THE AYURVEDIC PHARMACOPEIA

OF

BANGLADESH

Part I: Volume IV

MONOGRAPHS OF SINGLE DRUGS

First Edition

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF HEALTH AND FAMILY WELFARE
DIRECTORATE GENERAL OF HEALTH SERVICES
DEPARTMENT OF HOMEO AND TRADITIONAL MEDICINE
& ALTERNATIVE MEDICAL CARE (AMC)
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Functions:

1. Prepare an Ayurvedic Pharmacopeia of single drugs and compound drugs.
2. Ayurvedic Pharmacopeia expert committee will be carried out scientific works to generate data on monographs of single drugs in which lay down standards for compound formulations.
3. Will prepare monographs on single herb or plant including about 250 in numbers in two years period will be included in the Pharmacopeia providing information on identity, vernacular names, descriptions, important formulations, therapeutical index and pharmacognostical standards.
4. The Ayurvedic Pharmacopeia of Bangladesh Part I comprise of monographs of Ayurvedic single drugs of plant origin, which go into one or more. In compiling the monographs, the title of each drug had been given in Bangla and then comes the definition of the drug giving its identity in scientific nomenclature and very brief information about its source, occurrence, distribution and precautions in collection.
5. The monograph then gives norms and limits under " Purity and Safety Test" like tolerance of foreign matter, total ash, acid insoluble ash, alcohol soluble extract, water soluble extract, volatile oil contents. Some of them have a direct bearing on the purity and strength. Where possible, assay of one constituent or group of constituents like total alkaloids or total volatile oils has been given. However, under the heading 'Major Chemical Constituents' one or more constituents or group of constituents like oleoresins, essential oils, alkaloids have been mentioned which only have an informative value based on published research work in phytochemistry. In the case of water soluble or alcohol soluble extract specification of lower limit has an added relevance to the maturity of the drug in addition to its authenticity.
6. It will however, be worth mentioning that there is always a wide variation in crude drugs (raw materials) of plant origin in respect of their chemical contents, due to varied climatic conditions, geographical distribution, source and season of collection and lack of scientific methods of storage and preservation. Therefore, the variation in the chemical data created a great difficulty in fixing the standards for single drugs. However, the data has been fixed up by working out as many samples as possible procured from different sources.

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Legal Notice

The Ayurvedic Pharmacopeia of Bangladesh (A.P.B.), Part I, Vol.IV, is the book of standards for single drugs included therein and the standards prescribed in the A.P.B., Part I, Vol.IV, would be official. If

considered these standards can be amended and the Chairman of the Ayurvedic Pharmacopeia of Bangladesh.

Committee authorised to issue such amendments. Whenever such amendments are issued the A.P.B., Part I, Vol.IV, would be deemed to have been amended accordingly.

General Definitions

Title: The title of the book is "The Ayurvedic Pharmacopeia of Bangladesh". Wherever the abbreviation A.P.B. is used, it may be presumed to stand for the same and the supplements thereto.

Title of the Drugs: The name given on the top of each monograph of the drug is in Bengali as mentioned in the Ayurvedic classics 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.

Synonyms: Synonyms of each drug appearing in each monograph in Bangala, Hindi, Sanskrit, Urdu/Unani/Tibb and English have been mentioned as found in the classical texts, Ayurvedic Formulary of Bangladesh and as procured from the experts, scholars of Ayurveda.

Italic: Italic type has been used for scientific name of the drug appearing in the synonyms paragraph of each monograph.

Geographical Distribution: The geographical distribution emphasizes the locality or availability of particular single drugs within Bangladesh.

Organoleptic Properties: The organoleptic properties include Rasa (taste), Guna (attribute), Virya (potency), Vipaka (metabolism) and Karma (action). References were taken from various authentic Ayurvedic classics.

Purity and Safety Test: Under the heading “Purity and Safety Test” 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 defamed 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 extract, water soluble extract; ether soluble extract, moisture content; volatile oil content and assays are the methods upon which the standards of Pharmacopeia 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 Pharmacopeial 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 Pharmacopeia are alone authoritative. In Thin Layer

Chromatography (TLC)wherever given, the number of spots and R_f values of the spots with their colour have been mentioned as a guide for identification of the drug and not as Pharmacopeial 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. The microbial contamination, heavy metals and pesticides residues were followed according to WHO guideline. Directorate General of Drug Administration (DGDA) has recently taken an initiative to enhance the quality of Ayurvedic medicine through implementation of "Test Criteria" prepared by an expert committee.

Major Chemical Constituents: It describes the important chemical constituents, groups of constituents that reported in research publications and have mentioned as a references and not as pharmacopeial requirement.

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

% w/w (percentage weight in weight) expresses the number of grams of active substance, in 100 grams of product.

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

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

% v/w (percentage volume in weight) expresses the number of milliliters of active substance in 100 grams of product.

Percentage of Alcohol: All statements of percentage of alcohol (C_2H_50H) 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 Pharmacopeia are described in Appendices.

Solubility: When stating the solubility of chemical substances, the term "Soluble" is necessarily sometimes used in a general sense irrespective of concomitant chemical changes. Statements of solubility 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 solubility for which no figures are given, are intended to apply at ordinary room temperature. Pharmacopeial 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 monograph.

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

When the exact solubility of Pharmacopeial 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 I 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 Usages: It indicates the particular plants may acts on mentioned ailments**.**

Pharmacological Study: It introduces the research based evidence of specific medicinal plants.

Posology: 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 A.P.B. 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.

Formulations: Important formulations mentioned in the Bangladesh National Formulary of Ayurvedic Medicine as well as authentic texts.

Abbreviations and Acronyms

AMC	:Alternative Medical Care
cm.	: Centimeter
DGHS	: Directorate General of Health Services
ECNEC	: Executive Committee of the National Economic Council
gm.	: Gram
HNPSP	: Health, Nutrition and Population Sector Program
HNPSDP	: Health, Nutrition and Population Sector Development Program
kg.	: Kilogram
l	: Liter
m	: M
mm.	: Millim
mg.	: Milligram
ml.	: Milliliter
OP	: Operation Plan
PIP	: Programme Implementation Plan
PM	: Program Manager
TLC	: Thin Layer Chromatography
v/v	: volume by volume
v/w	: volume by weight
w/w	: weight by weight
w/v	: weight by volume
µ	: Micron (0.001 mm)
%	: Percentage

:

Introduction

Pharmacopoeia literally means “drug-making”. Pharmacopoeia is a book describing drugs, chemicals and medicinal preparations; this pertains especially to one issued by an officially recognized authority and serving as a standard. The Ayurvedic Pharmacopoeia of Bangladesh is a legal document of standards for the quality of Ayurvedic medicine and substances included therein. More than 90% of ingredients used in Ayurvedic medicine from plant origin. Mankind has used and continue to use plants for their medicinal properties. Over thousands of years, the knowledge for the application and administration of plants in the prevention and treatment of human disease and illness has grown and developed in to holistic lifestyle system, such as Ayurveda. These system is widely used, and traditional medicine remains a primary source of health care for up to 80% of the population of some African and Asian countrie. Bangladesh, due to its unique variety of geographical and climatic factors, has a rich and varied flora of the medicinal plants since the Vedic period. Bangladesh contains about 5,700 species of higher plants being situated in a larger part of South-Asian center of plant genetic diversity. Of which 260 species are cultivated and the rest of the species are virtually left on growing in natural vegetation in forests and in village thickets.

In an estimate, the international market of medicinal plants related to trade stood at 60 billion US Dollar per year. The demand for medicinal plants based raw materials are growing at an approximate rate of 10-15% per year globally. Medicinal plant sector has traditionally occupied an important position in the socio-cultural, spiritual and medicinal arena of rural and tribal lives of Bangladesh. In recent years, the growing demand for Ayurvedic product has led to a quantum jumping in volume of plants materials trade within and across the country. Bangladesh there is no systematic cultivation process or conservation strategies about medicinal plants. The local people conserve traditional knowledge through their experience and practice, which is handed down orally without any documentation. A uniform nomenclature or common name or group used for the identification of plants which the ancients used as sources of drugs has yet not been established. Morphological species identification for monitoring adulteration in plant materials is a great challenge, especially when the plants are purchased as raw drugs (dried or powdered whole plant or plant parts), which often lack the key morphological diagnostic characters that are required for species identification. According to the demand of medical practitioner and manufractueres needs identification of medicinal plants include organoleptic methods (taste, smell, sight and touch), macroscopic and microscopic identification (shape, colour and texture), and chemical profiling (TLC, HPLC-UV, HPLC-MS) for authentication of medicinal plants and Ayurvedic drugs. So considering the necessity of standard legal document the Director, Homeo and Traditional Medicine, Directorate General of Health Services, Dhaka has been taken work plan to preparation the Ayurvedic Pharmacopeia under HNPSP since 2003–2006 which was recognized by Executive Committee of National Economic Council (ECNEC). Having regard to all these considerations the Line Director, Alternative Medical Care (AMC) and

Director Homeo and Traditional Medicine proposed a body of National Ayurvedic Pharmacopeia Committee headed by Director General of Health Services consisting of experts on Unani or Ayurvedic or Homeopathic and other sciences including experts of pharmacognosy, chemistry and pharmacy. Director General of Health Services was accepted that National Committee on 06 January 2005 and three separate subcommittee was formed by the National Committee for Unani, Ayurvedic and Homeopathic pharmacopeia. By a tremendous effort of that committee, the Ayurvedic Pharmacopeia of Bangladesh, Part I, Volume I was prepared and which consists of 50 medical plants. Ayurvedic Pharmacopoeia of Bangladesh Volume II also consists of 50 monographs of single medicinal plants was published in June 2016 under HNPSDP. In that continuation, the Ayurvedic Pharmacopoeia of Bangladesh Volume III was published in June 2019 and now Volume IV is going to be published by June 2020 under 4th sector HPNSP which also consists of 50 monographs of single medicinal plants.

This pharmacopeia describes the macroscopic, microscopic characters along with their chemical standards on the protocol developed and designed by Ayurvedic Pharmacopeia Committee. It deals in detail about the permissible limits of foreign matter, total ash, acid insoluble ash, alcohol soluble extract, water soluble extract and chromatographic pattern of TLC. It also describes the Ayurvedic pharmacological properties like rasa, guna, virya, vipaka, karma in each monograph along with their therapeutic uses, some of the important classical formulations and therapeutic dose. Appendix of this volume contains the details of the protocols used in determination of various scientific standards. References of ancient Ayurvedic literature in its original form are an added attraction in order to authenticate the Ayurvedic statements made in each and every monograph. In the end English equivalents of Ayurvedic terms have been used to make the volume more useful for the people who are not conversant with Ayurvedic terminologies.

Agar

Botanical Name: *Aquilaria malaccensis* Lam.

Family: Thymelaeaceae

Synonyms:

Bangla: আগর (Agar), Agarkashtha, Agar Chandan

Hindi: Agar

Sanskrit: Aguru, Lauha

Urdu/Unani/Tibb: Ood Hindi, Agar

English: Aloeswood; Eaglewood

Geographical Distribution: Aquilaria malaccensis grows naturally in all ecological zones and on a variety of soils under wide climatic condition, including those that are rocky, sandy or calcareous, well-drained slopes and ridges and land near swamps. It is mostly found in the eastern hill regions in Sylhet division, Chittagong, Chittagong Hill Tract (CHT) and Cox's Bazar of Bangladesh. Also found in India, Myanmar, Malaysia, Indonesia and Philippines.

Plant Descriptions:

General Description: This plant is a large evergreen tree about 20 meters tall and 1.5–2.4 m in girth with somewhat straight and fluted bole. Leaves are alternate 0.5-10 cm by 2-5 cm oblong, lanceolate or elliptic, caudate, acuminate and glabrous with slender nerves. Venation is parallel. Petiole is 0.3-0.5 cm long. It is commercially used as fragrant and in prepation of drugs. The tree contains plenty of oleoresin and has irregular dark patches. The wood burns with a bright flame giving off pleasant smell. Flowers are white in colour, bisexual, pedicellate, in both axillary and terminal umbellate cymes, shortly pedunculed, perianth, companulate, lobes 5 spreading and densely pilose. Pedicels is 0.5-0.8 cm long, slender. Perianth remains persistent in fruit and 1.3-1.5 cm long, silky densely villous, connate at the base. Stamens are 10, anthers 10 with subsessile disc. Ovary is subsessile, villous and two-celled. Stigma is large, subsessile. Fruit is capsular, 3-5 cm long, obovoid, pericarp coriaceous and densely tomentose. Seeds are ovoid with a long tail.

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

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

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

Part Used: Aromatic resinous wood, oil

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Tikshna (Sharp), Snigdha (Unctuous)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Reduces phlegm, reduces vata, increases pitta, cures headache, skin diseases and vomiting.

Fig. *Aquilaria malaccensis* Lam.

Purity and Safety Test

Foreign matter	: Not more than 1% w/w
Total ash	: Not more than 13 % w/w
Acid insoluble ash	: Not more than 0.5 % w/w
Alcohol soluble extractive	: Not less than 1 % w/w
Water soluble extractive	: Not less than 2 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

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

Major Chemical Constituents: The major compounds identified were 4-phenyl-2-butanone (32.1%), jinkoh-eremol (6.5%) and alpha-guaiene (5.8%), while the major compounds in the commercial oil were alpha-guaiene (10.3%), caryophellene oxide (8.6%), and eudesmol (3.2%).

Therapeutic Use: Fever, bronchitis, asthma, loss of appetite, chronic diarrhea, hepatic disorders, intestinal disorders, gout, rheumatoid arthritis and vomiting; depression, anxiety etc.

Pharmacological Study: Antimicrobial, anti-oxidant, sedative, antihyperglycaemic, thrombolytic, antidiabetic, anticancerous, antidiarrhoeal, hepatoprotective, sedative, ulcer protective and CNS activities etc.

Contraindications: Should not be used during pregnancy, lactation, bleeding disorders, and known allergy to the plants of the Thymelaeaceae family.

Adverse Effects: There are no side effects observed for its uses in patients suffering from any respiratory diseases or digestive ailment. These side effects occur when Agar is taken in heavy dosage more than 6 gm per day.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Powder 3-5 gm in divided dosages, Oils-1-5 drops.

Formulations: Hangsadi Grita, Anu Taila, Himsagar Taila

Amlavetasa

Botanical Name: *Garcinia pedunculata* Roxb. ex Buch-Ham

Family: Guttiferae/Clusiaceae.

Synonyms:

Bangla: অম্লবেতস (Amlavetasa), Thaikal

Hindi: Amlavet, Amantamul

Sanskrit: Amlavetasa

Urdu/Unani/Tibb: Amalbeda

English: Indian rhubarb

Geographical Distribution: Garcinia pedunculata is distributed throughout Bangladesh. It is sometimes cultivated for its fruit in Bangladesh. Amlavetasa (Garcinia pedunculata) found in north eastern India, and South eastern regions of Asia such as parts of Myanmar.

Plant Descriptions:

General Description: Garcinia pedunculata is a tree growing around 20 metres tall. The bark is thick and corky. Leaves are lanceolate with prominent midribs. Male flowers are light green in sparsely flowered panicles. The female flowers are solitary. The roundish fruit has a diameter ranging between 8 and 12 cm. It has a juicy interior with edible arils.

Macroscopic Description: Macroscopically, the fresh leaf is 20 to 23.5 cm long, 9.5 to 12.5 cm width and petiole 1.8 to 2.6 cm long, some variation occur in shape of leaf, i.e. generally obovate, some elliptic and oblong in shape with obtuse and sub-acute leaf tip, cuneate at base and green in color. Midrib stout, prominent and lateral veins are distinct. The fruit is globose, yellow when ripe and 4 - 8 seeded.

Fig. *Garcinia pedunculata* Roxb. ex Buch-Ham

Microscopic Description: Transverse section of pedicel shows wavy outline; epidermis single layered; thick cuticle present; cortex parenchymatous with thick walked cells showing intercellular spaces; prismatic and rosette crystals of calcium oxalate and brown contents present throughout cortex; secretory canals present all over the region; pericycle discontinuous with patches of collenchyma; stele shows wavy outline with a continuous band of phloem and xylem interrupted by medullary rays; pith large, parenchymatous showing several isolated anomalous amphicribral vascular bundles at the periphery. Transverse section of fruit rind shows single layered epidermis; cuticle present; unicellular trichome occasionally present; mesocarp parenchymatous; prismatic and rosette crystals of calcium oxalate and brown contents present in cells of several layers of mesocarp, just below the epidermis; secretory cells present all over the region; middle and inner mesocarp shows amphicribral vascular bundles with a clear endodermis.

Powder -Parenchyma cells of epidermal tissue of pedicel in surface view showing paracytic stomata, spiral and scalariform vessels from rind trichomes, rosette crystals of calcium oxalate, non septate fibres up to 400 µ. In length from pedicel.

Part Used: Fruit

Organoleptic Properties

Rasa (Taste)	: Amla (Sour)
Guna (Attribute)	: Laghu (Light), Ruksha (Dry)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Amla (Sour)
Karma (Action)	: Anulomaka, Bhedana, Dipana, Kaphahara, Mutrala, Pacana, Vatahara./Depana Hridya Kaphahara Vatahara Vathakaphahara.

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 3 % w/w
Acid insoluble ash	: Not more than 2 % w/w
Alcohol soluble extractive	: Not less than 39 % w/w
Water soluble extractive	: Not less than 42 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of dichloromethane extract on aluminium plates precoated with silica gel 'G' 60 F254 (0.2 mm thickness) using toluene: ethyl acetate (5:1.5) under UV 366 nm shows fluorescent zones at Rf. 0.55, 0.93 and 0.96 (all blue). Under UV 254 nm spot appears at Rf.0.3 (green). On exposure to iodine vapour spots appear at Rf. 0.61 and 0.65 (both yellow). On dipping in vanillin sulphuric acid and on heating for 5 minutes at 105^{o} shows spots at Rf. 0.25 (blue), 0.44 (greenish blue), 0.84 (dark blue) and 0.95 (greenish blue).

Major Chemical Constituents: The phytochemical studies have shown the dried fruit rinds, and pericarp contains benzophenones, pedenculol, garcinol and cambogin. It also contains glycoside, saponins, phenolic compound, fixed oil, and fat.

Therapeutic Use: Anaha (Distension of abdomen due to obstruction to passage of urine and stools), Ajirna (Indigestion), Asmari (Calculus), Arsa (Piles), Aruci (Anorexia), Gulma (Abdominal lump), Hrdroga (Heart disease), Hikka (Hiccup), Krmi (Worm infestation), Kasa (Cough), Pliharoga (Splenic disease), Sula (Pain/Colic), Svasa (Asthma), Udavarta (Upward movement of gases), Vibandha (Constipation).

Pharmacological Study: Antioxidant, anti-inflammatory, cardioprotective, hepatoprotective, and anti-diabetic activity etc.

Contraindications: Should not be used during pregnancy, bleeding disorders, kidney disease, and known allergy to the plants of the Guttiferae/Clusiaceae family.

Adverse Effects: The acute oral administration of GF extract given at a dose of 2000 mg/kg to the mice indicated no mortality up-to 15 days. Similarly, by the administration of GF extract at a dose of 2000 mg/kg did not show any change in general behavior or lethality. So 1/10th of non-lethal dose (200 mg/kg) was selected for in vivo study.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Leaf juice 5-10 ml, Powder 2-4 gm, Decoction 50-100 ml

Formulations: Vaskar Lavan, Mahagni Bati, Kankayan Gudika

Apang

Botanical Name: *Achyranthes aspera* Linn.

Family: Amaranthaceae

Synonyms:

Bangla: আপাং (Apang)

Hindi: Chirchita, Latjira

Sanskrit: Mayura, Mayuraka, Pratyakpushpa, Kharamanjar, Shikhari

Urdu/Unani/Tibb: Chirchita

English: Prickly Chaff Flower

Geographical Distribution: It grows throughout the tropical and warmer regions of the world. The weed is also found in many other countries of Asia as well as Africa, America, Europe and Australia. It is also found in northern part of Bangladesh, Himachal Pradesh, India and an exotic medicinal plant of district Lalitpur, Uttar Pradesh, India.

Plant Descriptions:

General Description: Achyranthes aspera is an erect or procumbent, annual or perennial herb of about 1- 2 meter in height, often with a woody base. Stems angular, ribbed, simple or branched from the base, often with tinged purple colour. Flowering time of this plant is in summer. The stems are square, leaves elliptic ovate or broadly rhombate. The inflorescences are 8 - 30 cm long, with many single, white or red flowers, 3 – 7 mm wide.

Fig. *Achyranthes aspera* Linn.

Macroscopic Description:

Root: Yellowish brown colour, cylindrical tap root, gradually tapering, slightly ribbed, rough due to presence of root scars, secondary and tertiary root present.

Stem: Stem yellowish brown, erect, branched, cylindrical, hairy, solid and hollow when dry, 10-12 ridges present on outer surface.

Leaf: Leaves simple, nearly sessile, stipule absent, opposite decussate, slightly wavy margin, obovate, slightly acuminates and pubescent due to presence of hairs.

Seed: Seeds are brown colour, sub cylindric, truncate at the apex, round at the base, endospermic.

Flower: Arranged in inflorescence of long spikes, greenish-white, numerous, sessile, bracteate with two bracteoles, one spine lipped, bisexual, actinomorphic, hypogynous; perianth segments 5,free, membranous, contorted or quincuncial, stamens 5, opposite, the perianth lobes, connate forming a membranous tube-like structure, alternating with truncate and fimbriate staminodes, filament short; anther, two celled, dorsifixed; gynoecium bicarpellary, syncarpous; ovary superior, unilocular with single ovule; style, single; stigma, capitate.

Fruit: An indehiscent dry utricle enclosed within persistent, perianth and bracteoles

Microscopic Description:

Root: Mature root shows 3-8 layered, rectangular, tangentially elongated, thin-walled cork cells; secondary cortex consisting of 6-9 layers, oval to rectangular, thin-walled, parenchymatous cells having a few scattered single or groups of stone cells; followed by 4-6 discontinuous rings of anomalous secondary thickening composed of vascular tissues; small patches of sieve tubes distinct in phloem parenchyma, demarcating the xylem rings; xylem composed of usual elements; vessels simple pitted; medullary rays 1-3 cells wide; small prismatic crystals of calcium oxalate present in cortical region and numerous in medullary rays.

Stem: Young stem shows 6-10 prominent ridges, which diminish downwards upto the base where it becomes almost cylindrical; epidermis single layered, covered by thick cuticle having uniseriate, 2-5 celled, covering trichomes and glandular with globular head, 3-4 celled stalk; cortex 6-10 layered, composed of parenchymatous cells, most of them containing rosette crystals of calcium oxalate; in the ridges cortex collenchymatous; vascular bundles lie facing each ridge capped by pericyclic fibres; transverse section of mature stem shows lignified, thin-walled cork cells; pericycle a discontinuous ring of lignified fibres; vascular tissues show anomalous secondary growth having 4-6 incomplete rings of xylem and phloem; secondary phloem consisting of usual elements form incomplete rings; cambial strip present between secondary xylem and phloem; secondary xylem consisting of usual elements, fibres being absent; vessels annular, spiral, scalariform and pitted, fibres pitted, elongated, lignified; pith wide consisting of oval to polygonal, parenchymatous cells; two medullary bundles, either separate throughout or found in some cases, present in pith; micro-sphenoidal silica crystals present in some epidermal, cortical and pith cells.

Leaf Petiole: Shows crescent-shaped outline, having single-layered epidermis with thickcuticle; ground tissues consisting of thin-walled, parenchymatous cells containing rosette crystals of calcium oxalate; 4-5 vascular bundle situated in mid region.

Midrib: Shows a single layered epidermis, on both surfaces; epidermis followed by 4-5 layered collenchyma on upper side and 2-3 layered on lower side; ground tissue consisting of thin-walled, parenchymatous cells having a number of vascular bundles; each vascular bundle shows below the xylem vessels, thin layers of cambium, followed by phloem and a pericycle represented by 2-3 layers of thick-walled, non-lignified cells; rosette crystals of calcium oxalate found scattered in ground tissues.

Lamina: Shows single layered, tangentially elongated epidermis cells covered with thick cuticle having covering trichomes which are similar to those of stem found on both surfaces; mesophyll differentiated into palisade and spongy parenchyma; palisade 2-4 layered of thick parenchyma larger, slightly elongated in upper, while smaller and rectangular in lower surface; spongy parenchyma 3-5 layers thick, more or less isodiametic parenchymatous cells; idioblast containing large rosette crystals of calcium oxalate distributed in palisade and spongy parenchyma cells; stomata anisocytic and anomoacytic in both surface; stomatal index 4.5-9.0 on upper surface, 9.0-20.0 on lower surface; palisade ratio 7.0-11; vein islet number 7-13 per sq. mm.

Powder: Light yellow; shows fragments of elongated, rectangular, thin-walled epidermal cells, aseptate fibres, vessels with annular, spiral, scalariform and pitted thickening, uniseriate hair with bulbous base, rosette and prismatic crystals of calcium oxalate.

Part Used: Whole plant

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough), Tikshna (Sharp)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Pacify Kapha and Vata, evacuates Kapha and Pitta, Sirovirecana, Sodhahara, Vedana sthapana, Lekhan, Visaghna, Tvak Dosahara Vrana Sodhana, Dipana-Pacana, Medohar.

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 17 % w/w
Acid insoluble ash	: Not more than 5 % w/w
Alcohol soluble extractive	: Not less than 2 % w/w
Water soluble extractive	: Not less than 12 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total

yeast and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: Thin layer chromatography (TLC), using stationary phase Silica Gel 60 F254 while mobile phase used in various comparison chloroform and methanol in more polar mobile phase in mixture of chloroform : methanol with a ratio of 3 : 7, and more non polar mobile phase of chloroform and methanol with a ratio 8 : 2. By using non polar mobile phase phytochemicals retained on various retardation factor (Rf) after spraying vanillin - sulphate acid reagent, good separation showed marker compound in form of gray spot under UV light 254 nm at Rf value 0.47. While using more polar mobile phase, the phytocemicals retained in bad separation showed under UV light 254 nm.

Major Chemical Constituents: The major chemical constituents are alkaloids, flavonoids, saponins, carbohydtaes, proteins are present. Seeds contains saponin A and B. It also contains triterpenoid saponins, oleanolic acid achyranthine, betaine, pentatriaontane, 6 pentatriacontanone, hexatriacontane, hentriacontane, ecdysterone and tritriacontane.

Therapeutic Use: Kandu (itching), Kusta (skin disorders), Visa (scorpion & snake bites), Kapha & Vata diseases, Vrana (Wound), Karna Roga (ear diseases), Netra Roga (eye diseases), Aruci (loss of taste in food), Cardi (vomiting), Agnimandya (anorexia), Sula (pain), Udararoga (abdominal diseases), Arsa (piles), Krmi (worm infestation), Hrdroga (heart disease), Pandu (anaemia), Gandamala (lymphedenitis), Amavata (rheumatoid arthritis), Kasa (cough), Svasa (asthma) Mutraghata (urinary obstruction).

Pharmacological Study: Antimicrobial, larvicidal, antifertility, immunostimulant, hypoglycemic, hypolipidemic, anti-inflammatory, antioxidant, diuretic, cardiac stimulant, antihypertensive, anti-anasacra, analgesic, antipyretic, antinoiceptive, prothyrodic, antispasmodic and hepatoprotective.

Contraindications: Should not be used during pregnancy, lactation, bleeding disorders, and known allergy to the plants of the Amaranthaceae family.

Adverse Effects: Higher doses, may cause nausea and vomiting. At 6.0 mg/kg dose, it also caused remarkable increase in salivation and diarrhoea. Chronic toxicity showed (3.0 mg/kg) an increase in sedation, hypnosis, salivation and diarrhoea.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Svarasa: 10-20 ml, Decoction: 50-100 ml., Root powder: 2-4 gm., Seed powder: 500-700 gm., Kshara: 0.5-2 gm.

Formulations: Kshudabati Bati, Mahasnakha Drabak, Baharer Nani

Arahar

Botanical Name: *Cajanus cajan* (L) Millsp.

Family: Fabaceae

Synonyms:

Bangla: অড়হর (Arahar)

Hindi: Arahad, Arahar

Sanskrit: Adhaki, Tuvari

Urdu/Unani/Tibb: Arhar

English: Pigeonpea, red gram

Geographical Distribution: Cajanus cajan is distributed throughout Bangladesh; also found in India, China, Myanmar, Nepal, Pakistan, Sri Lanka and Thailand.

Plant Descriptions:

General Description: An erect woody, annual or short-lived perennial shrub or small tree, 1–4 m tall with a deep taproot (to 2 m). Young stems are angled and pubescent. Leaves trifoliate, alternate, set in a spiral around the stem; leaflets oblong, lanceolate, 2–10 cm long and 2–4 cm wide, pubescent; discolourous - green above, greyish-green below. Lateral petioles 2–3 mm long, terminal one 10–20 mm; stipules linear, 2–3 mm long. Flowers usually yellow, sometimes with purple or red streaks or plain red; calyx 10–12 mm long with 5 linear teethc. Pods flat, acuminate, pubescent, 5–9 cm long, 12–13 mm wide, containing 2–9 oval to round seeds varying in colour from light beige to dark brown. 16,000–18,000 seeds/kg.

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

Microscopic Description: Mature root shows 3-7 layers of cork of rectangular, tangentially elongated, thin walled cells, interrupted at certain places by lenticels; secondary cortex consists of outer 3-7 layers of thin-walled, somewhat tangentially elongated parenchymatous cell, followed by a row of oval to elongated stone cells, thick-walled, elliptical, with wide lumen; some adjoining parenchymatous cells contain prismatic crystals of calcium oxalate; in the inner region strands of isolated or groups of 2-12 lignified fibres present; secondary phloem consists of sieve elements, fibres and phloem parenchyma, traversed by phloem rays; phloem fibres lignified, variable in size with pointed tips and wide lumen scattered throughout phloem region in single or in groups; some stone cells, mostly in groups and possessing yellowish contents, also found scattered in inner phloem; phloem rays numerous, uni to triseriate and straight; ray cells rectangular to rounded in inner phloem region, rounded to tangentially elongated in outer phloem; cambium consisting of 4-6

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

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

Fig. *Cajanus cajan* (L) Millsp.

