.ex Thw.) Verdc, syn. *S. persica* Linn. (Fam. Salvadoraceae), a perennial, woody, glabrous shrub, distributed in the arid tracts of Punjab and north western parts of India.

#### SYNONYMS

Sanskrit	:	Guḍaphala, Srānsī, Pilū
Assamese	:	Arak, Irak
Bengali	:	Peelugachh, Jhal
English	:	Salt bush, Toothbrush Tree
Gujrati	:	Peelu, Khareejal
Hindi	:	Pilu, Jhak, Peelu, Kharjal
Kannada	:	Gonimara, Kankhina, Genumar
Kashmiri	:	--
Malayalam	:	Uka
Marathi	:	Pilu, Khakhan
Oriya	:	--
Punjabi	:	Peelu
Tamil	:	Kotumaavali, Chittuva, Perungoli, Udhaiputtai
Telugu	:	Gogu, Varagogu, Gunia
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Fruits are 3 to 5 mm in diameter, ellipsoid-ovoid, occasionally with a small pedicel attached; surface greenish or greenish-brown to dark brown in colour, with irregular wrinkles, sometimes shrunken; pericarp thin, easily separable, exhibiting creamish to dull brown seed, odour characteristic and taste bitter.

##### b) Microscopic

The epidermis is single layered consisting of thick walled, radially elongated cells covered externally with cuticle, the mesocarp differentiated into three zones, the outer and inner zone exhibiting thin walled parenchyma cells while a continuous zone of sclerenchymatous tissue with vascular bundles embedded in it is present in the middle region; testa shows single layered epidermis of thin walled cells followed by parenchymatous cells of the embryo containing aleurone grains and occasional oil globules.

**Powder** - Powder shows fragments of parenchymatous cells with aleurone grains and oil globules; scalariform, reticulate as well as border-pitted vascular elements; thick walled epidermal cells in surface view and sclereids.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 per cent, Appendix	2.2.2.
Total Ash	Not more than	15 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	4 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	12 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	40 per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of alcoholic extract on precoated Silica gel 'G' plate (Merck), using n-Butanol; Acetic acid; water (4:1:5), in visible light shows three spots at Rf.0.23, 0.80 (both light green) and 0.46 (light yellow); under UV (366 nm) two white spots appear at Rf.0.37 and 0.46; under UV (254nm) three spots appear at Rf.0.37 (white), 0.46 and 0.80 (both pink), on exposure to Iodine vapours four yellow spots appear at Rf.0.10, 0.37, 0.46 and 0.80, on spraying with vanillin sulphuric acid and heating the plate at 110°C for 10 minutes, six spots appear at Rf. 0.10, 0.23 (both violet), 0.37, 0.40, 0.46 and 0.80 (all orange).

**CONSTITUENTS** -  $\beta$ - sitosterol, sterol glycoside, benzyle isothioagnate, traces of alkaloid, fixed oil, sugar and fat, non-saponifiable portion of oil consists of dibenzylurea and dibenzlethiourea.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Kaṭu, Tikta
<b>Guna</b>	:	Laghu, Snigdha, Tīkṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Śothahara, Bhedana, Dīpana, Kaphahara, Rasāyana, Vātahara, Virecana, Vednāsthāpana, Śirovirccaka, Vidāhi

**IMPORTANT FORMULATIONS** - Miśrakasneha

**THERAPEUTIC USES** - Aśmarī, Arśa, Ānāha, Gulma, Jvara, Mūtrakṛcchra, Sarpaviṣa, Udararoga, Viṣavikāra, Bastivikāra

**DOSE** - 3-6 g.

### 63. Pilu(Lf)

### PĪLŪH (Leaf)

Pīlūh consists of leaf of *Salvadora persica* Linn. var. *wightiana* (Planch. ex Thw.) Verdc, syn. *S. persica* Linn. (Fam. Salvadoraceae), a perennial, woody, glabrous shrub, distributed in the arid tracts of Punjab and north western parts of India.

#### SYNONYMS

Sanskrit	:	Guḍaphalah, Sraṅsī, Pilukah
Assamese	:	--
Bengali	:	Peelugaach, Jhaal
English	:	Salt bush, Tooth brush Tree
Gujrati	:	Peelu, Khaaree jaal
Hindi	:	Jhak, Peelu, Pilu, Kharjaal
Kannada	:	Genumar, Gonimara, Kankhina
Kashmiri	:	--
Malayalam	:	Uka
Marathi	:	Khakhan, Pilu
Oriya	:	Kotungo, Toboto
Punjabi	:	Peelu
Tamil	:	Chittuva, Kotumaavali, Perungoli, Uthaiputtai
Telugu	:	Gogu, Gunia, Varagogu

#### DESCRIPTION

##### a) Macroscopic

Leaves are 3 to 10 cm in length and 1 to 4 cm in breadth, green, simple, stipulate, petiolate, oblong, ovate, margin entire, broad at base and acute at apex; veins prominent and raised on lower surface; both surfaces glabrous; taste and odour characteristic.

##### b) Microscopic

**Petiole** - Petiole somewhat circular in outline with a large crescent-shaped vascular bundle and two small vascular bundles fused together to form a central core of vascular tissue; the presence of interxylary phloem indicates anomalous growth; epidermis single layered, covered externally with thick cuticle; cortex a wide zone consisting of circular to oval parenchyma cells; pericycle represented by small patches of thick walled and lignified fibres; phloem consists of usual elements traversed by uni or biseriate medullary rays; xylem consists of vessels, tracheids, fibres and parenchyma; vessels show scalariform thickening and border pitted walls, tracheids are bordered as well as simple pitted, parenchyma cells and fibres are simple pitted; interxylary phloem present in the central xylem region; pith composed of thin walled parenchyma cells; rosettes of calcium oxalate crystals and starch grains present in the parenchyma cells of the cortex and pericyclic region

**Midrib** - Midrib shows single layered epidermis covered externally with thin cuticle on both the surfaces, except at a few places where a periclinal division is seen; cortex is a wide zone of thin walled parenchyma cells, the centre of midrib is occupied by a vascular cylinder consisting of a large crescent-shaped vascular bundle, the pericycle is represented by small patches of fibres, the phloem consists of usual elements, the xylem is represented by vessels, tracheids, parenchyma and fibres; interxylary phloem is present in the xylem region; the xylem is traversed by uniseriate medullary rays which become bi or tri seriate in the phloem region; rosettes of calcium oxalate crystals and a few starch grains are present in the parenchymatous cells of cortex and pericyclic region.

**Lamina** - Lamina shows isobilateral structure; cuticle present, both epidermises are single layered, except for occasional periclinal division; in surface view both the surfaces shows anisocytic and paracytic stomata; 2 or 3 layers of palisade cells are present below the upper and above the lower epidermis, remaining area being occupied by thin walled cells of pongy parenchyma; a number of small vascular bundle and vascular strand are distributed in the mesophyll of the lamina; idioblasts containing large rosettes of calcium oxalate crystals are present beneath both the epidermises; rosettes of calcium oxalate crystals are also present in spongy parenchyma and palisade cells; stomatal index 9 to 11 (upper surface) and 8 to 10 (lower surface); palisade ratio 5 to 6 (upper surface) and 4 to 5 (lower surface); vein islet number 4 to 6 (upper surface) and 5 to 7 (lower surface).

**Powder** - Pale green, shows presence of thin walled parenchyma cells several containing rosettes of calcium oxalate crystals and a few simple starch grains; fragments of epidermal cells showing anisocytic and paracytic stomata; fragment of scalariform and bordered pitted vessels, border and simple pitted tracheid, simple pitted parenchyma cells and thick walled fibres.

## **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 27 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 40 per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of alcoholic extract on Silica gel 'G' plate (Merck), using Toluene; Methanol (86:14), shows in visible light nine spots at Rf. 0.21, 0.25, 0.28(all green), 0.45 (bright yellow), 0.60 (faint green), 0.72(dark green), 0.79, 0.85 and 0.94 (all green); under UV (254nm) twelve spots appear at Rf. 0.14 (faint orange), 0.21, 0.25, 0.28 (all orange), 0.36, 0.45 (both light orange), 0.53 (faint orange), 0.60, 0.72, 0.79 (all light orange), 0.85 and 0.94 (both orange); on exposure to Iodine vapours ten spots appear at Rf. 0.14 (yellow), 0.21, 0.25, 0.28 (all green), 0.53, 0.60, 0.72, 0.79 (all faint yellow), 0.85, 0.94 (both bluish green), on spraying with sulphuric acid and heating 'G' plate at 110°C for 30 minutes, twelve spots appear at Rf. 0.14 (yellow), 0.21, 0.25, 0.28 (all dark green), 0.36 (faint brown), 0.45 (brown), 0.53 (faint brown), 0.60 (violet), 0.72, 0.79 (both faint brown), 0.85 (dark green) and 0.94 (blackish green).

**CONSTITUENTS** -  $\beta$ -sitosterol, glucotropaeolin, terpenes and flavonoids.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Tikṣṇa, Laghu, Sara, Snigdha
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Śirovirecaka, Śothahara, Bhedana, Dīpana, Kaphahara, Rasāyana, Vedanāsthāpana, Vidāhī, Virecana, Vātahara

### IMPORTANT FORMULATIONS - Pīlū Taila

**THERAPEUTIC USES** - Aśmarī, Apacī, Arśa, Bastivikāra, Bhagandara, Ānāha, Gulma, Jvara, Kṛmi, Mūtrakṛcchra, Nāḍīvraṇa, Udāvarta, Udararoga, Vātarakta, Vraṇa, Śarpavisa, Yonivyāpat, Duṣṭavraṇa, Vraṇśoṭha, Mukhapāka, Madyaja Tṛṣṇā, Plihāroga, Sarva Kuṣṭha

**DOSE** - 3-6 g.

## 64. Pīlu (Rt.Bk)

### PĪLŪH (Root)

Pīlūh consists of root bark of *Salvadora persica* Linn. var. *wightiana* (Planch.ex Thw.) Verdc, syn. *S. persica* Linn. (Fam.Salvadoraceae), a perennial, woody, glabrous shrub, distributed in the arid tracts of Punjab and north western parts of India.

#### SYNONYMS

Sanskrit	:	Guḍaphalah, Pilukah, Sransī
Assamese	:	--
Bengali	:	Jhaal, Peelugaach
English	:	Tooth brush Tree, Saltbush
Gujrati	:	Khaaree jaal, Peelu
Hindi	:	Jhak, Kharjaal, Peelu, Pīlu
Kannada	:	Genumar, Gonimara, Kankhina
Kashmiri	:	--
Malayalam	:	Uka
Marathi	:	Khakhan, Pīlu
Oriya	:	Kotungo, Toboto
Punjabi	:	Peelu
Tamil	:	Chittuva, Kotumaavali, Perungoli, Uthaiputtai
Telugu	:	Gogu, Gunia, Varagogu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

The root bark is 2 to 3 mm thick, woody, channeled; pale brown with longitudinal wrinkles, exhibiting scars of roots and rootlets; inner surface creamish to yellowish-brown; fracture, short and smooth; odour, foetid and taste characteristic.

##### b) Microscopic

The bark shows a wide zone of cork occupying half of the transection; cork cells differentiated into two zones, outer zone consisting of small rectangular cells whereas the lower cells are larger, rectangular and tangentially elongated; phellogen single layered; the phellogen consist of 10 to 20 layers of thin walled tangentially elongated parenchyma cells with small intercellular spaces; it is followed by a wide phloem being traversed by 2 to 5 seriate medullary rays; the phloem consists of usual element, a few fibres and isolated stone cells; several parenchyma cells are thick walled and arranged in somewhat radial rows in which stone cells and fibres are scattered; prismatic crystals

of calcium oxalate are present in the parenchyma cells of outer phloem and phelloderm regions.

**Powder** - Powder shows fragments of cork cells, thin walled parenchyma cells, thick walled and pitted parenchyma cells, prisms of calcium oxalate, fragment of thin walled fibres and stone cells, with thick walled and narrow central lumen.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 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	2 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 on Silica gel 60 plate (Merck), using Chloroform: Toluene; Methanol (10:75:15), shows under UV (254nm) one yellow fluorescence spot at Rf.0.46; on exposure to Iodine vapours four yellow spots appear at Rf. 0.17, 0.30, 0.46 and 0.67; on spraying with vanillin sulphuric acid and heating the plate at 110°C for 10 minutes, seven spots appear at Rf. 0.11 (blue), 0.17, 0.23 (both violet), 0.30 (yellow), 0.35, 0.46 and 0.67 (all blue).

**CONSTITUENTS** -  $\beta$ -sitosterol and elemental  $\gamma$ - monoclinic sulphur (S-8) and glucotropaeolin isolated from root.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Kaṭu, Tikta
<b>Guna</b>	:	Laghu, Sara, Snigdha, Ṭikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Śirovirecaka, Śothahara, Bhedana, Dīpana, Kaphahara, Rasāyana, Vātahara, Vedanāsthāpana, Vidāhī, Virecana

**IMPORTANT FORMULATIONS** - Arśakuṭhāra Rasa, Vaidūrya Rasayana, Chitrakhadiya Taila, Triphalādi Guṭika, Naracaka Cūrṇa, Vilvakhadhi Lepa, Pippalyādi Guṭika

**THERAPEUTIC USES** - Aśmarī, Arśa, Bastivikāra, Bhagandara, Duṣṭavraṇa, Ānāha, Gulma, Jvara, Kṛmi, Mūtrakrcchra, Madyaja Tṛṣṇā, Mukhapāka, Plīhāroga, Sarpaviṣa, Udāvarta, Udararoga, Vātarakta, Vrana, Yonivyāpat, Nādivraṇa, Vranaśoṭha, Sarvakuṣṭha, Apacī

**DOSE** - 10-20 g for decoction.

## 65. Potagala (Rt)

### POTAGALA (Root)

Potagala consists of dried root of *Typha elephantina* Roxb. (Fam. Typhaceae), a perennial grass-like shrub, about 1.5-3.0 m in height and found throughout plains of India, in stagnant water and the sides of streams and marshes.

#### SYNONYMS

Sanskrit	:	Erakā
Assamese	:	--
Bengali	:	Hogalaa
English	:	Elephant grass
Gujrati	:	Ghaabaajariyu
Hindi	:	Pateraa, Erakaa
Kannada	:	Apu, Jambuhullu
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Raamabaan
Oriya	:	Hogala
Punjabi	:	Boj, Bori, Patiraa
Tamil	:	Anaikkoria, Anaippul
Telugu	:	Enugajammu, Jammuguddi
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

The roots are upto 15 cm long and about 4 mm thick, arising in groups from the base of the stem; pale brown to light brown in colour, irregularly flattened with longitudinal fissures giving rise to several secondary and tertiary rootlets from its lower end, transversely cut surface shows creamish to pale yellow central core; taste and odour indistinct.