Part Used: Leaves, Seeds and Young stem

Organoleptic Properties

Rasa (Taste)	: Kasaya (Astringent), Madhur (Sweet)
Guna (Attribute)	: Laghu (Light), Ruksha (Dry), Grahi (Absorbent)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Pitta and Khapha Nashok (Alleviate pitta and Khapha)

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 3.5% w/w
Acid insoluble ash	: Not more than 0.7% w/w
Alcohol soluble extractive	: Not less than 2% w/w
Water soluble extractive	: Not less than 4% w/w

Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E.*coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

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

Major Chemical Constituents: Leaves of the plant are rich in flavonoids and stilbenes. Leaves also contains cajanuslactone, cajanin, longistylin C and longistylin A. They also contain saponins, conspicuous amount of tannins, and moderate quantities of reducing sugars, resins and terpenoids. Tender red pods contain carbohydrates, protein, fats, vitamins A, B and C, carotene, minerals, and amino acids. Constituents of the seeds are similar to those pods, and they are rich sources of vitamin B6, folic acid, tocopherol, minerals, amino acids and plant acids. Roots possess genistein and genistin. It also contains hexadecanoic acid, α amyrin, β-sitosterol, Pinostrobin, longistylin Aand longistylin C.

Therapeutic Use: Jaundice, diabetes, hepatitis, sores, skin irritations, measles, dysentery, renal stones and menstrual disorders.

Pharmacological Study: Hepatoprotective, antioxidant, antimutagenic, anticarcinogenic, antimicrobial, anthelmintic, hypocholesterolemic, anti-inflammatory etc.

Contraindications: Should not be used during pregnancy, bleeding disorders, kidney disease, and known allergy to the plants of the Fabaceae family.

Adverse Effects: There are no such side effect of pigeon peas.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 1-2 tsf leaf extract in adults.

Formulations: Kankayan Gudika, Moha Panchagavya Grita

Babla

Botanical Name: *Acacia arabica* (Lam.) Willd.

Family: Fabaceae

Synonyms:

Bangla: বাবলা (Babla), Babul, Babool

Hindi: Babul, Kikar

Sanskrit: Babbuula, Babbuuri, Baavari, Aabhaa, Shuulikaa, Shitaka

Urdu/Unani/Tibb: Aqaaqia, Babuul, Kikar, Mughilaan, Samur

English: Babul, Black Babul, Indian Gum arabic tree

Geographical Distribution: Acacia arabica is seen all over the Indian subcontinent to an altitude of up to 3000 meter. It is called Indian gum-Arabic tree. It is found very common in the forest fringes in Madhya Pradesh, Chhattisgarh, Jharkhand, and Uttar Pradesh, Rajasthan, Maharashtra and other dried parts of country. The tree is also distributed in Burma, Sri Lanka, and Bangladesh.

Plant Descriptions:

General Description: It is a medium-sized, evergreen tree with a short trunk and having round spreading crown with feathery foliage, found in the whole drier parts of India. It normally attains a height of 15 m and having girth of 1.2 m, although trees reach up to a height of 30 m with a girth of 3 m have also been reported. Bark is a rough dark brownish to nearly black in colour with longitudinally and deeply cracked fissured. Leaves are from 2.5- 5 cm long, bipinnate with spinescent stipules, pinnules narrowly oblong. It produces golden yellow flowers with fragrant, crowded in long-stalked globose heads. Pods are flat shaped, 7.5-15.0 cm, contracted between the circular seeds. The fruits are stalked and compressed moniliform pods with constriction in between seeds. There may be 8-12 seeds per pod. Pods ripen in the months of May to June.

Macroscopic Description: Bark hard, dark brown or black, deeply fissured transversely and longitudinally, inner surface, reddish brown, longitudinally striated and fibrous, breaks with difficulty and exhibits a fibrous fracture, taste, astringent.

Microscopic Description: Transverse section of mature bark shows, 15-25 layered, thin-walled, slightly flattened mostly rectangular, brown coloured cork cells, a few lenticels formed by rupturing of cork cells, secondary cortical cells ovate to elongated, many tanniferous stone cel1s, variable in shape and size present in large groups, secondary phloem consists of sieve tubes, companion cells, fibres, crystal fibres and phloem parenchyma phloem fibres in many groups and thick-walled, phloem tissues filled with reddish or brown contents present, crystal fibres thick-walled, elongated, divided by transverse septa into segments, each contain a prismatic crystal of calcium oxalate,

medullary rays uni to-multi- seriate run almost straight, ray cells elongated to polygonal, 20-24 cells high and 2-5 cells wide, crystals of calcium oxalate found scattered amongst the stone cell"cel1s of secondary cortex and phloem parenchyma.

Powder-Powder as such reddish brown coloured, under microscope many prismatic crystals of calcium oxalate, stone cells, both with narrow and wide lumen and striations and crystal fibres seen.

Part Used: Stem bark, fruit, gum seeds.

Organoleptic Properties

Rasa (Taste)	: Kasaya (Astringent)
Guna (Attribute)	: Guru (Heavy), Ruksa (Dry), Visada (Tasteless)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Grahi (Anti-diarrhea), Kaphahara (Kapha alleviator), Visaghna (antidote)

Fig. *Acacia arabica* (Lam.) Willd.

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 15% w/w
Acid insoluble ash	: Not more than 2% w/w
Alcohol soluble extractive	: Not less than 6 % w/w
Water soluble extractive	: Not less than 4 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for

crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of chloroform and methanol solvents showed that the chief phytoconstituents found in the plant are catechutannic acid; acacatechin, catechins, epicatechin, isorhamnetin, quercetin, phlobatannins, tannic acid, quercetin, catechu-red and gum. But in the present phytochemical analysis two known compounds (catechin/epicatechin and quercetin) are identified based on their Rf values. The Rf value of catechin is 0.15 and that of quercetin is 0.6-0.7, and there was no overlap with any other component in the analyzed sample at 200–450nm.

Major Chemical Constituents: The different parts of the plant are flourishing in tannins, stearic acid, vitamin-C, carotene, crude protein, crude fiber, arabin, calcium, magnesium and selenium15. This plant contains different types of bioactive components such as gallic acid, ellagic acid, isoquercitin, leucocyanadin, kaempferol-7-diglucoside, glucopyranoside, rutin, derivatives of (+)-catechin-5-gallate, apigenin-6,8-bis-Cglucopyranoside, m-catechol and their derivatives.

Therapeutic Use: Atisara **(**Diarrhea), Prabahika (dysentery), Grahani (colitis), Kustha (skin diseases), Arsa (hemorrhoids), Muhapak (stomatitis), Kanthasula (sore throat), Krimi (worms), wounds, Jwara (fever), sotha (edema), madhumeha (diabetes), medoroga (obesity), blood disorders, Kasa (cough), Swasa (asthma) and Pandu (anemia) etc.

Pharmacological Study: Antimicrobial, antioxidant, antidiarrheal, antipyretic, hypoglycaemic, hepatoprotective, immunomodulatory, anti-inflammatory, antiplasmodial etc.

Contraindications: It should not be used in small children, very old persons, pregnant women, lactating mother and known allergy to the plants of the Fabaceae family.

Adverse Effects: Allergic reactions have been reported. Adverse effects reported in clinical trials include unfavorable sensation in the mouth, early morning nausea, mild diarrhea, and bloating.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Decoction 20-30 gm, gum 2-3 gm per day.

Formulations: Mehabjra Rasayan

Bang

Botanical Name: *Cannabis sativa* Linn.

Family: Cannabaceae

Synonyms:

Bangla: ভাং (Bang), Ganja, Sidhi

Hindi: Bhaang, Bhanga

Sanskrit: Vijaya, Bhang, Madani, Indrasana, Trailokya-vijaya, Tribhuvan vijaya, Shukranaashana, Ganja

Urdu/Unani/Tibb: Qinaab, Bhang

English: Cannabis, Hemp

Geographical Distribution: Cannabis sativa is originally a native of Western and Central Asia. It has been cultivated since ancient times in Asia and Europe. In India cultivation of this plant is controlled and permitted only in the districts of Almora, Garhwal and Nainital (Uttarakhand, India) with small extent in Kashmir and Travancore. It found to grow wild and under illegal cultivation in the northern districts and also in Faridpur and Dhaka.

Plant Descriptions:

General Description: Annual plant;erect stems growing from 3 to 10 feet or more high, very slightly branched, having greyish-green hairs;leaves palmate, with five to seven leaflets (three on the upper leaves), numerous, on long thin petioles with acute stipules at the base, linear-lanceolate, tapering at both ends, the margins sharply serrate, smooth and dark green on the upper surface, lighter and downy on the under one;flowers small, unisexual, male having five almost separate, downy, pale yellowish segments, female single, hairy, glandular, five-veined leaf enclosing the ovary in a sheath;ovary smooth, one-celled, with one hanging ovule and two long, hairy thread-like stigmas extending beyond the flower for more than its own length; fruit small, smooth, light brownish-grey in color, and completely filled by the seed.

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

Microscopic Description: Transverse section of leaves and bracts, shows dorsiventral surface, upper epidermis with unicellular, pointed, curved, conical trichomes with enlarged bases containing cystoliths of calcium carbonate, mesophyll contains cluster crystals of calcium oxalate in many cells consisting of usually one layer of palisade cell and spongy tissue, trichomes on lower epidermis

conical, longer, 340 500µ but without cystoliths, numerous glandular trichomes, sessile or with a multicellular stalk and a head of about eight radiating, club-shaped cells secreting oleo-resin, present in the lower epidermis especially on mid-rib, bracteoles with undifferentiated mesophyll and on lower surface bear numerous glandular trichomes.

Part Used: Dried flowering top, growing top, leaves, seeds, resin

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Laghu/Light, Tikshna/Sharp
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Dipana/ deepana (Digestive stimulant), Grahi (Anti-diarrhea, binds stool), Pachana (digest ama/toxins), Vajikarana (Reproductive tonic/ aphrodisiac), Vyavayi (Spread throughout the body without first getting digested)

Fig. *Cannabis sativa* Linn.

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 15% w/w
Acid insoluble ash	: Not more than 5% w/w
Alcohol soluble extractive	: Not less than 10 % w/w
Water soluble extractive	: Not less than 13 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total

yeast and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of root in chloroform and benzene solvent showed pink, violet, brick-red color that confirms the presence of Cannabinol, Cannabidol and Tetrahydrocannabinol respectively. Likewise, in ethyl acetate: methanol: ammonia; red, orange and purple spots were observed that shows the presence of Tetrahydrocannabinoic acid (THC-COOH), Cannabidol (CBD) and Cannabinol (CBN). There 3 spots were found on each plate with samples A, B and C, when developed in Chloroform and Benzene in the ratio of 50:50 respectively. Rf values were found as 0.195, 0.435 and 0.798 with Pink, Violet and Grayish-violet colour spots in respect to Rf values. Likewise, Rf values 0.192 (Pink), 0.440 (Dark-red) and 0.804 (Orange-pink) were observed from sample B and 0.189 (Pink), 0.448 (Dark-violet) and 0.795 (Orange-pink) from sample C.

Major Chemical Constituents: More than 460 chemicals of various classes (cannabinoids, cannabispirans and alkaloids) are isolated from cannabis. Also more than sixty cannabinoids have been isolated, in which, the most important one is delta-9- tetrahydrocannabinol (THC). THC has Antiemetic properties) and it is the predominant psychoactive cannabinoid. Cannabinoids are present in leaves, flowering tops of female plants, bracts and resin of the plant (absent in fruits and stems) are responsible for many medicinal properties of the plant.

Therapeutic Use: Grahani (Malabsorption syndrome), Jwara (Fever), Atisara (Diarrhoea), Agnimandya (Diminished digestive fire), Ajeerna (Dyspepsia), Prameha (Urinary disorders), Siroroga (Disease of head), Kasa (Cough), Kustha (Diseases of skin), Pandu (Anemia), Sotha (Inflammation), Sula (Colic), Swasa (Asthma), Medoroga (Lipid disorders), Sitapitta (Urticaria) etc.

Pharmacological Study: Analgesics, Antidepressant, Anti-inflammatory, anti-emetics, anxiolytic, sedative, bronchodilator etc.

Contraindications: It should not be used in small children, very old persons, pregnant women, lactating mother and known allergy to the plants of the Cannabaceae family.

Adverse Effects: Cannabis produces euphoria and relaxation, perceptual alteration, time distortion and the intensification of normal sensory experiences such as eating. Short-term memory and attention, motor skills, reaction time and skilled activities are impaired while a person is intoxicated. In occasional users, the feeling of euphoria is replaced by anxiety and panic reactions and this is a common reason for discontinuation of use. Effects on the cardiovascular system include tachycardia, with heart rate increasing by 20–50% within few minutes; this effect lasts for up to 3h. Blood pressure decreases when standing but not in the sitting position.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 125-250 mg of the drug in powder form.

Formulations: Amlapittantak Churna, Mahalaxmi Bilash (sirorog), Brihat Dasomul Taila

Bhallataka

Botanical Name: *Semecarpus anacardium* Linn.

Family: Anacardiaceae

Synonyms:

Bangla: ভল্লাতক (Bhallataka), Bhela

Hindi: Chirchita, Latjira

Sanskrit: Bhallataka, Aruskara

Urdu/Unani/Tibb: Baladur, Bhilayan, Bhilaavan

English: Marking nut, Oriental cashee

Geographical Distribution: It is a moderate-sized deciduous tree found in the outer Himalayas and hotter parts of India up to 3500 ft. height. The plant is found in abundance in Assam, Bihar, Bengal and Orissa, Chittagong, central India and western peninsula of East Archipelago, Northern Australia.

Plant Descriptions:

General Description: A moderate to large sized deciduous tree attaining height of 12 m-15 m, with large stiff leaves. Leaves crowded at the ends of branches, alternate 20-60 cm long and 10-30 cm broad, obovate/ oblong with prominent secondary nerves. The tree is leafless in March- April. Bark 2-5 cm thick, dusky gray, blackish, with irregular quadrangular plates separated by narrow longitudinal furrows. In old trees bark is rough with exfoliating scales. Inner surface of bark is red, exuding juice which blackens on exposure.

Fig. *Semecarpus anacardium* Linn.

Macroscopic Description: Fruit laterally flattened, drupaceous, dark brown, nut 2.5-3 cm long, obliquely ovoid, smooth, shining with residual receptacle.

Microscopic Description: Fruit-Pericarp differentiated into epicarp, mesocarp and endocarp; in longitudinal section pericarp shows outer epicarp consisting of single layer of epidermal cells which are elongated radially and lignified. Characteristic glands are found in pericarp which exude oil globules and arise as small protuberances in epicarp. Due to pressure exerted by cells of mesocarp, some of epidermal cells and cuticle rupture and oil globules exude from oil glands; mesocarp has a very broad zone, 30-40 layers thick, composed mostly of parenchymatous cells having lysigenous cavities and fibro-vascular bundles, below epidermis a few outer cells of parenchyma smaller as compared to rest; rosette crystals of calcium oxalate found scattered in parenchymatous cells, some cells get dissolved and form lysigenous cavities which increase in size with maturity of fruit, cavities do not have any special lining and contain an acrid and irritant yellowish oily secretion; 19 endocarp consists of two distinct layers, innermost prismatic having very much elongated radial walls, being highly thickened, the outer layer is shorter and thinner than prismatic layer but the cells similar to the former; number of mesocarp parenchyma contain rosette crystals of calcium oxalate and oil drops in oil glands; lysigenous cavities of mesocarp contain oily vesicating substance, insoluble in water and soluble in alcohol, ether, chloroform.

Powder-Dark-brown; shows rosette crystals of calcium oxalate and oil globules.

Part Used: Fruit

Organoleptic Properties

Rasa (Taste)	: Kashaya/Astringent, Madhura/Sweet
Guna (Attribute)	: Laghu/Light, Snigdha/Unctuous, Tikshna/Sharp
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Madhura/Sweet
Karma (Action)	: Dipana, Kaphahara, Pacana, Vitahara, Chedi, Bhedi, Medhya.

Purity and Safety Test

Foreign matter	: Not more than 1% w/w
Total ash	: Not more than 4 % w/w
Acid insoluble ash	: Not more than 0.5 % w/w
Alcohol soluble extractive	: Not less than 11 % w/w
Water soluble extractive	: Not less than 5 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count,

	total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: TLC was carried out in two solvent system for poly phenols [Tolune:Ethylacetate (9.3:0.7)] and fats, oils [Benzene:Ethylacetate (6:1)]. Differences in Rf value was observed in the methanol extractives by using the mobile phase Tolune: ethyl acetate of sunken and floated fruits. The Rf values were 0.09, 0.17, 0.31, 0.52, 0.66 and 0.06, 0.24, 0.22, 0.60, 0.66 for sunken and floated respectively.

Major Chemical Constituents: The most significant components of the *S. anacardium* Linn. are bhilwanols, phenolic compounds, biflavonoids, sterols and glycosides. Bhilwanol from fruits was shown to be a mixture of cis- and transisomers of ursuhenol; this compound consists mainly of 1,2, dihydroxy-3 (pentadecadieny l 8',11') benzene and 1,2, hydroxy-3 (pentadecadieny l 8') benzene. Other components isolated are, anacardoside, semecarpetin, nallaflavanone, jeediflavanone, semecarpuflavanone, galluflavanone, anacarduflavone mono-olefin I, diolefin II, bhilawanol-A, bhilawanol-B, amentoflavone tetrahydroamentoflavone semicarpol, anacardic acid, tetrahydrobustaflavone, O-trimethyl biflavanone A1(21), O-trimethyl biflavanone A2, O-tetramethyl bifl avanone A1, O-hexamethyl bichalcone A, O-dimethyl biflavanone B, O-heptamethyl bichalcone B1, O-hexamethyl bichalcone B2, O-tetramethyl biflavanone C., phenolics.

Therapeutic Use: Vrana (Wound), Udar (ascites), Kusta (skin disorders), Arsa (piles), Grahani (inflammatory bowel diseases), Gulma (abdominal mass), Jwar (fever), Adhman (flatulence), Shwitra (vitiligo), Krimi (Helminthiasis), Swasa (asthma) etc.

Pharmacological Study: Antiatherogenic, anti-inflammatory, antioxidant, antimicrobial, anti tuberculous, anthelmintic, hepatoprotective, anti-spermatogenic, nootropic, analgesic, hypoglycaemic, and anti-carcinogenic activity.

Contraindications: It should not be used in small children, very old persons, pregnant women and individuals of predominant pitta constitution. The use of the same should be restricted in summer season.

Adverse Effects: When juice is applied to the skin, it causes an eczematous eruption on any part of the skin. Large doses it produces blister on throat and severe gastro-intestinal irritation, followed in some cases by impending fear of death, dyspnoea, tachycardia, hypotension, cyanosis, dilated pupils, areflexia, delirium, coma and death within 12 to 24 hours.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Detoxified fruit 1-2 gm in milk confection.

Formulations: Panchatikta Grita Guggul, Ballatak Grita, Sanjibani bati, Laudhrasav, Patrangasav.

Bidda Darak

Botanical Name: *Argyreia nervosa* (Burm.f.) Bojer.

Family: Convolvulaceae

Synonyms:

Bangla: বৃদ্দদারক (Bidda Darak), Bijataadaka

Hindi: Samandar-kaa-paat, Samundarsosh, Ghaavapattaa, Vidhaaraa

Sanskrit: Vridhadaru, Antaha Kotarapushpi, Chagalantri

Urdu/Unani/Tibb: Samandarotha

English: Elephant Creeper

Geographical Distribution: Argyreia nervosa is a native of India and Bangladesh. It grows wild in Comilla, Narshingdi, Dhaka and Jessore.

Plant Descriptions:

General Description: A very large climber; stem stout, white-tomentose. Leaves are 7.5-30.0 cm. in diameter, acute, ovate, glabrous above, persistently white-tomentose beneath, base cordate; petioles 5-15 cm, long, white-tomentose. Flowers in subcapitate cymes; penduncles 7.5-15 cm, long, stout, white-tomentose; bracts large, ovate-lanceolate with a long acumen, thin, veined, pubescent outside, glabrous inside, deciduous the outer sometimes 5 cm, long; pedicels very short often almost 0, white-tomentose. Calyx whitetomentose outside; corolla 5-6.3 cm, long, tubularinfundibuliform, the bands silky pubescent outside, tube somewhat inflated, white pubescent outside, rose purple and glabrous inside. Ovary glabrous. Fruit glabrous, 2.0 cm in diameter, apiculate.

Fig. *Argyreia nervosa* (Burm.f.) Bojer.

Macroscopic Description: The commercial samples of the root vary in size as well as in thickness. The thin pieces of the root usually 2-4 mm in diameter. Show somewhat smooth brownish exterior. When cut transversely such pieces show a thin periderm and cambium appearing as a dark line almost midway between the centre and the outer circumference separating the outer phloem from inner central wood. The thicker pieces of the root 5-25 mm in diameter or even more have a rough exterior due to the presence of large number of lenticels, a transversely cut surface of such root, shows colourless tertiary phloem and a pink coloured crescent shaped tertiary xylem.

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

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

Part Used: Roots, leaves, seeds, flower etc

Organoleptic Properties

Rasa (Taste)	: Kashaya (Astringent), Katu (Pungent), Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Sara (unsatable)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Balya, Adhobhagahara, Agnikara, Asthisandhana Kari, Ayurvridhikara, Kantikara, Kanthya, Kaphavatahara, Medhya, Rasayana, Rucya, Svarya, Vrishya, Vishaghna.

Purity and Safety Test

Foreign matter	: Not more than 1% w/w
Total ash	: Not more than 11 % w/w
Acid insoluble ash	: Not more than 0.8 % w/w
Alcohol soluble extractive	: Not less than 4 % w/w
Water soluble extractive	: Not less than 8 % w/w

Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: 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.

Major Chemical Constituents: A. speciosa contains various chemical constituents such as alkaloids (mainly ergoline), flavonoids, lipids, triterpenoids, saponin and steroids. The seeds mainly consisted of various fatty oils such as palmitic glycosides, stearic, oleic, linoleic and linolenic acid. It also contains some amount of free amino acid like glycine, leucine, phenylalanine, glutamic and αaminobutyric acid. In seed, serotonin (5HT) agonist like compound, LSD and its isomer also present which was accountable for its psychotropic property. Recently in the western hemisphere youngsters has been abused of this plant hence it's also known as "legal highs" or "biogenic drugs". Principally roots contain the Tetradecanyl palmitate, stigma steryl p-hydroxy cinnamate, hexadecanyl phydroxy cinnamate, quercetin and caffeic acid. Recently 6-methoxy coumarin-7-O-α-D-glucopyranoside (coumarin glucoside) also isolated by the researchers. The phytochemical investigation revealed the presence of kaempferol, quercetin, kaempferol.

Therapeutic Use: Shula (pain), shopha, Apasmara (epilepsy), Arsha (piles), Aruci (anorexia), Amavata (rheumatoid arthritis), Anaha (constipation), Gulma (tumor), Kasa (cough), Krimi (worm

infestation), Mutrakrcha (urinary tract infection), Meha (urinary disorders), Pandu (anemia), Raktapitta (hematemesis), Udavarta, Udara, Unmada (insanity), Vatarakta (gout), Kshaya (emaciation), shlipada (filarial).

Pharmacological Study: Antimicrobial, antidiarrhoeal, hepatoprotective, nootropic, anticonvulsant, central nervous system, hypoglycemic, antioxidant, antibacterial, antiviral, nematicidal, aphordiasic, immunomodulatory, analgesic, anti-inflammatory activity.

Contraindications: It should not be used in small children, very old persons, pregnant women, lactating mother and known allergy to the plants of the Convolvulaceae family.

Adverse Effects: Overdose can cause side effects such as nausea, vomiting, dizziness, hallucinations, blurred vision, dilated pupils, rapid movement of eyeballs, sweating, fast heart rate, and increased blood pressure.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 3-6 gm root powder, 1-2 gm seed powder.

Formulations: Tryodasang Guggul, Laksmi Bilash (Vat), Rasnasav.

Dandakalash

Botanical Name: *Leucas cephalotes* (Roth.) Spreng.

Family: Lamiaceae

Synonyms:

Bangla: দন্দকলস (Dandakalas), Halaksa, Ghalghase

Hindi: Guma, Guma madhupati

Sanskrit: Dronapushpi, Chitrapathrika, Chitrakshup

Urdu/Unani/Tibb: Bishkha, Guma

English: Spider wort

Geographical Distribution: It is commonly found throughout India and Bangladesh especially as a weed in cultivated lands, road sides and on waste lands at an altitude of 30-100 m high and ascending upto 1,800 metres in the Himalayas. It is also found in Java, Philippines, china, Malaysia and Mauritius. In East Asia it found at an elevation of 1,700 m in Afghanistan to Western China.

Plant Descriptions:

General Description: It is an annual, branched, erect plant reaches up to a height of 15-60 cm; leaves sub-sessile, linear, obtuse, pubescent up to 8.0 cm long and 1.25 cm broad, with entire or crenate margin; petiole 2.5-6 mm long; Flowers white, sessile small, in dense terminal or axillary whorls; bracts 6 mm long, linear, acute, bristle-tipped, ciliate with long slender hairs.

Fig. *Leucas cephalotes* (Roth.) Spreng.

Macroscopic Description:

Leaves: Yellowish-green, 3-9cm long, 1-2.5cm wide, ovate or ovate-lanceolate, sub-acute, more or less pubescent, crenate, serrate, taste, pungent.

Roots: Cylindrical, zigzag, smooth, along with numerous wiry, fine rootlets size variable, fracture, fibrous and taste is characteristic.

Stem: Light greenish-yellow, surface rough, hairy, quadrangular with four prominent furrows, up to 4mm thick nodes and antinodes distinct, taste slightly bitter.

Inflorescence: Sessile, white, crowded in dense, globose about 2-3.5 cm across, surrounded by numerous foliaceous bracts, thin, lanceolate, acute, ciliate, 1.2-1.5 cm long and 0.3-0.35cm wide.

Fruits: Schizocarpic carcerule, nutlets 3mm smooth, brown.

Flowers: Sessile, floral leaves like the cauline, bracts imbracts, foliuaceous, green, thin, membraneous. Seeds: 0.3 cm long and 0.1 cm wide, Oblong, trigonous, smooth, dark brown.

Microscopic Description:

Root - Shows a single layered epidermis composed of rectangular, thin-walled cells; secondary cortex consists of thin-walled,tangentially elongated, parenchymatous cells; secondary phloem consists of sieve elements and phloem parenchyma; secondary xylem consists of vessels, tracheids, fibres and xylem parenchyma; vessels long with spurs, vessels and tracheids have simple pits, xylem fibres much elongated with pointed ends and have moderately thick walls, some having simple pits; medullary rays 1-2 seriate, upto 8 cells high. Stem - Shows squarish outline with four ridges and furrows, consists of a single layered epidermis, composed of oval to rectangular, thin-walled cells having a number of uni to tricellular trichomes; secondary cortex 5-9 layered, consisting of 3-5 layers of circular, oval or irregular collenchymatous cells at the ridge and 2-4 layers of thin-walled, tangentially elongated, parenchymatous cells; endoderm is single layered, consisting of barrel shaped, thin-walled cells; pericycle single layered of thin-walled cells comparatively smaller than the cells of endodermis, a few pericyclic cells converted into pericyclic fibres; phloem very narrow consisting of usual elements; xylem consists of vessels, tracheids, fibres and large amount of xylem parenchyma; vessels mostly cylindrical with simple pits and spiral thickening; tracheids and xylem parenchyma have simple pits on their walls; pith wide consisting of circular to oval, thin-walled, parenchymatous cells.

Leaf

Petiole - shows a single layered epidermis, uni to tricellular trichomes with pointed ends, cortex consisting of single layered, round to angular collenchyma; parenchyma consists of thin-walled cells containing prismatic crystals of calcium oxalate, vascular bundles 4, 2 smaller located towards

each comer and 2 larger in centre. Midrib - shows epidermis on either side with uni to tricellular trichomes, followed by 1-2 layers collenchyma towards lower surface, 3-4 layers towards upper surface, followed by round to oval parenchyma, 4 - 7 layered;vascular bundle arc-shaped, present in centre.

Lamina - shows epidermis on either side with uni to tricellular trichomes rarely on upper surface; palisade single layered; spongy parenchyma 3-5 layered, irregular, thin-walled cells; a few veins present in this region; stomata diacytic, present on both surfaces; stomatal index 16.6-40.5 on lower surface, 16.6-30.7 on upper surface; palisade ratio 7-9.

Powder - Dull yellow; shows groups of round to polygonal parenchymatous cells, pitted and spiral vessels, aseptate fibres, uni to tricellular trichomes and diacytic stomata.

Part Used: Whole plant

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet), Lavana (Salty), Katu (Pungent)
Guna (Attribute)	: Guru (Heavy), Ruksa (Dry), Tikshna (Sharp)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Pitta-Kaphahara (Pitta-Kapha alleviator), Vatakar, Bhedani, Ruchya

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 17% w/w
Acid insoluble ash	: Not more than 6% w/w
Alcohol soluble extractive	: Not less than 5% w/w
Water soluble extractive	: Not less than 14 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*,

trans and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: Thin Layer Chromatography with Toluene: Ethyl Acetate: Diethylamine in (7:2:1) proportion as a solvent system and Dragondorff's reagent for detection of number of alkaloids showed four fluorescent spots and Rf values were 0.44, 0.51, 0.6, 0.72 and 0.86. under long wave (365nm) U.V. radiation.

Major Chemical Constituents: Leucas cephalotes (Roth) Spreng whole herb contains new Labdane, norlabdane and abietane type Diterpenes named Leucasdins A (1), B(2) and C(3), respectively and two protostane type triterpenes named Leucastrins A (4) and B (5) were isolated, together with a known triterpenes, oleanolic acid, five sterols 7-oxositosterols, 7-oxostigmasterol , 7α-hydroxysitosterol, 7α-hydroxystigmasterol and stigmasterol and eight flavones 5-hydroxy-7,4-dimethoxyflavone, pillion, gonzalitosin, tricin, cosmosin, apigenin 7-O-b-D-(6-O-pcoumaroyl) glucopyranoside, anisofolin A and Luteolin 4-O-b-D-glucuronopyranoside.