##### b) Microscopic

T.S. shows single layered epidermis, followed by wide cortex which can be differentiated into three zones; the outer cortical cells, below the epidermis consist of 5 to 7 layers of parenchyma cells arranged compactly followed by second zone consisting of circular to oval and tangentially elongated parenchyma cells; the central cortical region exhibits large air cavities lined by 1 or 2 layers of thin walled, compressed, narrow and radially elongated parenchyma cells - the trabiculae; the centre of the root exhibits a typical monocotyledonous structure consisting of alternating bands of xylem

and phloem surrounded externally by endodermis and pericycle; the cells of endodermis show thickening on radial and lower tangential walls; except phloem cells all the cells below the pericycle are thick walled and lignified; the vascular cylinder exhibits presence of numerous very long fibres with narrow to negligible lumen; the vessels show scalariform thickening whereas the tracheids have scalariform thickening or border pits; the parenchyma cells are radially elongated and simple pitted.

**Powder** - The powdered drug exhibits fragments of thin walled circular to oval and also radially elongated parenchyma cells; fragments of trabeculae; fragments of fibres showing negligible to narrow lumen; scalariform vessels; scalariform and border-pitted tracheids and simple pitted thick walled parenchyma cells.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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	7	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	20	per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of alcoholic extracts on precoated Silica Gel 60 plate (Merck), using Chloroform: Toluene: Ethyl acetate: Formic acid (6:4:0.5), shows in visible light two spots at Rf. 0.89(light green) and 0.64(pale green); under U.V. (254nm) four spots appear at Rf.0.28(pinkish orange), 0.64(light orange), 0.78 and 0.81(both whitish); on exposures to iodine vapours 8 spots appear at Rf. 0.10, 0.19, 0.28, 0.45, 0.57, 0.64, 0.78 and 0.93 (all yellow); on spraying with 5% ethanolic sulphuric acid and heating the plate at 110°C for 30 minutes 10 spots appear at Rf. 0.10(light violet), 0.19(violet), 0.28, 0.45(both faint brown), 0.57(violet), 0.64(dark brown), 0.78(blue), 0.81, 0.89 and 0.93(all faint brown).

**CONSTITUENTS** -  $\beta$ -sitosterol, cholestrol, quercetin and lanosterol.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Caḡṣuṣya, Grāhī, Kaphahara, Mūtrala, Pittahara, Vṛṣya, Vraṇaropana

**IMPORTANT FORMULATIONS** - Sukumāra Ghṛta

**THERAPEUTIC USES** - Aśmarī, Śopha, Dāha, Mūtrakṛcchra, Raktapitta, Raktavikāra, Vātarakta, Visarpa, Vraṇa, Bastiśoṭha, Śukradaurbalya

**DOSE** - 10-20 g for decoction.

## 66. Pudina(Aerialpart)

### PUDĪNĀH (Aerial Part)

PudĪnāh consists of the aerial part of *Mentha viridis* Linn. syn. *M. spicata* var. *viridis* Linn. (Fam. Lamiaceae) a perennial, creeping aromatic herb of 30 to 90 cm high, widely cultivated throughout the plains of India for culinary and medicinal purposes.

#### SYNONYMS

Sanskrit	:	Pūtihā, Rocanī, Podīnakah
Assamese	:	--
Bengali	:	Pudinaa
English	:	Spear-Mint, Garden Mint
Gujrati	:	Phudino
Hindi	:	Pudeenaa
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Pudinaa
Oriya	:	--
Punjabi	:	Parari pudina
Tamil	:	Pudeenaa
Telugu	:	Pudeenaa
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Drug consists of small chopped twigs; leaves opposite, decussate, shortly petiolate, petioles 2-mm long; mature leaves 2.5 to 3.5 cm long and 1.5 to 2.0 cm broad, very minutely hairy, ovate, apex acute, coarsely dentate, comparatively smoother and darker upper surface; stem square, minutely hairy, light brown to brown; flowers in loose cylindrical, slender spikes; awl like, throat of calyx naked, corolla smooth; seeds small, mucilaginous; aromatic odour and slightly pungent taste.

##### b) Microscopic

**Stem** - T.S. shows quadrangular outline with corner ridges and thin cuticle; epidermal cells tabular, multicellular uniseriate trichomes present, cortex 8 to 9 cells deep below ridges, while 2 to 3 cells deep elsewhere, variable in size; endodermis single layer; pericycle broken, consisting of sclerenchymatous cells; phloem 2 to 4 cells deep and made up of irregular shaped cells; xylem vessels 26 to 46  $\mu$  in dia; pith present.

## Leaf -

*Midrib*: T.S. shows protruded mid rib towards the lower surface; compact parenchymatous cells enclose a crescent-shaped vascular bundle; collenchymatous cells are absent.

*Lamina*: Dorsiventral, epidermal cell walls of both the surfaces in the surface view are wavy, stomata diacytic; covering trichomes present on the lower surface, uniseriate, 1 to 4 cells long, 42 to 350  $\mu$  in size with pointed apex; glandular trichomes 64 to 80  $\mu$  in diam. with a single basal cell and a head of 8 cells, found in depression of the epidermis; a single row of palisade cells towards the upper side followed by spongy parenchyma 3 to 4 cells deep; palisade ratio 6 to 8; vein islet number 18 to 20; stomatal index for upper epidermis 10 to 20, lower epidermis 15 to 30.

**Powder** - Blackish-brown, fibrous, free flowing, characterized by the presence of uniseriate non-glandular hairs (112 to 350  $\mu$ ), glandular trichomes 64 to 80  $\mu$  in diam, diacytic stomata, epidermal cell walls wavy.

## 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	4 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	2 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	7 per cent, Appendix	2.2.7.
Essential oil	Not less than	0.2 per cent, Appendix	2.2.10

## T.L.C.

T.L.C. of essential oil on silica gel 'G' plate using hexane : ethyl acetate (90:10) shows eight spots at Rf 0.28, 0.33, 0.38, 0.49, 0.55, 0.66, 0.80 and 0.88 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110°C.

**CONSTITUENTS** - Essential oil (0.2 to 0.8 percent) containing terpene such as carvone (60%) and limonene (10%) as major constituents.

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu
<b>Guna</b>	:	Laghu, Rukṣa, Tīkṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Balya, Dīpana, Kaphahara, Mūtrala, Vātahara, Rocana

## IMPORTANT FORMULATIONS - Pudīnārka

**THERAPEUTIC USES** - Jīrṇa Jvara, Śūla, Agnimāndya, Ajīrṇa, Aruci, Atisāra, Śvāsa, Chardi, Ādhmāna, Hikkā, Kāsa, Kṛmi, Mūtrakṛcchra, Kaṣṭhārtava, Prasūtījvara, Mada, Visucikā, Grahāṇi, Vaktrajāḍya, Jvara

**DOSE** - 5-10 ml patra svarasa.  
20-40 ml phāṇṭa.  
1-3 drops taila.

## 67. Pullani(Lf)

### PULLĀNĪ (Leaf)

Pullānī consists of leaf of *Calycopteris floribunda* Lam. (Fam. Combretaceae), a scandent shrub, distributed in the deciduous forests of western Peninsula.

#### SYNONYMS

Sanskrit	:	Pullānī, Toyavallī, Kāravelli
Assamese	:	--
Bengali	:	--
English	:	--
Gujrati	:	--
Hindi	:	Kokkarai
Kannada	:	Marsadabaguli, Enjarige Kubsa
Kashmiri	:	--
Malayalam	:	Pullaani, Varavalli
Marathi	:	Ukshi, Bogull
Oriya	:	--
Punjabi	:	--
Tamil	:	Minnaarukoti, Pillani, Therulankodl
Telugu	:	Bandimurududu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

The leaves are 7 to 12 cm by 4 to 6 cm ovate-lanceolate or elliptic-oblong, acute or acuminate, petiole 0.5 cm to 1.0 cm long; upper surface dull green, lower pale brown with prominent veins, both surfaces hairy; taste, astringent and odour characteristic.

##### b) Microscopic

###### Leaf -

**Petiole** - The transverse section exhibits a single layered epidermis with numerous unicellular covering as well as short stalked or sessile glandular trichomes with 12 to 16 celled head; wide cortex consisting of thin walled parenchymatous cells; a crescent shaped vascular bundle consisting of usual elements, surrounded dorsally as well as laterally by a sheath of fibres is present in the centre of petiole; rosettes of calcium oxalate crystals are seen in some of the cortical cells.

**Midrib** - The transverse section shows single layered epidermis covered externally with cuticle; long, unicellular covering as well as short stalked or sessile glandular hairs with 12 to 16 heads present on both the surfaces; cortex consisting of thin walled parenchyma cells; a crescent shaped vascular bundle consisting of usual elements surrounded by a continuous ring of fibres present in the center of the cortex, rosettes of calcium oxalate crystals found in some of the cortical parenchyma cells.

**Lamina** - The epidermal cells have wavy outline in surface view; anamocytic stomata present on lower surface only; unicellular, long covering trichomes as well as glandular hair similar to those described under petiole, present on both surfaces but more pronounced on lower side.

The transverse section shows dorsiventral structure with two layers of palisade cells below the upper epidermis; mesophyll represented by cells of spongy parenchyma and small vascular bundles and vascular strands; rosettes of calcium oxalate crystals seen in some of the cells of spongy parenchyma; stomatal index 23 to 29; palisade ratio 4 to 7 and vein islet number 5 or 6.

**Powder** - Pale green; shows fragments of upper epidermal cells with covering as well as glandular trichomes; lower epidermal cells with stomata, covering and glandular trichomes, fragments of fibres, reticulate and scalariform vascular elements; scattered covering and glandular trichomes and parenchyma cells with rosettes of calcium oxalate.

#### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	2	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	8	per cent, Appendix	2.2.7.

#### **T.L.C.**

T.L.C. of alcoholic extract on precoated Silica gel 'G' plate (Merck), using Ethyl acetate: Methanol: Water (8:11:8) shows in visible light six spots at Rf. 0.13 (light brown), 0.49 (yellow), 0.61 (pale yellow), 0.71 (light yellow), 0.92 (dark yellow) and 0.96 (light orange); under U.V. (254 nm) four spots appear at Rf. 0.61, 0.71 (both white), 0.92 (yellow) and 0.96 (orange); on exposure to Iodine vapours five spots appear at Rf. 0.44, 0.61, 0.71 (all yellow), 0.92 (brown) and 0.96 (dark yellow); on spraying with vanillin sulphuric acid and heating the plate at 110°C for 10 minutes, six spots appear at Rf.0.13, 0.44 (both faint brown), 0.61 (violet), 0.71 (faint brown), 0.92 (black) and 0.96 (dark green).

**CONSTITUENTS** - Octacesanol, sitosterol, calycopterin, 3'0-Methylcalycopterin, 4-0 methylcalycopterin, ellagic acid quercetin and proanthocyanidin.

**PROPERTIES AND ACTION**

**Rasa** : Tikta  
**Guna** : Laghu, Rukṣa  
**Virya** : Uṣṇa  
**Vipaka** : Kaṭu  
**Karma** : Kaphahara, Pittahara, Bhedini, Vibandhahara

**IMPORTANT FORMULATIONS** - Marma Guṭikā

**THERAPEUTIC USES** - Jvara, Kṛmi, Kuṣṭha, Pāṇḍu

**DOSE** - 3-6 g.

## 68. Pullani(LRt)

### PULLĀNĪ (Root)

Pullānī consists of root of *Calycopteris floribunda* Lam (Fam. Combretaceae), a scandent shrub, distributed in the deciduous forests of western peninsula.

#### SYNONYMS

Sanskrit	:	Kāravelli, Pullānī, Toyavallī
Assamese	:	--
Bengali	:	--
English	:	--
Gujrati	:	--
Hindi	:	Kokkarai
Kannada	:	Enjarige Kubsa, Marsadabaguli
Kashmiri	:	--
Malayalam	:	Pullaani, Varavalli
Marathi	:	Bogull, Ukshi
Oriya	:	--
Punjabi	:	--
Tamil	:	Minnaarukoti, Pillani, Therulankodl
Telugu	:	Bandimurududu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

The roots are upto 3 cm. in diameter occasionally with attached rootlets, surface with fine longitudinal wrinkles, buff brown to greyish-brown, bark very thin; fracture, tough and fibrous; taste and odour indistinct.

##### b) Microscopic

T.S. shows narrow cork consisting of tangentially elongated cells, phelloderm is a narrow zone represented by thin walled and tangentially elongated parenchyma cells; phloem is composed of soft tissues; xylem is a solid cylinder consisting of vessels and tracheids showing bordered pits and reticulate thickening, simple pitted parenchyma cells and fibres; patches of interxylary phloem of soft tissues are seen in xylem region, the medullary rays are uniseriate; rosettes of calcium oxalate crystals are present in some of the parenchyma cells of phloem and interxylary phloem.

**Powder** - Powder shows fragments of cork cells, parenchyma cells containing rosettes of calcium oxalate crystals, scattered rosettes of calcium oxalate crystals and fragments of vessels and tracheids showing bordered pits and reticulate thickening.

### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than 2 per cent, Appendix	2.2.2.
Total Ash	Not more than 2.5 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than 0.5 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than 4 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than 3 per cent, Appendix	2.2.7.

### **T.L.C.**

T.L.C. of alcoholic extract on Silica gel 'G' precoated plates (Merck), using Ethyl acetate:Methanol;Water (8:11:8) shows under UV (254nm) two spots at Rf.0.39 and 0.71(both faint blue); on spraying with 5% ethanolic sulphuric acid and heating the plate at 110°C for 30 minutes, three spots appear at Rf. 0.39, 0.71 (both faint brown) and 0.88 (violet).

**CONSTITUENTS** - Octacesanol, sitosterol, calycopterin, 3'0-methylcalycopterin, 4-0 methylcalycopterin, ellagic acid, gossoypol and quercetin.

### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Tikta
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Katu
<b>Karma</b>	:	Bhedini, Kaphahara, Pittahara, Vibandhahara

**IMPORTANT FORMULATIONS** - Marma Guṭikā

**THERAPEUTIC USES** - Jvara, Kṛmi, Kuṣṭha, Pāṇḍu

**DOSE** - 3-6 g.

## 69. Pullani(St)

### PULLĀNĪ (Stem)

Pullānī consists of stem of *Calycopteris floribunda* Lam. (Fam. Combretaceae), a scandent shrub, distributed in the deciduous forests of western peninsula.

#### SYNONYMS

Sanskrit	:	Kāravelli, Pullānī, Toyavallī
Assamese	:	--
Bengali	:	--
English	:	--
Gujrati	:	--
Hindi	:	Kokkarai
Kannada	:	Enjarige Kubsā, Marsadabaguli
Kashmiri	:	--
Malayalam	:	Pullaani, Varavalli
Marathi	:	Bogull, Ukshi
Oriya	:	--
Punjabi	:	--
Tamil	:	Minnaarukoti, Pillani, Therulankodl
Telugu	:	Bandimurududu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Pieces of stem cylindrical, about 8 to 10 mm thick, surface light brown, smooth; bark thin, easily separable; fracture hard and fibrous; taste and odour indistinct.

##### b) Microscopic

T.S. of stem shows narrow cork consisting of rectangular and tangentially elongated cells, phelloderm exhibits 5 to 8 layers of thin walled parenchymatous cells; phloem is composed of soft tissues being traversed by uniseriate medullary rays; xylem is a wide zone consisting of scalariform and reticulate vessels with transverse or lateral wall perforations and tracheids, simple pitted fibres and parenchyma cells; medullary rays are uniseriate; patches of interxylary phloem made up of soft tissues are seen in this region; intraxylary phloem is present at the periphery of pith; the pith consists of thin walled parenchyma cells with isolated stone cells; rosettes of calcium oxalate crystals scattered in phloem and interxylary phloem.

**Powder** - Light brown; shows fragments of vascular elements, scalariform and reticulate vessels and tracheids, stone cells, pitted fibres and parenchyma, thin walled parenchyma cells, parenchyma cells with rosettes of calcium oxalate crystals and isolated rosettes of calcium oxalate crystals.

### **IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	5	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	2	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	2.5	per cent, Appendix	2.2.7.

### **T.L.C.**

T.L.C. of alcoholic extract on Silica gel 'G' precoated plates (Merck), using Ethyl acetate:Methanol:Water (8:11:8) shows in visible light two spots at Rf. 0.89 (light yellow) and 0.94 (dark yellow); under UV (254nm) four spots appear at Rf. 0.30, 0.51, 0.58 (all light blue) and 0.89 (yellow); on exposure to Iodine vapours four spots appear at Rf. 0.34, 0.51, 0.58 and 0.89 (all yellow); on spraying with 5% ethanolic sulphuric acid and heating the plate at 110°C for 30 minutes, five spots appear at Rf. 0.34, 0.51, 0.58, 0.89 (all faint brown) and 0.94 (black).

**CONSTITUENTS** - Octacesanol, sitosterol, calycopterin, 3'-O-Methylcalycopterin, 4-O methylcalycopterin, ellagic acid.

### **PROPERTIES AND ACTION**

<b>Rasa</b>	:	Tikta
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Bhedini, Kaphahara, Pittahara, Vibandhahara

**IMPORTANT FORMULATIONS** - Marma Guṭikā

**THERAPEUTIC USES** - Jvara, Kṛmi, Kuṣṭha, Pāṇḍu

**DOSE** - 3-6 g.

## 70. Putikaranja(St.Bk)

### PŪTĪKARĀÑJA (Stem Bark)

Pūtīkarañja is the dried stem bark of *Caesalpinia crista* Linn. (Fam. Caesalpinaceae); a prickly, shrubby climber found throughout India upto an altitude of 1200 m.

#### SYNONYMS

Sanskrit	:	Cirabilvah, Pūtīkah, Prakiryah
Assamese	:	--
Bengali	:	--
English	:	Indian elm
Gujrati	:	Charela, Kanajho
Hindi	:	Chilbil, Kanju, Banchillaa, Paapari
Kannada	:	Tapasigida
Kashmiri	:	--
Malayalam	:	Avil, Nettavil
Marathi	:	Baavalaa
Oriya	:	--
Punjabi	:	Chirbil
Tamil	:	Avali, Aapa
Telugu	:	Tapasi, Nemalinara
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Bark curved, 0.8 to 1.5 mm thick, dark reddish or nearly blackish in colour with a number of sharp prickles; inner surface light brown to dark brown and smooth; fracture, short; odourless; slightly astringent in taste.

##### b) Microscopic

**Stem bark-** T.S. of stem bark consists of layers of radially tiered cork, covered by degenerated dark layers of dead cells of cork, followed by 16 to 22 layers of phelloderm; phelloderm cells are thin walled, parenchymatous; some cells are filled with starch grains that are spherical, variable in size measuring from 1.5 to 5  $\mu$ m, with a centric hilum; rosettes or prismatic crystals of calcium oxalate also present; stone cells are present in the form of a continuous ring; secondary phloem consists of companion cells, sieve cells; phloem parenchyma and thick walled phloem fibres in groups, traversed by medullary rays; simple, rarely compound starch grains and clusters crystals of calcium oxalate also found in secondary phloem region.

**Powder-** Light brown, easily flowable, taste-slightly astringent, odourless; shows the presence of simple to compound starch grains composed of 2 to 4 components; prismatic and rosettes of calcium oxalate crystals; cork in surface view, sclereids, phloem fibres, parenchymatous cells contains prismatic and clusters of calcium oxalate.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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	10	per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of alcoholic extract of stem bark powder on Silica gel 'G' plate using Toluene: Formic acid: Glacial acetic acid (82: 14.5: 4.5) under UV light (365 nm) shows one fluorescent zone at Rf. 0.70 (green). On exposure to iodine vapour, six spots appear at Rf. 0.06, 0.25, 0.68, 0.72, 0.86 and 0.95 (all yellow).

**CONSTITUENTS** - Flavonoid, Saponins and Alkaloids.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Śothahara, Bhedanīya, Dīpana, Kṛmighna, Śleṣmasaṃśamana, Anulōmana, Lekhanīya, Viṣghna, Apārāpatana

**IMPORTANT FORMULATIONS** - Viṣṇu Taila, Indukānta Ghr̥ta, Pramehamihira Taila

**THERAPEUTIC USES** - Arśa, Śvitra, Gulma, Kaṇḍu, Kuṣṭha, Prameha, Tvakroga, Udara, Vraṇa, Pakva-Śopha, Ślīpada, Vātaja Śula, Śula, Masūrikā, Amlapitta, Śarira-Durgandha

**DOSE** - 50-100 ml. in the form of decoction.

## 71. Renuka (Fr)

### RĒṆUKA (Seed)

Renukā consists of dried fruit of *Vitex negundo* Linn. (Fam. Verbenaceae) a small tree with triplicate to pentafoliate leaves and bluish inflorescence, found throughout India.

**Note :** 'Renuka' is the fruit of *Vitex agnus-castus* Linn., a plant of foreign origin according to the AFI. However, since they are not available in the market, the recognised substitute fruits of *Vitex negundo* have been taken here as Renuka. 'Nirgundi' is the dried leaf of *Vitex negundo*

### SYNONYMS

Sanskrit	:	Rājaputrī, Nandini, Kapilā, Dvijā, Bhasmagandhā, Pāṇḍupatrī, Hareṇukā
Assamese	:	--
Bengali	:	Renuka, Kaunttee, Renuka Beej
English	:	Chaste-Tree, Hemp-Tree
Gujrati	:	Harenu, Renuka
Hindi	:	Renukaa, Renuka, Sambhaalooka Beej
Kannada	:	Renuka
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Renuka Beej
Oriya	:	--
Punjabi	:	--
Tamil	:	Yettee
Telugu	:	Jeevakamu
Urdu	:	--

### DESCRIPTION

#### a) Macroscopic

The fruit is a rounded drupe, 1 to 3 mm in diameter, 1/3 rd to 3/4 th of its size surrounded by a dull grey cup like, persistent calyx alongwith pedicel; calyx cup may show one or two vertical splits; fruit colour light brown to black; locules two, each containing two seeds; texture smooth, taste and odour not characteristic.

#### b) Microscopic

Fruit shows a circular outline; the outermost layer consists of compact, rounded or barrel shaped epidermal cells; epidermis bears abundant, characteristic bicelled, bent or wavy trichomes; distal cell of the trichomes generally broken; the subepidermal

ground tissue comprising the mesocarp, composed of thin walled, angular cells which overarch between the two loculi of the fruit at the distal end; mesocarp also contains a ring of vascular strands; thick walled lignified cells inner to mesocarp comprise the endocarp; each loculus contains 1 or 2 flattened seeds; calyx consists of an outer epidermal layer of small cells followed by a central tissue of thin walled angular cells.

**Powder** -The powder shows stone cells, bicellular trichomes and groups of vessels with scalariform thickenings beside tissue fragments comprising both thin and thick walled cells.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	5	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	3	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	2	per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (8-2), shows under U.V. (366nm) spots at Rf. 0.36 (Blue), 0.52 (Yellowish green), 0.57 (Bluish green), 0.63 (Bluish green), 0.71 (Blue), 0.84 (Blue), 0.93 (Bluish green); on spraying with anisaldehyde- sulphuric acid reagent and heating the plate for ten minutes at 110°C under U.V. (366nm) spots appear at Rf. 0.04 (Greyish Black), 0.58 (Blue), 0.73 (Blue), 0.90 (Blue), 0.97 (Yellow).

T.L.C. of the n-Hexane extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : ethylacetate (95:5) shows under U.V. (366nm) spots at Rf 0.13 (Green), 0.27 (Green), 0.34 (Green), 0.44 (Green), 0.51 (Green), 0.66 (Green), 0.77 (Green), 0.84 (Green), 0.90 (Dark Green); on spraying with anisaldehyde: sulphuric acid reagent and heating the plate for ten minutes at 110° C under U.V. (366nm) spots appear at Rf 0.13 (Yellow), 0.27 (Yellow), 0.34 (orange yellow), 0.44 (Light yellow), 0.51 (Greenish Yellow), 0.65 (Pale yellow), 0.77 (pale yellow), 0.84 (Yellow), 0.90 (Yellow).

**CONSTITUENTS** - Seeds contain hydrocarbons such as *n*-tritriacontane, *n*-hentriacontane, *n*-pentatriacontane and nonacosane. Other constituents of the seeds include  $\beta$ - sitosterol, *p*-hydroxybenzoic acid and 5 oxyisophthalic acid.

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Laghu
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpanī, Kaphahara, Medhya, Pācanī, Vātahara, Viṣaghna, Pittakara, Garbhapātinī, Mukhavaimalyakara

**IMPORTANT FORMULATIONS** - Pramehamihira Taila, Vāsācandanādi Taila, Candanādi Taila, Daśamūlariṣṭa, Sārsvatāriṣṭa, Mahāyogarāja Guggulu, Aṇṭaitaila, Balāśvagandha Lākṣādi Taila

**THERAPEUTIC USES** - Dāha, Dadru, Daurbalya, Gulma, Kāsa, Kaṇḍu, Netraroga, Tṛṣṇā, Klaibya

**DOSE** - 1-3 g.

## 72. Riddhi (tuber)

### RIDDHI (Tuber)

Riddhi consists of dried tuber of *Habenaria intermedia* D.Don (Fam. Orchidaceae); a glabrous, small, erect, herbaceous plant found in temperate Himalayas, upto 2000 m commercial samples are usually processed in steam or boiling water and dried before marketing.

#### SYNONYMS

Sanskrit	:	Aśvāsini
Assamese	:	--
Bengali	:	--
English	:	--
Gujrati	:	--
Hindi	:	--
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	--
Oriya	:	--
Punjabi	:	--
Tamil	:	--
Telugu	:	Jeevakamu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Unprocessed tubers are 1.5 to 3.5 cm long and 1.0 to 2.5 cm thick, oval, obovate or oblong in shape; buff to yellowish brown, with shrunken surface, covered with numerous fine hairs; internally white to creamish in colour; showing scars of aerial portion at the apex and beaked or sometime round base; odourless; taste, palatable and mucilaginous.

Processed tubers; with scar or attached stem on top; 1.5 to 3.0 cm in length and 0.5 to 1.5 cm in width, conical, tapering to a beaked base, surface rough, occasionally grooved, grayish-brown; very hard to break; fractured surface show creamy interior; taste palatable and mucilaginous; odourless.

## b) Microscopic

T.S. of unprocessed tuber shows 2 to 3 layered epidermis with long unicellular hairs, followed by a distinct exodermis and 15 to 20 layers of cortical parenchyma, cells of which in proximity of exodermis are smaller as compared to the remaining cells of cortex region; a few parenchymatous cells of outer cortex contain bundles of raphides. It is followed by a typical polystelic condition consisting of 14 to 16 diarch steles arranged in a ring and 7 to 10 steles distributed among the parenchyma in the central region; schizogenous mucilage canals lined by an epithelium of usually 6 to 9 cells are found distributed throughout the parenchymatous tissue; small and large starch grains mostly of simple type are found distributed in abundance throughout the parenchyma as well as in the epithelial cells of mucilage canals; the smaller ones are mostly found with hilum as a point or cleft and large one are round to oval with centrally situated hilum in the form of a point or cleft or triangular or 2 to 3 stellate cleft.

The processed tubers show no anatomical changes except the gelatinized starch grains.

**Powder** - The powder shows the presence of a large number of starch grains, long needle shaped raphides in bundles or isolated; fragments of root hairs, mucilage canals, parenchymatous cells and vessels with scalariform thickening.

## IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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	14	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	22	per cent, Appendix	2.2.7.

## T.L.C.

T.L.C. of alcoholic extract on Silica gel 'G' precoated plates (Merck), using Toluene : Methanol (84:16) shows in visible light four spots at Rf. 0.41, 0.35 (both light yellow, 0.22 and 0.16 (both pink); under UV rays (254nm) three spots appear at Rf. 0.79 (white), 0.67 (dark blue) and 0.39 (yellow), on exposure to iodine vapours five spots appear at Rf.0.79, 0.41, 0.35, 0.22 and 0.16 (all yellow); on spraying with 5% vanillin sulphuric acid and heating the plate at 110°C for 10 minutes, nine spots appear at Rf. 0.79, 0.67, 0.61, 0.41, 0.39, 0.35, 0.22 and 0.19 ( all pink) and 0.16 (violet).

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Guru, Picchila, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Pittahara, Rasāyana, Tridoṣaśāmaka, Vātahara, Vṛṣya, Śukrajanana, Ojovardhaka

**IMPORTANT FORMULATIONS** - Aśoka Ghṛta, Amṛtaprāśa Ghṛta, Daśamūlāriṣṭa, Chāgalādyā Ghṛta

**THERAPEUTIC USES** - Jvara, Kṣaya, Raktavikāra, Mūrchā

**DOSE** - 3-6 g.

### 73. Rohisha(Wh.Pl)

## ROHĪṢA (Whole Plant)

Rohīṣa consists of dried leaf, stem and root of *Cymbopogon martinii* (Roxb.) Wats. (Fam. Poaceae) a perennial, sweet scented grass, 1.5 to 3.5 m high, occurs wild in dry localities and cultivated in many parts of India.