Therapeutic Use: Kamala (jaundice), Jwara (fever), Krimi (worm infestation), Shopha (painful inflammatory conditions), Kasa (cough), Tamaka shwasa (bronchial asthama), Pandu (anaemia) and Prameha (urinary disorders) etc.

Pharmacological Study: Antiasthamatic, antihyperglycemic, antipyretic, antimicrobial, antiinflammatory, antioxidant, antiarthritic, antihelminthic, cytotoxic, antiulcer, hepatoprotective, larvicidal activity etc.

Contraindications: It should not be used in small children, very old persons, pregnant women, lactating mother and known allergy to the plants of the Lamiaceae family.

Adverse Effects: Excess use may cause burning sensation.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 1-3 gm of the drug in powder form.5-10 ml of the drug in juice form.

Formulations:

Duralova

Botanical Name: *Alhagi pseudalhagi* (Bieb.) Desv.

Family: Fabaceae

Synonyms:

Bangla: দুরালভা (Duralova), Dulal labha, Javasha

Hindi: Javaso

Sanskrit: Yavasa, Yasa, Yavasaka

Urdu/Unani/Tibb: Aqaaqia, Babuul, Kikar, Mughilaan, Samur

English: Persian Manna Plant

Geographical Distribution: The plant is found in temperate and tropical Eurasia and the Middle East, Northern India, Afghanistan, Armenia, Azerbaijan, Northwest China, Cyprus, Iran, Iraq, Israel, Jordan, Kazakhstan, Kuwait, Lebanon, Mongolia, Pakistan, Syria, Tajikistan, Turkey, Turkmenistan, Uzbekistan and Russia. In China, the plant is mainly distributed in Xin Jiang Uighur Autonomous Region. In India, it is mostly found in arid and dry regions of Gujarat, Punjab, Uttar Pradesh and Rajasthan.

Plant Descriptions:

General Description: It is a deep rooted, rhizomatous, perennial shrub, with roots that can extend six to seven feet into the ground. The spiny, intricately-branched shrub reaches 1.5 to 4 feet in height. The plant, which is grayish green and hairless, has simple, entire leaves that are alternately arranged. The leaf shape is oval to lance-shaped. The small pea-like flowers are pinkish purple to maroon and are borne on short, spine-tipped branches that arise from the leaf axials. The reddish-brown to tan fruits are found between the seeds, with a short narrow beak at the end.

Fig. *Alhagi pseudalhagi* (Bieb.) Desv.

Macroscopic Description: Macroscopical observations indicated the roots to be stout, cylindrical, tortuous, tap root, 3 to 7 cm in length, 0.2 to 1 cm in diameter, surface rough, longitudinally irregularly striated, often shows lateral root or scars left by them, fracture outer short, inner fibrous, externally dark brown, internally pale brown. Stem with aerial branches arising from the stout basal cylindrical underground crown are rough, externally studded with nodules of stem bud, 3 to 4 cm in length and 0.1 to 1 cm in diameter, internodes are short about 0.5 to 1.5 cm in length, nodes are swollen, spiny, surface rough, longitudinally at places with globular vegetative bulk striated, axillary spines measuring 0.5 to 1.5 cm in length, fracture short, externally yellowish green to brown in colour. Leaves are simple, alternate, elliptical, 0.5 to 1.0 cm long and 0.2 to 0.5 cm broad, oblong, mucronate, subsessile, hairy, young drooping, stipulate, with silvery hue. Flower 1-8 in numbers, on spine tipped branches, red, about 7 to 9 mm long, pedicels short. Pod are 3 to 4 cm long, falcate, inequally constricted between the seeds on the lower side.[2]

Microscopic Description:

Stem - Cylindrical, glabrous, slightly rough at basal region with slender; hard, sharp axillary spines upto 3.8 cm long; branched, terete, striate, glabrous, nearly 0.1-1 cm thick; yellowish-green to yellowish-brown. Leaf - Simple, alternate, oblong, mucronate obtuse, drooping, opposite, extipulate, 0.5-1 cm long, 0.5-0.7 cm broad. elliptical, smooth or puberulous with very short petiole, stipules green; no taste and odour.

Root -Shows 6-10 layers of tangentially elongated, radially arranged cork cells; cork cambium single layered, filled with reddish-brown contents; secondary absent; phloem composed of sieve elements, phloem parenchyma and phloem fibres; some phloem parenchyma cells filled with tannin; xylem consists of vessels, tracheids, fibres parenchyma and xylem rays; vessels mostly solitary with simple pits; tracheids and fibres thick-walled, ascptate with bluntly pointed ends; medullary rays 1 4 cells wide, 3-45 cells long; pith composed of a few thin-walled, angular, parenchymatous cells; starch grains simple, rounded to oval, 5.5-14.75 µ in dia. present throughout the region.

Stem - Shows a single layered epidermis covered externally with thick cuticle; cortex composed of 8-15 layers of oval, tangentially elongated cells, numerous tanniniferous cells found scattered in this region; pericycle present in form of fibre groups; phloem composed of sieve elements, parenchyma and fibres; some parenchyma cells filled with tannin; xylem consists of vessels, tracheids, xylem fibres, xylem parenchyma and xylem rays; vessels solitary or in groups of 2-3 with simple pits; tracheids and fibres, a few with thick wall and simple pits; medullary rays 2 3 cells wide pith composed of rounded, thin-walled, parenchymatous cells, some cells filled with tannin.

Leaf Petiole - appears circular in outline; shows single layered epidermis covered externally with cuticle; hypodermis 2-3 layered, filled with tannin, 'D" shaped collateral vascular bundle present in

central region; rest of tissue between vasculr bundle and hypodermis composed of thin-walled, parenchymtous cells some of which are filled with tannin.

Midrib - appears biconvex in outline; epidermis single layered, covered externally with thick cuticle; hypodermis 1-2 layered, filled with tannin; pericycle present in the form of fibres strands; vascular bundle collateral; xylem situated above phlome, rest of tissue between vascular bundle and pericyclic strand is parenchymatous.

Lamina - epidermis consisting of single layered cells, covered with cuticle; paracytic stomata present on both surfaces hypodermis single layered filler vith tannin; mesophyll not differentiated into palisade and spongy parenchyma, consisting of thin-walled oval to polygonal cells having chlorophyll; rounded to elongated tanniniferous cells found scattered in mesophyll.

Powder-Greenish-brown; shows fragments of epidermal cells consisting of rectangular to polygonal, elongated, thin-walled, parenchymatous cells with paracytic stomata, pitted vessels, fibres, tanniniferous cells, simple, round and oval starch grains measuring 5.5- 14.75 µ in diameter.

Part Used: Whole plant

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet), Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Laghu (Light), Sara (Motile)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Dipana (Digestive), Pitta-Kaphahara (Pitta-Kapha alleviator)

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 13.5% w/w
Acid insoluble ash	: Not more than 2.5% w/w
Alcohol soluble extractive	: Not less than 2% w/w
Water soluble extractive	: Not less than 10 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.

Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: Thin layer chromatography of the methanolic extract of plant on silica gel 60 F254 plate using toluene: ethyl acetate: methanol (7:3:0.5) as mobile phase shows six spots at Rf 0.28 (purple), 0.41 (faint purple), 0.63 (purple), 0.75 (purple, spot for stigmasterol), 0.82 (yellowish green) and 0.89 (blue) on spraying with anisaldehyde- sulphuric acid reagent and heating the plate, for five minutes at 105 °C. The percentage of stigmasterol ranged from 0.36 to 0.44 in the various samples analyzed by HPTLC densitometric method using precoated plates of silica gel 60 F254 as stationary phase, toluene: ethyl acetate: methanol (7: 3: 0.5) as mobile phase and scanning at 656 nm. Analysis of the mineral contents of plant collected from Ashafa, Toroba, Wahat and Wehait (Saudi Arbia) indicated that aluminum is in higher concentration (shoots and roots) followed by copper, manganese and zinc. The concentration of Zn found higher in shoots than in roots, but the concentration of Zn was less in shoots than in roots.

Major Chemical Constituents: The plant contained many bioactive metabolites including flavonoids, fatty acids, coumarins, glycosides, sterols, steroids, resins, vitamins, alkaloids, carbohydrates, tannins, unsaturated sterols and triterpenes.

Therapeutic Use: Trisna (thirst), chardi (vomiting), kasa (cough), jvara (fever), vatarakta (gout), raktapitta (haemorrhagic diseases), visarpa (erysipelas) etc.

Pharmacological Study: Antioxidant, antiulcer, hepatoprotective, antispasmodic, antidiarrheal, antinociceptive, antipyretic, antiinflammatory, anti-rheumatic, antibacterial and antifungal etc.

Contraindications: It should not be used in small children, very old persons, pregnant women, lactating mother and known allergy to the plants of the Fabaceae family.

Adverse Effects: Adverse effects may in people of hot temperament, chicken pox, haematuria, bloody diarrhea, piles, dysuria and high grade fever.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Recommended dose is 20-50 gm of the drug in powder form for decoction.

Formulations: Drakshadi Churna, Brihat Khadir Batika, Tarakeswar, Rasnasav, Punarnovasav.

Gajapipul

Botanical Name: *Scindapsus officinalis* (Roxb.) Schott

Family: Araceae

Synonyms:

Bangla: গজপিপুল (Gajapipul) Gajapeepal

Hindi: Gajapeepal

Sanskrit: Gajakrishna, Hastipipali, Gajapippali, Karipippali, Kolavalli

Urdu/Unani/Tibb: Gajapippali

English: Sweet flag

Geographical Distribution: Scindapsus officinalis is a common plant in tropical forests of many parts of India, Myanmar, China and Nepal. In India the plant is cultivated for its fruits at Midnapur, Bengal and is found in southern cities of Calicut and Cochin. It is also present in Rosa thicket in managed sal (Shorea robusta Gaertn.) forests of Gorakhpur region.

Plant Descriptions:

General Description: The plant of Scindapsus officinalis is a large, stout, epiphytic and perennial climber with adventitious aerial roots growing on trees and rocks. The climber contains about 20-30 leaves, with each leaf about 10-15 cm wide, leathery in nature and ovate in shape. Flowers are densely arranged in spadix, which is cylindrical. The color spathe green outside and yellow within. Seeds are kidney shaped, 0.4-0.6 cm long and 0.3-0.4 cm wide, smooth, shiny, greyish-brown with a dent.

Fig. *Scindapsus officinalis* (Roxb.) Schott

Macroscopic Description:

Fruit – Color of the fruit is brownish grey. Seed are present in each fruit. Central core is present in the transverse cut circular pieces of about diameter 2.0- 3.0 cm and thickness 2.0-3.5 cm. Odour and taste are not distinct.

Leaves – size of the leaves are 12.5-25 by 6.3-15 cm which are dark green. Petiole are present about size 7.5-15 cm. Peduncle are much shorter than the petiole.

Seed –Colour of the kidney shaped seed is greyish-brown of length about 0.4-0.6 cm and 0.3-0.4 cm wide. Odour and taste are not distinct.

Microscopic Description:

Spadix–spadix has thick straight central axis, 1.5 mm thick. Seed coat and endosperm are present in each seed and seed are present in each fruit. Pericarp are not present in the seed. These microscopic characteristics are seen in the Lateral section (L.S) of the spadix. In the Transverse section of the spadix, vascular bundles are present which are collateral. Parenchymatous bundle sheath are also present in the outer of vascular bundles.

Fruit–shows more or less loosely arranged, thin-walled, parenchymatous cells having more or less isodiametric cells filled with brown content and numerous acicular crystals of calcium oxalate. Pericarp–Epidermal cells and subepidermal cell are present in the pericarp. Mixture of thin walled parenchyma cells and thick walled tissue. sclereids are also found in the ground Seed – contains thin walled testa, sclereid like cells (wide lumen), lignified stone cells (very narrow lumen), parenchymatous cells. Oils globules and aleurone grains are present in the parenchymatous cells. Seed also contains the dense endosperm and seed coat.

Seed-coat – consist of the outer zone of sarcotesta, 20 µm wide, in which the cells are wide, angular and parenchymatous. Seed coat is 100-130 µm thick. Inner seedcoat (three-layered) about 150 µm thick are also present in the inner with parenchyamatous sarcotesta. Sclerotic cells are found in the outer and inner layered of inner seed coat and middle layer consist of parenchymatous cells.

Endosperm – Cellular type endosperm in which dense starch grains are present when viewed under the polarised light microscope.

Powder – consist of stone cells (lumen), numerous needle-like acicular crystals of calcium oxalate and oil globules. Colour of the powder of the Scindapsus officinalis are dark brown.

Part Used: Fruit

Organoleptic Properties

Rasa (Taste) : Katu (Pungent)

Guna (Attribute) : Ruksa (Dry)

Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Dipana (increasing appetite), Kaphahara (productive cough), Stanya (breast problems) and Varnya (improving skin complexion)

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 14% w/w
Acid insoluble ash	: Not more than 1.5% w/w
Alcohol soluble extractive	: Not less than 3% w/w
Water soluble extractive	: Not less than 11 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of alcoholic extract of drug on Silica gel 'G' plate using Chloroform: Methanol (1:1) shows two spots at Rf. 0.65 and 0.73 (both light yellow) in visible light Under U.V. (366 nm) four fluorescent zones at Rf. 0.27, 0.65, 0.73 and 0.93 (all blue) are visible. On exposure to Iodine vapour five spots appear at Rf. 0.20, 0.27, 0.65, 0.73 and 0.93 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 1l0°C. Three spots appear at Rf. 0.65, 0.73 (both light brown) and 0.93 (brown).

Major Chemical Constituents: The fruits contain sterol, oil, a mixture of sugars and two glycosidic coloring substances, scindapsin A and B which on hydrolysis yield the aglycons *i.e.* scindapsinidine A and B. Free sugars like rhamnose, fructose, glucose and xylose together with some di and trisaccharides.

Therapeutic Use: Atisara (diarrhea), svasa (dyspnea), krimiroga (worm infestation) and kanthya roga (throat infections) etc.

Pharmacological Study: Anthelmintic, antidysenteric, antiasthmatic, antiinflammatory, analgesic, antibacterial, carminative, diaphoretic, hypoglycemic etc.

Contraindications: It should not be used in small children, very old persons, pregnant women, lactating mother and known allergy to the plants of the Araceae family.

Adverse Effects: Excess use may cause gastric irritation.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 2-3 gm of the drug in powder form.

Formulations: Saribadi Churna, Kumar Kalyan Grita, Moharasun Pinda, Dhatri Louha, Punarnovasav.

Ikkhu

Botanical Name: *Saccharum officinarum* Linn**.**

Family: Poaceae

Synonyms:

Bangla: ইক্ষু (Ikkhu) Unkh

Hindi: Ikha, Ganna

Sanskrit: Ikshava, Pundrakah, Rasalah

Urdu/Unani/Tibb: Ganna, Naishkar

English: Sugarcane

Geographical Distribution: The sugarcane is grown all over the country; however, the major growing district are Rajshahi, Kustia, Jessore, Dinajpur, Rangpur, Faridpur, Mymensingh, Tangail, Jamalpur and Dhaka.

Plant Descriptions:

General Description: S. officinarum, is a perennial plant, grows in clumps consisting of a number of strong unbranched stems. A network of rhizomes forms under the soil which sends up secondary shoots near the parent plant. The stems vary in colour, being green, pinkish, or purple and can reach 5 m (16 ft) in height. They are jointed, nodes being present at the bases of the alternate leaves. The internodes contain a fibrous white pith immersed in sugary sap. The elongated, linear, green leaves have thick midribs and saw-toothed edges and grow to a length of about 30 to 60 cm (12 to 24 in) and width of 5 cm (2.0 in).

Fig. *Saccharum officinarum* Linn**.**

Macroscopic Description: Stem upto 6 m high, cylindrical, solid, with, distinct node and internode, 3-8-12 cm long and 2-4 cm in dia; smooth, shining and polished pale or dark green to dark yellow, red violet and often striped having a bud at each node; odour, characteristic; taste, juicy and sweet.

Microscopic Description: Stem-Shows a single layered epidermis consisting of thick-walled, lignified, rectangular cells followed by 2-3 layers of sclerenchymatous hypodermis; ground tissue consisting of thin-walled, parenchymatous cells having a number of collateral, conjoint, closed type of vascular bundles, scattered throughout the ground tissue, more numerous and closer towards periphery; each vascular bundle surrounded by a fibrous sheath of sclerenchyma, thickness of the sheath gradually decreasing in the bundles towards the centre; besides the xylem and phloem elements, each bundle surrounds a water containing cavity.

Powder-Powder light brick red; shows pieces of epidermis, ground tissue, vessels and sclerenchyma.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet)
Guna (Attribute)	: Guru (Heavy), Sara, Snigdha (Slimy)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Balya (Tonic), Pittahara (pacify pitta), Brmhana (Nourishing), Vrsya (sexual tonic), Vatasamaka (vata alleviator) Mutrala (Diuretics)

Part Used: Stem

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 6% w/w
Acid insoluble ash	: Not more than 2.5% w/w
Alcohol soluble extractive	: Not less than 15% w/w

Water soluble extractive	: Not less than 17 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

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

Major Chemical Constituents: Ikshu contains sucrose. It is also containing various fatty acid, alcohol, phytosterols, higher terpenoids, flavonoids, -O- and -C-glycosides, and phenolic acids. Iksu stem contain 62 calories, 82.5 g water, 0.6 g protein, 0.1 g fat, 16.5 g total carbohydrate, 3.1 g fiber, 0.3 g ash, 8 mg Ca, 6 mg P, 1.4 mg Fe, 0 mg b-carotene, 0.02 mg thiamine, 0.01 mg riboflavin, 0.10 mg niacin, 3 mg ascorbic acid, per 100 gm.

Therapeutic Use: Raktapitta (hematemesis), Visarpa (erysipelas), Mutrakrccra (urinary tract infection), Ojoksya (loss of immunity), Nasa Rakta srava (nasal bleeding), Grahani (IBS), Pandu (Anaemia), Kasa (Cough) etc.

Pharmacological Study: Immunostimulatory, prokinetic, hypoglycemic, antioxidant, steroidogenic, antimicrobial, hypolipidemic, hepatoprotective, anticancer, diuretic, antiurolithiatic, anticoccidial etc.[4]

Contraindications: It should not be used in allergy to the plants of the Poaceae family.

Adverse Effects: The side effects of consuming sugarcane juice is extremely low, but however it can lead to some health issues. An ingredient called policosanol present in sugarcane can cause insomnia, upset stomach, dizziness, headaches and weight loss if consumed excessively. It can also cause blood thinning and can affect the cholesterol levels in the blood.[5]

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 15-30 gm in decoction form, 200-400 ml in the juice form.

Formulations: Trinapanchamul Kwath, Kushabaleha, Kamdev Grita.

Jafran

Botanical Name: *Crocus sativus* Linn**.**

Family: Iridaceae

Synonyms:

Bangla: জাফরান (Jafran)

Hindi: kesar, saphran, zaffran, zafran

Sanskrit: Bhavarakta, Saurab, Mangalya, Kumkum

Urdu/Unani/Tibb: Zafran

English: Saffron, saffron cress

Geographical Distribution: The origins of Crocus sativus is not clearly known, some suggest eastern Mediterranean as its endemic place and some consider its Iranian origin. As per the archaeological and historical data, the domestication of C. sativus is very old (2,000 to 1,500 years BC). The C. sativus is reported to be cultivated in Afghanistan, Azerbaijan, China, Egypt, France, Greece, India, Iran, Iraq, Israel, Italy, Japan, Pakistan, Morocco, Spain, Switzerland, Turkey, United Arab Emirates since ancient times and recently Australia also have started its cultivation.

Plant Descriptions:

General Description: The saffron plant belongs to the Iridaceae family. This herbaceous perennial plant reaches 10 to 25 cm in height developing from its bulbs. The bulb, of sub-ovoid shape, is of variable size and forms. It has a massive structure and is covered by many concentric spathes. Each mother bulb produces from apical buds one to three large daughter bulbs and several small bulbs from lateral buds. Saffron has two types of roots: fibrous and thin roots at the base of the mother bulb, and contractile roots formed at the base of the lateral buds. The leaves vary from five to 11 per bud. They are very narrow and measure between 1.5 and 2.5 mm of dark green color. They

measure 20 to 60 cm in length with a whitish band in the inner part and a rib on the outside. The flowers of Crocus sativus begin to appear at the beginning of autumn, towards the end of September of purple color composed of six tepals, three are internal, whereas the three others. external, which meet at the long tube that arises from the upper part of the ovary. At their appearance, the flowers are protected by whitish membranous bracts. The pistil is composed of an inferior ovary from which a thin style, 9 to 10 cm long, arises. The style ends with a single stigma composed of three filaments of intense red color whose length exceeds that of the tepals, which are the part of the plant interesting for the man from the point of view of culture.

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

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

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

Fig. *Crocus sativus* Linn**.**

Organoleptic Properties

Rasa (Taste) : Katu (Pungent), Tikta (Bitter)

Guna (Attribute) : Snigdha (Slimy)

Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Vatahara, Varnya, Visaghna, Slesmahara, Rasayana, Jantuhara

Part Used: Stigma and style

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 7.5% w/w
Acid insoluble ash	: Not more than 1% w/w
Alcohol soluble extractive	: Not less than 15% w/w
Water soluble extractive	: Not less than 17 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. studies showed that the presence of highest numbers phytoconstituents with different colors. T.L.C. of n-Butanol: Glacial acetic Acid: Water (4:1:2v/v/v) shows three spots at Rf. 0.39, 0.48 and 0.61 (both light yellow) in visible light Under U.V. (366 nm).

Major Chemical Constituents: It contain numerous volatile compounds and ingredients including crocin, picrocrocin and safranal and these compounds are accountable for color, taste and odor of saffron respectively. Safranal is the major coloring constituent of saffron, so saffron is used as a flavoring and coloring agent. In addition to these compounds, saffron also contains little amounts of other pigments like anthocyanin, α-carotene, β- carotene, and zegxantin.

Therapeutic Use: Headache (Siroroga), Depression (Avasad), Cough (Kas), Asthma (Swasa), Vomiting (Chardi) Eye disesaes (Drsti Roga), Psoriasis (Ekkustha), Rejuvenating (Vajikarana) etc.

Pharmacological Study: Antihypertensive, anticonvulsant, antitussive, antigenototoxic and cytotoxic effects, anxiolytic aphrodisiac, antioxidant, antidepressant, antinociceptive, antiinflammatory, and relaxant activity.

Adverse Effects: Saffron use in large dose is contraindicated in pregnancy. It may cause contraction of the uterus and abortion. Severe side effects may result from ingesting 5 g saffron. No side-effect when used in proper doses.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 25-50 mg in powder form.

Formulations: Kamini Vidravan Ras, Patrangasav, Brihat Chandanadi Taila

Jarul

Botanical Name: *Lagerstroemia speciosa* (L.) Pers**.**

Family: Lythraceae

Synonyms:

Bangla: জারুল (Jarul)

Hindi: Jarul

Sanskrit: Jarula, Kramuka

Urdu/Unani/Tibb: Jarul

English: Pride of India, Queen Crape

Geographical Distribution: Three is native to South and Southeast Asia. This water loving plant is found around the wetlands areas in Bangladesh.

Plant Descriptions:

General Description: A deciduous or semi-decidous small to meium sized or rarely large tree up to 40 meters tall; bole fairly staright to crooked, branchless for up to 18 meters, upto 100 cm in diameters, often fluted and sometimes with small buttresses, bark surface smooth or with small papery flakes, grey to light fawn-brown mottled, inner bark fibrous, grey-fawn to yellow, turning dirty mauve or purple upon exposure; crown usually bushy and spreading. Leaves opposite, distichous, simple, entire, stipules minute or absent. Flowers in a large, axillary or terminal panicle, often showy, calyx funnel or bell shaped, 6 lobed, petals often 6, inserted near the mouth of the calyx tube, white to pink or purple,

clawed, wrinkled, stamens many, in several rows, ovary superior, 3-6 locular with many ovules in each cell. Fruit a large woody capsule on the persistent calyx. Seed with an apical wing.

Fig. *Lagerstroemia speciosa* (L.) Pers**.**

Macroscopic Description: It is a tall tree that can grow up to 20 to 25 m in height, but it flowers while it is still a shrub. Its bark is creamy-brown or grey in colour, smooth and peels in thin flakes. The leaves are approximately 11 to 26 cm long and 7 to 12 cm wide and are broadly ovate or oblong in shape. The mature leaves are smooth. There are 10 to 15 pairs of side veins, looped at the margin and quite prominent below. Old leaves are orange-red in colour. The flowers are 5 to 7.5 cm in diameter and bright pink to purple in colour. The fruit is 1.5 to 2.5 cm in size and globose in shape.

Microscopic Description: The transverse section of the midrib shows that epidermal cells were rectangular to round in shape, with dividing cells occurring regularly. Some epidermal cells contained spherical clusters of rosette aggregate calcium oxalate crystals, and some cells are enlarged and mucilaginous. The mucilage cells tend to protrude into the mesophyll and sometimes appears to be below the upper epidermis. Cells of the upper epidermis is about twice as large as those of the lower epidermis. The mesophyll is well differentiated and composed of a double palisade layer that made the lamina and spongy layers 4 to 6 cells thick. The lamina in the sectional view of the leaves shows an upper epidermis in which some cells contained mucilage, palisade and spongy parenchyma, and lower epidermis. The upper epidermal cells are polygonal cells. The cell length is approximately equal to the width or twice as long as the straight wall. The lower epidermal cells are irregularly shaped, and their walls were slightly sinuous. The anomocytic stomata are only find in lower epidermis.

Powder: The leaf powders are olive-green colour with a slightly bitter taste. The powdered drugs displayed some of the same microscopic characteristics, such as part of the upper epidermis with the part of palisade mesophyll, stomata, rosette aggregate calcium oxalatecrystals, fibres and vessels.

Organoleptic Properties

Rasa (Taste)	: Kasaya (Astringent), Katu (Pungent)
Guna (Attribute)	: Laghu (Light), Ruksha (Dry)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)

Karma (Action) : Kapha-Pitta Samaka

Part Used: Leaves, bark and fruit

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 7.4% w/w
Acid insoluble ash	: Not more than 1.2% w/w
Alcohol soluble extractive	: Not less than 9.0 % w/w
Water soluble extractive	: Not less than 13.1 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: Thin Layer Chromatography (TLC) of Butanol: acetic acid: water (4: 1: 5) of aqueous fruit extract detect 6 different spots in the TLC plate and R_f values are 0.15, 0.30, 0.42, 0.52, 0.74 and 0.91. TLC analysis of methanolic fruit showed one spots in in the solvent toluene:ethyl acetate:glacial acetic acid (55: 45: 0.5) and R_f *value* is 0.89.

Major Chemical Constituents: The chemical constituents of Lagerstroemia speciosa includes corosoli acid, lageracetal, amyl alcohol, ellagic acid, gallic acid, 4- hydroxyl benzoic acid, beta sitosterol, 3,3,4-triO-methl ellagic acid, 3-O-methyl-3,4-methylenedioxy ellagic acid, Asiatic acid, alphitolic acid, 3,3 –di-O- methyl ellagic acid, 3,4,3,4- tetra-Omethyl flavellagic acid, 3, 41-di-O-methl-3,4- metheledioxy flavellagic acid, 3-O-methyl ellagic acid, 6,7-dihydroxy coumarin, alanine, isoleucine, alpha amino butyric acid, ellagitannin 7 and methionine. This species also consists of metals like Iron, Magnesium, and Zinc.

Therapeutic Use: Madhumeha **(**diabetes mellitus), Medhroga (obesity), Wound, Kustha (skin diseases), Mutrackriccha (urinary disorders), Anaha (constipation) etc.

Pharmacological Study: Anti-diabetic, antiinflammatory, antiobesity, antiviral cytotoxic, antibacterial, anti nociceptive, antimicrobial, antioxidant, antifibriotic activity etc.

Adverse Effects: Banaba can affect blood sugar control, so people with diabetes should monitor their blood glucose levels closely. Banaba might make blood pressure become too low in people with low blood pressure.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Leaf juice (30 - 50 ml) and Leaf powder (3-6 gm).

Formulations:

Joba

Botanical Name: *Hibiscus rosa-sinensis* Linn.

Family: Malvaceae

Synonyms:

Bangla: জবা (Joba), Javaphul, Jaba

Hindi: Jasut, Jasun, Gudhal, Gurhal

Sanskrit: Japa, Japapushpa, Raktapushpi, Japakusuma, Japapushpa, Java, Joba, Raktapushpi

Urdu/Unani/Tibb: Gul-e-Gurhal

English: Chinese hibiscus, Chinese rose, Rose of China, Shoe Flower

Geographical Distribution: It grows on its own in tropic and sub tropic regions of the world. Hibiscus rosa sinensis are native to Tropical Asia. A native of Southeastern Asia (China), the plant is commonly found throughout India, Bangladesh and often planted as a hedge or fence plant.

Plant Descriptions:

General Description: Hibiscus rosa-sinensis is an evergreen woody, glabrous, showy shrub 5-8 feet in height. Leaves are bright green, short petiolated, ovate or lanceolate, more or less acuminate; irregularly and coarsely serrated towards the top, entire near base, glabrous on both

sides, a few minute stellate hairs on the nerves beneath stipules, lanceolate subulate and glabrous. Pedicels are axillary, solitary, and longer than the leaves and joined above the middle. Flowers are large, solitary, axillary, bisexual, bell shaped with 5 petals, with red pistil and stamens in orange colour projecting from centre. The flowers are generally red in the original varieties but generally lack any scent. Also many colors are available in a single, double or multi-shades including white, yellow, orange, red, pink, purple, etc.

Fig. *Hibiscus rosa-sinensis* Linn.

Macroscopic Description: Flower ebracteate, pedicellate, complete, regular, actinomorphic, bisexual, protandrous hypogynous, cyclic. Epicalyx 5, free, green, linear. Calyx 5, gamosepalous, campanulate, inferior, green. Corolla 5, polypetalous, obovate, sinous upper margin, mucilaginous, twisted, inferior, red. Androecium many, monoadelphous, epipetalous, antisepalous. Gynoecium pentacarpellary, syncarpous, superior, style united below and free at its tips, stigma 5, capitate, velvety red. Odour fragrant; taste mucilaginous. Flower shows hypogynous ovary, monadelphous stamen in a staminal tube and style with trifid stigma passing through the staminal tube.

Microscopic Description:

Root – The roots show cork, phelloderm and the secondary phloem which is stratified due to 8-10 tangential bands of phloem fibres alternating with parenchyma. The xylem is a broad zone and some of the vessels show tyloses. Clusters of calcium oxalate are present in the phelloderm.

Stem – Microscopically it shows outermost thin cork, the middle region of which is strongly thickened due to the heavy deposition of lignin. Phelloderm is narrow zone followed by a wide zone of secondary phloem. Mucilage cells are present in the pith. Powder mounted in nitrocellulose give green fluorescence under UV light.

Leaf – Leaf present a dorsiventral structure. Both the glandular and stellate types of trichomes are present. Stomata are of ranunculaceous or rubiaceous typa, present on the lower surface. A few mucilage cells are present in the midrib zone. Starch grains and clusters of calcium oxalate crystals are present. Powdered leaf when treated with 1 N NaoH in methanol emits dark green fluorescence under UV light. Palisade ratio is 4.44: Stomatal index 20.38; Vein islet number 23-97 per sq. mm.

Flower–Flower powder shows spheroidal, pantoporate, pore-circular pollen grains; stellate trichomes single, elongated, conical or twisted and convoluted; glandular trichomes uni or bi-seriate, multicellular- cylindrical and bi-or multiseriate, multicellular-globose or clubshaped; ranunculaceous type of stomata; sphaeraphide calcium oxalate crystals.

Powder – Purplish red. Shows cluster crystals of calcium oxalate ; large, spinuous and yellow pollen grains; glandular, multicellular trichomes, as well as covering stellate type trichmoes; fragments of calyx tissue bearing anomocytic stomata and stellate and glandular trichomes; spiral vessel and cluster crystals and fragments of overy with stellate trichomes, fragments of style with

stomata, trichomes and cells with red contents, fragment of another with pollen grains, fragments of hairy stigma with reddish pigments, spinuous walls and trichomes; fragments of corolla tissues.

Organoleptic Properties

Rasa (Taste)	: Kasaya (Astringent), Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Ruksha (Dry)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha-Pitta Samaka, Hirdya, Raktarodhaka, Stambhana

Part Used: Leaves, roots, flowers

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 7.7% w/w
Acid insoluble ash	: Not more than 0.7% w/w
Alcohol soluble extractive	: Not less than 2.6 % w/w
Water soluble extractive	: Not less than 6.3 % w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: Thin Layer Chromatography (TLC) using the mobile phase Ethyl acetate: formic acid: glacial acetic acid: water (100: 11: 11: 26) for ethanolic flower extracts of four morphotypes of Hibiscus rosa-sinensis Linn showed the presence of various phytochemical constituents such as flavonoids glycosides, tannin, glycosides, phenolic compound, terpenoids, triterpenoids and phytosterols.

Major Chemical Constituents: Leaves and stems contain β-sitosterol, stigma sterol, taraxeryl acetate and three cyclopropane compounds and their derivatives. Flowers contain cyanidindiglucoside, flavonoids and vitamins, thiamine, riboflavin, niacin and ascorbic acid Petals of Hibiscus rosasinensis have quercetin-3di0-beta-D-glucoside, quercetin-3-7-di-0-beta-Dglucoside, quercetin-3-0-beta-D-sophorotrioside, kaempferol-3-0-beta-D-xylosyl-glucoside, cholesterol, campesterol, ß-sitosterol, catalase.

Therapeutic Use: Anemia, wound, cough, infertility, leucorrhoea, irregular menstruation, vitiligo, alopecia and dandruff etc.

Pharmacological Study: Antitumor, antifertility, antiovultory, antiimplantation, antiinflammatory, analgesic, antiestrogenic, antipyretic, antispasmodic, antiviral, antifungal, antibacterial, hypoglycaemic, spasmolytic, CNS depressant, hypotensive activity etc.

Adverse Effects: It can cause abortion. It reduces fertility in both males and females. In males, it reduces sperm production. In females, it reduces ovulation, prevents implantation and causes miscarriage.

Precautions: Internal use is contraindicated in small children and pregnant or lactating women.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Leaf paste (10-20 gm) and flower powder (5-10 gm).

Formulations: Patrangasava

Jotishmati

Botanical Name: *Celastrus paniculatus* Wild.

Family: Celastraceae

Synonyms:

Bangla: জ্যোতিষমতি (Jotishmoti), Kijri, Malkangani

Hindi: Malkangani, Malkangni

Sanskrit: Jyotishmati, Paravatpadi, Kangunika, Kanguni, Maalkanguni, Svarnalatika, Kaakandaki

Urdu/Unani/Tibb: Malkanghi

English: Celastrus, Staff Tree, Black Oil Plant, Climbing Staff Tree, Intellect Tree

Geographical Distribution: Jyotishmati found in all over India especially in Punjab, Kashmir and all hilly area at the altitude of 3000m. It also found in Shrilanka, Maldives and Philippines.

Plant Descriptions:

General Description: A large, deciduous, climbing unarmed shrub attending a height of 10 m, with long slender elongating branches which are reddish brown with stem up to 23 cm in diameter and covered with elongate lenticles. Leaves are simple, alternate, 6-10 by 3-6 cm. ovate or obovate, shortly acuminate, crenateserrate in upper part, usually entire near base, crenulate, coriaceous, glabrous, base rounded or acute, petioles 6-12 mm long. Inflorescence is paniculate. Flowers yellowish or greenish white, unisexual in terminal pyramidal panicles, 5-15 cm long, pedicels pubscent, bracts small and lanceolate. Calyx pubscent outside; lobes semi-orbicular, ciliate; petals 3mm long, oblong, rounded at apex. Capsule 9-12 mm in diameter, subglobose, bright yellow, transversely wrinkled. Seeds 1-6, often solitary, completely enveloped in scarlet, fleshy aril.

Fig. *Celastrus paniculatus* Wild.

Macroscopic Description:

Leaves-Fresh leaves are green in color, odorless with a slightly acrid taste. The leaves are simple, apex is acute, acuminate or obtuse and base is cuncate, obtuse or rounded. Margin is finely crenate, venation is reticulate, shape is very variable, elliptic, ovate, broadly. The leaves are glaberous; sometime pubescent, average leaf size is 11 cm length and 6 cm breadth.

Seeds- Dried ripe seeds more or less covered by orange-red crusty aril, seed without aril also found, measuring 5-6 mm in length and 2.5-3.35 mm in breadth, a few roughly three or two sided being convex on the sides. One edge of several seeds shows a faint ridge. Surface usually smooth and hard, Colour-light to dark brown, Odour-unpleasant, taste- bitter.

Microscopic Description:

Root-Transverse section of root shows circular in outline and consists of multicellular uniseriate trichomes. Outermost is a thin zone of cork which is dark coloured. Secondary cortex is noticeable with polygonal cells in 12-16 layers which contain starch and oil globules. Pith is nearly obligated in the secondary structure.

Leaves-Micromorphological features revealed that the cells of the epidermis were cuticularized. The upper epidermal cells are comparatively larger than lower one, while the lower epidermises have a thick cuticle compare to upper epidermis. The polygonal epidermal cells observed with anticlinal walls. The leaf shown the presence of anomocytic type of stomata, ranging from 18 to 20 mm in length and 14 to 15 mm in width, they were in abundance on the lower epidermis while upper epidermis had comparatively less and mostly observed along the midrib region of the lamina.

Seed - Shows single layered epidermis covered externally with thick cuticle which contains stannin and 4-6 layers of thin-walled, collapsed, parenchymatous cells and layer of radially elongated stone cells. The parenchyma of upper one or two layers is longer than of the below with triangular intercellular spaces, inner most layer of parenchyma contains crystals of calcium oxalate. Beneath stone cells layer are quadrangular to octagonal in shape, tangentially elongated cells filled with brownish contents. Endosperm prepared by thin-walled, polygonal, parenchymatous cells shows embryo spathulate contains oil globules and aleurone grains.

Powder -Oily, dark brown; under microscope observed groups of endospermic parenchyma, stone cells, oil globules and aleurone grains and shows fluorescence under U.V. light as following:-

Powder as such brown Powder + 1 N NaOH – Grenish. In Methanol Powder + Nitrocellulose - Light green.[2]

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter)
Guna (Attribute)	: Sara, Usna (Hot), Tiksna (Sharp)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Medhya (intellect promoting), Deepan (Appetizer), Vatanuloman (maintain normal gati of vata.), Vamak (induces vomiting), Mrudurechaka or Mootral (Diuretic), Shirovirechana (removes Dosha by nasal route), Hridya uttejaka (stimulate heart), Aarthava janana (induces menstruation), Kushtagna (useful in skin disorders), Vedanasthapana (reduces pain), Jwaragna (anti-pyretic), Buddhivardhaka (promotes intellect), Smrtivardhak (sharpens memory), Kaphagna (alleviates Kapha).

Part Used: Seeds, Root, Root Bark, Leaves, Bark

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 6% w/w
Acid insoluble ash	: Not more than 1.5% w/w
Alcohol soluble extractive	: Not less than 20 % w/w
Water soluble extractive	: Not less than 9% w/w
Oil content	: Not less than 45% w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-

methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of alcoholic extract of drug on Silica gel 'G' plate using Toluene :Ethylacetate (90 : 10) shows two spots at Rf. 0.82 (pink) & 0.94 (yellow) in visible light. Under U.V. (366 nm) four fluorescent zones visible at Rf. 0.54, 0.82, 0.89, (all blue) & 0.94 (yellow). On exposure to Iodine vapour eight spots appear at Rf. 0.04, 0.15, 0.20, 0.35, 0.54, 0.63, 0.82 & 0.89 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate at 105°C for ten minutes four spots appear at Rf. 0.35, 0.54 (both blue), 0.82, 0.89 (both greenish blue).

Major Chemical Constituents: The leaves contain alkaloids, saponin, a glycoside and coloring matter. The leaves are emmenagogue and leaf sap is a good antidote for opium poisoning. It acts as antimicrobial and antifungal. Preliminary phytochemical screening of the petroleum ether and ethyl acetate extracts of leaves reveals the presence of steroid and terpenoid while methanol extracts show positive results for steroid, terpentoid, carbohydrate, alkaloid, saponin and phenolic compounds. Root bark and stem-Pristemerin Seed-Celapagine, Celastrine, Paniculatine, Malkanguniol, Malkangunin, Paniculatadiol, β Sitosterol, β Amyrin, Acetic Acid, Benzoic Acid, Formic Acid, Linoleic Acids, palmitic and stearic acids, celapanigine, celapanine, celastrol, 5-stigmasten-3β-ol.[3]

Therapeutic Use: Vatavyadhi (nervine disorders), Aruchi (anorexia), Kashtarthava (dysmenorrhea), Kushta (skin diseases), Agnimandya (loss of appetite), Gulma (abdominal tumor), Shoth (inflammation), Kasa (cough), Shwas (asthma), Mutrakrucha (difficulty in urination), Klaibya (impotency), Pakshaghat (paralysis), Ardit (facial palsy), Grudrasi (sciatica) etc.

Pharmacological Study: Antihistaminic, sedative, anticonvulsant, antiprotozoal, antiviral, antipyrectic, antiulcerogenic, anti-emetic, antibacterial, schizontocidal, emmenagogue, hypotension, stimulant, central muscle relaxant, hypolipidaemic, antiatherosclerotic, spasmolytic, tranquillier, anti-inflammatory, antifertility (antispermatogenic). etc.

Adverse Effects: If is given in higher doses (more than 2gm), it may cause Vamana (induce vomiting),

Virechana (induce purgation).

Precautions: Internal use is contraindicated in small children and pregnant or lactating women.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Seeds- 5-15, Oil- 5-15 drops, Seed powder -1-2gm.

Formulations: Panchatikta Grita Guggul, Kumar Kalpadruma Ghrita, Brihat Marichyadi Taila**.**

Kadam

Botanical Name: *Anthocephalus cadamba* (Roxb.) Miq.

Family: Rubiaceae

Synonyms:

Bangla: কদম (Kadam), Kadamba

Hindi: Kadamb, Kadam

Sanskrit: Kadambah, Vrtta puspa, Priyaka

Urdu/Unani/Tibb: Kadam

English: Wild chinchona

Geographical Distribution: Anthocephalus cadamba is mostly located in deciduous forests and are generally cultivated in plains. They are mostly found in Asia, Australia, and the Pacific region. They are also cultivated in India, Bangladesh, Pakistan, Sri Lanka, Burma, Thailand, Laos, Vietnam, Cambodia, Indo-Malesia, and many other tropical regions all over the world.

Plant Descriptions:

General Description: Anthocephalus cadamba is a fast-growing large tree with a broad umbrella-shaped crown and straight cylindrical bole. It has broad spreading branches and rapidly grows within 5–6 years. The branches are characteristically arranged in tiers. The tree may reach a height of 45 m with a stem diameter of 100–160 cm, and sometimes, it has a small buttress up to 2 m high. At the age of 4 years kadam may start flowering. In India it is flowering in July to December. Flowers are bisexual.

Fig. *Anthocephalus cadamba* (Roxb.) Miq.

Macroscopic Description: Bark externally greyish-green with shallow fissures, exfoliating in small irregular woody scales, internally light reddish to reddish-brown, easily separates from inner bark into tangential strips; taste, bitter.

Microscopic Description: Stem Bark -Outer most zone of the bark shows rhytidoma with cork 4-6 layers wide, composed of thin-walled, rectangular cells; phloem fibres same in structure as found in inner bark; middle bark composed of rectangular or tangentially elongated cells without intercellular spaces, some cells contain chlorophyll, most cells thick-walled but a few thin-walled containing prismatic crystals of calcium oxalate, a few cells with brown contents; inner bark consists of groups of fibres alternating with phloem, traversed by uni to triseriate, elongated cells of phloem rays; phloem composed of sieve tubes, phloem fibres, companion cells and phloem parenchyma; cells of phloem parenchyma thin walled and polygonal; phloem fibres lignified with narrow lumen and pointed ends; outer region of inner bark and phloem tissues thin-walled, comparatively large and consisting of rounded to polygonal cells a few phloem cells in this region compressed; phloem rays uni-to triseriate and arranged close to one another, cells distinct and slightly elongated, some cells at the periphery of inner bark tilled with chlorophyll contents.

Powder-Brown; shows fragments of cork cells, phloem cells, fibres, and a few prismatic crystals of calcium oxalate.

Organoleptic Properties

Rasa (Taste) : Madhura (Sweet), Lavana (Salty), Kashaya (Astringent)

Guna (Attribute) : Ruksha (Dry)

Virya (Potency)	: Sita (Cooling)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Pittahara, Vatahara, Vranaropana, Vedanastapana

Part Used: Bark and Fruit

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 9% w/w
Acid insoluble ash	: Not more than 1.5% w/w
Alcohol soluble extractive	: Not less than 3% w/w
Water soluble extractive	: Not less than 5% w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T. L C. of alcoholic extract of the drug on Silica gel 'G' plate using Ethylacetate: Methanol: Water (100:13.5:10) shows under U.V (366 nm) nine fluorescent zones at Rf. 0.03, 0.13, 0.21, 0.31, 0.57, 0.64, 0.79, 0.83 and 0.90 (all yellow) On spraying with 5% Methanolic Sulphuric acid reagent on heating the plate at 110°C for ten minutes four spots appear at Rf. 0.63 (yellowish grey), 0.70 (orange yellow), 0.79 (grey) and 0.90 (grey).

Major Chemical Constituents: The major constituents of the palnt are triterpenes, triterpenoid glicosides, flavonoids, saponins, indole alkaloids, cadambine, cadamine, isocadambine, isodihydrocadambine.

Therapeutic Use: Daha, Raktapitta, Vrana, Yonidosha, Visavrana etc.

Pharmacological Study: Antidiabetic, antioxidant, antitumor, antihepatotoxic, hypolipidemic, analgesic, antipyretic, antiinflammatory, antifilarial antimalarial, sedative, antiepileptic, urolithiatic, immunomodulatory, gastroprotective, anthelminthic, wound healing, antimicrobial activity etc.

Adverse Effects: No any adverse effects found in proper doses.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 0.5 - 1.5 gm of the drug in powder form.

Formulations: Kadaladya Grita, Grahani Mihir Taila

Kakdumur

Botanical Name: *Ficus hispida* Linn.

Family: Moraceae

Synonyms:

Bangla: কাকডুমুর (Kakdumur), Kakadumbar, Dumar, Kako-dumar

Hindi: Konea-dumbar, Kathumar, Daduri, Dagurin, Gobla, Kagsha, Katgularia, Totmila

Sanskrit: Kakodumbara, Kakodumbur, Malayu, Malpu Phalgu, Malaya, Jaghanephala, Moolakarkati, Shvitra bhaishajya, Kashthodumbara

Urdu/Unani/Tibb: Kath Gular

English: Wild fig, Devil fig

Geographical Distribution: It is found everywhere in Bangladesh and also in many parts of Asia and as far southeast as Australia.

Plant Descriptions:

General Description: An evergreen, small tree up to 17 m tall, bark smooth, grey; leaves often decussate, asymmetrical, pentagonal to oblong, 10-35 cm x 4-20 cm, base subcordate to broadly cuneate, apex acuminate, margin crenulate, with 5-10 pairs of veins and prominent reticulation below, hispid, stipules 1-2.5 cm long; figs on long twigs hanging from the trunk and main branches, obovoid, 25-40 mm in diameter, densely brown pubescent, pale or greenish-yellow when ripe; male flowers in 1-2 rows, with 1 stamen, female flowers sessile or stipitate.

Fig. *Ficus hispida* Linn.

Macroscopic Description: Dried syconus fruit, ovoid with a central circular hole and short stalk, 1-2 cm in dia., wrinkled; greyish-brown; seeds less than 1 mm in dia. And yellowish-brown in colour, odour and taste not characteristic.

Microscopic Description: Fruit shows a sinlge layered epidermis, covered with thick cuticle having a few unicellular trichomes, epidermis, followed by 4-6 layers of hexagonal to polygonal, collenchymatous cells, a few cells contain rosette crystals of calcium oxalate; mesocarp composed of large, oval to polygonal, thick-walled parenchymatous cells, a few vascular vessels showing spiral thickening.

Powder - Greyish-brown; shows groups of oval to polygonal, thin-walled cells of mesocarp and endosperm, fragments of polyhedral, thick-walled epidermal cells in surface view, spiral vessels and abundant unicellular trichomes.

Organoleptic Properties

Rasa (Taste) : Madhura (Sweet), Amla (Sour), Katu (Pungent), Tikta (Bitter), Kashaya (Astringent)

Guna (Attribute)	: Guru (Heavy), Snigda
Virya (Potency)	: Sita (Cooling)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Grahi, Kaphahara, Vatahara Pittahara, Mannsakara, Sukrakara, Mala Stambhana, Brmihana.

Part Used: Root Bark and Fruit

Purity and Safety Test

Foreign matter	: Not more than 1% w/w
Total ash	: Not more than 13% w/w
Acid insoluble ash	: Not more than 1.5% w/w
Alcohol soluble extractive	: Not less than 3% w/w
Water soluble extractive	: Not less than 12% w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of the alcoholic extract of the drug on Silica gel 'G' plate using n-Butanol: Acetic acid: water (4:1:5) shows under U.V. (366 nm) two fluorescent zones at Rf 0.36 and 0.92 (both blue). On exposure to Iodine vapour four spots appear at Rf. 0.20, 0.36, 0.41 and 0.92 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for ten minutes at 105°C two spots appear at Rf. 0.20 (grey) and 0.92 (brown).

Major Chemical Constituents: F*icus hispida* have shown the presence of alkaloids, carbohydrates, proteins and amino acids, sterols, phenols, flavanoids, gums and mucilage, glysocides, saponins and terpenes. Bark contains lupeol acetate, beta- amyrine acetate, and

beta-sitosterol. Leaves contains hispidin, oleonalic acid, bergaptine, beta-amyrine and beta-sitosterol. Fruits contains linalool, linalool oxide, terpeneol and 2,6-dimethyl-1,7-octadiene-3,6-diol etc.

Therapeutic Use: Vrana (ulcer), Kustha (skin disease), Pandu (anaemia), Arsa (piles), Kamla (jaundice), Atisara (diarrhoea), Daha (burning sensation), Kandu (itching), Raktapitta (haematemesis and malena), Vatapittajaroga etc.

Pharmacological Study: Hypoglycemic, antidiarrheal, cardioprotective, antiulcerogenic, sedative, anticonvulsant, neuroprotective, hepatoprotective, antineoplastic, antiinflammatory, antipyretic activity etc.

Adverse Effects: No any adverse effects found in proper doses.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 10 -20 gm of the drug in powder form.

Formulations: Bibhitakadi Kwath, Kusthari Ras.

Kakrol

Botanical Name: *Momordica dioica* Roxb. ex Willd.

Family: Cucurbitaceae

Synonyms:

Bangla: কাকরুল (Kakrol), Kartoli

Hindi: Kakora, Parora, Golbandra

Sanskrit: Vahisi

Urdu/Unani/Tibb: kantola

English: Small bitter gourd, Spine gourd, Teasel gourd

Geographical Distribution: This is climbing creeper generally found throughout India, Pakistan, Bangladesh, Himalayas to Ceylon. Reported up to an altitude of 1500 m in Assam and Garo hills of Meghalaya.

Plant Descriptions:

General Description: Kakrol is about 5–7 meters in length, a popular summer vegetable of which its fruit, young twigs and leaves are used as vegetable. It is dioecious, perennial in nature having

tuberous roots. The green fruit is extensively used as vegetable by cooking or frying. Leaves 1.5-4 inches long, cordate, acute more or less 3-5 lobed; Flowers large, dioecious and yellow in colour; Fruit 1-3 inches long, shortly beaked, densely covered with soft spines.

Macroscopic Description: Leaves of plant are simple membranous, broadly ovate in outline, variable in length 3.8-10cm by 3.2-8 cm, cordate at the base, deeply lobed in 3-5 triangular lobes, punctated, entire but distantly denticulate, petiole 1.3-4.5 cm. long channeled above, pubescent and glandular. Male flower is solitary, up to 2.8 cm long and yellow coloured. Petals 1.3- 2.5 cm long, oblong lanceolate. Calyx five lobed, linear lanceolate. Corolla five partite, stamen three. Female flower is solitary, small bract below the middle of the peduncle, calyx and corolla as in male without staminodes or in form of gland three united, ovary clothed with long soft papillae and many ovuled, ellipsoid. Yellow coloured. Fruit is shortly beaked, obtuse with inner red kernel, densely echinate with soft spines, green and yellow at maturity. Seeds are rounded broadly ellipsoid, slightly compressed, slightly and irregularly corrugated enclosed in red pulp. Stem slender, branched, furrowed, glabrous and shining. Tendrils are elongated, simple, striate and glabrous.

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

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

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Tikshna (Sharp)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kaphahara, Pittahara, Rasayana, Rucikara

Part Used: Fruit, Leaves, Root

Fig. *Momordica dioica* Roxb. ex Willd.

Purity and Safety Test

Foreign matter	: Not more than 1% w/w
Total ash	: Not more than 8% w/w
Acid insoluble ash	: Not more than 2% w/w
Alcohol soluble extractive	: Not less than 3 % w/w
Water soluble extractive	: Not less than 31% w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not

more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: 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 110oC.

Major Chemical Constituents: It contains many phytoconstituents. Phytoconstituents of Momordica dioica are traces of alkaloids, steroids, triterpenoids, flavonoids, glycosides, saponins, triterpenes of urisolic acid dark brown semidrying oil and saturated fatty acids, ascorbic acids, vitamin A, thiamine, ribnoflavins, niacin, protein carbohydrates, lectins, ascorbic acids, carotenes, bitter principles, oleanoic acid, stearic acid, gypsogenin, alpha-spiranosterol hederagenin, momordicaursenol. The alkaloid presents in seed called momordicin and present in root called Momordicafoetida. Spiny gourd contains glycosidic structures known as Cucurbitacins and Cucurbitane glycosides structures.

Therapeutic Use: Asmari (renal stone), Arsa (piles), Swasa (asthma), Hikka (hiccup), Jwara (fever), Kamla (jaundice), Kasa (cough), Mutrackriccha (urinary disorder), Madhumeha (diabetes mellitus), Netraroga (eye disorders), Siroroga (headache) etc.

Pharmacological Study: Diuretic, laxative, hepatoprotective, antivenomous, antihypertensive, antiinflammatory, antiasthmatic, antipyretic, antileprosy, antidiabetic, antidepressant, antihelminthic, antihemorroidal, antiasthmatic, analgesic etc.

Adverse Effects: No any adverse effects found in proper doses.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 3-6 gm.

Formulations: Ushiradi Churna, Dosomularista, Jirakadyarista, Brihat Chandanadi Taila.

Kash

Botanical Name: *Saccharum spontaneum* Linn.

Family: Poaceae

Synonyms:

Bangla: কাশ (Kash)

Hindi: Kans, Kansi, Kas

Sanskrit: ikshugandha, kasa, kasah, kash, kasha, kashi, khaggara, svetacamara

Urdu/Unani/Tibb: Kansa, Kasa

English: Wild sugarcane, Kans grass

Geographical Distribution: It is native to South Asia. Globally it is distributed throughout the tropical countries of Asia, Africa, America as well as in Australia. It is often planted in Bangladesh, Sri Lanka, India, Nepal and Pakistan.

Plant Descriptions:

General Description: It is perennial grass, growing up to 3 meters in height, with spreading rhizomatous roots. Leaves are harsh and linear, 0.5 to 1-meter-long; 6 to 15 mm wide. Inflorescence are plumose panicles, which are white and erect, measuring 15-30 cm long, with slender and whorled branches, the joints covered with soft white hair.

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

Fig. *Saccharum spontaneum* Linn.

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

Powder: Dark brown; shows fragments of thin-walled, tabular, somewhat rectangular, epidermal cells in surface view, oval to polygonal: thin-walled parenchymatous and thick-walled polygonal

sclerenchymatous cells, pointed unicellular hairs, vessels with reticulate thickening, small round to oval starch grains, measuring 8-24 µ in diameter.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet), Tikta (Bitter)
Guna (Attribute)	: Sara
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Pittahara, Vrsya, Balakrt, Srmahara, Rucikrt

Part Used: Root

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 7% w/w
Acid insoluble ash	: Not more than 4% w/w
Alcohol soluble extractive	: Not less than 3 % w/w
Water soluble extractive	: Not less than 4% w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography T.L.C. of the alcoholic extract on Silica gel 'G' plate using n-Butanol: Acetic acid: Water (4:1:5) shows under U.V. (366 nm) one fluorescent zone at Rf. 0.83 (green). On exposure to Iodine vapour three spots appear at Rf. 0.30, 0.83 and 0.90 (all yellow). On spraying with

5% Methanolic Sulphuric acid reagent and heating the plate for ten minutes at 105°C six spots appear at Rf. 0.13, 0.23, 0.30 (all dull yellow), 0.69, 0.83 and 0.90 (all grey).

Major Chemical Constituents: Saccharum spontaneum roots contain phenols, triterpenes, essential oils, steroids, anthraquinones, coumarin, anthrones, flavonoids, and alkaloids.[2]

Therapeutic Use: Raktapitta (haematemis and malena), Mhutarakricchra (urinary disorders), Asmari (renal stone), Daha (burning), Kshaya (emaciation) etc.

Pharmacological Study: Diuretic, antiinflammatory, antioxidant, antidiarrheal, CNS depressant, hypolipideamic activity etc.

Adverse Effects: No any adverse effects found in proper doses.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 3-6 g. of the drug in powder form.

Formulations: Trinapanchamul Kwath, Kushabaleha

Kesaraj

Botanical Name: *Wedelia calendulacea* (L.) Less.

Family: Asteraceae

Synonyms:

Bangla: কেশরাজ (Kesaraj), Kesuriya

Hindi: Bhangra, bhanra, babri, mochkand, pilabhamgara

Sanskrit: bhringaraja, bhrngaraja, bhrngarajaka, devapriya, haripriya, harivesa, kesaraja, markava, pavana, pita-bhringi, pitabhringaraja, pitabhringi, svarnabhringara, vandaniya, pitabhrnga, pitabhrngaraja, pitabhrngarajah, pitbhrngarajah

Urdu/Unani/Tibb:

English: Chinese wedelia, Singapore daisy, Trailing Daisy, Wild marigold

Geographical Distribution: It is found everywhere in Bangladesh and grows as a weed in Dhaka, Mymensingh, Tangail, Patuakhali and sporadically in other areas.

Plant Descriptions:

General Description: It is tender, spreading, and hairy herb, with the branches usually less than 50 com long. The leaves are oblong to oblong-lanceolate, 2-4.5 cm in length, and narrowed at both ends. The margins are enter or obscurely toothed; and both surfaces are covered with sharp-pointed, appressed, straight, and stiff hairs. The heads are stalked, about 1 cm in diameter, and yellow. The involcral bracts are oblong-ovate. The ray flowers are 8-12 spreading, about equal to the bracts, and broad; the disk flowers number about 20, and are short, narrow, and pointed. The achenes and nearly cylindric and hairy.

Fig. *Wedelia calendulacea* (L.) Less.