### SYNONYMS

Sanskrit	:	--
Assamese	:	--
Bengali	:	Agam Ghaas, Agiyaa Ghaas
English	:	Rosha Grass, Rusa grass
Gujrati	:	Rondso, Ronsdo
Hindi	:	Rohis, Roosaa, Roosaaghaas, Mirchagandha
Kannada	:	Dunllu, Harehullu
Kashmiri	:	--
Malayalam	:	Sambhaarppullu
Marathi	:	Rohish gavat
Oriya	:	--
Punjabi	:	Agya ghass
Tamil	:	Kaavattampillu, Munkipul, Chooraiappul
Telugu	:	Kaamakchhi - Kassuvu
Urdu	:	--

### DESCRIPTION

#### a) Macroscopic

**Root** - Short, stout and woody; roots fibrous; many culms arise from root stumps.

**Culm** - Erect, terete, smooth shiny, upto 6 mm in dia., internodes 5 to 16 cm long, solid.

**Leaf** - Blades linear-lanceolate or lanceolate tapering to long filiform acuminate point, cordate and amplexicaul at base, upto 50 cm long and 3.5 cm broad; upper leaves are smaller, leaf surface glabrous, margin scabrid; midrib prominent and protruded on the lower surface; leaf sheath shorter than the internodes, glabrous, striate, auriculate, tight and clasping the culm, ligules membranous, 2 to 3 cm long.

**Inflorescence** - Spathate panicle, compound, upto 30 cm long; primary axis bears 2 or 3 branches at each node, these end in a spatheole which bears a pair of racemes, spatheole 1.8 mm long become reddish at maturity; racemes 1.5-2.0 cm long become sessile or shortly pedicelled, lower raceme base and lower most pedicel swollen; sessile spikelet

about 3.5 mm long, lower glume 1 mm wide, ovate, with deep median groove, broadly winged, 2 nerved; awn 12 to 18 mm long; pedicellate spikelet about 4 mm long, glabrous; lower glume lanceolate, 8 nerved, flower hermaphrodite or male, stamens-3, anthers 1 or 2 mm long, style 2, stigma pilose.

#### **b) Microscopic**

**Root** - T.S. shows thin walled epiblema with unicellular root hairs; cortex composed of thin walled, parenchymatous cells; large air chambers present in the cortex; endodermis single layered and pericycle two cell layered; central vascular strand has outer 2 or 3 layers of sclerenchymatous cells followed by 3 to 5 cells deep zones of thin walled phloem with a row of circular cavities of 12 to 25  $\mu$  diam.; 5 to 10 cell layer thick zone encloses xylem vessels; which are 35 to 50  $\mu$  in diam.; pith cells thick walled and devoid of any cell contents.

**Stem** - T.S. shows thick cuticle; epidermis devoid of any appendages; hypodermis 6 to 10 cells deep and composed of sclerenchymatous cells; vascular bundles scattered throughout the ground tissue with a row of smaller vascular bundles in the hypodermis; cells of ground tissue thin walled, parenchymatous; vascular bundles present in the ground tissue enclosed by 2 or 3 layers of sclerenchymatous cells.

**Leaf** - T.S. shows isobilateral structure, with a spongy mesophyll between; outline showing a slightly concave upper surface and a convex lower surface; midrib protruded towards lower side; cells of upper epidermis interrupted by the presence of bulliform or motor cells; lower epidermal cells are more uniform in size and smaller; stomata present on both surfaces, characteristically placed in a straight line between veins, mesophyll consists of chlorenchymatous cells placed radially around smaller vascular bundles; bundle sheath present around smaller vascular bundles, on either side of the midrib vascular bundle; group of sclerenchymatous fibres are found and may extend upto bundle sheath; vascular bundle of midrib usually has two conspicuous metaxylem vessels.

Lower epidermis can be distinguished from the upper epidermis by its having more number of stomata, smaller epidermal cells and presence of microhairs and papillae; stomata of the lower epidermis - oval, mostly with low dome shaped long cells present between the veins; long cells of lower epidermis possess 1 or 2 papillae, while papillae are absent on the long cells of upper epidermis; short cells over the veins in rows of more than 5 cells and may be in pairs; silica bodies abundant over the veins mostly dumbbell shaped, occasionally cross-shaped, narrow and crenate; prickle and micro hairs present; micro hairs two celled, observed only on lower epidermis; the basal cell of micro hairs is wide as compared to distal cell; distal cell tapers to an acutely pointed apex.

**Powder** - Brown, fibrous, free flowing, shows debris from leaves showing characteristic graminaceous stomata, silica bodies, and micro hairs; also contains pitted parenchyma and fiber.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 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	5 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	7 per cent, Appendix	2.2.7.
Essential oil	Not less than	0.2 per cent, Appendix	2.2.10

### T.L.C.

T.L.C. of essential oil on silica gel 'G' plate using hexane : ethyl acetate (90:10) shows seven spots at Rf 0.25, 0.38, 0.47, 0.57, 0.64, 0.71 and 0.78 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110°C.

**CONSTITUENTS** - Essential oil (0.5 percent) containing terpenes such as geraniol, geranyl acetate, citronellol, linalool, geranyl butyrate, myrcene,  $\alpha$ - and  $\beta$ -pinene.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Laghu, Rukṣa, Ṭikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Pittahara, Kaphavātaśāmaka, Bālagrahaḥara, Puṁstvaghna

**IMPORTANT FORMULATIONS** - Balā Taila, Māsabalādi Kvātha Cūrṇa

**THERAPEUTIC USES** - Śūla, Apasmāra, Aruci, Hṛdroga, Jvara, Kāsa, Kuṣṭha, Prameha, Raktapitta, Pinasa, Kaphajvara, Kaṇṭha Roga, Kaṭiśūla, Vṛṣcika-Viṣa

**DOSE** - 10-20 g.

## 74. Rumimastagi (Resin)

### RŪMĪMASTAGĪ (Resin)

Rūmīmastagī is a resin obtained from *Pistacia lentiscus* Linn. (Fam. Anacardiaceae), a shrub or small tree indigenous to the countries bordering on the Mediterranean.

#### SYNONYMS

Sanskrit	:	--
Assamese	:	--
Bengali	:	Rumi-Mastungi
English	:	Mastic
Gujrati	:	Rumi Mastagee
Hindi	:	Rumi Mastagee, Rumi Mastiki, Mastagee
Kannada	:	---
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Rumaa Mastakee
Oriya	:	--
Punjabi	:	--
Tamil	:	--
Telugu	:	Jeevakamu
Urdu	:	Rumee Mastagee

#### DESCRIPTION

##### a) Macroscopic

The resin occurs in small, hard, pear shaped, ovoid or nearly globular, sometimes elongated tears, about 2 to 8 mm in diameter; pale yellow in colour; brittle, breaking into clear glossy fracture, interior transparent, crushing to a sandy powder, taste, slightly agreeable; odour, aromatic.

#### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 per cent, Appendix	2.2.2.
Total Ash	Not more than	2.6 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	0.34 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	94 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	0.5 per cent, Appendix	2.2.7.

## ASSAY

The drug on steam distillation yields colourless oil (1.5-2.0% v/w), which is heavier than water. (Method in Appendix 2.2.10.).

## T.L.C.

T.L.C. of alcoholic extract on Silica gel 'G' precoated plates (Merck), using Toluene : Methanol (95:5); under UV (254nm) shows one spot at Rf. 0.17 (blue fluorescence): on spraying with Vanillin-sulphuric acid and heating the plate at 110°C for 30 minutes, twelve spots appear at Rf. 0.12, 0.17, 0.23 (all violet), 0.40 (blue), 0.41 (purple), 0.44, 0.46, 0.49, 0.56, 0.69, 0.80 and 0.86 (all blue).

**CONSTITUENTS** - Resin, volatile oil, a bicyclic terpenoid and fatty acids.

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Dīpana, Kaphahara, Mūtrala, Vṛṣya, Varṇya, Vājīkaraṇa, Rakta Saṅgrāhika, Mukhadurgandhanāśaka, Daśansthiratākara

**IMPORTANT FORMULATIONS** - Eladi, Kameda, Sukrama Vati

**THERAPEUTIC USES** - Agnimāndya, Śoṭha, Śvāsa, Ādhmāna, Grahaṇī, Kāsa, Mūtrakṛcchra, Raktasrāva, Vātapittaja Vikāra

**DOSE** - 1-2 g.

## 75. Sarala (Exudate )

### SARALA (Exudate)

Sarala is an exudate obtained by tapping the wood of *Pinus roxburghii* Sargent syn. *P. longifolia* Roxb. (Fam. Pinaceae), a monoecious conifer found in north-western Himalayas at an altitude between 460 and 1500 m.

#### SYNONYMS

Sanskrit	:	Śrih, Śrīveṣṭaka, Śrīvāsah, Śriniketah, Śryāhvah, Vṛkṣadhūpakah
Assamese	:	--
Bengali	:	Sarala gaachh
English	:	Oleo-resine of Pine
Gujrati	:	Teliyo devdaar, Pilo berajo
Hindi	:	Cheed-Ka-Gond, Gandhabirojaa
Kannada	:	Saral, Sriveshtaka
Kashmiri	:	--
Malayalam	:	Charalam, Saralam
Marathi	:	Sarala deeka
Oriya	:	Sidhaa, Saral
Punjabi	:	Cheed
Tamil	:	Pinaimaaru
Telugu	:	Saral
Urdu	:	Cheed

#### DESCRIPTION

##### a) Macroscopic

Blackish brown in colour, semi solid, mostly associated with debris from needles, wood chips and bark of the source tree; odour, terebinthene.

#### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	1 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	0.4 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	74 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	0.15 per cent, Appendix	2.2.7.
Volatile oil	Not less than	18 per cent, Appendix	2.2.10

## ASSAY

### G.L.C. -

G.L.C. of Turpentine oil on the Gas Chromatograph Model NUCON - 5765, Column & Stationary phase : 30m fused silica capillary column walls coated with FFAP, Carrier Gas : Helium, 1.5 ml. min<sup>-1</sup>, Column Temperature : 90° C for 2 min. then programmed at the rate of 7° C min<sup>-1</sup> to 220° C, Injection port Temperature : 220° C, Detector Temperature : 240° C, Recorder : 2mV, signal attenuation 1:100, Chart speed : 1 cm.min<sup>-1</sup>, Sample size : 0.10 ml (For GC analyses, pure (0.1ml) is injected with a 1.0 ml syringe).

The identification of compounds is done by comparing the retention time of peaks and by peak enrichment technique with standard samples run under similar operating conditions such as 1- $\alpha$ - pinene (Rt = 6.31 min.); 1- $\beta$ -pinene (Rt = 7.18 min.); car-3-ene (Rt = 7.76 min.); longifolene (Rt = 15.46 min.).

### T.L.C.

T.L.C. of rosin (Material left after separation of essential oil) on a precoated silica gel G plate, using methanol : hexane (5:95). One spot at Rf. 0.80 on spraying with 2% vanillin in sulfuric acid (dark pink to purple fluorescent) and on spray with 0.04 per cent bromocresol green solution shows yellow spot.

**CONSTITUENTS** - 1- $\alpha$ -pinene, 1- $\beta$ -pinene, car-3-ene, longifolene and other mono & sesquiterpenes.

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Snigdha, Ṭikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpana, Kaphahara, Rakṣoghna, Vātahara, Viṣaghna, Durgandhahara, Duṣṭavraṇaśodhaka, Varṇaprasādana

**IMPORTANT FORMULATIONS** - Amṛtaprasa Cūrṇa, Kuṣṭadi Taila

**THERAPEUTIC USES** - Agnimāndya, Ādhmāna, Grahabādhā, Kṛmiroga, Kaṇṭharoga, Kaṇḍu, Koṭha, Kuṣṭha, Mūrccā, Sotha, Tvakroga, Urustambha, Vātavayādhī, Yonidoṣa, Jatrūrdhavaroga, Sveda-Daugandhya, Karṇaśūla, Nāḍivrana, Piḍakā, Yūkaroga

**DOSE** - 1-3 g.

## 76. Sarpagandha(Rt)

### SARPAGANDHĀ (Root)

Sarpagandhā consists of air dried root of *Rauwolfia serpentina* (Linn.) Benth. ex Kurz (Fam. Apocynaceae); a perennial undershrub widely distributed in India in the sub-Himalayan tracts upto 1,000 m as well as, in the lower ranges of the Eastern and Western Ghats and in the Andamans.

#### SYNONYMS

Sanskrit	:	Nākuli, Candrikā, Chandramārah
Assamese	:	--
Bengali	:	Chaandar
English	:	Rauwolfia Root, Serpentina Root
Gujrati	:	Amelpodee
Hindi	:	Chhotaa Chaand, Dhavalbaruaa
Kannada	:	Sutranaabhu
Kashmiri	:	--
Malayalam	:	Amalpori
Marathi	:	Adkai, Chandra
Oriya	:	Dhanbarua, Sanochado
Punjabi	:	--
Tamil	:	Sarppaganti
Telugu	:	Sarpagandhi
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Pieces of roots mostly about 8 to 15 cm long and 0.5 to 2 cm in thickness, sub-cylindrical, curved, stout, thick and rarely branched; outer surface greyish-yellow to brown with irregular longitudinal fissures; rootlets 0.1mm in dia; fracture, short, slight odour and bitter taste.

##### b) Microscopic

**Root-** Root comprises of stratified cork of about 18 layers, of which the cells of 8 to 12 layers are smaller, suberized and unligified; cells of remaining layers large, suberized and lignified; phelloderm parenchymatous, some cells packed with starch grains and prismatic and clusters crystals of calcium oxalate; secondary phloem tissue consists of sieve cells, companion cells and parenchymatous cell containing starch grains and crystals of calcium oxalate; phloem fibres absent; phloem parenchyma occasionally filled with granular substances; starch grains mostly simple but compound granules also occur with 2 to 4 components; individual granules spherical, about 5 to 15 µm in

diameter, with well marked hilum simple or split in a radiate form; stone cells are absent (distinction from many other species such as *R. canescens*, *R. micrantha*, *R. densiflora*, *R. perakensis* and *R. vomitoria*); secondary xylem is traversed by well developed lignified medullary rays of about 1 to 5 cell wide but uniseriate rays are more prominent; vessels singly or in pairs; xylem parenchyma cells lignified; fibres present; cells of medullary rays thick walled also filled with starch grains and calcium oxalate prisms.

**Powder** - Coarse to fine, yellowish-brown, free flowing, odour slight, bitter in taste; characterized by spherical, simple to compound starch grains, calcium oxalate prisms and clusters; vessels with simple perforation, occasionally tailed; tracheids lignified; xylem fibres irregular in shape, occurs singly or in small groups, walls lignified, tips occasionally forked or truncated; wood parenchyma cells are filled with calcium oxalate crystals and starch grains; stone cells phloem fibres absent.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 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	4 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	10 per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of the methanol and Ammonia extract of root powder on silica gel 'G' plate using Toluene : Ethyl acetate : Diethylamine (70 : 20: 10) shows eight spot on spraying with Dragendorff reagent at Rf. 0.11, 0.13, 0.25, 0.37, 0.47, 0.51, 0.61 and 0.82 (all reddish brown). The spot at Rf. 0.82 is of reserpine.

**CONSTITUENTS** - Rauwolfia contains indole alkaloids, such as reserpine, serpentinine and ajmalicine.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpanī, Kaphahara, Mūtral, Pācanī, Rucya, Vātahara, Viṣaghna, Nidrāprada, Kāmāvasādaka, Hṛdavasādaka.