Macroscopic Description:

Stem-2 to 4 mm in diameter; flat, nodes and internodes prominent, rooting at the lower nodes; slightly hairy; blackish brown in colour; fracture, short; slightly pungent in taste. **Leaf-** Opposite, subsessile, linear-oblong, oblanceolate, margin entire, scabrous with short white hairs or more or less glabrous; base tapering; dark green, odourless, tasteless; both fresh and dry leaves leave black stain on the fingers, when crushed as such or with water. **Flower-** Heads solitary on long slender axillary peduncles with ray and disc florets, involucre bracts large, oblong obtuse, much longer than the disc floret; ray florets female, ligulate, ligule 2 or 3 toothed, yellow, style long acute and recurved; fruit achene, triquetrous, tip truncate, disc floret

bisexual, tubular, limb elongated, five toothed, anther syngenceous, epipetalous, filament fine with hairy tips, style long, acute and fruit characters are the same as in ray floret; no pappus.

Microscopic Description:

Stem –TS almost circular in outline, cuticle thin, some epidermal cells filled with yellowish contents, followed by 3 to 5 layers of collenchymatous hypodermis; cortex aerenchymatous, with large intercellular spaces, endodermis and pericycle distinct, latter in the form of sclerenchymatous cap over vascular bundles, cambium distinct, phloem consists of sieve tubes, companion cells and phloem parenchyma, xylem in the form of a continuous ring, pith large, collenchymatous with cells showing a little thickening at the angles.

Leaf –

Midrib - TS slightly convex in outline on the upper side, more convexed on the lower side, upper and lower epidermis covered by thin cuticle, 4 to 6 and 2 or 3 layers of collenchyma present adjacent to upper and lower epidermis respectively, bicollateral vascular bundles, 3 to 5 in number one median large and 2 or 4 lateral small, distinct sclerenchymatous bundle sheath present top and bottom of the bundle, xylem and phloem consist of usual elements, mesophyll parenchymatous, some cells filled with druces and rhomboidal crystals of calcium oxalate.

Lamina - Dorsiventral; both upper and lower epidermis covered with thin cuticle, in surface view both epidermis show an isocytic to anisocyctic stomata, 2 types of trichomes, (i) long, unicellular, walls warty, with 9 to 12 radiating basal epidermal cells, (ii) small 3 to 5 celled, basal epidermal cells not differentiated; upper epidermis followed by single layered palisade parenchyma, spongy parenchyma 6 to 8 layered, loosely arranged; mesophyll traversed by a large number of veins, idioblasts containing druses and rhomboidal crystals of calcium oxalate present in this region, palisade ratio 3 or 4 vein islet 2 to 5 /mm2 and vein termination numbers 5 to 9 /mm2 while trichome numbers 3 to 9 and stomatal index 12 to 14 on upper surface and 22 to 25 on lower surface of the leaf.

Powder –Yellowish green, pleasant smell and bitter taste, on microscopic examination unicellular and multicellular trichomes; patches of epidermal cells of leaf with anisocytic stomata, idioblasts containing druses and prismatic crystals of calcium oxalate, palisade cells, groups of papillate epidermal cells of petals and bracts, endothelial cells, parenchymatous cells of anther lobe, pollen grains, acolpate, upto 10 µ in diameter with spinous exine, fibres of bundle sheath and pericycle, tracheids and vessels with spiral, scalariform and reticulate secondary wall thickenings.

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter), Kashaya (Astringent)
Guna (Attribute)	: Tiksna (Sharp)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	:Kaphahara, Vatahara, Mutrala, Hrdya, Swedakar, Kesya, Balya.

Part Used: Whole plant

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 9.5% w/w
Acid insoluble ash	: Not more than 1% w/w
Alcohol soluble extractive	: Not less than 17% w/w
Water soluble extractive	: Not less than 31% w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of methanolic extract on silica gel 'G' plate (0.2 mm thick) using ethyl acetate: methanol: water (7:3:1) and on spraying with anisaldehyde-sulphuric acid reagent and heating the plate at 105° for 10 min., spots appear at 0.47 (light yellow), 0.58 (light grey), 0.75 (blackish grey), 0.81 (light grey), 0.89 (yellowish organge), 0.92 (light grey).

Major Chemical Constituents: The plant contains alkaloids, saponins, tannin, flavonoids, a lactone, wedelolactone and norwedilic acid. Expressed juice of Wedelia chinensis contains an oil-soluble black dye, waxy compounds, phytosterols, carotene and resin. The plant also contains inorganic salts, siliceous materials, pectin and mucin.

Therapeutic Use: Arsa (piles), Atisara (diarrhoea), Daurbalya (weakness), Hrdroga (heart disease), Indralupta (alopecia), Jvara (fever), Krimi (helminthiasis), Kamla (jaundice), Kasa (cough), Pandu (anaemia), Plihavriddhi (splenomegaly), Sirahsula (headache), Slipada (fliariasis), Swasa (asthma), vrana (Ulcer) etc.

Pharmacological Study: Antioxidant, antiinflammatory, immunestimulatory, anthelmintic, hepatoprotective, antimalarial, hypoglycemic, expectorant, antibacterial, antifungal, neuroprotective, antidepressant, antipyretic activity etc.

Adverse Effects: No any adverse effects found in proper doses.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 3-6 gm of the drug in powder form.

Formulations: Grahani Mihir Taila, Brihat Somraji Taila

Khejur

Botanical Name: *Phoenix dactylifera* Linn.

Family: Arecaceae

Synonyms:

Bangla: খেজুর (Khejur)

Hindi: Kajoor, Kejur

Sanskrit: Khalva, Vardhipatraka

Urdu/Unani/Tibb: Kulthi

English: Horse gram, kulthi bean, hurali, Madras gram

Geographical Distribution: It is cultivated in North Africa, Arabian Peninsula and Middle East since long period. It is sldo now cultivated in Iran, Iraq, USA, Pakistan, Saudi Arabia, Egypt, UAE, Sudan, South Sudan, Algeria, Tunisia, India, Spain, Maurutiana, Morokko, Mali, Oman, Tanzania, Australia, Libya, etc. It is also cultivating in Bangladesh.

Plant Descriptions:

General Description: Tall tree upto 36 m in height, occasionally found cultivated or self-grown in India. Trunks covered with persistant bases of petioles, the base usually surrounded by a mass of offshoots or sudcen; leaves in poen crown, pinnate 20-40 cm long, linear, keeled lower pinnae modified into spines; flowers in branched spadices, small; fruit an oblog berry 2.5 –7.5 cm long, reddish or yellowish brown when ripe; seed cylindric, hard with a longitudinal furrow.

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

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

Organoleptic Properties

Rasa (Taste)	: Madhur (Sweet), Kasaya (Astringent)
Guna (Attribute)	: Guru (Heavy), Snigdha (viscous)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhur (Sweet)
Karma (Action)	: Balya (Tonic), Hrdya (Cardiac tonic), Tarpaka, Vata-Kaphahara, Pittahara, Mamsavardhaka, Rucikara.

Part Used: Fruit

Fig. *Phoenix dactylifera* Linn.

Purity and Safety Test

Foreign matter	: Not more than 1% w/w
Total ash	: Not more than 3% w/w
Acid insoluble ash	: Not more than 0.5% w/w
Alcohol soluble extractive	: Not less than 20 % w/w
Water soluble extractive	: Not less than 65% w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not

more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

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

Major Chemical Constituents: Dates are rich source nutrients as carbohydrates (44-88%), Dietary fibers (6.4-11.5%), fats (0.2-0.5%) and proteins (2.3-5.6%), alkaloids, steroids, flavonoids, vitamins and tannins.. Dates also contain fatty acids e.g. Palmitolieic acid, Oleic, Linoleic and Linolenic acid. There are 23 types of amino acids in date`s proteins and some of them are not present in nutritious fruits like bananas, oranges and apples. Besides this vitamin A, B1, B2 and nicotinic acid are also constituents of dates.

Therapeutic Use: Daha (burning), Gulma (abdominal tumor), Hikka (hiccup), Jvara (fever), Kasa (cough), Murccha (faint), Prameha (urinary disorders), Raktapitta (haematemesis), Swasa (asthma), Ksaya (emaciationa), Trsna (thirst) etc.

Pharmacological Study: Anticancer, antioxidant, hepatoprotective, antidiabetic, antihypertensive, antiulcertavie, antiinflammatory, antiproliferative, antimutagenic, antidiarheal, antibacterial, antifungal antiviral etc.

Adverse Effects: There isn't enough information to know if it is safe in the larger amounts that are used as medicine or when used on the skin.

Dosage Forms: Semisolid, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Fruit 10-15 gm.

Formulations: Draksadi Curna, Eladi Gutika.

Korobi

Botanical Name: *Nerium indicum* Mill.

Family: Apocynaceae

Synonyms:

Bangla: করবী (Korobi), Karbbe, Karbee

Hindi: Karavira, Kaner

Sanskrit: Karavirah, Ashvamarak, Hayamara

Urdu/Unani/Tibb: Surkh Kaner

English: Red Oleander, Rose Bay, Rose Laurel

Geographical Distribution: It is commonly found as an ornamental shrub in the gardens throughout India. It is cultivated all over the world, especially in south-west Asia. It is exclusively native to India, Bangladesh, Nepal, Myanmar and China.

Plant Descriptions:

General Description: Nerium indicum is evergreen shrub or small tree that grows up to 5 m. in height. The leaves are long, simple, whorled, linear-lance late, 9-14 cm in length with horizontal nerves. Leaves are in pairs of three or whorled, green, leathery, narrowly elliptic to linear entire. The flowers grow in clusters at the end of each branch. The flowers have both male and female organs, soft sweet-scented, single or double cymes with attractive color that varies from white, pink or red, sweet smelled and 4-5 cm in diameter. Fruit of Nerium is long about 15-20 cm, cylindrical, deep longitudinal, narrow parallel lines or ridges and paired growing with the stem. The seeds usually are flat and winged or have a tuft of fine, seeds contained in fruit are numerous, compressed and white and grayish in color having smooth hairs.

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

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

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

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Laghu (Light), Ruksha (Dryness), Tikshna (Sharp)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Sirovirecana, Caksusya, Krmighna, Sothaghna, Kusthhara.

Part Used: Root

Fig. *Nerium indicum* Mill.

Purity and Safety Test

Foreign matter	: Not more than 1% w/w
Total ash	: Not more than 7.5% w/w
Acid insoluble ash	: Not more than 3.5% w/w
Alcohol soluble extractive	: Not less than 8 % w/w
Water soluble extractive	: Not less than 8% w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform: Methanol (8:2) shows under U.V. (366 nm) ten fluorescent zones at Rf. 0.11, 0.15 (both yellow) 0.19 (blue), 0.26 (yellow), 0.49 (pink), 0.60, 0.64, 0.72, 0.88 (all blue) and 0.95 (yellow). On exposure to Iodine vapour ten spots appear at Rf. 0.11, 0.22, 0.30, 0.49, 0.53, 0.64, 0.68, 0.72, 0.90 and 0.95 (all yellow). On spraying with 5% Methanolic Sulphuric acid reagent and heating the plate at 105°C for about ten minutes eleven spots appear at Rf. 0.05, 0.11, 0.22, 0.30, 0.49, 0.53 (all grey) 0.64 (yellow), 0.68, 0.72 (both grey), 0.90 (violet) and 0.95 (brown).

Major Chemical Constituents: The bark contains scopoletin, scopolin, tannins, red coloring matter, a aromatic oil, wax and flobefin and a yellow colored stable oil. The roots contain bitter glycosides, fenolinic acid and a aromatic oil. Its roots contain glycosided, neriodorin, neriodorein, and karabin. It contains neriodin, nerium D, rutin and anhydro-oleandrin.[3]

Therapeutic Use: Hrdroga (cardiac disease), Jvara (fever), Krimiroga (disease due to microbes and parasites), Kandu (itching), Kushtha (skin diseases), Netraroga (eye diseases), Vrana (wounds), Tamakashvasa (asthma), etc.

Pharmacological Study: Antinociceptive, Antimitotic, antibacterial, antifungal, antiviral, cadiotonic, neuroprotective, antioxidant, antimalarial, hepatoprotective, antidiabetic, analgesics, antiulcer, antiinflammatory, anticancer activities etc.

Adverse Effects: The cardiac glycosides of this plant may affecting the sinus or AV nodes with PR interval prolongation and progression to atrioventricular dissociation and systemic hyperkalemia may worsen cardiac function.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 30-125 mg of the drug in powder form.

Formulations: Manikya Ras, Brihat Marichadi Taila, Brihat Kasisadya Taila.

Koronja

Botanical Name: *Pongamia pinnata* Linn.

Family: Leguminosae

Synonyms:

Bangla	: করঞ্জ (Koronja)
Hindi	: Karanj
Sanskrit	: Karanjaka, Natkamala
Urdu/Unani/Tibb	: Karanjwa
English	: Pongam oil tree

Geographical Distribution: Pongamia pinnata is an important nonedible minor oilseed tree that grows in the semiarid regions. It is probably originated from India and grows naturally in India, Bangladesh, Pakistan, Malaysia, Thailand, Vietnam, Australia, Florida, and Sri Lanka and also in northeastern Australia, Fiji, Japan, and the Philippines. In the USA Pongamia pinnata was introduced into Hawaii in the 1960s by Hillebrand. In Bangladesh it is popularly known as Koroch.

Plant Descriptions

General Description It is a medium sized semi evergreen glabrous tree with a short bole spreading crown upto 18 m or more in height. P. pinnata is a fast-growing tree which reaches 40 feet in height and spread, forming a broad, spreading canopy casting moderate shade. It is a monotypic genus and grows abundantly along the coasts and riverbanks, which requires excellent drainage and a sunny location. In India, billions of karanja trees exist where karanja trees are cultivated commercially and seed is collected from December to April. However, in Bangladesh it is not cultivated commercially yet.

Fig. *Pongamia pinnata* Linn.

Macroscopic Description:

Root: Taproot is thick and long, lateral roots are numerous and well developed.

Leaf: very often mottled with dark brown dots, specks, lines or streak; leaves compound, leaflets 5-7 ovate, acuminate or elliptic; fruits thick, woody, smooth, compressed, with a short curved beak. Alternate, odd pinnately compound, 2 to 4 inches, evergreen, hairless.

Flower: Flowers lilac or pinkish white, Lavender, fragrant, in axillary racemes 2-4 together, short-stalked, pea shaped, 15-18mm long

Seed: Compressed ovoid or elliptical, been-like, 10-15cm long, dark brown, oily. Seeds 1 or 2 per pod, reniform to nearly round, smooth or wrinkled, testa reddish brown leathery. Bark: Thin gray to grayish brown and yellow on the inside.

Microscopic Description:

Transverse section of seed shows, testa composed of a layer of palisade like outer epidermis, filled with brown pigment, covered externally with a thick cuticle, a layer of large, thin walled, somewhat rectangular cells, 2-4 layers of thick-walled parenchyma cells, a few rows of cells with small inter-cellular spaces, 2-3 layers of thick-walled elongated cells, a few layers of spongy parenchyma having large inter-cellular spaces, a number of parenchyma cells containing brown pigment, cotyledons composed of outer layer of epidermis with cylindrical cells, externally covered with thin cuticle, epidermis followed by rectangular to polygonal cells of mesophyll, filled with globules, also present scattered in this region.

Part Used: Fruits, Leaves, Root bark, stem bark, twigs and seed oil.

Organoleptic Properties

Rasa (Taste)	: Katu, Tikta
Guna (Attribute)	: Tikshna (Sharp),
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Krmijit, Kushaghna, Kaphavataghna, Vranasodhana

Purity and Safety Test

Foreign matter	: Not more than 1%w/w
Total ash	: Not more than 3%w/w
Acid insoluble ash	: Not more than 0.1%w/w
Alcohol soluble extractive	: Not less than 23%w/w
Water soluble extractive	: Not less than 13%w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total

	enterobacteriaceae, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: The method involves separation of components by TLC on pre-coated silica gel G 60 F (254) plates developed on toluene: ethyl acetate (7:3 v/v) and detection at 260 nm in absorbance mode. The sensitivity of the method was found to be 100 ng. The linearity range was 50-300 ng. Rf value: 0.11 (Blue), 0. 23 (White), 0.36 (Flourescent white), 0.48 (Flourescent white), 0.58 (Flourescent white). The marker constituent Karanjin was isolated and Rf value was 0.77 (Flourescent white), 0.92 (Blue).

Major Chemical Constituents: It is important medicinal plant with diverse phytochemical spectrum. The plant shows the presence of many chemical constituents like alkaloids, tannins, steroids, glycosides, demethoxy-kanugin, glabrin, kanugin, karangin, flavonoids and fixed oils. Hypolipidemic and antihyperlipidemic activity of Pongamia pinnata was observed due to the presence of flavonoids and other polyphenolic constituents. Pongamol and karangin are active polyphenols isolated from the fruits of this plant and showed antidiabetic activity.

Therapeutic Usages: Yonidosha (vaginal and uterine disorders), Kushtagana (skin disease), udavarta (bloating), Gulma (abdominal tumours), Arsha (piles), Vrana (wound) and Krimi (worm infestation).

Pharmacological Study: Anti-inflammatory, anti-plasmodial, antioxidant, anti-hyperammonemic, hepatoprotective, antiulcer, antidiarrhoeal, antipyretic, antimicrobial activity etc.

Contraindications: Known allergy to the plants of the Leguminosae family.

Adverse Effects: Toxicity studies with karanjin, carried out in rats for safety evaluation, indicated no lethal effect up to 20 mg kg−1 b.w. when orally fed.

Precautions: Do not use in a high dose or for longer periods of time. Precaution may be taken during concomitant use of anti-diabetic drugs.

Dosage Forms: Crude drug, capsules, tablets and pills.

Posology: 0.25 gm of the drug in powder form. 5-10 g of the drug for decoction.

Formulations: Ayaskrita

Koyet Bael

Botanical Name: *Feronia limonia* Linn.

Family: Rutaceae

Synonyms:

Bangla: কয়েতবেল (Koyet Bael), Kavataleal, Kavita

Hindi: Kaitha, Kath Bel or Kabeet

Sanskrit: Kapittha, Dadhittha, Dadhiphala, Surabhichhada, Dantshatha, Kapipriya

Urdu/Unani/Tibb: Kuvet

English: Wood Apple, Elephant apple, Curd fruit, Monkey fruit

Geographical Distribution: Feronia limonia is native to India and also cultivated in Bangladesh, Pakistan and Srilanka. It is also frequently grown throughout Southeast Asia, in northern Malaya and on Penang Island.

Plant Descriptions:

General Description: It. is a moderate sized, deciduous, erect tree with a few upward reaching branches bending outward near the summit where they are subdivided into slender, branchlets drooping at the tips throughout India. It is a slow growing tree up to 9m tall, grows all over India in dry and warm areas up to 450m elevation, often tree with rough, spiny bark. The spines are axillary, short, straight, 2-5 cm long on some of the zigzag twigs.

Fig. *Feronia limonia* Linn.

Macroscopic Description: Fruit pulp occurs mostly in broken pieces and sometimes entire, measuring about 4-5 cm in dia; semicircular, rough, hard, having longitudinal ridges and furrows; reddish brown; odour, aromatic; taste, sour.

Microscopic Description: Fruit Pulp-shows irregular, thin-walled, parenchymatous cells; numerous idioblast cells filled with reddish-brown content; stone cells, slightly triangular and oval, with concentric striations and narrow lumen, found in groups; a few fibro-vascular bundles distributed in the pulp; xylem vessels having spiral thickenings.

Powder-Reddish-brown; shows fragments of fibro vascular bundles, stone cells, triangular to oval with concentric striations and narrow lumen, vessels and idioblast filled with cell content.

Organoleptic Properties

Rasa (Taste)	: Kashaya (Astringent), Madhura (Sweet), Amla (Sour); Unripe Pulp: Amla (Sour), Kashaya (Astringent)
Guna (Attribute)	: Laghu (Light), Unripe Pulp: Guru (Heavy)
Virya (Potency)	: Sita (Cooling); Unripe Pulp: Ushna (Hot)
Vipaka (Metabolism)	: Madhura (Sweet); Unripe Pulp: Amla (Sour)
Karma (Action)	: Vata-pitta-har;Rakta-pitta-har

Part Used: Fruit

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 6% w/w
Acid insoluble ash	: Not more than 1% w/w
Alcohol soluble extractive	: Not less than 12% w/w
Water soluble extractive	: Not less than 25% w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-

methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Chloroform: Ethylacetate: Formic acid (5:4:1) shows one spot at Rf. 0.91 (grey) in visible light. Under U.V. (366 nm) three fluorescent zones appear at Rf 0.14 (sky blue), 0.91 (blue) and 0.95 (blue). On exposure to Iodine vapour six spots appear at Rf. 0.06, 0.12, 0.37, 0.50, 6.91 and 0.95 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 110°C for ten minutes five spots appear at Rf. 0.12 (brown), 0.37 (brown), 0.50 (violet), 0.91 (violet) and 0.95 (violet).

Major Chemical Constituents: The preliminary phytochemical analysis of Feronia limonia plant parts showed the presence of alkaloids, flavonoids, phenols, terpenoids, tannins, fats steroids, saponins, glycosides, gum, mucilage and fixed oils. The unripe fruits contain stigmasterol. Fruit pulp contains large quantity of citric acid and other fruit acids, mucilage and minerals. Alkaloids, coumarins, fatty acids and sterols have been detected in the pericarp. It also contains umbelliferone, dictamnine, xanthotoxol, scoparone, xanthotoxin, isopimpinellin, isoimperatorin and marmin. Leaves contain stigmasterol, psoralen, bergapten, orientin, vitedin, saponarin, tannins and an essential oil. Marmesin, feronolide and feronone have been isolated from the bark. Seeds contain fixed oil, carbohydrates, proteins and amino acids. Roots contain feronia lactone, geranylum belliferone, bargapten, osthol, isopimpinellin, marmesin and marmin.

Therapeutic Use: Weakness of heart, liver and lungs; anorexia, digestive disorders, urinary problem, scurvy, sore throat, thirst, hiccups etc.

Pharmacological Study: Antioxidant, antidiabetic, antihyperlipidemic, antiinflammatory, analgesic and antipyretic; anti-asthmatic, Wound healing, hepatoprotective, neuroprotective, nephroprotective and diuretic; cardioprotective, antibacterial, antiulcer activity etc.

Adverse Effects: No any adverse effects found in proper doses.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: 1-3 gm of the drug in powder form.

Formulations: Phalarista, Dosomularista (Kasturi), Dosomularista

Kulotha Kalai

Botanical Name: *Macrotyloma uniflorum* (Lam.) Verdc.

Family: Fabaceae/Leguminosae

Synonyms:

Bangla: কুলথ কালাই (Kulotha Kalai)

Hindi: Kulathi, Kulthi, Kurathi

Sanskrit: Khalva, Vardhipatraka

Urdu/Unani/Tibb: Kulthi

English: Horse gram, kulthi bean, hurali, Madras gram

Geographical Distribution: It is grown in India, Bangladesh mainly to furnish feed and fodder for cattle and horse. It makes excellent hay and is suitable as green manure.

Plant Descriptions:

General Description: Climbing herb with slam up to 60 cm. tall with a perennial fibrous rhizome stem annual densely covered with whitish hairs. The tap root produces a branched root system with smooth, rounded nodules. Nodules containing nitrogen fixing bacteria. Macrotyloma uniflorum is an erect, sub-erect or trailing, densely hairy annual herb Compound, alternate, Trifoliolate, stipules lanceolate petiole 1-7 cm. long leaflet ovate elliptical apex rounded to acute base rounded lateral leaflets a symmetric hairy to glabrescent on both surfaces. Flower Short only 6-12 mm. long. The flower is cream - yellow with purple spot in auxiliary racemes with 2 appendages at base. Flower zygomorphic, bisexual, Fruit is a linear oblong pod 3-8 cm.x4-8 mm. up curved towards apex acuminate, densely hairy. When young later mar sparsely so margins glabrous smooth or warty dehiscent 5-10 seeds. Seed size ranges 6-8 mm long and 3-4mm broad smooth of which 100 seed weight is recorded 4gm. Seed trapezoidal oblong or somewhat rounded.

Macroscopic Description: The seeds are roughly trapezoidal and flattish, with quite thin cotyledons. The hylum is small and linear and located in a small depression on the seed's lateral margin. The length of archeological specimens are usually 3.0-4.0 mm, width 2.0-2.6 mm and thickness 1.4-2.0 mm.

Microscopic Description:

Testa: Epidermis is single layered, thin walled and shining cells because mucilage in this layer.

Endosperm: Endosperm form bulk of the seed with thick walled polygonal parenchymatous cells.

Alueron: Outer portion of the seed contains alueron grains which are protein in nature.

Embryo: In the mid of the seeds, embryo can be seen which provide nutrition.

Organoleptic Properties

Rasa (Taste)	: Kasaya (Astringent)
Guna (Attribute)	: Laghu (Light), Sara
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Vidahi, Svedasangrahaka, Krmihara, Kaphavatahara.

Part Used: Seeds

Fig. *Macrotyloma uniflorum* (Lam.) Verdc

Purity and Safety Test

Foreign matter	: Not more than 0.82% w/w
Total ash	: Not more than 4.6% w/w
Acid insoluble ash	: Not more than 0.47% w/w
Alcohol soluble extractive	: Not less than 20 % w/w
Water soluble extractive	: Not less than 5.03% w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of E. *coli*, total *yeast* and *mould* count, total *enterobacteriaceae* are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$ and 10^4 $cfug^{-1}$ respectively for crude plant materials. The load of total viable aerobic count, total*enterobacteriaceae*, *Salmonellae spp*, *S. aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3 mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzene are not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: TLC and HPTLC analysis of acetone extract having highest yield and polyphenol with flavonoid content was processed for identification of individual compounds. Chromatographic studies showed presence of quercetin, chlorogenic acid and ferulic acid like phenolic acid.

Major Chemical Constituents: It contains an enzyme (urease) and oil. Kulattha seeds contain 21% of crude protein, 11% of pentosan and about 3% of water soluble gum. They also contain traces of urease and phosphorus. The other chemical constituents present in the seeds are Genistein, Dalberioidin and Collidin.

Therapeutic Use: Asthma, bronchitis, colic, diarrhea, dysuria, hepatomegaly, hiccup, kidney stones, leucorrhoea, obesity and splenomegaly etc.

Pharmacological Study: Antihypercholesterolemic, antimicrobial, antiobesity, antihelminthic, analgesic, antiinflammatory, antidiabetic, anticholelithiasis, antihistaminic, antiulcerative, antioxidant, antiobesity, antiurolithiasis, diuretic, hemolytic, hepatoprotective, antidiabetic and antihypertensive properties etc.

Adverse Effects: Long term consumption and higher doses may cause hepatotoxicity.

Precautions: Internal use is contraindicated in small children and pregnant or lactating women.

Dosage Forms: Crude drug, capsules, tablets and pills.

Storage: Storage in a well-closed container, protected from light and moisture.

Posology: Seed powder 4-6 gm.

Formulations: Bala Taila, Saptaprasta Mahamash Taila

Kunch

Botanical Name: *Abrus precatorius* Linn.

Family: Fabaceae

Synonyms:

Bangla	: কুচ (Kunch)
Hindi	: Ratti, Ghungchi
Sanskrit	: Raktika, Kakananti
Urdu/Unani/Tibb	: Ghongcha, Ratti
English	: Coral pea, crab s eye,

Geographical Distribution: Abrus precatorius is found in South Africa, China, Islands, West Indies, India, Brazil, etc. Plant found all throughout the plains of India, from Himalaya down to Southern India and Ceylon. It is native to India, at altitudes up to 1 200 m on the outer Himalayas but now found in all tropical countries.

Plant Descriptions

General Description: Abrus precatorius plants are seen growing wild throughout all tropical forests, and are propagated through seeds. Traditionally the seeds were used for decorative and gold-weighing purposes. The seeds are used in a variety of jewelry, trinkets, and ornaments; the Abrus seed itself is known by a variety of names that include rosary pea, prayer bead, and jequirity bean. Precare (from which the species name is derived) meaning to pray, references its common use in rosaries. The seeds of Abrus precatorius have been used through history in a variety of roles. Due to their uniform size and weight, they were once known as rati, and used as weights for weighing gold and silver. Formerly Indians used these seeds to weigh gold using a measure called a Ratti, where 8 Ratti = 1 Masha; 12 Masha = 1 Tola (11.6 Grams). The Abrus seeds have also been used for medicinal purposes, including the treatment of chronic eye disease. Arabic culture has purportedly used the seed as an aphrodisiac known as coq's eye. The toxicity of the Abrus seed was associated with its use as a fish poison as well as a homicidal agent.

Macroscopic Description: Abrus precatorius is a woody twinning plant with characteristic toxic red seeds with black mark at the base. Leaves resemble tamarind leaves having 20-40 leaflets. It is a beautiful, much-branched, slender, perennial, deciduous, woody, prickly twining or climbing herb. Stem cylindrical, wrinkled, bark smooth-textured, brown. Leaves stipulate, pinnately compound; leaflets 7-24 pairs, 0.6-2.5 cm x 0.4-1.2 cm, turgid, oblong, obtuse, truncate at both ends, appressed hairy. Flowers in auxiliary racemes are shorter than leaves, pink or pinkish-white. Pods 1.5-5.0 cm x 0.8-1.5 cm, turgid, oblong, appressed hairy, with a sharp deflexed beak, silkytextured, 3 to 5-seeded.

Microscopic Description: Transverse section of seed shows testa about 75µ thick, greater parts being formed by epidermis, composed of radially, much elongated cells, arranged irregularly and measure 45-50 µ in length, Inner region of thin testa consists of collapsed cells forming a hyaline layer about 25 thick, endodermis composed of thick-walled µ cellulosic parenchyma, isodiametric cells larger towards inside, walls mainly of hemicellulose and swell considerably in water, outer one or two layers of cells of endodermis (pseudoepidermis) formed of rather smaller cells, walls of which swell to less extent in water.

Part Used: The roots, leaves and seeds of the plant are used medicinally.

Organoleptic Properties

Rasa (Taste)	: Tikta, Kasaya
Guna (Attribute)	: Laghu, Ruksa, Tiksna
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kesya, Vranapaha, Vatapittajvarapaha, Kandughna, Garbhanirodhaka


Fig. *Abrus precatorius* Linn.