**IMPORTANT FORMULATIONS** - Sarpagandhādi Cūrṇa, Sarpagandhāyoga, Sarpagandhā Vaṭi, Sarpagandhā Ghana Vaṭī

**THERAPEUTIC USES** - Śūla, Anidrā, Apasmāra, Bhūtabādhā, Bhrama, Jvara, Kṛmiroga, Madaroga, Unmāda, Yoniśūla, Raktavīta, Mānasaroga, Visūcikā, Vraṇa.

**DOSE** - 1-2 g.

## 77. Svetapunarnava(Rt)

### ŚVETAPUNARNAVĀ (Root)

Śvetapunarnavā consists of root of *Boerhaavia verticillata* Poir. (Fam. Nyctaginaceae), a herbaceous weed with a tendency to climb, widely distributed in the plains throughout India during rainy season.

#### SYNONYMS

Sanskrit	:	Vṛscīva
Assamese	:	--
Bengali	:	Shatapunyaa
English	:	Horse purslane, Blunt leaved Hogweed
Gujrati	:	Vasedo, Vasedee
Hindi	:	Safed Punarnavaa, Gada Poornaa
Kannada	:	Maachchugoni, Vinleey Duvelladkilu
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Pundharighentuli
Oriya	:	--
Punjabi	:	Itsita
Tamil	:	Sharunnai, Mukkarattai-Kirai

#### DESCRIPTION

##### a) Macroscopic

Roots occur in small pieces of 5 to 7.5 cm in length and upto 2 cm in thickness; texture rough; lenticels dot like or slightly transversely elongated, arranged in transverse rows; colour brown, freshly cut surface creamish to light brown; odour and taste not distinctive.

##### b) Microscopic

Root shows anomalous secondary growth; periderm present and consisting of phellem, phellogen and phelloderm; part of phellem and phellogen sloughed off and phelloderm mostly crushed but forms a continuous layer around the stelar region; the phellogen consists of 4 or 5 layers of rectangular and tangentially elongated cells; cortex composed of parenchymatous cells that are usually crushed; raphides present in some cells of cortex; centre of the root occupied by xylem consisting mostly of vessels, fibres and tracheids; concentric but irregular rings of cambium, patches of xylem and phloem, and parenchyma alternate in turn towards the periphery; medullary rays are not distinct; starch abundant in parenchyma; most of the starch grains rounded or hemispherical in shape; the compound starch grains, however, are scanty.

**Powder** - The powder show raphides (usually broken) and fragments of fibres, and vessel members showing scalariform thickenings; starch present.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	16	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	4	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	7	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	2	per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene:ethylacetate:acetic acid (5:4.5:0.5), shows under U.V. (366nm) spots at Rf 0.37, 0.59, 0.80 (All Blue). On spraying with anisaldehyde: sulphuric acid reagent and heating the plate for ten minutes at 110°C spots appear at Rf 0.19 (Greyish Black), 0.59 (Greyish Black), 0.69 (Blue), 0.79 (Purple).

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Kaphahara, Vātahara, Viṣaghna, Pittaśāmaka, Agnidīpaka, Jvarahara

**IMPORTANT FORMULATIONS** - Kumāryāsava (A), Punarnavādyriṣṭa, Dhānvantara Ghṛta, Dādhika Ghṛta

**THERAPEUTIC USES** - Śopha, Śoṭha, Hṛdroga, Kāsa, Pāṇḍu, Plīhāroga, Sūla, Sarpaviṣa, Udararoga, Vṛṣcikaviṣa, Viṣavikāra, Urahkṣata, Rakta Vikāra, Paittika Jvara, Cāturthikajvara, Śrāva, Vātakanṭaka, Vidradhi Alarkaviṣa, Mūṣakaviṣa

**DOSE** - 5-15 g.

## 78. Tailaparnah(Lf)

### TAILAPARNAH (Leaf)

Tailaparnah consists of mature leaf of *Eucalyptus globulus* Labill. (Fam. Myrtaceae) a large tree attaining a height of 90 m or more, native to Australia, but planted world wide and introduced in Nilgiris, Anamalai and Palni hills, Simla and Shillong at an altitude of 1500-2500 m.

#### SYNONYMS

Sanskrit	:	Nīlaniryāsa, Ekaliptah, Sugandha Patrah
Assamese	:	--
Bengali	:	--
English	:	Blue gum, Eucalyptus
Gujrati	:	--
Hindi	:	Yukeliptas
Kannada	:	--
Kashmiri	:	--
Malayalam	:	Yukkaalimaram
Marathi	:	Nilgiri
Oriya	:	--
Punjabi	:	--
Tamil	:	Yukkaalimaram
Telugu	:	Jeevakamu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Drug consists of mature leaves, more or less scimitar shaped, thick, leathery, greyish-green, petiolate, upto 26 cm long and 4 cm broad; petioles 2.0 to 3.5 cm long and 0.5 to 1.5 mm thick, sometimes twisted; apex acute to acuminate, base obtuse; midrib prominent, particularly on the lower surface; margin of leaf entire and somewhat thickened, brittle and possess numerous brown to dark brown corky warts. In transmitted light, numerous oil glands can be seen as translucent dots; upper surface smooth, lower surface slightly rough due to the presence of projecting veins; venation - unicostate reticulate; lateral veins anastomose near the margin forming a continuous line; odour strong and characteristic.

##### b) Microscopic

**Leaf** - T.S. shows typical isobilateral structures with two or three rows of palisade cells on both upper and lower sides, surfaces show thick cuticle; numerous sunken stomata

and large ovoid schizogenous oil cavities of 160 to 200  $\mu$  diam.; idioblasts present with rosettes or prismatic calcium oxalate crystals; rosette crystals 25 to 35 $\mu$  in size, prismatic crystals 15 to 25 $\mu$  in size; vascular bundle of midrib are crescent shaped with one vascular strand present on each side, all having interrupted patches of sclerenchyma; corky warts comprising of 10 or more layers of cells; laminary bundles enclosed in bundle sheath, the cells of which extend to the epidermis on both sides; upper and lower epidermal cells have straight walls; stomata anomocytic; stomatal index on both upper and lower surface 5 to 10; the palisade ratio on upper surface 5 to 17 and lower surface 3 to 6.

**Powder** - Yellowish brown, free flowing, characterized by the presence of cluster and prismatic crystals of calcium oxalate; epidermis straight walled with sunken stomata; fibers present.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	9	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	14	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	21	per cent, Appendix	2.2.7.
Essential oil	Not less than	2	per cent, Appendix	2.2.10

### T.L.C.

T.L.C. of hexane extract on silica gel 60 F 254 plate using Toluene : Acetone (95:05) shows four spots at Rf 0.22, 0.35, 0.41 and 0.49 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110°C.

**CONSTITUENTS** - Essential oil containing terpenes such as 1,8 - cineole, camphene, sabinene, myrcene, p-menthone,  $\alpha$ - and  $\gamma$ -terpinene, fenchone,  $\alpha$ -  $\beta$ -thujone, citral, verbenone.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Snigdha
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpana, Hṛdya, Kaphahara, Mūtrala, Pācana, Vātahara, Durgandhināśaka, Agnimāndya, Balaprada

**IMPORTANT FORMULATIONS** - Ekādaśaśatikaprasāniṇī Failam, Mahāsugandhika Taila, Pañcavakra Rasa, Pañcaguṇa Taila, Mārtaṇḍabhairava Rasa, Jvaramāri Rasa

**THERAPEUTIC USES** - Śūla, Agnimāndya, Śvāsa, Hṛdroga, Jvara, Kṛmi, Kṣaya, Pūyameha, Plīhāroga, Pratiśyāya, Pravāhikā, Svarabheda, Viṣamajvara, Jīrṇakāsa, Bastiroga

**DOSE** - 1-2 g.

## 79. Tinisha (Wd)

### TINIŠAH (Wood)

Tinišah consists of wood of *Ougeinia oojeinensis* (Roxb.) Hochr. syn. *O. dalbergioides Benth.* (Fam. Fabaceae), a small to medium sized deciduous tree, found in the outer Himalayas and sub Himalayan tracts from Jammu to Bhutan up to an altitude of 1500 m and extending through the whole of the northern and central India into greater part of Deccan Peninsula.

#### SYNONYMS

Sanskrit	:	Tinih, Syandanah, Rathadru
Assamese	:	--
Bengali	:	Tinish
English	:	Sandan
Gujrati	:	Tanacha
Hindi	:	Sandan, Saanana, Tinsaa
Kannada	:	Karimutale, Kalabangaa
Kashmiri	:	--
Malayalam	:	Totukara, Malavenna
Marathi	:	Timas, Syandan
Oriya	:	Vanjan
Punjabi	:	--
Tamil	:	Narivengai, Naiponai
Telugu	:	Tellamotuku, Dargu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Wood pieces are roughly cubic and about 2 to 3 cm in size; outer part yellow or cream, internal part light to dark brown in colour; cut surfaces are fibrous, wood pieces devoid of any odour.

##### b) Microscopic

**Sap wood** - Diffuse porous, vessels in cross sections solitary, in short radial multiples or in clusters, forming oblique chains, about 30 to 220  $\mu$  in diam. with reticulate thickenings and simple pits, without gummy deposits; frequency of vessels per sq. mm is 14 to 18; axial parenchyma is paratracheal, aliform, confluent - broad and filled with simple starch grains 4 to 21  $\mu$  in dia. with prominent striations and slit like centric hilum; fibres present in patches; marginal fibres possess abundant prismatic crystals of calcium oxalate, 4 to 10  $\mu$  in size; fibres are occasionally septate; rays uni- to

multiseriate, heterogenous, usually homocellular, some cells may contain minute starch grains of about 8  $\mu$  diam.; cells contain no tannin.

**Heart wood** - T.S. shows vessels of same size as those of sap wood but are usually filled with brownish gummy material and possess bordered pits; frequency of vessels per sq. mm is 6 to 8; axial parenchyma is paratracheal, aliform and is usually filled with brownish substance but lack starch grains; marginal fibres contain abundant prismatic crystals of same size as observed in the sapwood, ray, axial parenchyma and fibres contain tannins.

**Powder** - Brown, fibrous, free flowing, characterized by the presence of several lumps of brown gummy material, xylem parenchyma, medullary ray cells, simple starch grains, xylem vessels with several small slit like pits and fibres containing crystals of calcium oxalate.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	1 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	5 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 methanol extract on silica gel 'G' plate using diethyl ether : hexane (78:22) shows six spots at Rf 0.47, 0.50, 0.62, 0.65, 0.72 and 0.86 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110°C.

**CONSTITUENTS** - Flavonoids mainly homoferreirin and ougeinin.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kuṣṭhaghna, Medohara, Pittahara, Rasāyana, Viṣaghna, Vraṇaropaṇa, Kaphaśoṣaṇa, Śoṇitasthāpana

**IMPORTANT FORMULATIONS** - Ayaskṛti

**THERAPEUTIC USES** - Śoṭha, Śvitra, Dāha, Kṛmi, Kuṣṭha, Medoroga, Prameha, Pravāhikā, Raktāsisāra, Raktapitta, Raktavikāra, Vraṇa, Atiśara, Pāṇduroga

**DOSE** - 50 - 100 ml Kvātha.

## 80. Tintidika (AerialPart )

### TINTIDĪKAH (Aerial Part)

Tintidīkah consists of mature dried aerial part of *Rhus parviflora* Roxb. (Fam. Anacardiaceae), an evergreen or sub-deciduous shrub commonly found on the dry hot slopes of Himalayas from Punjab to Nepal and in the hills of Peninsular India at an altitude of 600-2100 m.

#### SYNONYMS

Sanskrit	:	Tintidīka
Assamese	:	--
Bengali	:	--
English	:	Sumac
Gujrati	:	--
Hindi	:	Tungalaa, Samakadana, Raitung
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	--
Oriya	:	--
Punjabi	:	Khatte Masoor, Raitung, Tungaa
Tamil	:	--
Telugu	:	Jeevakamu
Urdu	:	Sumaak

#### DESCRIPTION

##### a) Macroscopic

**Stem** - Young stem branched, reddish-brown, tomentose; stem pieces 10 to 15 cm long and upto 4 cm in diam., old ones woody with longitudinal striations and glandular protuberances, greenish-brown, bark separable from wood, inner surface of bark reddish-brown, wood light brown in colour; fracture, hard and fibrous.

**Leaf** - Trifoliate when intact, leaflets elliptic, oblong, obovate, petiolate, petiole 2.5 to 3.5 cm in length, tomentose, terminal leaflet large, obovate, 7 to 8.5 cm in length, 3 or 4 cm broad, rather thick, basal margin entire and cuneate, upper coarsely and irregularly crenate, pubescent, laterals relatively broader and more rounded at base, sessile, pubescent and smooth.

**Fruit** - Drupe, oval, yellowish-green to brownish-green, glabrous, shining, fruits present on panicles; calyx persistent; fruit wrinkled.

## **b) Microscopic**

**Stem** - T.S. shows cork, cortex and stele; patches of cortical fibres, secretory canals and rhomboid crystals of calcium oxalate, measuring about 13  $\mu$  well distributed in the cortex; xylem in the form of a continuous cylinder traversed by uni or biseriate medullary rays; border pitted and scalariform vessels present; lignified fibres septate, measuring 300 to 770  $\mu$  in length and upto 50  $\mu$  in width; pith parenchymatous, possessing tannins, starch grains and rhomboid crystals of calcium oxalate.

**Petiole** - T.S. shows a single layered epidermis covered with cuticle; abundant unicellular and multicellular, uniseriate trichomes measuring 30 to 360  $\mu$  in length and 10 to 20  $\mu$  in width; cortex consisting of 3 or 4 layers of collenchymatous cells and 5 or 6 layers of parenchymatous cells, some cells of collenchyma and parenchyma contain rhomboidal crystals of calcium oxalate, measuring upto 20  $\mu$ ; collateral vascular bundles 15 to 17 in number, surrounding a central parenchymatous pith and capped by an arch of pericyclic fibres; secretory canals present in phloem region.

**Midrib** - T.S. shows single layered epidermis, covered with cuticle; nonglandular, unicellular and uniseriate, multicellular trichomes abundantly present on the epidermis, followed by collenchymatous tissue; vascular bundles 5 to 7 in number, arranged in a circle, conjoint, collateral, each capped by an arch of fibres; secretory canals present in phloem region; pith consists of parenchymatous cells.

**Lamina** - T.S. shows dorsiventral structure, epidermal cells composed of cubical to slightly elongated and rectangular cells, externally covered with cuticle; below upper epidermis 2 or 3 layers of palisade parenchyma present; lower epidermis single layered with thick cuticle; unicellular and uniseriate, multicellular trichomes present on both surfaces, measuring upto 200  $\mu$  in length and about 30  $\mu$  in width; palisade parenchyma followed by loosely arranged spongy parenchyma cells; mesophyll traversed by vascular bundles; each vascular bundle surrounded by bundle sheath, extending from upper epidermis to lower epidermis as bundle sheath extension. In surface view lower epidermis shows anomocytic type of stomata while upper epidermis is devoid of stomata; stomatal index 6 to 10 on lower epidermis; vein islet number 12 to 15; palisade ratio 2 to 4.

**Powder** - Brown, odour slightly strong, somewhat acrid in taste; fragments of palisade tissue, calcium oxalate crystals, trichomes, starch grains, bordered pitted vessels and vessels having scalariform thickenings.

## IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 per cent, Appendix	2.2.2.
Total Ash	Not more than	5 per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	0.7 per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	10 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	12 per cent, Appendix	2.2.7.

## T.L.C.

T.L.C. of the alcoholic extract on silica gel 'G' plate (0.2 mm thick) using chloroform : methanol: acetic acid (80:20:2) shows under UV (254 nm) six spots at Rf. 0.11, 0.18, 0.29, 0.54 (all brown), 0.80 and 0.91 (both yellowish green). Under UV (366nm) seven fluorescent spots appear at Rf. 0.11, 0.18, 0.29, 0.54, 0.70 (all brown), 0.80 and 0.91 (both pink). On exposure to iodine vapour eight spots appear at Rf. 0.11(pinkish brown), 0.15, 0.22 (brown), 0.38, 0.64, 0.74, 0.80 and 0.91 (all yellowish brown). On spraying with 5% ferric chloride solution seven spots appear at Rf. 0.15, 0.24 (both green), 0.41 (faint brown), 0.54 (blue), 0.73 (faint brown) 0.83 and 0.91 (both brown).

**CONSTITUENTS** - Tannins (Gallic acid); flavones (myricetin, quercetin, myricitrin, quercitrin, kampferol); glycosides (isorhmnetin-3- $\alpha$ -L-arabinoside)

## PROPERTIES AND ACTION

<b>Rasa</b>	:	Amla
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Amla
<b>Karma</b>	:	Dīpana, Grāhī, Jvaraghna, Kaphavātahara, Pittakara, Rocana, Vātahara

**IMPORTANT FORMULATIONS** - Yavāni Ṣāḍava, Hingvacādi Cūrṇa, Srī Rāmabāṇa Rasa

**THERAPEUTIC USES** - Agnimāndya, Aruci, Atisāra, Pravāhikā, Tṛṣṇā, Vātavikāra

**DOSE** - 3 - 6 g.

## 81. Trapusha (Sd)

### TRAPUṢAM (Seed)

Trapuṣam consists of dried seed of *Cucumis sativus* Linn. (Fam. Cucurbitaceae), an annual trailing or climbing plant, numerous varieties widely cultivated throughout India upto an altitude of 1200 m. The seeds are devoid of mucilagenous outer layer.

#### SYNONYMS

Sanskrit	:	Śvetakarahāṭakaṃ, Sudhāvāsah, Mutralaṃ, Kaṇṭakiphalam
Assamese	:	--
Bengali	:	Ksheeraa, Shashaa
English	:	Cucumber
Gujrati	:	Taanslee
Hindi	:	Kheeraa
Kannada	:	Mullusavte, Santekaayi
Kashmiri	:	--
Malayalam	:	Vellari
Marathi	:	Tause, Khiraa
Oriya	:	Kantiaali Kaakudi
Punjabi	:	Khiraa
Tamil	:	Vellarikkaay, Pippinkaay
Telugu	:	Khirakaya
Urdu	:	Kheeraa

#### DESCRIPTION

##### a) Macroscopic

Seeds compressed, elongated, ellipsoid, dorsiventrally convex and laterally ridged; size variable, about a cm or occasionally more in length and upto 0.5 cm wide; micropyle pointed, distinctly visible; outer surface glossy, brittle, peelable; yellowish-white; kernel, oily, creamish-white; taste, mildly sweet, oily; not slippery to touch when moistened: odour, nil.

##### b) Microscopic

Outermost layer of testa absent; hypodermis sclerenchymatous, two layered, outer layer of small, circular, stone cells, inner layer of large, oval, thick walled, striated, lignified sclereids placed at right angle to outer layer; a large zone of aerenchyma filled with loosely packed parenchymatous cells; cotyledon lined by compact layer of cuticularized thin walled epidermis, cotyledon of several layers of elongated, closely packed parenchymatous cells, largely hexagonal, packed with aleurone grains, starch and fat globules; innermost two layers much more elongated, palisade like, and distinct; each

cotyledon shows five distinct patches of small, thin walled, polygonal cells present midway, in a roughly trapezoidal shape.

**Powder** - Creamish-white to light-green, oily, shows groups of yellowish, wavy-walled sclereids from testa in surface view, also isolated ones; fragments of parenchymatous cells; annular or spiral xylem vessels in groups; abundant oil globules, aleurone grains, and starch grains.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	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	7	per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (20:0.5) shows spots at Rf 0.31 (purple), 0.40 (brown), 0.48 (purple), 0.52 (light purple), 0.60 (purple), 0.70 (light grey) and 0.78 (pinkish brown) on spraying with vanillin-sulphuric acid reagent and heating the plate at 105°C for about ten minutes.

**CONSTITUENTS** - Fixed oil and sugars.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta
<b>Guna</b>	:	Guru, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Balya, Kaphakara, Mūtrala, Vātapittahara, Abhiṣyandī, Mūtrabastiviśodhaka, Agnisādana

**IMPORTANT FORMULATIONS** - Chardi, Mūtrakṛcchra, Raktavikāra, Mūtraghāta, Raktapitta, Daurbalya, Dāha, Anidrā, Śīrahśūla, Śītajvara

**THERAPEUTIC USES** - Śītajvara, Anidrā, Chardi, Dāha, Daurbalya, Mūtraghāta, Mūtrakṛcchra, Raktapitta, Raktavikāra, Śīrahśūla

**DOSE** - 3-6 g powder.

## 82. Tuni (St.Bk)

### TŪNĪ (Stem Bark)

Tūnī consists of stem bark of *Cedrela toona* Roxb. (Fam. Meliaceae), a large, rapidly growing, nearly evergreen tree attaining a height upto 18 m, and distributed in tropical Himalayas from the Indus eastward, ascending to 1000 m and also throughout the hills of Central and Southern India.

#### SYNONYMS

Sanskrit	:	Nandīvr̥kṣa, Tuni, Tūna, Nandī
Assamese	:	--
Bengali	:	Toongaachha
English	:	Toon, Red cedar
Gujrati	:	Toonee
Hindi	:	Tun, Toonee, Tuni
Kannada	:	Mandurike, Kempu Gandagheri
Kashmiri	:	--
Malayalam	:	Madagirivempu, Ikana, Patukarana
Marathi	:	Toonee, Kurak
Oriya	:	--
Punjabi	:	--
Tamil	:	Karamusuli, Shevagil Malavembu
Telugu	:	Nandichettu, Galimanu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Bark available in long pieces, channelled, of varying thickness; external surface, rough and rugged due to exfoliation and vertical cracks, fissured, dark grey having lenticels, inner surface, red, laminated and fibrous; fracture, fibrous and splintery; odour, very mild and pleasant; taste, sharp and acrid.

##### b) Microscopic

Stem bark shows exfoliating cork, 8 to 10 layers consisting of tangentially elongated, radially arranged, thin-walled cells; cortex, 12 to 15 layers of rectangular parenchymatous cells, outer layers having cells filled with small rosette crystals of calcium oxalate at regular intervals; inner layers of cortex of isodiametric cells having abundant larger rosette crystals; occasionally stone cells may be present in outer cortex; phloem fibres abundant in patches, thick walled; medullary rays narrow, generally biseriate; starch grains, simple or compound, present in cortical region.

**Powder** - Light reddish-brown; shows occasional fragments of cork cells; fibres, large, abundant in groups, a few isolated, lignified with distinct lumen, tips bluntly pointed or having distinct indentation; stone cells, few, of varying shapes, elongated to isodiametric; phloem parenchyma, thin-walled, containing calcium oxalate rosettes and prisms; abundant prismatic and rosette calcium oxalate crystals, rosettes of varying sizes measuring 11 to 60  $\mu$ , prisms, small; starch grains, simple or compound having 2 to 6 components, 3-component grains most common, round and oval measuring upto 10  $\mu$  in dia., cleft hilum.

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

### T.L.C.

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using petroleum ether : hexane : ethyl acetate : formic acid (10:30:15:1) shows spots at Rf. 0.34, 0.44, 0.57 and 0.88 (all purple) on spraying with vanillin-sulphuric acid reagent and heating the plate at 105°C for about ten minutes.

**CONSTITUENTS** - Triterpenoids.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Grāhī, Kaphahara, Medohara, Pittahara, Bhagnasandhānaka

**IMPORTANT FORMULATIONS** - Nyagrodhādi Kvātha Cūrṇa

**THERAPEUTIC USES** - Dāha, Gaṇḍamālā, Kaṇḍu, Kuṣṭha, Prameha, Raktapitta, Raktavikāra, Viṣavikāra, Vraṇa, Yoniroga, Bāla Pravāhikā, Śvetakuṣṭha, Medovikāra

**DOSE** - 3-6 g kvātha-10-20 ml.

### 83. Vanda(Lf)

## VANDĀ (Leaf)

Vandā consists of the dried leaf of *Dendrophthoe falcata* (Linn. f.) Ettingsh. syn. *Loranthus falcatus* Linn. f. (Fam. Loranthaceae), an epiphyte, mostly on fruit trees, and distributed throughout India.

### SYNONYMS

Sanskrit	:	Vṛkṣādānī, Bandāka, Vṛkṣaruhā, Saṃharṣā
Assamese	:	--
Bengali	:	Maandaa
English	:	Mistletoe
Gujrati	:	Baando
Hindi	:	Bandaa
Kannada	:	Bandanike, Bandhulu
Kashmiri	:	--
Malayalam	:	Ittikanni, Itil
Marathi	:	Baandagul, Banda
Oriya	:	Vrudhongo
Punjabi	:	Pulluri
Tamil	:	Baadanikaa, Jiddu
Telugu	:	Jeevakamu

### DESCRIPTION

#### a) Macroscopic

Leaves petiolate, exstipulate, opposite, decussate, simple, ovate to oblanceolate, glabrous, soft and leathery when young, brittle when dry; margin entire; base decurrent; apex acute; slightly astringent; odour resembling those of tealeaves.

#### b) Microscopic

Transverse section of the leaf shows a thick cuticle, upper and lower epidermis composed of squarish cells with convex periclinal outer walls; surface views of upper and lower nearly similar; stomata paracytic, present on both surfaces; mesophyll of lamina consisting of 2 to 4 layers inner to upper and lower epidermis made up of compactly arranged short rectangular cells and irregularly arranged parenchyma cells of middle layers but possessing a few intercellular spaces; occasional vascular strands passing through this middle portion; isolated sclereids about 50 µ thick containing prismatic crystals of about 12 µ present in parenchyma; midrib bulging prominently on both the surfaces and containing a group of 3 to 5 vascular bundles; xylem of vascular bundles oriented towards upper epidermis and consisting of tracheids, vessels and parenchyma; phloem present towards lower epidermis and consisting of thin walled

cells; bundle sheath absent; each vascular bundle associated with patch of collenchymatous cells outside the phloem; tannin (ranging from yellow to brown in colour) abundant in parenchyma cells of midrib and lamina region, especially in the 2 or 3 subepidermal layers; stomatal index 9 to 13 on upper surface and 10 to 14 on lower surface.

**Powder** - The powder shows angular epidermal cells and groups of thin walled, rectangular, closely packed parenchyma cells many of which contain tannins.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	14	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	4	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	3	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	3	per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of the alcohol soluble extract on Silica gel 'G' plate (0.2 mm thick) using toluene : ethyl formate : formic acid (5:4:1) as mobile phase shows under U.V. (366 nm) spots at Rf. 0.06 (Brown); 0.39(Blue); 0.46 (Blue); 0.55 (Red); 0.81 (Pink). On spraying with anisaldehyde: sulphuric acid reagent and heating the plate for ten minutes at 110° C two spots appear at Rf 0.35(Light Green), 0.45 (Orange).

**CONSTITUENTS** - Leaves contain flavonoids such as Quercetin, quercetrin;Tannins comprising of gallic and chebulinic acid.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Śukrajanana, Grāhī, Kaphahara, Mūtravirecanīya, Pittahara, Rakṣoghna, Rasāyana, Vātahara, Vṛṣya, Vraṇaropana, Śramahara, Netrya, Grahanāśana, Maṅgalakara, Garbhasthāpana

**IMPORTANT FORMULATIONS** - (No formulations)

**THERAPEUTIC USES** - Bhagandara, Hikkā, Mūtraroga, Raktapitta, Viṣamajvara, Viṣaroga, Vraṇa, Vandhyatva, Vātā-Śmarī

**DOSE** - 10 - 20 ml juice.

## 84. Vanda(St)

### VANDĀ (Stem)

Vandā consists of the dried stem of *Dendrophthoe falcata* (Linn. f.) Ettingsh. syn. *Loranthus falcatus* Linn. f. (Fam. Loranthaceae), an epiphyte, mostly on fruit trees, and distributed throughout India.

#### SYNONYMS

Sanskrit	:	Bandāka, Saṃharṣā, Vṛkṣādānī, Vṛkṣaruhā
Assamese	:	--
Bengali	:	Maandaa
English	:	Mistletoe
Gujrati	:	Baando
Hindi	:	Bandaa
Kannada	:	Bandhulu, Badanike
Kashmiri	:	--
Malayalam	:	Itil, Ittikkanni
Marathi	:	Baandagul, Banda
Oriya	:	Vrudhongo
Punjabi	:	--
Tamil	:	Pulluri
Telugu	:	Baadaniaa, Jiddu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Small twigs of aerial branches ranging from 2 mm to 2.5 cm in thickness; the bark of stem thin, dark brown and specked with lighter brown, uniformly distributed lenticles; the wood reddish-brown after removal of thin bark; stem slightly rough to touch; fracture irregular; fractured surface dark brown; no distinct taste or odour.

##### b) Microscopic

A transverse section of stem reveals a circular outline with a thick cuticle, and epidermis made up of squarish or barrel shaped cells with convex outer periclinal walls and interrupted here and there by lenticular openings; cork made up of thin-walled, crushed rectangular cells; cortex consisting of many layers of tangentially elongated and rounded cells interspersed with sclereids upto 85  $\mu$  in size and in groups of 2 to 4; many cells of cortex, especially those of outer few layers contain tannins ranging in colour from yellow, orange to dark brown; groups of pericyclic fibres form a ring outside phloem; cambium present; xylem surrounding the central pith and composed of well developed vessels, fibre and parenchyma, 1 to 4 seriate medullary rays composed of

radially elongated cells present; pith consists of thin walled, rounded or polygonal parenchymatous cells; small groups of sclereids, up to 85  $\mu$  each in size present in both pith and medullary rays; prismatic crystals present in association with sclereids and medullary ray cells.