Purity and Safety Test

Foreign matter	: Not more than 2%w/w
Total ash	: Not more than 3%w/w
Acid insoluble ash	: Not more than 0.5%w/w
Alcohol soluble extractive	: Not less than 3%w/w
Water soluble extractive	: Not less than 15%w/w

Microbial contamination : In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography:: In this qualitative identification using a ready-made aluminum plates of silica gel GF_{254} and using 3 different developing solvent systems for detection the plant alkaloids in fraction one (F-1) comparing with alkaloid standard(s) and detection by spraying with Dragendorff's spray reagent, $S2_k$: Chloroform: acetone: diethyl amine (50 : 40 :10), $S4_k$: Dichloromethane: methanol: water: formic acid: diethyl amine (72.3 : 25 : 2.5 : 0.1 : 0.1) and $S5_k$: Toluene: ethyl acetate: diethyl amine(70 : 20 : 10). Thin layer chromatography of different fractions F- 1 confirms the presence of indolic alkaloid abrine in fraction-1, and that alkaloid appeared as single spot by using the mobile phase systems ($S2_k$, $S4_k$ and $S5_k$). The spot of alkaloid have the same retention factor (Rf) value comparing with its corresponding standard after detection by the dragendorff's sparying reagent.

Mobile phases	**Rf value of abrine standard**	**Rf value of abrine alkaloid in (F-1)**
$S2_k$	0.4	0.38
$S4_k$	0.58	0.60
$S5_k$	0.24	0.23

Major Chemical Constituents: Several groups of secondary compounds have been isolated from this species, including alkaloids, steroids and other triterpenoids, isoflavanoquinones, anthocyanins, starch, tannin, protein, flavanoids, phenolic compound, fixed oil, amino acid and the flavones luteolin, abrectorin, orientin, isoorientin and desmethoxycentaureidin 7-0-rutinoside.

Therapeutic Usages: Kamoddeepana (increase sexual streagnth), Shukrajanana (promotes sperm production), Ruchya (increase taste), Visharana (anti-toxin), Vranahara (promote wound healing), Chakshushya (useful in improving eye sight), Keshya (improves quality of hair), Tvachya (improves quality of skin) and Balaprada (improves strength and immunity).

Pharmacological Study: Antidiabetic, antioxidative, neuroprotective, antiviral, anticonvulsant, antiepileptic, abortifacient, antiimplantation, antihelmintic, antidepression, memory enhancing, diuretic, antimicrobial, antiyeast, antiinflammatory, antiarthritic and analgesic, anticancer, anti fertility, antispermatogenic, anti estrogenic, antimalarial, antiallergic, antiasthmatics, anticataract activity.

Contraindications: Known allergy to the plants of the Leguminosae family. It has antifertility activity. It should not use in ascieties, pregnancy and lactation.

Adverse Effects: The poisoning by the seeds of Abrus precatorius has been reviewed and reported often in literature. Abrus poisoning generally causes severe vomiting and abdominal pain, bloody diarrhea, convulsions, and alteration of sensorium with depression of central nervous system.

Precautions: Do not use in a high dose or for longer periods of time. Strong precaution may be taken in diabetes and electrolyte imbalance. Over dose may cause death.

Dosage Forms: Crude drug, capsules, tablets and pills. Store in a well-closed container, protected from light and moisture.

Posology: 60-180 mg of the drug in powder form.

Formulations: Tribrityadi Mahagada, Gunjabhadra Ras

Lotakasturi

Botanical Name: *Hibiscus abelmoschus* Linn.

Family: Malvaceae

Synonyms:

Bangla	: লতাকস্তুরি (Latakasturi)
Hindi	: Kasturi Bhendi
Sanskrit	: Latakasturi, Katuka, Katukahvaya
Urdu/Unani/Tibb	:
English	: Musk mellow, Musk seed

Geographical Distribution: Abelmoschus is a genus of about fifteen species of flowering plants in the mallow family, Malvaceae, native to tropical and sub-tropical area including Africa, Asia and northern Australia. There are four known domesticated species of the genus Abelmoschus; among these, *A. esculentus* (common okra) is most widely cultivated in south and East Asia, Africa, and the southern USA. In the humid zone of west and central Africa, *A. caillei* (West African okra) with a longer production cycle, is also cultivated. Plants of *A. manihot* sometimes fail to flower and this species is extensively cultivated for leaves in Papua New Guinea, Solomon Islands and other South Pacific Islands. The fourth domesticated species, namely, *A. moschatus*, is cultivated for its seed, which is used for ambretee in India and several animism practices in south Togo and Benin.

Plant Descriptions

General Description: Abelmoschus moschatus Medik syn. Hibiscus abelmoschus Linn belonging to family Malvaceae, commonly known kasturibhendi (H), muskmallow, ambrette (E) is an aromatic and medicinal plant. It was formerly included within Hibiscus, but is now classified as a distinct genus. The genus comprises annual and perennial herbaceous plants, growing to 2 m tall.

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

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

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

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

Part Used: Seeds.

Fig. *Hibiscus abelmoschus* Linn.

Organoleptic Properties

Rasa (Taste)	: Madhura, Katu, Tikta
Guna (Attribute)	: Laghu
Virya (Potency)	: Sita
Vipaka (Metabolism)	: Madhura
Karma (Action)	: Caksusya, Kaphahara, Vrsya, Cedini, Mukha daurgandhya nasaka, Vasti Visodhani

Purity and Safety Test

Foreign matter	: Not more than 2%w/w
Total ash	: Not more than 5%w/w
Acid insoluble ash	: Not more than 0.3%w/w
Alcohol soluble extractive	: Not less than 10%w/w
Water soluble extractive	: Not less than 9 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total

yeast and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene: Ethylacetate (9: 1) under UV (366 nm) shows two fluorescent zones at Rf. 0.36 and 0.93 (both blue). On exposure to Iodine vapour five spots appear at Rf. 0.19, 0.31, 0.53, 0.71 and 0.93 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C five spots appear at Rf. 0.19, 0.31, 0.53, 0.71 and 0.93 (all grey). On spraying with 5% Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C five spots appear at Rf. 0.19, 0.31, 0.53, 0.71 and 0.93 (all grey).

Major Chemical Constituents: It is reported that 14 compounds are isolated and identified as 6-hydroxy-stigmasta-4-en-3-one (1), 6-hydroxy-stigmasta4,22-dien-3-one (2), stigmasta-5-en-3-ol-7-one (3), stigmasta-5, 22-dien-3-ol-7-one (4), stigmast-5-en-3, 7-diol (5), stigmast-5, 22-dien-3, 7-diol (6), stigmast-4, 22-dien-3, 6-dione (7), stigmasta-4, 22-dien-3-one (8), ergosta-7, 22-dien-3-ol (9), cycloart-25-en-3,24-diol (10), lupeol (11), aurantiamide acetate (12), stigmaste-rol (13), hexadecanoic acid (14). Compounds 1-12 are obtained from the genus Abelmoschus plant for the first time and also from the Malvaceae for the first time.

Therapeutic Usages: Basti vishodhini (cleanes urinary bladder), Vrushya (aphrodisiac, improves vigour), Chakshushya (improves vision, well for eyes, useful in eye disorders), Chedani (cutting in nature), Kaphahara (decrease kapha), useful in trushna (excessive thirst) and vastyama (urinary tract disorders).

Pharmacological Study: Anti inflammatory, larvicidal, antiviral, effect on nervous system, wound healing effects, antidiabetic, cyto-protective, antioxidant, anticancer, antimicrobial, immunomodulatory effects etc.

Contraindications: Known allergy to the plants of the Malvaceae family. It is contraindicated in constipation, planning to conceive, as it has antifertility activity, concomitant use of gonadotrophin hormone, Ascieties, Pregnancy and lactation.

Adverse Effects: This is likely safe when taken by mouth in amounts found in food. The safety of taking larger amounts by mouth or applying this to the skin is unknown. In some people, it may cause skin irritation.

Precautions: Do not use in a high dose or for longer periods of time. Caution should be taken in pregnancy and lactation.

Dosage Forms: Crude drug, capsules, tablets and pills. Store in a well-closed container, protected from light and moisture.

Posology: 2-4 gm of the drug in powder form.

Formulations: Grahani Ballav, Brihat Chandanadi Taila

Majuphal

Botanical Name: *Quercus infectoria* G. Olivier

Family: fagaceae

Vernacular name:

Bangla	: মাজুফল (Majuphal)
Hindi	: Maajoophal, Majuphal
Sanskrit	: Mayaphala
Urdu/Unani/Tibb	: Mazu, Mazuphal
English	: Oak-Gall

Geographical Distribution: Quercus infectoria is very mistreous beautiful herb belong the family of fagaceae called Majuphal in Bangla. It is very popular in many regions of the world as instant vagina tightening herb. For this it is used by the Korean and Chinese female from many years ago. The plant is found in Turkey, Syria, Persia, Cyprus and Greece. The various Quercus species originated in Iran, Iraq and Turkey, but are now widespread and particularly common in Asia Minor, Europe and North Africa and some parts of India (Garhwal Himalayas) and Nepal.

Plant Descriptions

General Description: Plant galls or cecidia are hypertrophic or hyperplasic cells, tissues, or organs induced by parasitic organisms. One of the most important hosts prone to such abnormal outgrowth is Quercus infectoria G. Olivier from family Fagaceae. Originated from Celtic language, Quercus means “beautiful tree”, and infectoria refers to the process of producing galls as an infection. The galls are excrescences on the twigs, resulting from insect attack of the growing, rudimentary leaves. A particular insect puncture the branches of the plant *Quercus infectoria* and lays eggs inside. A fluid secreted from the particular part and becomes globular in shape that is called as Mazu. It is hard, heavy and rounded. It has numerous rounded projections on the surface. But surface is clear in between projections. The outer surface is bluish green in colour while inside is yellowish or grayish white. There is a central small cavity inside the Mazu. It has no odour but very astringent in taste. It has been graded into two types: (i) heavier, outer surface bluish, non-perforated. It is best variety and more effective. (ii) white, lighter and perforated. The mature insect escapes into the air through a hole bored in the side of the gall.

Macroscopic Description: Galls are spherical or pear-shaped, hard and brittle 1.2 to 2.5 cm in diameter having a short basal stalk and numerous rounded projections on the upper part of the

gall; they usually sink in water; surface, smooth, rather shining, bluish-green, olive green or white brown.

Bark is slightly grayish in colour. Leaves are rigid, glabrescent with spinous teeth measuring 4-6 cm in length; acorns cylindrical. They are alternate, short petiolate, elongate, sinuate, roughly thorny-tipped serrate. Flowers are unisexual. The male flowers are tangled into hanging, axillary catkins, with 6-8 tepaledperigone and 6 to 10 stamens. The female flowers are single or in small groups in the leaf axils of dropping stipules. The perigone is 6-tipped with aninferior 3 chambered ovary surrounded by an initially inconspicuous and thenlater cup shaped cupula. Fruits are globose, 0.63 cm, lemon in colour and tingledyellow. They are up to 4 cm long, cylindrical, shiny brown and are three timeslonger than the cupula and are covered with the narrow scale.

Fig. *Quercus infectoria* G. Olivier

Microscopic Description: Gall shows outer most zone of small thin-walled parenchymatous cells, irregular in shape; a ring of large, oval-shaped sclerenchymatous cells and a small inner zone of thick-walled parenchymatous cells present near the central cavity; outer zone of the parenchyma differentiated into three type of cells; uppermost small, irregular, thin walled, middle large, oval, and inner long parenchymatous cells, all having intercellular spaces; vascular bundles irregularly distributed in this region, consisting of small patches of xylem and phloem; vessels with spiral and reticulate thickening; around the central cavity, a ring of sclerenchyma of great variation in shape and size, present, with rectangular, ovoid, elongated, small sclereids, having heavily thickened striated walls with numerous pits, lumen large, usually filled with dense brown material, large sclereids are much elongated; a few rosette crystals of calcium oxalate in outer and middle region and prismatic crystals in inner parenchymatous cells present; starch grains simple and compound with central hilum, compound grains consisting of 2 to 5 or sometimes more

components, simple grains round to oval, measuring upto 25 µ in dia, present abundantly in innermost zone of parenchyma.

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

Part Used: Galls

Organoleptic Properties

Rasa (Taste)	: Kasaya (Astringent)
Guna (Attribute)	: Laghu (Light), Ruksha (Dry)
Virya (Potency)	: Sheeta (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kaphahara, Pittahara, Dipaniya, Grahi

Purity and Safety Test

Foreign matter	: Not more than % w/w
Total ash	: Not more than 2% w/w
Acid insoluble ash	: Not more than 0.5% w/w
Alcohol soluble extractive	: Not less than 60% w/w
Water soluble extractive	: Not less than 55 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of the alcoholic extract on Silica gel 'G' using Chloroform: Ethylacetate: Formic acid (5:4:1) shows in visible light three spots at Rf. 0.60, 0.69 & 0.78 (all grey). Under U.V. (366 nm) three fluorescent zones are visible at Rf. 0.60, 0.69 & 0.78 (all grey). On exposure to Iodine vapour five spots appear at Rf. 0.60, 0.69, 0.78, 0.84 & 0.96 (all yellow). On spraying with Ferric chloride reagent four spots appear at Rf. 0.13, 0.60, 0.69 & 0.78 (all greyish blue).

Major Chemical Constituents: Phytochemical screening of galls shows the presence of saponins, alkaloids, tannins, glycosides, triterpenes, sterols, phenolic compounds, carbohydrates, and flavonoids. The main constituents found in the galls of QI are tannin (50–70%), gallic acid, and ellagic acid.

Therapeutic Usages: Arsa (piles), atisara (diahhhoea), grahani (IBS), Pravahika (dysentery), Sveta Pradara (leucorrhoea), alopecia (bladness), Bhagandar (anal fissure), Kasa (bronchitis), Agnimandya (dyspepsia), Jwara (fever) etc.

Pharmacological Study: Analgesic, antidote, anti-inflammatory, antipyretic, antiseptic, antistomatitis, deodorant, derivative, desiccant, expectorant, germicidal, hypnotic, hypoglycaemic, powerful astringent, sedative, styptic, tonic, tonic to teeth and wound healing, antimicrobial, analgesic, and antioxidant activity, antioxidant properties, antioxidant, antimicrobial, and healing activity.

Contraindications: Known allergy to the plants of the Fagaceae family. Manjakani is not suitable in Excessive vaginal dryness, Constipation, Dry Skin, Skin irritation, Cuts and rashes.

Adverse Effects: The side effects of Manjakani are rare. The high doses of Manjakani can cause Constipation (common), Nausea, Vomitting, Malnutrition (when used for long-term in high doses: High tannin content when taken in extremely high doses can cause slow absorption of nutrients from the foods, which can cause a deficiency of several nutrients), Anemia (when used for long-term in high doses).

Precautions: Do not use in a high dose or for longer periods of time. Manjakani should not be used during pregnancy because it could cause congenital birth defects. The internal use of Manjakani should be avoided by lactating mothers because the safety profile is yet unknown.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: 1-3 gm of the drug in powder form**.** Children: 125 mg to 500 mg, Adults: 250 mg to 1000 mg. The maximum dosage should not exceed 6 grams per day. The recommended treatment duration with Manjakani (Quercus Infectoria) ranges from 3 days to 3 months.

Formulations: Madayantyadi Churna

Manasasij

Botanical Name: *Euphorbia neriifolia* Linn.

Family: Euphorbiaceae

Synonyms:

Bangla	: মনষাশিজ (Manasasij)
Hindi	: Thuhar, Sehunda
Sanskrit	: Sudha, Vajradruma, Snuk
Urdu/Unani/Tibb	:
English	: Milkhedge

Geographical Distribution: Euphorbia neriifolia grows widely around the dry, rocky and hilly areas of north, central and south India. Euphorbia neriifolia is found throughout the Deccan Peninsula of India. It is indigenous plant of South Asia, but now locally cultivated and naturalising in Srilanka, India, Burma (Myanmar), Bangladesh, Thailand and throughout the Malaysian region except for Borneo; also occasionally cultivated in other topical regions. It is also found in E. Asia.

Plant Descriptions:

General Description: Euphorbia neriifolia belonging to the family Euphorbiaceae consists of 5 sub-families, 49 tribes, 317 genera and 800 species. There are about half dozen species of *Euphorbia* genus are under the name of snuk and it synonyms. *Euphorbia neriifolia* is a xerophytic, erect, prickly, succulent, fleshy, large, much branched shrub, which sometimes grows into a small tree of 2-6 metres height or more with rounded branches. The tree looks somewhat like a cactus. It is characterized by the presence of white milky latex that exudes when broken and which is more or less toxic. The Euphorbias are named after a Greek surgeon called Euphorbus. He was physician of Juba II who was the Romanised king of a North African kingdom, and is supposed to have used their milky latex as an ingredient for his potions. Full exposure to the sun needs for cultivation but can also succeed to grow in light shade. They prefer rocky areas for the growth. They need well drained soil. Grows well in dry place and rocky area.

Macroscopic Description: E. neriifolia is glabrous erect branched succulent, xerophytic tree or shrub up to 20 ft or 1.8–4.5 m high with jointed cylindrical or obscurely 5-angled branches. The fresh young leaves are simple, dark green in colour having leathery texture. The surface is glabrous with reticulate venation. The average leaf size is (8–14 ± 2) cm (length) and (4–8 ± 2) cm (breadth)

and (1.3 ± 0.2) mm (thickness) with pointed and acute tip [10]. Peri-clinical divisions in the third and fourth layers of peripheral meristem initiate the leaf. The trunk is covered with reticulate bark. Stem is cylindrical, succulent, and glabrous; internodes are 4–10 cm in length and 2–6 cm in diameter. Nodes are constricted 1–4 cm in diameter which show spirally running rows of tubercles inserted on flat and creamish white corky bases. A small circular gland is being located at the base of the tubercle. The nodal region shows shorter spines having 1–5 mm length and a bud adjacent to it. Taste is acrid or astringent. Dried stems are tough, shrivelled, longitudinally ridged, furrowed and wrinkled. It is easily breakable at the node which exposing hollow pith attached with white parenchymatous papery scales.

Microscopic Description: Transverse section shows a single layered epidermis composed of squarish, thin walled, parenchymatous cells, followed by a thick zone of cortex, differentiated into two parts, outer of thin walled, rectangular, oval and oblong parenchymatous cells of about 20 layers depth, inner wider zone, consisting of about 30-40 layers of thin-walled, oblong or ovoid, elongated parenchymatous cells having a number of rounded and oval latex cells, some contain dark yellowish latex, the number of latex cells gradually reduce towards outer side, below cortex, about 10 layers of phloem present, containing group of fibres towards cortex, xylem consists of vessels, tracheids, fibres and xylem parenchyma, pith consists of thin-walled, rounded or oval, parenchymatous cells, starch and calcium oxalate crystals absent.

Powder- Cream yellow, under microscope shows, vessels, fibres and cortical cells, starch and calcium oxalate crystals absent.

Part Used: Roots, leaf and milky latex

Fig. *Euphorbia neriifolia Linn.*

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter)
Guna (Attribute)	: Guru, Tiksna (Strong)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Bhedana, Tiknavirecana, Amakaphavatahara

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 8% w/w
Acid insoluble ash	: Not more than 1% w/w
Alcohol soluble extractive	: Not less than 5% w/w
Water soluble extractive	: Not less than 15 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: Small quantities of samples (2 mg/ml) were dissolved in their respective solvents. Quercetin (1 mg) standard was dissolved in methanol. Different mobile phases with varying concentrations were employed in the screening programme and selected the one in which separation of flavonoid was clear: n-butanol: acetic acid: water (2:2:6). All plates were visualized directly after drying and with the help of UV at 254 nm and 366 nm in UV TLC viewer. The Rf value of the different spots that were observed was calculated. Out of all the n-butanol: acetic acid: water (BAW, 2: 2: 6) was found to be the most appropriate solvent system for separation of

flavonoids from ethanol extract of EN. After TLC three spots resolved that were nomenclatured as F1, F2 and F3 have Rf values of 0.60, 0.79 and 0.90 respectively.

Major Chemical Constituents: Phytochemical screenings of hydro-ethanolic, petroleum ether, benzene, chloroform, ethyl acetate, ethanol and aqueous extracts mainly revealed the presence of proteins, glycosides, alkaloids, phenolics, flavonoids, saponins, and terpenoids of tannins, reducing sugar, triterpenoidal saponin, alkaloids mucilage, carbohydrates, calcium oxalate, quercetin, gallic acid and traces of essential oil.

Therapeutic Usages: Deepana (improves digestion), Rechana (induces severe purgation), Anilapaha – vatahara (useful in treating disorders of vata dosha imbalance such as neuralgia, paralysis, constipation, bloating etc). It is indicated in Sotha, Gulma, Kustha, Meha, Udararoga, Unmada (Schizophrenia), Arsha and Meda (Obesity), anal-fistula.

Pharmacological Study: Analgesic, antiinflammatory, mild CNS depressant, wound healing activity along with humoral and cell mediated immunostimulating activity, antioxidant activity, antiseptic, diuretic.

Contraindications: Known allergy to the plants of the Euphorbiaceae family. It is contraindicated in hepatic and renal disease, diarrhea and pregnancy.

Adverse Effects: Excess use of Snuhi can cause severe purgation and if the milk of the plant falls to the eye, it may casues blindness. Toxicological studies indicated various pathological changes in the liver, heart and kidney

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills. Store in a well-closed container, protected from light and moisture.

Posology: 125 -250 mg of the drug in powder form. Stem juice- 5 to 10 ml. Milky latex- 125-250 mg Sodhana of this drug is to be done before use as described in appendix.

Formulations: Mahasnakha Drabak, Avya Lavana, Brihat Kasisadya Taila

Mash Kalai

Botanical Name: *Phaseolus radiatus* Linn.

Family: Leguminosae

Synonyms:

Bangla	: মাষ কালাই (Mash Kalai)
Hindi	: Munga
Sanskrit	: Mudga
Urdu/Unani/Tibb	: Moong
English	: Green Gram

Geographical Distribution: The mung bean is native to southwest Asia, where its was first cultivated 5000 years ago. Currently it grown in India, Pakistan, Iran, Burma, China, Vietnam, Japan and Bangladesh. It is also grown in Tadzhikistan, Transcaucasia, and southern Kazakhstan. Around 45% of the total world mungbean production is in India. In China, mungbean is grown in about.0.5 million hactor per year with an average of 2 ton/hactor yield. In Thailand and the Philippines, mungbean is the most important grain legume; in Sri Lanka it ranks second, while in India, Burma, Bangladesh and Indonesia it is the third most important grain legume.

Plant Descriptions:

General Description: Phaseolus is a species of annual herbaceous plants of the Phaseolus genus of the Leguminosae family. It is originated from the wild species *P. sublobatus*. There are three subspecies *Phaseolus indicus*, *Phaseolus chinensis*, and *Phaseolus Iranicus*. The mung bean is 25-

100 cm tall and very hairy, with a ramose stem that is erect, decumbent, or procumbent, and a tapr oot. Mungbean matures in about 60 to 70 days after sowing. The plants are heat and moisture loving. It is planted in the spring or after the harvest. In India, mungbean is used as a pulse in the preparation of "dahl", a soup porridge eaten with a cereal or other traditional cuisines, and is a main protein source for the vegetarian diet. In other Asian countries, mungbean is used for bean sprouts, starch noodles, mungbean soup, and deep fried patties of different kinds. Mungbean is known for its easy digestibility and low flatus production compared to other pulses. The green pods and seeds may be used as vegetables.

Macroscopic Description:

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

A key to identify four Asiatic Vigna species is given below:

A. Geiinination epigeal and petiole of primary leaves short

a. Hilum not concave - V. radiata (mungbean) b. Hilum concave -V. mungo (blackgram)

B. Germination hypogeal and petiole of primary leaves long

a. Hilum not concave - V. angularis (adzukibean) b. Hilum concave - V. umbellata (ricebean)

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

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

Part Used: Flowers, Seeds and oil.


Fig. *Phaseolus radiatus* Linn.

Organoleptic Properties

Rasa (Taste)	: Madhura, Kasaya
Guna (Attribute)	: Laghu, Ruksa
Virya (Potency)	: Sita
Vipaka (Metabolism)	: Madhura

Karma (Action)	: Grahi, Kaphahara, Pittahara, Varnya, Balaprada, Netrya
Purity and Safety Test	
Foreign matter	: Not more than 1%w/w
Total ash	: Not more than 4%w/w
Acid insoluble ash	: Not more than 1%w/w
Alcohol soluble extractive	: Not less than 1.5%w/w
Water soluble extractive	: Not less than10 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

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

Major Chemical Constituents: The mung bean is rich in polyphenolics. The major phenolic constituents in the mung bean are phenolic acids (1.81–5.97 mg rutin equivalent/g), flavonoids (1.49–1.78 mg catechin equivalent/g), and tannins (1.00–5.75 mg/g). As the main secondary metabolite in plants, phenolic acids can be divided into hydroxycinnamic acids and hydroxybenzoic acids, according to their chemical structure. To date, five hydroxycinnamic acids and three hydroxybenzoic acids have been identified in the mung bean. Caffeic, p-coumaric, and t-ferulic acids are the most common hydroxycinnamic acids in the mung bean, while gallic acid is the most frequently occurring

hydroxybenzoic acid. In addition, phenolic acids are mainly present in free or bound forms in plant cells. Bound phenolics are considered to exert a greater effect on health benefits, because they are more likely to escape from upper gastrointestinal digestion, along with cell wall materials, and are absorbed into blood plasma through microflora digestion activity.

Therapeutic Usages: Agnimandya (loss of appetite), Arochaka (anorexia), Amlapitta (hyperacidity), Atisara (diarrhoea), Pravahika (dysentary), Grahani (irritable bowel syndrome,), Chardi (emesis), Kamala (jaundice), Sthoulya (obesity), Prameha (urinary diseases), Pratishyaya (rhinitis), Shvasa (dyspnoea), Kasa (cough), Rajayakshma (pthisis), Kushta (skin diseases), Sheetapitta (urticaria), Shotha (inflammatory conditions), Vidradhi (abscess), Arsha (haemorrhoids) etc.

Pharmacological Study: Antioxidant effects, antimicrobial, anti-inflammatory, antidiabetic effects, lipid metabolism accommodation, antihypertensive, antitumor effects, antifungal activities.

Contraindications: Known allergy to the plants of the Leguminosae family.

Adverse Effects: It is superior functional foods. There are no known adverse effects in recommended therapeutic dose.

Precautions: Do not use in a high dose or for longer periods of time. Caution should be taken in pregnancy and lactation, concomitant use of antidiabetics and antihypertensive drugs.

Dosage Forms: Crude drug, capsules, tablets and pills. Store in a well-closed container, protected from light and moisture.

Posology: Juice of flower 50-100 gm. for yusa.

Formulations: Mashbaladi Kwath, Sri Kameswar Modak, Kamdev Grita, Mahamash Taila.

Maynaphal

Botanical Name: *Randia dumetorum* Lam.

Family: Rubiaceae

Synonyms:

Bangla	: ময়নাফল (Mayanaphal)
Hindi	: Manphal
Sanskrit	: Madani
Urdu/Unani/Tibb	: Mainphal, Jauz-ul-Qai
English	: Emetic nut

Geographical Distribution: Mainphal, Madan, Emetic nut tree are few common names of the plant Randia dumetorum (synonym xeromphis spinosa) Keay, a thorny shrub belongs to family Rubiaceae and is seen in tropical and subtropical regions. This tree is found almost throughout India up to 4, 000 ft attitude. In Bangladesh it is distributed mainly in humid and temperate climatic zones of hilly areas of Tangail, Bagura and Chattagram.

Plant Descriptions:

General Description: The plant is enlisted in Ayurvedic Pharmacopoeia of India. Being widely used in Ayurveda from 4 B.C onwards, the plant finds mention in Carakasamhita under asthapanopaga, anuvasanopaga, and vamanadravya and phalini dravya varga. Susrutasamhita too mentions the same under aragvadhadivarga, mushkakadi, urdhvabhagahara groups Madanakalpa a chapter dedicated to *Randia dumetorum* proclaims that "madanaphala" is the best and safe emetic drug available for therapeutic purposes. The text recommends very specific time, method of harvesting the fruits and further processing them before employing for therapeutic purposes.

Macroscopic Description: A large deciduous thorny shrub grows up to 5 meters of height. Leaves are simple, obovate, wrinkled, shiny and pubescent. Fruits are 1.8-4.5 cm long, globose or broadly ovoid, longitudinally ribbed or smooth yellowish-brown in color and crowned with

persistent calyx-limb. Fruit contains numerous seeds, 0.4-0.6 cm long, compressed, smooth, brown and very hard. Flowers are white, fragrant, solitary, seen on at the end of short branches.

Microscopic Description: Trasnverse section of fruit shows epicarp consisting of single layered epidermis, sometimes obliterated in surface view, epidermal cells thin-walled and polygonal, mesocarp, broad zone consisting of thin-walled, parenchyamatous cells, some cells contain reddish-brown content, a number of vascular bundles found embedded in this zone, endocarp stony consisting of light yellow polygonal, sclerenchymatous cells of variable shape and size. Transverse section of seed shows a seed coat, consisting of single layered, rounded to oval epidermal cells, a few layers of yellowish-brown pigmented cells, endosperm forms bulk of seed consisting of large oval and irregular shaped parenchymatous cells, albumen horny, transluscent, cells of outermost layer smaller in size.

Powder: Powder is reddish brown, under microscope shows numerous, large, irregular, reddish brown cells sclereids of variable shape and size, pieces of xylem vessels with reticulate thickenings, thin- walled, crushed parenchymatous cells and yellow-orange pieces of seed coat.

Part Used: Roots and fruits

Organoleptic Properties

Rasa (Taste)	: Madhura, Tikta
Guna (Attribute)	: Laghu (Light), Ruksha (Dry)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Vamana, Lekhana

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 6% w/w
Acid insoluble ash	: Not more than 0.25% w/w
Alcohol soluble extractive	: Not less than 19% w/w
Water soluble extractive	: Not less than 16 %w/w

Fig. *Randia dumetorum*

Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: Two g of sample was soaked overnight in 20 ml of 90 % ethanol. The solutions were continuously stirred for 6 hrs and kept for next 18 hrs. Next day altered the samples, dried and 10 % solution. Seven µl of the solution was applied on Merck Aluminium plate pre-coated with silicagel 60 F_{254} of 0.2mm thickness. The plate was developed in Toluene: Ethyl acetate: Acetic Acid=5.0:4.2:0.8, dried and visualized in UV 254 nm and 366 nm. Then the plate was placed in iodine chamber till the colour of the spots appeared. The ethanol extracts under UV 254 nm showed 2 spots at Rf value 0.53 and 0.68 (green colour); under UV 366 nm, showed 2 spots at Rf 0.50 and 0.62 (blue) and, after derivatization, with showed 1 spot at Rf 0.54.

Major Chemical Constituents: Root bark of Randia dumetorum contains triterpene, -1- keto-3-hydroxyoleanane, mannitol, saponins, and coumarin glycosides. Leaves contain an iridoid-10-methylixoside. Ripe fruit contains glycosides, randioside A, mollisidial triterpenoid glycosides and randianin, six saponinsdumetoronins A to F. Saponins named as dumentoronin from fruit pulp of Randia dumetorum Dumetoronin A, B, C, D, E and F etc.

Therapeutic Usages: Gulma, kustha, vidradhi, slesmajvara, pratisyaya, ulcers, asthma, flatulence, colic, emesis therapy (treating by inducing vomiting), diarrhoea and dysentery.

Pharmacological Study: Antibacterial, antiallergic, antiinflammatory, analgesic, antispasmodic, abortifacient, anodyne, expectorant and immunomodulatory activity.

Contraindications: Known allergy to the plants of the Asparagaceae family. It is contraindicated in hepatic and renal disease and pregnancy. The fruit of the plant has abortifacient properties.

Adverse Effects: Its excessive dose may cause vomiting, diarrhea, indigestion and anorexia.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills. Store in a well-closed container, protected from light and moisture.

Posology: 0.5 -1.0 gm of the drug in powder form for decoction. 3- 6 gm of the drug for induction of vomiting.

Inducing vomiting

- In hot water, add Mainphal seed powder, Sendha namak (each 6 g) and Pippali churna (1 g). Drink this to induce vomiting to get relief from excessive Pitta and kapha.
- Soak Mainphal seed powder (3-6g) in water (25 ml) for an hour. Grind in mortar and pestle. Add honey and sendha namak and drink empty stomach.
- The powder of seeds in a dose of 2-4 grams with water can also be used.

Formulations: Sri Kameswar Modak.

Mithabish

Botanical Name: *Aconitum ferox* Wall. ex Ser.

Family: Ranunculaceae

Synonyms:

Bangla	: মিঠা বিষ/ বৎসনাভ (Mithabish/Vatsanabha)
Hindi	: Bisa, Meethabisha, Bachhnaag, Teliya Bish
Sanskrit	: Amra, Visa Vajranaga, Sthavaravisa, Vatsanagaka
Urdu/Unani/Tibb	: Bachnak, Mithalelia, Beesh, Atees
English	: Aconite, Indian Aconite, Monk's hood

Geographical Distribution: The plants grow well in woodlands, gardens and moderately shaded areas. It grows well in heavy clay soils and prefers a moist calcareous soil in sun or semi-shade. The species is naturally available in the lower alpine region, ranging from 2100-4500 m and is commonly found within the altitudinal range of 3000-3500 m. The plant is generally found in the Himalayas covering the states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, West Bengal (Darjeeling), Assam and Arunachal Pradesh of India. The density of the plant is higher in the stretch from Central Nepal to Bhutan.

Plant Descriptions:

General Description: Aconite is a Greek word meaning arrow (Acron). The arrows were coated with this poison and used. Hence the name is aconite. It was used as an arrow poison early in Chinese history'. Aconite is one of the oldest known drugs and is of two different kinds viz., poisonous and non-poisonous. Among the poisonous varieties both A. ferox and A. Chasmanthum are used as Vatsanãbhi/Visa in India. Vatsanabha or Mahavisha is the plant of Ranunculaceae family, a species of monk's hood which is a deciduous perennial with tall and erect stems crowned by racemes of large eye catching blue, purple, white zygomorphic flowers with numerous stamens. Vatsanabha is also identified as Vatsanaga, Ksweda, Visa and Amrita. Classically, Charaka has categorized Vatsanabha under Sthavara Visha, Susruta under Kanda Visha and Kaiyadeva nighantu under Visha Varga. All parts of the plants are poisonous. Tuber is chiefly used as a poison. Leaves handled or rubbed on the skin, produces tingling and numbness. The odor of the

plant has a nar cotic effect; its pollen causes pain and swelling in the eyes. It imparts a sensation of tingling & numbness to the tongue, lips & mouth when chewed.

Varieties & adulterants: There are many herbs under genus aconitum that may make confusion and adulteration also. Some confusing or controversial herbs are sringi visha, A. heterophyllum - prativisa.

Macroscopic Description:

It is a perennial herb.

Roots— paired; daughter-tuber ovoid- oblong to ellipsoid, 2.5-4 cm long, about 1-1.5 cm thick, with filiform root-fibers, lark brown externally, yellowish on fracture; another-tuber much shrunk and wrinkled with more numerous root-fibers.

Stem— erect, with or without a slender, hypogynous base, simple, 40-90 cm high, covered with short spreading yellow hairs in the upper part and glabrous below.

Leaves— scattered, distant, glabrous; petioles slender upto 25cm; blade orbicular-cordate to reniform in outline with a rather wide sinus; palmately 5-lobed.

Inflorescence— peduncle straight, bearing flowers on both sides; flowers pale dirty blue, borne in a dense terminal raceme, 10-25 cm long; helmet-vaulted with a short sharp beak, resembling a pea flower.

Fruits— carpels 5, tomentose; follicles oblong, 15-20 mm long and 4-5 mm. broad; seeds obovoid to obpyramidal, 2.6-3 mm. long, winged along with the raphe.

Microscopic Description:

Root -Shows epidermis 1-3 layered, suberised, papillose on outside, primary cortex consisting of 8-10 layers of oval to tangentially elongated, thin-walled, parenchymatous cells, without or with a few intercellular spaces, a few rectangular or triangular stone cells in singles found scattered in this zone; primary cortex separated by distinct endodermis; inner bark parenchymatous, consisting of round to oval cells, containing a few groups of phloem strands, occupying more than half the radius; cambium having 6 - 10 angles; xylem vessels arranged almost in a ring, some scattered, often forming 'V' shaped ring, enclosing xylem parenchyma in older portions; bundles compact often wedge-shaped having acute apex; xylem exarch, metaxylem vessels met in centre; starch grains simple measuring 6-18 in dia. and compound grains consisting of 2-5µ components with hilum in centre, present in cortical cells, phloem parenchyma and xylem parenchyma.

Powder - Light grey; shows vessels, a few aseptate fibres, and numerous simple and compound starch grains having hilum in the centre, single grain measuring 6-18 µ in dia.

Part Used: The tuberous root is medicinally used in various preparations. Both the ancient and modern descriptions indicate that the collection of root is preferred during winter.

Organoleptic Properties

Rasa (Taste)	: Madhura
Guna (Attribute)	: Vikasi, Viyavayi, Laghu, Ruksa, Usna, Tiksna, Yogavahi
Virya (Potency)	: Usna
Vipaka (Metabolism)	: Madhura
Karma (Action)	: Rasayana, Tridosahara, Svedala, Pittasantapakaraka


Fig. *Aconitum ferox* Wall. ex Ser.

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 5.5% w/w
Acid insoluble ash	: Not more than 2% w/w
Alcohol soluble extractive	: Not less than 8% w/w
Water soluble extractive	: Not less than 24 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Chloroform: Methanol (90:10) shows six spots at Rf. 0.10, 0.20, 0.39, 0.56, 0.74 and 0.96 (all yellow) on exposure to Iodine vapour. On spraying with Dragendorff reagent two spots appear at Rf. 0.39 and 0.96 (both orange).

Major Chemical Constituents: The tuber of Vatsanabha contains 0.4–0.8% diterpene alkaloids and the concentration of aconite in the fresh plant is between 0.3% and 2.0% in tubers and 0.2% and 1.2% in the leaves. The highest concentration of aconite is found in the winter. The major alkaloids are aconitine, pseudaconitine, bikhaconitine, diacetyl pseudaconitine, aconine, picro-aconine, veratry pseudaconitine, chamaconitine, veratryl gama aconine, and di-Ac–Y-aconitine.

Therapeutic Usages: Fever, rheumatoid arthritis, sciatica, diabetes, gout, paralysis, asthma, colic and hypertension and also acts as a rasayana

Pharmacological Study: Analgesic, antiinflammatory, antimicrobial, anaesthetic, antiarthritic, diuretic, stimulant, antihelminthic, anticarcinogenic and hepatoprotective activities.

Contraindications: Known allergy to the plants of the Ranunculaceae family. This is a very poisonous plant and should only be used with extreme caution and under the supervision of a qualified practitioner. It is strongly contraindicated in acidosis, hypokalemia, hypertension, arrhythmias and the convulsions.

Adverse Effects: Palpitation, hypertension, and ventricular ectopics/arrhythmias,nausea, salivation, pain in stomach, vomiting, and diarrhea may develop. Paresthesia and tingling and numbness in the lips were also noted in few cases. Impure or impurely purified Vatsnabha if administered in any form will cause Daha (acute burning sensation) all over the body. It may also cause Murcha (Syncope), Hrutrodana (cardiac arrest) which may usually lead to Mrutyu (death) of patient. Use of Vatsnabha in higher dose may also lead to toxicity and death.

Precautions: It is dangerous to exceed the normal dose. Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills. Store in a well-closed container, protected from light and moisture.

Posology: 15 - 30 mgs of the drug in powder form. The fatal dose is 1 g of root, 250 mg of root extract, 20 drops of tincture extract, and 3 to 5 mg (average 4 mg) of the alkaloid aconitine. The fatal period is 3–24 h (average, 6 h).

Formulations: Mahasankha Bati, Brihat Vat Gajangkush, Nogendra Bati, Agnitundi Bati, Agnikumar Ras, Brihat, Sanjibani bati, Mritasanjibani Bati, Mritunjoy Ras, Kaphaketu.

Mohuaful

Botanical Name: *Madhuca longifolia* (L.) J. F. Macbr.

Family: Sapotaceae

Synonyms:

Bangla	: মহুয়া (Mahuwa)
Hindi	: Mahuwa
Sanskrit	: Gudapuspa
Urdu/Unani/Tibb	: Mahuva
English	: The Indian Butter tree, Mahawash tree

Geographical Distribution: Madhuca Indica is a forest tree found in central and northern India and Malaysia. It is commonly observed in various parts of the Indian sub-continent, including Bangladesh. Within India it is distributed in the peninsula region. It is often planted as an avenue tree along the road sides and in temples.

Plant Descriptions

General Description: Butter tree is a deciduous tree with a large, spreading, rounded crown that can grow 16 metres or more tall. The short bole can be 80 cm in diameter. It is commonly harvested from the wild and is also often cultivated in the tropics. It grows in areas where annual daytime temperatures are within the range 2 - 46°c. It grows best where the mean annual rainfall is between 550 - 1,500 mm. requires a sunny position and prefers a deep loamy or sandy-loam soil with good drainage. Flowering of this medium sized tree take place during the season of March to April, in every years. A long-lived tree, it commences bearing when about 10 years old. A full grown tree can produce up to 90 kg of flowers in a year.

Macroscopic Description: A medium sized to large deciduous tree, usually with a short, hole and large rounded crown found throughout the green forest part of India and Bangladesh. Stem bark is quilled, 3-4 cm in thickness. Outer surface is grayish brown with deep vertical cracks exfoliating in scales. Inner bark when fresh is deep pinkish red in colour, on drying it turns brown with striations

of milky latex. It has fibrous fracture, without any odour and with astringent taste. Leaves are 10-30-centimeter-long, are thick and leathery most of leaves pointed at the tip, clustescent glabrred near end of branches epileptic or elliptic oblong 7.5 to 23 cm into 3.8 to 11.5 cm. Flowers are small and fleshy, dull or pale white in color and in define fascicles near end of branches. Fruits are 2-6 cm long, fleshy and greenish.

Microscopic Description:

Corolla: There is a single layer of epidermis in the petal. Beneath the epidermis lie irregularly shaped and thin-walled parenchyma cells. In the parenchymatous tissues lie the scattered vascular bundles. Androecium: 4 pollen chambers are present inside the anther and in the centre of these pollen chambers lay cells of connective tissue. The epidermis of androecium is single layered and has a thin cuticle. Endothecium: It has oval, radially elongated lignified cells. Tapetum is not distinct.

Pollen grains: These are single or found in groups, spherical in shape, with clear exine and intine walls scattered in the pollen sac, a few cells of the vascular bundles are observed inside the connective tissues.

Powder study: Powdered bark is brown, non aromatic, astringent and coarse in texture. Microscopically, the powder shows: cork cells, cortical cells, stone cells, crystal fibers, tannin filled cells, fibers, starch grains of simple and compound types, calcium oxalate crystals are prism shaped, phloem fibers and sclerenchymatous patches are thick walled, internally simple pitted.

Part Used: Flowers, Seeds and oil.

Organoleptic Properties

Rasa (Taste)	: Madhura
Guna (Attribute)	: Guru
Virya (Potency)	: Sita
Vipaka (Metabolism)	: Madhura
Karma (Action)	: Sukrala, Balya, Pittakara, Vatahara, Sramahara, Ahrdya.

Purity and Safety Test

Foreign matter	: Not more than 2%w/w
Total ash	: Not more than 5%w/w
Acid insoluble ash	: Not more than 0.5%w/w
Alcohol soluble extractive	: Not less than 25%w/w
Water soluble extractive	: Not less than70 %w/w

Fig. *Madhuca longifolia* (L.) J. F. Macbr.

Microbial contamination : In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: Methanolic extract were prepared by using 90% v/v methanol and 5 gm powder sample. The concentrated extracts were dropped into 25 ml acetone with constant stirring to precipitate the saponins. The precipitate obtained was filtered, collected and dried at 105°C. For TLC dried residue was dissolved in methanol and the standard saponin was also dissolved in methanol (2mg/ml). Both the samples were loaded on silica gel 60F (E Merck). The plate was developed using,

chloroform: glacial acetic acid: methanol: water (6: 3.2: 1.2: 0.8). The plate was sprayed with Anisaldehyde sulphuric acid. The sample of plant extract gave Rf value of 0.2 and the standard saponin also revealed Rf value at 0.2.

Major Chemical Constituents: It has been reported that Mahua consists of phenols, flavonoids like quercitin. Leaves are composed of quercetin, β-carotene, erthrodiol, palmitic acid, myricetin, 3-O-arabionoside, 3-O-Lrhamnoside, quercitin, 3-galactoside, xanthophylls, 3 βpalmitoxy-olean-12-en-28-ol, oleanolic acid, β-sitosterol, stigmasterol, β-sitosterol, n-octacosanol. Bark is composed of ethylcinnamate, sesquiterpene alcohol, α and β-amyrin acetates, 3 β-monocaprylic ester of erythrodiol and 3 β-capryloxy oleanolic acid, α-tocopherol. Seeds are composed of quercetin, oleic, linoleic, arachidic, stearic and palmitic aids, aspartic acid, isoleucine, leucine, cystine, α-alanine, proline, threonine, Mi-saponin A and B and myricetin. Mahua fruit consist of -hexacosanol, β-sitosterol and its 3β-D- n glucoside. Vitamins like A & C are found in Mahua flowers.

Therapeutic Usages: Tuberculosis, rheumatoid arthritis, cholera, paralysis, snake-bite, debility, tonsillitis, influenza, piles, arthritic pain, helminthiasis, low semen count, headache, flatulency, and infections, besides being used as a blood purifier and as an antidote to poison.

Pharmacological Study: antihyperglycemic, anti-inflammatory, antimicrobial, antibacterial, analgesic, diuretic, aphrodisiac, demulcent, astringent and cooling.

Contraindications: Known allergy to the plants of the Sapotaceae family.

Adverse Effects: No toxic signs or mortality were observed during the experimental period. The LD50 of the haemal extracts was determined to be greater than 2000 mg kg−1 b.w. However excess dose of mahua oil may lead to antifertility effect as reported by European Food Safety Association. It suggests that it causes testicula atrophy and degenerative changes in rats; whereas, no mutagenic or genetic toxicity has been reported in literature till date.

Precautions: Do not use in a high dose or for longer periods of time. Caution should be taken in pregnancy and lactation.

Dosage Forms: Crude drug, capsules, tablets and pills. Store in a well-closed container, protected from light and moisture.

Posology: Juice of flower 10–15 ml, Decoction of bark: 50 –75 ml

Formulations: Madhukasav, Undami, Aravindasav, Abyarista.

Murba

Botanical Name: *Sansevieria roxburghiana* Schult. & Schult

Family: Asparagaceae

Synonyms:

Bangla	: মুর্বা (Murba)
Hindi	: Marul
Sanskrit	: Muruva
Urdu/Unani/Tibb	: Turbud Safed
English	: The Bowstring Hemp

Geographical Distribution: Sansevieria roxburghiana is an herbaceous perennial plant found in eastern coastal region of India, Sri Lanka, Indonesia, Bangladesh, tropical Africa and Myanmar. In Bangladesh, Sansevieria roxburghiana are wildly distributed in Gazipur, Savar and Tangail. Sometimes Sansevieria roxburghiana is confused with the Sri Lankan species Sansevieria *zeylanica*, which differs in the shorter and lighter colored leaves contain numerous darker lines on the back.

Plant Descriptions

General Description: Sansevieria roxburghiana is one of the Sansevieria genuses of Agavaceae family that is discovered by the Scottish botanist and physician William Rexburg. It is a scapigerous, perennial herb with erect, slightly narrowed base leaves. It flowers are dull brownish white in color that comes May to September on the year. Murva is one of the most controversial drugs in Ayurveda with more than 7 plant species from different families being used as the source in different parts of the country. *Lannea coromandelica* and *Maerua arenaria* are also referred as

Murva. *Chonemorpha fragrans* (macrophylla) is used as Murva in Kerala, *Sansevieria roxburghiana* in Tamil Nadu, Clematis triloba in Gujrat, and Maharashtra, and *Helicteres isora* in Punjab, and *Marsdenia volubilis* in Southern states.

The roots of this medicinal herb are wrongly supplied as Trivrit / White Turpeth (Safed Nishoth) in Northern India because the accepted botanical source of Turpeth (Nishoth) is Operculina turpethum (Linn.) Silva Manso synonym Ipomoea turpethum R. Br.

Macroscopic Description: *Sansevieria roxburghiana* is a Stem less, with a creeping rootstock evergreen perennial plant, producing succulent, erect, rigid leaves 45-75cm or more long and 25mm wide from a rhizomatous rootstock. Leaves are erected, slightly narrowed at the base measuring 10-20 x 2-4 cm flat with a subulate point up to 2.5 cm long. The leaf surface is smooth, the lower contrast, slightly rough. The Raceme spike-like flowering stem grows 30-75 cm long. Flowers are borne in clusters of 4, Pedicels 6-9 cm long and jointed. The bract is narrowed 3 to 4 millimeters long and lanceolate. The flower tube is 6 to 7.5 millimeters long. The lobes are 8.5 to 9.5 millimeters in size.

Microscopic Description: Transverse section of root reveals the epiblema is outermost layer which is composed of single layer of hexagonal compactly arranged cells. Cortex composed of 12 - 14 layers, cells of which are circular, oval and single walled, it measured 20 - 40µ. Endodermis is single layered and composed by radially elongated parenchymatous cells which measures 20 - 30 x 30-35 µ. Pericycle is single layered and shows continuous prominent ring. Cells measures 10 - 15 x 20-25 µ. Phloem composed of 3 - 5 layers having rectangular cells. It measured 10 - 15 x 20 - 25 µ. Phloem is followed by large circular strands of xylem; vessels are circular, oval in outline, single or in groups of two, it measures from 35 - 50 µ. Ray parenchyma is uniseriate, cells are radially elongate, ovate, rectangular, fibers places and axil parenchyma occupies the rest of the space. Transverse section of leaf shows the epidermis of both surfaces is single layered and covered by cuticle. The upper epidermis is composed by squariesh to rectangular cells which measures 5 - 7 x 10 - 15 µ and lower epidermis also composed by squariesh to rectangular cells which measures 5 - 10 x 10 - 15 µ. Trichomes are absent on both surfaces. The stomata are tetracytic, amphistomatic with stoma measure 51.15 X 18.15 µ of adaxial surface and 49.50 X 19.80 µ of a baxial surface.

Part Used: Rhizome **(**Root) and Leaves

Fig. *Sansevieria roxburghiana Schult. & Schult*

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Kashaya (Astringent)
Guna (Attribute)	: Laghu (Light), Ruksha (Dry), Tikshna (Sharp)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kaphahara, Vatahara

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 5.8% w/w
Acid insoluble ash	: Not more than 0.15% w/w
Alcohol soluble extractive	: Not less than 11.1% w/w
Water soluble extractive	: Not less than 12.2 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: The different ratio of solvents was used chloroform: Methanol (19:1) and Ethyl acetate: Acetone (9.5:0.5). The samples were run and were visualized using iodine and exposing it to UV light. The Rf value was calculated by taking a average of both the plants leaves Rf Values. Then the major bands were scrapped out and dissolved in methanol, separated the supernatant and allowed it to drying as fragment. Major spot were observed on silica coated thin layer chromatographic plates with various solvent systems. The Rf values were calculated and recorded for the developed spots and showed the developed spots of leaves of S. roxburghiana with Chloroform: Methanol (60:40).

Major Chemical Constituents: It contains carbohydrates, alkaloids, flavonoids, tannins, saponins, carotenoids gallic acid, palmitic acid, caftaric acid, isorahmnitin-3-O-βD-glucopyranoside, buphanidine, diethyl phthalate, 6-methyl-1-octanol, 3,3-dimethylhexanal, proteins, and phytosterols. It also contains a rare homoisoflavonoid Cambodianol. Sansevierine is the active constituent that excerts more therapeutic action.

Therapeutic Usages: Chronic cough, purgative, febrige, gonorrhoea, heartdisease, itch, leprosy, fever, cough, piles, asthma, tuberculosis, tonic in glandular enlargement, rheumatism and dysuria, snake bite and hemorrhoids.

Pharmacological Study: Antitumor, antibacterial, antidiabetic, antimicrobial, antifungal, antioxidant, analgesic, antibacterial and antimicrobial activity.

Contraindications: Known allergy to the plants of the Asparagaceae family.

Adverse Effects: The higher dose (2000 mg/kg) showed mild toxic characteristics.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills. Store in a well-closed container, protected from light and moisture.

Posology: Oral dose of 100 mg/kg body weight. The recommended dose of decoction is 50-100ml/day and 2-5-gram powder.

Formulations: Ushnadi Churna, Brihat Yogaraj Guggul, Pippalyadi Grita, Bisam Jwarantak Louha, Laudhrasav, Manjisthasav.

Nagabala

Botanical Name: *Grewia hirsuta* Vahl.

Family: Tilaceae

Vernacular name:

Bangla	: নাগবলা (Nagabala)
Hindi	: Kukurbicha, Phrongli, Kakarundah
Sanskrit	: Gudasarkara, Nagabala
Urdu/Unani/Tibb	: Kakarundehrumi
English	: Veronicalolia

Geographical Distribution: Grewia hirsuta is a shrub or a small tree that can grow up to 5 metres tall. This plant is found in East Asia such as India, Srilanka, Bangladesh, Thailand, Myanmar, Vietnam, Thailand, Laos, etc. In India, it is usually found in Vindhya regions like eastern U.P, Bihar and Rajasthan. It is generally found in mixed deciduous and dry evergreen forests.

Plant Descriptions

General Description: The genus Grewia hirsute belongs to Tiliaceae family. This genus comprising shrubs and trees and is distributedin the warmer parts of the world. There are 40 species ofgenus are present in India. Among them some have medicinal value. There is some controversy about nagabala and claimed defferent argument by the Acharays. Acharays Bhavaprakasanighantu mentioned 3 defferent nagabalas. These are i. Nagabala 1 (Sida veronicaefolia Lam.), ii. Nagabla 2 (Sida spinosa Linn.) and iii. Nagabala 3 (Grewia hirsuta Vahl.).

Fig. *Grewia hirsuta* Vahl.

Macroscopic Description: A branched shrub or small tree, young parts softly pubescent, leaves distichous, ovate or lanceolate, acute, serrate, the uppersurface glabrescent or with few stellate hairs, the lower usually densely villous with fasciculate hairs, base rounded, oblique, 3-nerved, petioles long, densely hairy, stipules subulate, longer than the petioles, linear-lanceolate, hairy, flowers polygamous (male and bisexual), in axillary umbellate cymes, buds ovoid, densely villous, peduncles 1-3, pedicels 2-4, very short, pubescent, bracts linearlanceolate, hairy. The root is tapering and provided with fibrous rootlets. The external colour is yellowish brown while internal colour is creamish yellow. Outermost region is epiblema. It follows secondary cortex (periderm) which contains secondary phloem and secondary xylem and indiscriminately scattered vessels. At the centre inconspious pith is present.

Microscopic Description:

The stomata were of anisocytic type. The stomatal index was 10-13. The stellate hairs were with warty arms and their trichome index was 15-19.

Leaf: Transverse section of the midrib portion was characterized by squarish ridge on the upper side bearing a profusion of stellate hairs and a more or less spherical bulge including the vascular bundle on the lower side. The upper ridge was lined by 2-3 layers oflacunar eollenchyma and a central 6-7 layered patch ofsclerenchyma. The sclerenchyma here was thin walled with a large lumen. There was another bigger curved patch of sclerenchyma below the ridge where the cells had thickened walls and small lumen. These two patches were separated by a large mucilage cavity. Just attached to the sclerenchyma patch on the lower side was a curved patch of parenchyma containing 5-6 mucilage cavities. A third Patch of sclerenchyma was present below these mucilage canals. In between this layer and xylem were small angular parenchyma which looked like internal phloem. Xylem was crescent shaped and consisted of 18-20 rows oftracheids interrupted by rays. Below the xylem were 7-8 layers ofphloem, and outer to this layer was a pericycle consisting of 2-3 layers of fibres. Between the vascular bundle and epidermis was the ground tissue containing 8-10 lysigenous (mucilaginous) cavities in a row and cells containing large prismatic crystals and an outer region of lacunar hypodermal eollenchyma. The lower epidermis was wavy. In the lamina portion, upper epidermis was wavy and covered by a thick almost straight cuticle. Between the epidermal layers and cuticle there were many oval or elliptic cavities containing mucilage. The cells ofthe epidermis was rectangular and peculiar in containing brown deposits, one per cell. The palisade was single layered and closely packed. The spongy cells were elongated and formed a network with large intercellular spaces and lower epidermis consisted of barrel shaped cells and had a thick cuticular layer outside. Both stellate and glandular trichomes were seen on the surface of leaves. Stellate trichomes were peculiar in having many small warty arms and spiny projections throughout They were concentrated more on the upper-ridged portion ofthe midrib. The glandular triehomes, seen more in die lamina, were having a unicellular stalk and a 3-4 celled head.

Leaf: Powder study. The components present in the powder were stellate hairs with warty arms, mucilage cells of epidermis, palisade and spongy, fibres with phloem and cells containing prismatic crystals, mucilage cavities, vascular bundles, anisocytic stomata and multicellular glands.

Part Used: Roots, Fruits and Leaves

Organoleptic Properties

Rasa (Taste)	: Madura (sweet)
Guna (Attribute)	: Guru (Heavyness), Snigdha (Oily), Picchila (Slimmy)
Virya (Potency)	: Sheeta (Cold)
Vipaka (Metabolism)	: Madura (sweet)
Karma (Action)	: Pacify pitta and vata

Purity and Safety Test

Foreign matter	: Not more than % w/w
Total ash	: Not more than 3.0 % w/w

Acid insoluble ash	: Not more than 1.4 % w/w
Alcohol soluble extractive	: Not less than 45.5% w/w
Water soluble extractive	: Not less than 6.5 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of root powder on Silica gel 'G' using Toluene: Ethylacetate: Formic acid (6:3:1) shows in visible light one spot at Rf. 0.99 (Green). Under U.V. (365 nm) five fluorescent zones are visible at Rf. 0.99, 0.98, 0.80, 0.60 and 0.32 (all yellow). On exposure to Iodine vapour five spots appear at Rf. 0.99, 0.98, 0.80, 0.60 and 0.32 (all yellow).

Major Chemical Constituents: Plant parts are found to have all the essential mineral elements, carbohydrates, proteins, fatty acids and other active metabolites like flavonoids, tannins, phenols, alkaloids, steroids and triterpenoids, lignans, lactones, flavones, anthocyanins etc.

Grewia contains anthocyanin type cyanidin 3- glucoside vitamin C, minerals and dietary fibers. The seeds contain 5% of a bright-yellow oil containing 8.3% palmitic acid, 11.0% stearic acid, 13.4% oleic acid, 64.5% linoleic acid; 2.8% unsaponifiable. Qualitative examination reveals the presence of Alkaloids, Sugars, Tannin & Phenolic compound, Steroids, Flavonoids. Drug is soluble both in water and alcohol, due to the respective soluble metabolites.

Therapeutic Usages: Nagbala has properties to pacify provocation of vata and pitta humor. It is useful as nervine tonic, brain tonic, demulcent, anti- acidic, expectorant, carminative, diuretic, aphrodisiac and cardiac tonic, remove vata, kapha and biliousness, rheumatism, fruit is used as astringent and stomachic.

Pharmacological Study: Radioprotective, antioxidant, antimalarial, antihyperglycemic antipyretic, analgesic, antifungal, antiviral, antiplatelate, anticancer and immunomodulatory effect of Plant. Immunomodulatory effect:

Contraindications: Known allergy to the plants of the Tilaceae family.