**Powder** - Powder shows vessel elements with simple pitted thickenings, groups of sclereids containing prismatic crystals (size of crystal 30 to 35  $\mu$  long and 15 to 17  $\mu$  wide) and fragments of parenchyma cells containing tannins.

### IDENTITY, PURITY AND STRENGTH

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

### T.L.C.

T.L.C. of the alcohol soluble extract of the drug in chloroform as a mobile phase shows under UV (366 nm) spots Rf 0.13 (Grey); 0.24 (Green); 0.35 (Blue); 0.56 (Yellow); 0.76 (Grey); 0.85 (Orange Pink); 0.96 (Pink).

**CONSTITUENTS** - Young shoots contain nearly 10 per cent tannins and the stem contains  $\beta$ -amyrin-0-acetate, oleonic acid its methyl ester acetate,  $\beta$ -sitosterol and stigmasterol.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Śramahara, Śukrajanana, Garbhasthāpana, Grāhī, Grahanāśana, Kaphahara, Mūtravirecanīya, Maṅgalakara, Netrya, Pittahara, Rakṣoghna, Rasāyana, Vātahara, Vṛṣya, Vraṇaropāṇa

**IMPORTANT FORMULATIONS** - (No formulations)

**THERAPEUTIC USES** - Bhagandara, Hikkā, Mūtraroga, Raktapitta, Vātā-Śmarī, Vandhyatva, Viṣamajvara, Viṣaroga, Vraṇa

**DOSE** - 10 - 20 ml juice.

## 85. Vanda(Aerial Rt.)

### VANDĀ (Aerial Root)

Vandā consists of the dried aerial root of *Dendrophthoe falcata* (Linn. f.) Ettingsh. syn. *Loranthus falcatus* Linn. f. (Fam. Loranthaceae), an epiphyte, mostly on fruit trees, and distributed throughout India.

#### SYNONYMS

Sanskrit	:	Bandāka, Saṃharṣā, Vṛkṣādānī, Vṛkṣaruhā
Assamese	:	--
Bengali	:	Maandaa
English	:	Mistletoe
Gujrati	:	Baando
Hindi	:	Bandaa
Kannada	:	Badanike, Bandhulu
Kashmiri	:	--
Malayalam	:	Itil, Ittikkanni
Marathi	:	Baandagul, Banda
Oriya	:	Vrudhongo
Punjabi	:	--
Tamil	:	Pulluri
Telugu	:	Baadanikaa, Jiddu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Adventitious root greyish brown outside, yellowish to brown inside, slender, contorted and knotty in appearance, sending out haustoria into the host plant or, also into its own branches; rarely branched; fracture, irregular; odour and taste not distinct.

##### b) Microscopic

A transverse section of adventitious root is circular in outline; cuticle and epidermis sloughed off; outermost zone consists of broken tissue of cork and cortex followed by cork cambium made of rectangular cells; cortex wide, many layered, made of thin walled rounded cells and selereids upto 50  $\mu$  size, present singly or in groups of 2 to 4; many cells of cortex contain tannin; patches of pericyclic fibres surround the vascular ring; phloem composed of small thin walled cells present outside the xylem and separated from it by the vascular cambium; xylem interrupted by short, 1 or 2 seriate medullary rays composed of radially elongated cells; xylem composed of scattered vessels, parenchyma and fibres; pith wide, composed of rounded parenchymatous cells interspersed with thick walled fibres of about 5  $\mu$  in dia.

**Powder** - Powder shows tracheids and vessel members with simple pitted thickenings, broken fibres; stone cells with faint incomplete radial striations, upto 50  $\mu$  in size and containing prismatic crystals.

### 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	12	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	1	per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of the alcohol soluble extract of the drug on silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (80:20) as mobile phase shows under U.V. (at 366 nm) spots at Rf 0.35 (Blue); 0.58 (Blue); 0.90 (Blue).

**CONSTITUENTS** - Catechin and leucocynidin in the bark.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Śramahara, Śukrajanana, Garbhasthāpana, Grāhī, Grahanāśana, Kaphahara, Mūtravirecanīya, Maṅgalakara, Netrya, Pittahara, Rasāyana, Vātahara, Vṛṣya, Vraṇaropana

**IMPORTANT FORMULATIONS** - Mūtravirecanīya Kāṣāya Cūrṇa

**THERAPEUTIC USES** - Bhagandara, Hikkā, Mūtraroga, Raktapitta, Vātā-Śmarī, Vandhyatva, Viṣamajvara, Viṣaroga, Vraṇa

**DOSE** - 10 - 20 ml juice.

## 86. Vanda(Fl)

### VANDĀ (Flower)

Vandā consists of flowers of *Dendrophthoe falcata* (Linn.f.) Ettingsh. syn. *Loranthus falcatus* Linn. f. (Fam. Loranthaceae), a semi-parasite, mainly on fruit trees, and distributed throughout India.

#### SYNONYMS

Sanskrit	:	Bandāka, Saṃharṣā, Vṛkṣādānī, Vṛkṣaruhā
Assamese	:	--
Bengali	:	Maandaa
English	:	Mistletoe
Gujrati	:	Baando
Hindi	:	Bandaa
Kannada	:	Badanike, Bandhulu
Kashmiri	:	--
Malayalam	:	Itil, Ittikanni
Marathi	:	Baandagul, Banda
Oriya	:	Vrudhongo
Punjabi	:	--
Tamil	:	Pulluri
Telugu	:	Baadanikaa, Jiddu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Flowers actinomorphic, bisexual, regular, complete, coloured, apetalous, epigynous with cup or disc shaped receptacle, pentamerous; perianth-tepals 5, free and strap shaped towards the distal end and in the form of a sickle-shaped tube towards the basal end; surrounded at the base by a cup-shaped calyx; the perianth tube measures about 40 to 55 mm in length; it is narrow at the base and gradually widens towards the upper part; the perianth lobes become strongly reflexed at maturity. Inside the perianth tube are 5 cushion shaped nectarines; androecium stamens 5, epiphyllous, starting from two-thirds of length of perianth tube and continuing to the tip of perianth lobes, appressed to the style in young flowers; filaments orange coloured; anthers monothealous, dark, basifixed; gynoecium ovary 1, inferior, obscurely unilocular; style long, filamentous; stigma capitate; placentation basal, one ovule in each locule.

**b) Microscopic**

**Powder** - The powder shows characteristically triradiate, smooth walled, pollen grains upto 45  $\mu$  in size and having a depression in the centre at distal end of each arm, and endothelial tissue.

**IDENTITY, PURITY AND STRENGTH**

Foreign matter	Not more than	1	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	20	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	4	per cent, Appendix	2.2.7.

**T.L.C.**

T.L.C. of the alcoholic extract on Silica gel 'G' plate (0.2 mm thick) using toluene : ethylformate : formic acid (5:4:1) as mobile phase shows under U.V. (at 366 nm) spots at Rf value 0.11, 0.16, 0.26 (Blue), 0.45 (Pink). On spraying with anisaldehyde : sulphuric acid reagent and on heating the plate for ten minutes at 110°C spots at Rf. 0.07 (Black); 0.12 (Green Black); 0.22 (Blue); 0.31 (Yellow); 0.40 (Yellow); 0.88 (Green) appear.

**PROPERTIES AND ACTION**

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Rakṣoghna, Śramahara, Śukrajanana, Garbhasṭhāpana, Grāhī, Grahanāśana, Kaphahara, Mūtravirecanīya, Netrya, Pittahara, Rasāyana, Vātahara, Vṛṣya, Vraṇaropana

**IMPORTANT FORMULATIONS** - (No formulations)

**THERAPEUTIC USES** - Bhagandara, Hikkā, Mūtraroga, Raktapitta, Vātā-Śmarī, Vandhyatva, Viṣamajvara, Viṣaroga, Vraṇa

**DOSE** - 10 - 20 ml juice

## 87. VandaFr.)

### VANDĀ (Fruit)

Vandā consists of the dried fruit of *Dendrophthoe falcata* (Linn. f.) Ettingsh. syn. *Loranthus falcatus* Linn. f. (Fam. Loranthaceae), an epiphyte, mostly on fruit trees, and distributed throughout India.

#### SYNONYMS

Sanskrit	:	Bandāka, Saṃharṣā, Vṛkṣādānī, Vṛkṣaruhā
Assamese	:	--
Bengali	:	Maandaa
English	:	Mistletoe
Gujrati	:	Baando
Hindi	:	Bandaa
Kannada	:	-
Kashmiri	:	Ittikanni, Itil
Malayalam	:	Baandagul, Banda
Marathi	:	Vrudhongo
Oriya	:	--
Punjabi	:	Pulluri
Tamil	:	Baadanikaa, Jiddu
Telugu	:	Jeevakamu

#### DESCRIPTION

##### a) Macroscopic

The fruit is an ovate pseudo berry, upto 3 mm in thickness and 3 to 8 mm in length; greenish-yellow when mature and turning brown when dry; the top of the fruit is crowned by a persistent calyculus; the fruit contains an elongated, flask-shaped seed upto 5 mm long and 2 mm thick, rugose, brown, hard, and enclosed in a shiny, viscid film.

##### b) Microscopic

T.S. of the pseudoberry shows the outer tissues of thalamus separated by a zone of viscid mass from the inner tissues of the seed. Fruit tissue consist of an outer epicarp formed of a single layer of epidermis composed of squarish or rounded, thickly cuticularized cells followed by 3 or 4 layers of thick walled, larged sized, squarish cells containing tannins; mesocarp consist of multiple layers of small relatively clear cells with interspersed groups of stone cells. Fruit wall delimited inside by multiple layers of large, rounded, thin walled parenchymatous cells containing yellow to dark brown tannins; the seed consists of an outer viscid zone delimited towards inside by a ring of

tissues made of several layers of isodiametric cells mostly containing brown pigment in outer 2 or 3 layers and a ring of vascular bundles. Inner to this is a zone comprising of radially elongated, compactly arranged thin-walled cells rich in starch towards the center; centre of the seed occupied by a mass of uniform, isodiametric, parenchymatous embryonic cells.

**Powder** - Cellular debris and stone cells with circular striations 20 to 35  $\mu$  are seen, groups of cells containing tannins also present.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	1	per cent, Appendix	2.2.2.
Total Ash	Not more than	8	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	17	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 (0.2 mm thick) using toluene: ethylacetate: acetic acid (5:4.5:0.5), shows under U.V. (366nm) spots at Rf. 0.23 (Greyish Black), 0.57, 0.72 (Pink), 0.81 (Blue), 0.89 (Pink). On spraying with anisaldehyde- sulphuric acid reagent and on heating the plate for ten minutes at 110° C spots appear at Rf. 0.22, 0.37 (Blue), 0.52 (Purple), 0.57 (Greyish Black), 0.67, 0.72 (Dark Blue), 0.75 (Purple).

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Grāhī, Kaphahara, Pittahara, Rasāyana, Vātahara, Vṛṣya, Viṣaghna, Vraṇaropaṇa, Rakṣoghna Śramahara, Grahanāśana

### IMPORTANT FORMULATIONS - (No formulations)

**THERAPEUTIC USES** - Aśmarī, Arśa, Kaṇṭharoga, Mūtraghāta, Mūtrakṛcchra, Mūtraruḥ, Netraroga, Raktapitta, Slīpada, Vātarakta, Vātavikāra, Vrana, Mūtraśarkarā, Garbhasrāva, Sopharoga, Āmātisāra, Viṣamjvara

**DOSE** - 10 - 20 ml.

## 88. Vanyajiraka(Fr)

### VANYAJĪRAKA (Fruit)

Vanyajīraka consists of dried fruit of *Centratherum anthelminticum* (L.) Kuntze (Fam. Asteraceae), an annual, robust, erect herb, found throughout India upto 1850 m in Himalaya and Khasi hills and often cultivated.

#### SYNONYMS

Sanskrit	:	Āraṇyajīrakah, Bṛhatpālī, Somarājī, Vanajīrakah
Assamese	:	--
Bengali	:	Somaraaj
English	:	Purple Flebane, Worm Seed Fleabane
Gujrati	:	Kaaleejeeree, Kadavijeeree
Hindi	:	Kaalijeeree, Karajiri, Soharaai
Kannada	:	Kaadujeerage, Kaarijirige
Kashmiri	:	--
Malayalam	:	Krimishatru, Kattujirakam
Marathi	:	Kadujire
Oriya	:	--
Punjabi	:	--
Tamil	:	Kaattuchirakam, Chittilai
Telugu	:	Adavijilakaroa, Garetikamma
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

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

##### b) Microscopic

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

**Powder** - The powder exhibits fragments of fibres, fibre sclereids, scalariform vascular elements, thin walled parenchymatous cells with aleurone grains and oil globules, covering as well as glandular trichomes thin walled radially elongated cells of pappus.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2.0 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 60 precoated plate (Merck) using Petroleum ether (60-80°C); Diethyl ether: Acetic acid (70:32:2), shows under UV (366 nm) one spot at Rf. 0.48 (light blue); on exposure to iodine vapours 4 spots appear at Rf. 0.48 (dark orange), 0.57, 0.68 and 0.84 (all faint orange); after spraying with 5% ethanolic sulphuric acid and heating the plate at 110°C for 30 minutes, 4 spots appear at Rf. 0.48 (black) 0.57, 0.68 and 0.84 (all faint brown).

**CONSTITUENTS** - Sterols, avenasterol and vernosterol, a bitter principle, essential oil, resins and fixed oil consisting of myristic, palmitic, stearic, oleic, linoleic and vernolic acids

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Tikṣṇa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Dīpana, Kaphahara, Mūtrala, Stambhana, Vātahara, Jantunāśaka, Netrya

**IMPORTANT FORMULATIONS** - Madhusnuhī Rasāyana

**THERAPEUTIC USES** - Śūla, Śopha, Śvāsa, Gulma, Hikkā, Jvara, Kāsa, Kṛmi, Kuṣṭha, Mūtraghāta, Raktavikāra, Vraṇa, Kaṇḍū, Svitrakuṣṭha

**DOSE** - 1-3 g.

## 89. Vidarikanda (Tuber)

### VIDĀRĪKANDA (Tuber)

Vidārīkanda is the dried tuber of *Pueraria tuberosa* DC. (Fam. Fabaceae), a large, perennial climber with tuberous roots, upto 60 cm long and 30 cm thick, even weighing upto 35 kg, from about 5 or 10 kg; they are distributed nearly throughout India.

#### SYNONYMS

Sanskrit	:	Ikṣugandhā, Vidārī
Assamese	:	--
Bengali	:	Shimiya, Shimiabatraji, Bhui Kumdo
English	:	Indian Kudju
Gujrati	:	Khakharvel, Vidaree, Vidareekand
Hindi	:	VidareeKand, Bilaikand, Sural, Patal Kand
Kannada	:	--
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Bendriya bel, Bindree, Vendrichavel
Oriya	:	--
Punjabi	:	Siali
Tamil	:	Nilpushni Kezhugu
Telugu	:	Nelagummudu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Dried cut pieces of tuber, 3 to 5 cm large, 2 to 4 cm broad and fibrous; outer surface where present, light brown in colour; outer surface, where epidermis is present, is light brown with transverse warts and ridges; cut surface creamy; fleshy, transverse small warts and ridges are found on the surface, texture smooth; sweet in taste, no particular smell (cut pieces of the tubers of *Ipomoea digitata*, substitute of *P. tuberosa*, are cubical, smooth, light cream in colour and can easily be distinguished).

##### b) Microscopic

T.S. of whole root tuber is slightly wavy in outline, epidermis not discernible; 3 to 4 layers of cork cells, followed by 5 to 7 layers of parenchymatous cells present; cork cambium-brown in colour and 2 or 3 cells thick, endodermis well developed; pericycle fibrous followed by 2 layers of stone cells filled with sandy crystals; phloem consist of sieve tubes, companion cells, patches of bast fibres and phloem parenchyma; xylem pentarch in young root, consist of vessels with scalariform cross perforation, tracheids, xylem fibres and parenchyma; medullary rays broad and parenchymatous. The medullary

rays and phloem cells are filled with starch grains which are polygonal, 2 to 5 µm in diameter, simple or two to many-compound, hilum usually indistinct, occasionally a central cleft, lamellae indistinct. In macerated preparation crystal fibres are multicellular, articulated, each cell carrying a crystal of calcium oxalate, some of the articulated fibres are swollen in the middle like a bulb pipette.

**Powder** - Greyish-brown, no characteristic odour, bitter in taste; shows parenchyma filled with starch, septate fibres in the form of crystals fibres as well as shaped bulb like pipette; vessels with simple and scalariform cross perforation plates, stone cells, and starch as described under microscopy; powder treated with 1N NaOH in methanol and nitro-cellulose in amylacetate gives light green fluorescence under UV 254 nm.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Moisture content	Not more than	10	per cent, Appendix	2.2.9.
Total ash	Not more than	11	per cent, Appendix	2.2.3.
Acid insoluble ash	Not less than	1	per cent, Appendix	2.2.4.
Alcohol soluble extractive	Not less than	13	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	22	per cent, Appendix	2.2.7.
Starch	Not less than	14	per cent, Appendix	2.2.13

### T.L.C.

T.L.C. of the methanolic extract on precoated silica gel 'G' plate (0.2 mm thick) using toluene : ethyl acetate : methanol (80 : 20 : 0.5) shows under UV (366 nm) blue fluorescent zones at Rf. 0.19, 0.25, 0.34, 0.38. On spraying with anisaldehyde-sulphuric acid reagent and heating for ten minutes at 120°C, spots appear at Rf. 0.19 (green), 0.34 (Magenta), 0.45 (green), 0.48 (blue), 0.62 (blue), 0.67 (red) and 0.92 (dark pink).

**CONSTITUENTS** - Pterocarpan-tuberosin, pterocarpanone-hydroxytuberosone, two pterocarpenes-anhydrotuberosin and 3-O-methylanhydrotuberosin, and a coumestan tuberostan. An isoflavone-puerarone and a coumestan-puerarostan.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura
<b>Guna</b>	:	Guru, Snigdha
<b>Virya</b>	:	Śīta
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Balya, Hṛdya, Jīvaniya, Mūtral, Pittahara, Svarya, Vājīkaraṇa, Vātahara, Vṛṣya, Varṇya, Bṛhaṇa, Stanyadu, Rasāyanī

**IMPORTANT FORMULATIONS** - Śatāvryādi Ghṛta, Mahāviṣagarbha Taila,  
Marmagutikā, Nityānanda Rasa,  
Sārasvatāriṣṭa, Aśvagandhādyariṣṭa

**THERAPEUTIC USES** - Śūla, Dāha, Kāsa, Kṣaya, Mūtrakṛcchra, Raktadoṣa, Raktapitta,  
Viṣamajvara, Visarpa, Śukrakṣaya

**DOSE** - 3-6 g.

## 90. Viralā (St.Bk)

### VIRALĀ (Stem Bark)

Viralā consists of dried stem bark of *Diospyros exsculpta* Buch. - Ham. syn. *D. tomentosa* Roxb. (Fam. Ebenaceae), a small or occasionally large tree found distributed in sub-Himalayan tract, Rajasthan, Madhya Pradesh, Bihar and Orissa.

#### SYNONYMS

Sanskrit	:	Tindukah, Tinduki
Assamese	:	--
Bengali	:	Kend, Gaab
English	:	Gaub Persimon, Indian Persimon
Gujrati	:	Timbaru
Hindi	:	Gaabh, Tendu, Kendu
Kannada	:	Holitupare, Kushaarta
Kashmiri	:	--
Malayalam	:	Panchchi, Pananchi, Panachcha
Marathi	:	Temburani
Oriya	:	--
Punjabi	:	Tendu
Tamil	:	Panichchai, Tumbika
Telugu	:	Tinduki, Tumikechettu
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Bark available in pieces of variable lengths, usually 1 to 1.5cm thick, light brown in colour, surface uneven with exfoliating rectangular scales, slightly curved, outer surface ash coloured, inner surface brownish, striate but smooth; fracture, granular; odour, characteristic, taste, sweet and astringent.

##### b) Microscopic

T.S. shows a thick portion of rhytidome; cork consists of 5 or 6 layers of tangentially elongated rectangular, dorsoventrally compressed thin walled cells, a few strongly lignified and filled with reddish brown masses; cortex consists of 4 to 6 layers of thin walled parenchymatous cells, many containing prismatic calcium oxalate crystals, measuring 20 to 70  $\mu$  and starch grains about 6 to 10  $\mu$ ; tanniferous cells present; phloem traversed by uniseriate medullary rays; sieve tube associated with companion cells; phloem parenchyma consists of cells with thin, dark reddish brown walls many of the cells contain calcium oxalate crystals mostly prismatic type but a few clusters also

observed; patches of fibres present with a fairly large lumen; sclereids occur in groups of 8 to 10, oval to elongate in shape, measuring 45 to 175  $\mu$  in length with thick striated walls, the lumen is very small often reduced to a line; pit canals present.

**Powder** -Ash colour, coarse; fragments of thick-walled cork cells with dense brown content; sclereids elongated and oval shaped showing pit canals with narrow lumen; calcium oxalate crystal in the form of prisms and clusters; a few yellowish tannin cells.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2 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	1.5 per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	2 per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of the alcoholic extract on precoated silica gel 'G' (E . Merck grade) plate using Chloroform : Acetone (98 : 2) shows under UV (366 nm) two fluorescent zones at Rf. 0.88 (blue) and 0.93 (green). On spraying with Anisaldehyde - Sulphuric acid reagent and heating the plate for five minutes at 105°C six spots appear at Rf. 0.32 (pink), 0.49 (pink), 0.56 (grey), 0.71(dark pink), 0.88 (pink) and 0.93 (pink).

**CONSTITUENTS** - Triterpenoids (Lupeol, Betulin, Betulinic acid, Oleanolic acid) and Sterol.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Tikta, Kaṣāya
<b>Guna</b>	:	Guru, Snigdha
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Madhura
<b>Karma</b>	:	Grāhī, Kaphahara, Pittahara, Vraṇaropaṇa, Jihvājādyakara, Savarṇakara

**IMPORTANT FORMULATIONS** - Nayagrodhādi Kvātha Cūrṇa

**THERAPEUTIC USES** - Aruci, Atisāra, Bhagna, Medoroga, Prameha, Raktapitta, Udarda, Vibandha, Vraṇa, Yoniroga, Pittaroga, Karṇasrāva, Agnidagdha Vraṇa, Atidagdha Vraṇa, Trṣa, Daha

**DOSE** - 5 - 10 g.

## 91. Vishala (Rt)

### VIŚALĀ (Root)

Viśalā consists of dried root of *Trichosanthes bracteata* (Lam.) Voigt (Fam. Cucurbitaceae), a large perennial, upto 9 m in height, dioecious, branched, woody tendril climber, commonly growing in moist thickets from the Himalayas to the south, ascending upto an altitude of 2,500 m.

#### SYNONYMS

Sanskrit	:	Mahākāla, Gavādanī
Assamese	:	--
Bengali	:	Maakaal
English	:	--
Gujrati	:	Raataan Indraayan
Hindi	:	Maakaal, Mahar Kaundala, Lal Indraayan, Mahakaal
Kannada	:	Avagudehannu
Kashmiri	:	--
Malayalam	:	Kaakkattonti
Marathi	:	Kaundal, Kavandal
Oriya	:	Mahaakaal
Punjabi	:	Kaehree, Aankorattai
Tamil	:	Korattai
Telugu	:	Erraa Chedupucca
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Well developed fibrous roots, pale yellow to creamish-brown, available in pieces, 4 to 15 cm long, 0.3 to 2 cm thick; cylindrical and slightly curved; deeply grooved longitudinally; external surface, dusty, shrivelled, rough due to exfoliating cork, longitudinal fissures and root scars; fracture, fibrous; taste, bitter and astringent.

##### b) Microscopic

**Root-** Root shows multi-layered cork, outer layers exfoliating, inner of rectangular cells, cortex narrow with a row of sclereids externally and shows presence of patches of fibres; phloem, narrow of small polygonal cells; bulk of root composed of large rounded vessels arranged in radiating rows interspersed by dominant strands of multiseriate medullary rays filled completely with starch grains; pith absent.

**Powder-** Deep creamish-brown; abundant sclereids of various shapes, mostly in groups, isodiametric sclereids 20 to 30  $\mu$ , thick-walled with round lumen, strongly striated;

fibres, singly and in groups; cork cells; well developed reticulately thickened and border-pitted vessels; starch grains, mostly simple.

### IDENTITY, PURITY AND STRENGTH

Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	14	per cent, Appendix	2.2.3.
Acid-insoluble ash	Not more than	3	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	1	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	4	per cent, Appendix	2.2.7.

### T.L.C.

T.L.C. of the alcoholic extract on precoated silica gel 'G' plate (0.2 mm thick) using chloroform : methanol (9:1) shows spots at Rf 0.16, 0.42, 0.63, 0.69, 0.77 and 0.83 (all purple) on spraying with vanillin-sulphuric acid reagent and heating the plate at 105°C for about ten minutes.

**CONSTITUENTS** - Saponins, trichosanthin.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Kaṭu, Tikta
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaphahara, Pittahara, Vāmaka, Viṣaghna, Prasūtikṛta

**IMPORTANT FORMULATIONS** - Pānīya Kalyaṇaka Ghṛta, Viśālādi Cūrṇa

**THERAPEUTIC USES** - Granthi, Gulma, Jvara, Kāmalā, Kāsa, Kuṣṭha, Prameha, Slīpada, Svāsa, Vṛddhi, Vraṇa, Āmadoṣa, Antarvṛddhi, Stanapidā, Plīhodara, Gaṇḍamaya, Mūḍhagarbha

**DOSE** - 1 -3 g.

## 92. Vyaghranakha(Fr)

### VYĀGHRANAKHA (Fruit)

Vyāghranakha consists of mature fruit of *Capparis sepiaria* Linn. syn. *C. zeylanica* Linn. f. (Fam. Capparidaceae), a perennial climbing shrub with hooked stipular spines, distributed throughout India, in the plains.

#### SYNONYMS

Sanskrit	:	Ahimsrā, Vyāghrāyudha
Assamese	:	--
Bengali	:	--
English	:	--
Gujrati	:	--
Hindi	:	Baghanai, Kanthari, Kareruaa
Kannada	:	Kathiramullu, Mulhukallari
Kashmiri	:	--
Malayalam	:	--
Marathi	:	Ardanti, Vyaghranakh, Wag, Wagati
Oriya	:	--
Punjabi	:	--
Tamil	:	Atandai, Kattukathiri, Marandan, Thoratti
Telugu	:	Nalla uppi
Urdu	:	--

#### DESCRIPTION

##### a) Macroscopic

Subglobose, many seeded berry; green when young, red brown when ripe, 3 to 4 cm in diameter, on a greatly thickened stalk; seeds are trigonal, 4 to 5 mm long, 3 to 4 mm wide, 2 to 3 mm thick with white thin covering; seed coat hard.

##### b) Microscopic

**Fruit** - Epicarp shows thick cuticle covering the single layered epidermal cells followed by thick walled parenchyma, filled with yellow contents, mesocarp composed of thick walled parenchyma, having groups of pitted sclereids at places along with some vascular strands, endocarp contains collapsed cells, abundant oil globules present.

**Seed** - T.S. shows testa having thick cuticle; with a single layered, laterally elongated, loosely packed, pigmented, epidermal cells, followed by 8 to 10 layers of compactly arranged circular pitted stone cells with very thick wall and narrow lumen; tegmen

consists of collapsed cells; endosperm parenchyma filled with oil and aleurone grains, oil cells with yellowish oil at some places.

**Powder** - Reddish brown, sticky, shows sclereids, parenchymatous cells filled with oil and cells filled with aleurone grains.

### IDENTITY, PURITY AND STRENGTH

Acid-insoluble ash	Not more than	1	per cent, Appendix	2.2.4.
Alcohol-soluble extractive	Not less than	30	per cent, Appendix	2.2.6.
Water-soluble extractive	Not less than	26	per cent, Appendix	2.2.7.
Foreign matter	Not more than	2	per cent, Appendix	2.2.2.
Total Ash	Not more than	8	per cent, Appendix	2.2.3.

### T.L.C.

T.L.C. of the alcoholic extract on silica gel 'G' (0.2 mm thick ness) plate using toluene : methanol (6:3) shows nine bands at Rf. 0.12, 0.23, 0.32, 0.53, 0.56, 0.61, 0.64, 0.71, 0.86 (all brown), on spraying with 5% Ethanolic-sulphuric acid reagent and heating the plate for ten minutes at 105°C.

**CONSTITUENTS** - Thioglucoside glucocapparin, n-triacontane, á-amyrin and fixed oil.

### PROPERTIES AND ACTION

<b>Rasa</b>	:	Madhura, Kaṭu, Tikta, Kaṣāya
<b>Guna</b>	:	Laghu, Rukṣa
<b>Virya</b>	:	Uṣṇa
<b>Vipaka</b>	:	Kaṭu
<b>Karma</b>	:	Kaphahara, Vātahara, Varṇya, Viṣaghna, Kaṇḍughna

**IMPORTANT FORMULATIONS** - Balā Taila

**THERAPEUTIC USES** - Bhrama, Jvara, Kaṇḍu, Koṭha, Kuṣṭha, Pravāhikā, Raktapradara, Sarpaviṣa, Vātavikāra, Vraṇa, Viṣvikāra, Pīdaka, Graharoga, Mukhadurgandha

**DOSE** - 2-6 g.