Adverse Effects: There is known side effect of this plant.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: Decoction (Kwatha): 50 -100 ml. Powder: 3 -6 gm

Formulations: Kusthari Ras

Narikel

Botanical Name: *Cocos nucifera* Linn.

Family: Arecaceae

Vernacular name:

Bangla	: নারিকেল (Narikel)
Hindi	: Nariyal, Gola
Sanskrit	: Narikela, Trnaraja
Urdu/Unani/Tibb	: Narjil, Narial
English	: Coconut Palm

Geographical Distribution: It is an important member of the family Arecaceae (palm family) popularly known as coco-nut, coco, coco-da-bahia, or coconut-of-the-beach. The plant is originally from Southeast Asia (Malaysia, Indonesia, and the Philippines) and the islands between the Indian

and Pacic Oceans. From that region, the fruit of the coconut palm is believed to have been brought to India and then to East Africa. After the discovery of the Cape of Good Hope, this plant was introduced into West Africa and, from there, dispersed to the American continent and to other tropical regions of the globe. Coconut is now grown in more than 90 countries throughout the world some of which includes Maldives, India, Philippines, Sri Lanka, Bangladesh and Indonesia.

Plant Descriptions:

General Description: The scientific name for coconut palm or coconut tree is Cocos Nucifera. Coco is a Spanish and Portuguese word meaning 'a grin', 'a monkey face'. Many may think that coconut is a nut but botanically, coconut is a drupe (stone fruit), not a nut. The use of coconut oil is so respected that it was and still it is an important part of Ayurvedic medicine since 1500 BC. Coconut palm prefers the area with abundant sunlight and regular rain fall. Coconut needs high humidity of about 70-80% for optimum growth. Coconut palms require warm conditions for successful growth and are intolerant of cold weather. Coconut oil is produced by crushing the dried kernel (dried kernel is also known as 'copra'). This dried kernel contains at least 60-65% of the oil. (Oil extraction: see appendix) Classically there is no standard classification, but manufacturers use certain words like virgin, unprocessed, organic etc. Virgin coconut oil is actually unprocessed coconut oil and does not undergo through refinery processes. It is unfiltered and manufactured without any additives. This oil is minimally processed. It does not undergo any further processing such as refining, bleaching and deodorization.

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

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

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

Part Used: All parts of the coconut

Organoleptic Properties

Rasa (Taste)	: Madura (sweet)
Guna (Attribute)	: Guru (Heavyness), Snigdha (Oily)
Virya (Potency)	: Sheeta (Cold)
Vipaka (Metabolism)	: Madura (sweet)

Karma (Action) : Balya, Hrdya, Vrsya, Vatahara Pittahara, Kaphakara, Brmhana, Bastisodhaka, Vistambhi

Purity and Safety Test

Foreign matter : Nill

Total ash : Not more than 2.5 % w/w

Acid insoluble ash : Not more than 0.5 % w/w

Alcohol soluble extractive : Not less than 13% w/w

Water soluble extractive : Not less than 10 %w/w

Fig. *Cocos nucifera* Linn.

Microbial contamination : In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more

than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

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

Major Chemical Constituents: Phytochemical studies of the coconut fiber (mesocarp) revealed that the presence of phenols, tannins, leucoanthocyanidins, avonoids, triterpenes, steroids, and alkaloids in ethanol extract. The lyophilized extract and fractions, as well as ethylacetate extracts, from the C. nucifera fiber are rich in polyphenols, compounds such as catechins, epicatechins, tannins, and avonoids. The constituents of the liquid albumen were identiedas vitamin B, nicotinic acid (B3, 0.64 mg/mL), pantothenicacid (B5, 0.52mg/mL), biotin (0.02 mg/mL), riboavin (B2, <0.01 ng/mL), folic acid (0.003 mg/mL), with trace quantities of vitamins B1, B6, and C, pyridoxine, thiamine, folic acid, amino acids, L-arginine, plant hormones (auxin). Coconut oil contains 92% saturated fatty acids in the form of triglycerides.

Therapeutic Usages: Mutraroga (urinary disorders), shula (pain), vajikaran (aphrodisiac), charma roga (diseases of skin), mutrakruchcha (dysuria), prameha (increased frequency of urine), amlapitta (acidity), raktapitta (bleeding disorder), rasayan (rejuvenating agent) etc.

Pharmacological Study: Antiinflammatory, antibacterial, anti- neoplastic, antihelminthic, antinociceptive, antioxidant, antifungal, anti- diabetic and antitumor activities, anti-helminthic activity etc.

Contraindications: Known allergy to the plants of the Arecaceae family.

Adverse Effects: There is known side effect of this plant.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: Recommendation of coconut oil depends on various factors such as an individual's present body weight, physical activity, lifestyle and presence or absence of a particular clinical condition. Healthy individuals who are not overweight or obese and without any clinical condition can consume 4 teaspoons per day. Athletes, individuals who are underweight, growing children can consume 5-6 teaspoons coconut oil per day. Individuals with heart disease, altered lipid profile and increased body weight (overweight or obese or with abdominal obesity) can consume 3-4 teaspoons of virgin coconut oil per day.

Formulations: Narikel Lavana, Narikel Khar, Himsagar Taila.

Nirmali Phal

Botanical Name: *Strychnos potatorum* Linn.

Family: Loganiaceae

Vernacular name:

Bangla	: নির্মলী ফল (Nirmali Phal)
Hindi	: Chillikavi
Sanskrit	: Nirmali, Payah Prasadisa
Urdu/Unani/Tibb	: Nirmali
English	: Clearing nut

Geographical Distribution: Strychnos potatorum is known as Clearing Nut tree belong to the family Loganiaceae (Logania family) and genus strychnosit. Its synonym *is* Strychnos heterodoxa originated from many rural parts of Burma, Sri Lanka, East Asia, India and tropical Africa-DR Congo

due to availability of muddy water in the area. In India, the Clearing Nut tree is a common tree of medicinal importance and found in southern and central parts of India.

Plant Descriptions:

General Description: Strychnos potatorum flourish in red aerated alluvial soil. It also grows profusely under a wide range of temperature which varies from 32^0C to 40.9^0C during the hottest month and 11^0C to 18^0C during the coldest months. The species thrives in black cotton soil; however, the growth is slow due to most soil conditions as a result of rainy seasons. Clearing nut tree produces round, soft fleshy fruits. Barked and crushed fruits are used as Fish poison; nonetheless, young fruits are consumed locally as food. The pulp of the fruit is recurrently consumed as food.

Macroscopic Description: Strychnos potatorum is a medium-sized, glabrous tree of height 12.13 m. Stem is fluted and covered with black, thick, square to rectangular scales. Bark is 1.32 cm thick, black or brownish-black, corky, with very deep and narrow vertical, thin ridges, which easily break off. Branches are swollen at nodes. Leaves are about 57.5 cm long, nearly sessile, subcoriaceous, ovate or elliptic, acute, glabrous and shining, spuriously three or five nerved, with lateral nerves springing from the lower part of the mid rib, nearly reaching the tip. The base rounded or acute, petioles 2.5 mm long flowers large for the genus, in short almost glabrous nearly sessile axillary cymes; peduncles 0.5 mm long; and pedicels very short. Caly ×2 mm long, fivelobed; lobes 2.5 mm long, oblong, acute with a tuft of hair inside towards the base of each lobe. Ovary ovoid, glabrous, tapering into a long glabrous style; and stigma obscurely twolobed. Fruit is a berry, black when ripe, globose, 12 cm in diameter, whitish, shining, with short addressed yellow silky hairs. Seeds are globose in shape. Population of nirmali is depleting fast due to self nongenerative mechanism in fruits. They are often decayed and are prone to fungal attack as soon as they fall.

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

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

Part Used: Seeds

Organoleptic Properties

Rasa (Taste)	: Madura (sweet), Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Sira (cold), Guru (Heavyness)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Madura (sweet)

Karma (Action) : Caksusya, Vatahara, Slesmahara, Vicaghna, Jala Prasadakara

Purity and Safety Test

Foreign matter : Not more than 2% w/w

Total ash : Not more than 2 % w/w

Acid insoluble ash : Not more than 0.5 % w/w

Alcohol soluble extractive : Not less than 1% w/w

Water soluble extractive : Not less than 5 %w/w

Fig. *Strychnos potatorum* Linn.

Microbial contamination : In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more

than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of the alcoholic extract on Silica gel 'G" plate using Toluene: Ethylacetate: Diethylamine (70:20: 1 0). On spraying with Dragendorff reagent with tartaric acid two spots appear at Rf. 0.38 (orange and corresponding to that of Brucine) and at Rf. 0.55 (faint orange and corresponding to that of Strychnine).

Major Chemical Constituents: Phytochemical studies revealed the presence of diaboline (major alkaloid) and its acetate brucine, loganin, mannose, sucrose, arachidonic, lignoceric, linoleic, oleic, palmitic, and stearic acids. On saponification of the oil: β-sitosterol, stigmasterol (also in leaves and bark along with campesterol); oleanolic acid and its 3β acetate, saponins containing acid oleanic, galactose and mannose (seeds) and triterpenes and sterols mannogalactans. Among the five groups of phytochemicals determined from the root, stem bark, and seeds of *Strychnos potatorum* tannins were found to be the most abundant one followed by saponins and alkaloids.

Therapeutic Usages: Aruci, Krmi, Prameha, Mutrakrcchra, Mutrasmari, Trsna, Netraroga, Sarkara Meha, Apasmara and Sula, Gonorrhea, Leukorrhea, Bronchitis, Chronic Diarrhea, Dysentery, Conjunctivitis and other eye disease.

Pharmacological Study: Hypotensive activity, anticonvulsant activity, and antiprotozoal, antimicrobial and antimalarial activities, antioxidant property.

Contraindications: Known allergy to the plants of the Loganiaceae family.

Adverse Effects: There is no known side effect of this plant. No signs of toxicity and mortality up to the dose level of 2000mg/kg body weight orally in mice were observed. Excessive use (more than 5 gm) may cause nausea and vomiting.

Precautions: Do not use in a high dose or for longer periods of time.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form.

Posology: 3-6 gm.

Formulations:

Padmakastha

Botanical Name: *Prunsus cerasoides*

Family: Rosaceae

Vernacular name:

Bangla	: পদ্মকাষ্ঠ (Padmakastha)
Hindi	: Padmakha, Padma Kastha, Paja
Sanskrit	: Padmagandhi, Pitarakta
Urdu/Unani/Tibb	:
English	: Biyd Cherry

Geographical Distribution: Prunsus cerasoides is the synonym of *Prunus puddum* Roxb. ex Wall. Brandis, belong to the family of Rosaceae found in mixed or openforest in temperate Himalayan regions from Garhwal of India to Nepal, Sikkim, Bhutan and south-west China. It is also cultivated as an ornamental plant at wayside resting places and public parks or gardens. In India the plant is restricted to regions of Himalaya ranging from 1500-2400 m asl. In Garhwal Hills it is distributed abundantly in temperate zones of Pauri, Tehri, Chamoli and Uttarkashi districts. Locally it is known as 'Panyyan'.

Plant Descriptions:

General Description: The common name of Prunsus cerasoides *is* Padam, Wild Himalayan Cherry or Dwarf Cherry. It is a middle sized or a large evergreen trees and shrubs; bark smooth, brown, peeling off in horizontal strips exposing a shining copper colored surface. A large number of them are valued as ornamentals on account of their showery flowers. The genus also includes a large number of stone fruits, apricots, cherries, plums, peaches, as well as the almonds. Prunus cerasoides is one among them and it has been identified as an excellent framework tree species for restoring evergreen forest in seasonally dry tropical forestlands. It is worshipped in all auspicious occasions by the inhabitants. People never cut the whole tree and use only its twigs in rituals as the wood are forbidden to be used as fuel. The plant is strongly recommended for plantation as rich source of pollen and nectar to honeybees besides its religious value. Thus it is common to observe quite old trees of Prunus cerasoides in the area. But the potential of the plant as rich source of pollen and nectar for honey bees is not tapped adequately. Both Apis cerana and Apis mellifera honey bees extensively visit the flowers of Himalayan cherry. As this is one of the very few plants that bloom during early winter, it is very important for the development of colonies during that season.

Macroscopic Description: A middle sized or a large tree, bark smooth, brown, peeling off in horizontal strips exposing a shining copper colored surface. Sap wood- Whitish and lustrous; Heart Wood- is reddish brown, closely grained moderately hard and strong, durable and seasons well. It is resistant to fungus and insect attack and works to good finish. Leaves - membranous, ovate - lanceolate or elliptic-lanceolate, blade 7.5 - 12.5 cm, glossy, nearly glabrous, margin sharply serrate, with one or more conspicuous glands on the petiole. Stipules long, 3-5 parted, glandular, and fringed. Flowers: white, pink or crimson 2.5 cm in diameter in umbellate fascicles, peduncles and are the rich sources of nectar and pollen for bees. Drupes ovoid, oblong or ellipsoid, 1.25-2 cm long, obtuse at both ends, yellow or reddish; Stone - rugose, pony, ovoid, wrinkled and furrowed, pulp very little. Flowering and Fruiting: October – May, Pollen: Grains 3 – zonicolporate, colpus broad, lip pointed, endocolpium indistinct. Exine surface finely straite, straie thick. Exine 2.5 μm thick, ecto exine as thick as endoexine; columella indistinct; AMB circular, triangulate 39x28 μm. Shape sub-prolate.

Microscopic Description: Mature heart wood consisting of vessels, fibres, tracheids and xylem parenchyma traversed by xylem rays; vessels lignified, moderately thick-walled, reticulate thickening, fairly large, with bordered pits having an oval-shaped, lateral perforation at each end, measuring, upto 220 µ in length and upto 68 µ in width; fibres occur mostly in groups, usually found associated with other xylem elements, moderately thick-walled, narrow lumen, pointed at both ends, 55-137 µ long; tracheids usually thick-walled, µ long; tracheids usually thick-walled, lignified, elongated cells; xylem parenchyma lignified, elongated cells; xylem parenchyma composed of thick-walled, found associated with vessels and fibres, oval to elongated, polygonal cells; xylem rays uni to multiseriate, uni and biseriate more common, multiseriate, generally 3-6 cells wide, 40-50 cells high; cut materials, when treated with ferric chloride solution turn the yellow pigments blue or black, indicating tannin.

Powder - Reddish-brown; shows fragments of abundant groups or single pointed fibres measuring 55-137 µ in length, moderately thick-walled, fairly large vessels with reticulate thickening and bordered pits, thick-walled, lignified tracheid cells, pieces of ray cells and xylem parenchyma cells.

Used parts: Bark, stem, seed, and heartwood.

Fig. *Prunsus cerasoides*

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Lagu (Light)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Garbhasthapana, Rucya, Vatala

Purity and Safety Test

Foreign matter	: Not more than 1% w/w
Total ash	: Not more than 1% w/w
Acid insoluble ash	: Not more than 0.5% w/w
Alcohol soluble extractive	: Not less than 3% w/w
Water soluble extractive	: Not less than 1%w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene: Ethylacetate (9:1) shows under UV (366 nm) a fluorescent zone at Rf. 0.64 (blue). On exposure to Iodine vapour seven spots appear at Rf. 0.15, 0.32, 0.42, 0.53, 0.59, 0.64 and 0.76 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 105°C four spots appear at Rf. 0.15, 0.32, 0.53 and 0.59 (all violet).

Major Chemical Constituents: Heartwood: Dihydrotectochrysin, dihydrowogonin, pinocembrin, chrysin, naringenin, kaempferol, aromadendrin, quercetin, taxifolin, 7-hydroxy-5, 2´, 4´-trimethoxy flavanone (Carasinone), 2´-hydroxy 2, 4, 4´, 6'- tetramethoxy chalcone (Carasidin),2´,4´ dihydroxy-2, 4, 6´- trimethoxy-chalcone (carasin) Stem: Narigenin, apigenin, β-sitosterol, sakuranetin, prunetin, genkwanin Sapwood: A flavone glycoside puddumin A [7-O-(β-D-glucopyranosyl)-5- O-methylnaringenin], genistein prunetin, n-pentacosane, triacontane, noctacosanol, β-sitosterol, ursolic acid , oleic, palmitic and stearic acids, afzelin, kaempteritrin, naringenin, β-sitosterol-β-D-glucoside , Stem bark: Padmakastein and its derivatives, β-sitosterol behenate, tectochrysin, genistein, leucocynidin, 4´- glucoside of genkwanin, chrysophenol, emodin, 8β-D glucosides, orientalone,

physcion, β- sitosterol glucoside, amygdalin, prunasetin (isoflavone), sakuranetin, puddumetin, flavanone, sakuranetin (5, 4´- dihydroxy-7-methoxy flavone) and its 5-glucoside, neosakuranin (2, 4´-dihydroxy-4-methoxy-6- glucosidoxy chalcone), leucocyanidin, puddumin B (naringenin-4´-methyl ether-7-O-β-D-galactoside), Taxifolin. Root bark: Ursolic acid, stigmasterol, prunetinoside, glucogenkwanin.

Therapeutic Usages: Visphota (boils, blister), Daha (burning sensation as in gastritis, neuropathy, burning sensation in eyes), Kustha (skin diseases), Raktapitta (Bleeding disorders such as nasal bleeding, heavy periods), Chardi (vomiting), Trisna (excessive thirst), Bhrama (dizziness, delusion), Visarapa (herpes) and Garbha samsthapana (Protects pregnancy).

Pharmacological Study: Antispasmodic, antioxidant, diuretic, emmenagogue, depurative, anti-abortifacient, analgesic, carminative, conceptive, expectorant, febrifuge and tonic, anti-inflammatory etc.

Contraindications: Known allergy to the plants of the Rosaceae family.

Adverse Effects: Excessive consumption of Padmak might cause certain side effects like weakness, spasms, Dilation of the pupils and convulsions in some people.

Precautions: Do not use in a high dose or for longer periods of time. Although Padmak is safe to be taken in pregnancy, it is recommended to consult a physician before using Padmak during pregnancy.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: Powder or churna: 1-3 gm. and Decoction 40 -50 ml. Padmaka shtha should always be used fresh in order to retain the pharmacological activities. Padmaka Kwatha should never be used because on boiling, all the volatile principles in it are lost. It should always be made in the form of Phanta using Luke warm water.

Formulations: Kamdev Grita, Mahabhringaraj Taila, Nilkantha Ras, Saribadyasav.

Piyaz

Botanical Name: *Allium cepa* Linn.

Family: Liliaceae

Vernacular name:

Bangla : পিয়াজ (Piyaz)

Hindi : Piyaz

Sanskrit : Palandu

Urdu/Unani/Tibb :

English : Onion

Geographical Distribution: Allium cepa Linn.is a bulbous plant widely cultivated in almost every country of the world. Onions produced in European countries accounted for 10.9% of the world production, being Asia (65.5%) the most important producer. Onions have been cultivated globally, in at least 175 countries, for around 5000 years.

Plant Descriptions

General Description: Onion has been valued as a food and amedicinal plant since ancient times. It is widely cultivated, second only to tomato, and is a vegetable bulb crop known to most cultures and consumed worldwide. It is commonly known as "Queenof the kitchen," due to its highly valued flavor, aroma, and unique taste, and the medicinal properties of its flavon compounds. The herbaceous plant onion grows in temperate zones. Onion is known as Phalandu in Sanskrit. Its medicinal properties and physical properties are explained in texts of ayurveda. Ayurveda acharyas have explained the uses of onion in various health conditions and have classified onions based on their colours. "Rakta phalandu" (Red coloured onion) and "shweta phalandu" (white coloured onion) are two varieties of onions.

Macroscopic Description: Macroscopically, Bulbus Allii Cepae varies in size and shape from cultivar to cultivar, 2–20cm in diameter; flattened, spherical or pear-shaped; white or coloured. The plant reaches a height of 2-5 ft and bears cluster of greenish white flowers. Onions develop from the base of leaves to form underground bulbs. Seeds of onion are black in colour.

Microscopic Description: The external dried leaf scales of the bulbs show a large-celled epidermis with lightly spotted cell walls; the cells are elongated longitudinally. The underlying hypodermis runs perpendicular to the epidermis and contains large calcium oxalate crystals bordering the cell walls. The epidermis of the fleshy leaf scales resembles that of the dried leaf scales, and the epidermal cells on the dorsal side are distinctly longer and more elongated than the epidermal cells on the ventral side. Large calcium oxalate crystals are found in the hypodermis; stomata rare; large cell nuclei conspicuous; and spiral vessel elements occur in the leaf mesophyll.

Powder: Contains mainly thin-walled cells of the mesophyll with broken pieces of spiral vessel elements; cells containing calcium oxalate crystals are scarce.

Used parts: Bulb and Seed

Organoleptic Properties

Rasa (Taste)	: Madura (sweet), Katu (pungent)
Guna (Attribute)	: Guru (heaviness), Snighda (oily), Teeksna (strong)
Virya (Potency)	: Anushna (not very hot in potency)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha vardhaka, Vatahara

Purity and Safety Test

Foreign matter	: Not more than 1% w/w
Total ash	: Not more than 6% w/w
Acid insoluble ash	: Not more than 1.0% w/w
Alcohol soluble extractive	: Not less than 4% w/w
Water soluble extractive	: Not less than 5%w/w

Fig. *Allium cepa* Linn.

Microbial contamination : In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans* and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more

than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: TLC analysis of flavonoids in onion bulbs comprised determination of quercetin after acid hydrolysis of the extracts and separation on TLC silica gel 60 plates using of ethyl acetate/formic acid/bidistilled water 85+10+15 (V/V/V) as mobile phase. Optimization of TLC separation was performed to obtain optimal conditions for the resolution of the standard mixture – quercetin and spiraeoside employing different types of adsorbents, namely, cellulose, silica gel and modified silica gel – RP-18. The mobile phases used in normal phase systems were mixtures with ethyl acetate, methanol, water, 1, 2-dichloroethanol, butanol, chloroform, acetone, acetic or hydrochloric or formic acid, in different combinations and proportions. The dominant peaks in the majority of chromatograms: the first identified as quercetin (Rf 0.176) and the second as quercetin-4'-O-glucoside – spiraeoside (Rf 0.305).

Major Chemical Constituents: A. cepa is known to contain many vitamins and minerals and is rich in sulphur amino acids. Moreover, a variety of secondary metabolites has been identified in this species, such as flavonoids (particularly flavonols and anthocyanin, Quercetin, Quercitrin, Myricetin), phytosterols, Kaempferol, Allyl sulfide and saponins. Sulfur and non-sulfur-containing chemical constituents have been isolated from Bulbus Allii Cepae; the sulfur compounds are the most characteristic. The organic sulfur compounds of Bulbus Allii Cepae, including the thiosulfinates, thiosulfonates, cepaenes, S-oxides, S, S´-dioxides, monosulfides, disulfides, trisulfides, and zwiebelanes occur only as degradation products of the naturally occurring cysteine sulfoxides.

Therapeutic Usages: Dyslipidemia, diabetes, joint disorders, digestive ailments, loss of appetite, gallbladder diseases, angina pectoris, high blood pressure, atherosclerosis, sore throat, asthma, bronchitis, cough, intestinal gas and intestinal worms. The great physician Hippocrates suggested onion as a diuretic, laxative, and emmenagogue.

Pharmacological Study: Hypoglycemic, cardioprotective, hypolipidemic activities, anti-allergenic, anti-inflammatory, vasodilatory, anti-carcenogenic, anti-oxidant, antibacterial, anti-melanogenesis, and antispasmodic, antifungal and antiproliferative activities.

Contraindications: Allergies to the plant. The level of safety of Bulbus Allii Cepae is reflected by its worldwide use as a vegetable. However, onions do not cause acid reflux or heartburn in healthy people, but it is not good food for people suffering with acid reflux, heartburn and gastroesophageal reflux.

Adverse Effects: Allergic reactions such as rhinoconjunctivitis and contact dermatitis have been reported.

Precautions: Bulbus Allii Cepae is not mutagenic in vitro. No general precautions have been reported, and no precautions have been reported concerning drug interactions, drug and laboratory test interactions, nursing mothers, paediatric use, or teratogenic or non-teratogenic effects on pregnancy.

But exhibit anti-coagulant and fibrinolytic properties, this can be harmful for people with bleeding disorders.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: Onion juice 10 -20 ml and dried seed powder 1-3 gm.

Formulations: Baharer Nani

Polash

Botanical Name: *Butea monosperma*

Family: Fabaceae

Vernacular name:

Bangla	: পলাশ (Polash)
Hindi	: Dhak, Tesu
Sanskrit	: Kimsuka, Raktapuspaka
Urdu/Unani/Tibb	: Dhak, Palaspapda

English : Bastard peak

Geographical Distribution: Butea monosperma (Palash) which belongs to the family Fabaceae grows wildly in India, Burma and Sri Lanka. It grows throughout the Indian subcontinent, especially in India (Indo-Gangetic plains), Vietnam, Malaysia, Western Indonesia, Laos, Cambodia, Bangladesh, Nepal and Thailand.

Plant Descriptions:

General Description: Butea monosperma is a medium-sized deciduous tree belongs to family fabaceae and sub- family papilionaceae. It has been used in traditional medicine practice from ancient time. It is also known as flame of forest commonly known as Palash or Dhak. Palash is described in Charaka Samhita, Susruta Samhita, Upanisads, Vedas, Astanga Sangraha and Astanga Hridaya. *Butea monosperma* is most popularly known as 'flame of the forest' because of its vibrant red colour flowers. This tree grows up to 50 ft high with cluster of flowers. It loses its leaves as the flowers develop in the month of February - April. It is capable of growing in water logged situations, black cotton soils, saline, alkaline, swampy badly drained soils and on barren lands except in arid regions.

Macroscopic Description: It is an erect, medium-sized, 12-15 m high, deciduous tree with a crooked trunk and irregular branches. It grows slowly and attains a height of about 5 to 8 m and diameter of about 20 to 40 cm when it matures at the age of about 50 years or so. Its wood is greenish white in colour, soft and weighs about 14 to 15 kg per cubic foot. The bark is ash colour and thickness is about 0.5 - 1 cm. The leaves are compound, with three leaflets. The leaves have 3 foliate, large and stipulate, 10-15 cm long petiole. These flowers start appearing in February and stay on nearly up to the end of April.The size is nearly 2 to 4 cm in diameter. The fruit of palas is a flat legume. Pods are stalked12.5-20 by 2.5-5 cm, thickened at the sutures. Young pods have a lot of hair, a velvety cover and mature pods hang down. The seeds are flat from 25 to 40 mm long, 15 to 25 mm wide, and 1.5 to 2 mm thick. The seed-coat is reddish -brown in colour, glossy, and wrinkled, and encloses two large, leafy yellowish cotyledons.

Microscopic Description: Stem Bark -Mature bark shows rhytidoma consisting of alternating layers of cork, secondary cortex and phloem tissue; cork cells, thin-walled, 5-10 or more layered, rectangular, dark-brown; secondary cortical cells round and irregular in outline, dark brown, moderately thick-walled; tanniniferous cells, often in groups, having brown colour, sometimes containing mucilage and other materials found scattered in this zone; beneath this zone regular cork consisting of 4-12 rows of radially arranged, rectangular cells followed by a zone of 2 - 4 layers of sclereids; secondary phloem consisting of sieve tubes, companion cells, phloem parenchyma, phloem fibres, crystal fibres, traversed by phloem rays; in outer and middle phloem regions phloem tissues get crushed and form tangential bands of ceratenchyma; phloem fibres arranged in tangential bands alternating with sieve tubes and phloem parenchyma; most of fibre groups contain prismatic crystals of calcium oxalate forming crystal sheath; in macerated

preparation phloem fibres appear thick-walled lignified elongated with tapering or bifurcated ends; crystal fibres divided into a number of chambers containing a prismatic crystal of calcium oxalate in each chamber; phloem rays multiseriate 4 - 12 cells wide, 7 - 50 cells in height, straight; prismatic crystals of calcium oxalate found scattered in the secondary phloem tissues and phloem rays; starch grains simple or compound having 2 – 3 components, measuring 2.75 - 13.75 µ in dia., found scattered in phloem parenchyma and phloem ray cells abundantly; tanniniferous cells and secretory cavities also occur in secondary phloem.

Powder - Reddish-brown; shows numerous prismatic crystals of calcium oxalate, starch grains simple and compound with 2 - 3 components measuring 3-14µ in dia., dark brown coloured cells, sclereids mostly in groups, thin-walled cork cells, numerous crystal fibres in group or singles.

Used parts: All parts of the tree. Charak and Sushruta mentioned the medicinal use of seeds and bark.

Fig. *Butea monosperma*

Organoleptic Properties

Rasa (Taste)	: Katu (pungent), Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Sara, Snighda
Virya (Potency)	: Ushna (hot in potency)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Vrsya, Kaphavatasamaka, Agnidipaka, Saraka

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 12% w/w

Acid insoluble ash	: Not more than 1.5% w/w
Alcohol soluble extractive	: Not less than 10% w/w
Water soluble extractive	: Not less than 14%w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Toluene: Ethylacetate (90: 10) under U.V. (366 nm) shows four fluorescent zones at Rf. 0.10, 0.18, 0.48, 0.65 (all blue). On exposure to Iodine vapour three spots appear at Rf. 0.10, 0.48 and 0.67 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for about ten minutes at 105°C three spots appear at Rf. 0.10, 0.48 and 0.67 (all violet).

Major Chemical Constituents: The main constituent of the flower is butrin (1.5%), besides butein (0.37%) and butin (0.04%). Also contains flavonoids and steroids. Other than these in flowers, coreopsin, isocoreopsin, sulphurein (glycoside) and other two with monospermoside and isomonospermoside structures are also identified. Roots contain glucose, glycine, glucosides and aromatic compounds. Tetramers of leucocynidin are isolated from gum and stem bark. Seed contains oil. The bright colour of the flower is attributed to the presence of chakones and aurones.

Therapeutic Usages: Tonic, astringent, aphrodisiac anddiuretics, hepatic disorder, viral hepatitis, diarrhea, depurative and tonic, Krimi, Arsa and Vatakaphaja rogas, tumors, piles, skin diseases, wounds and ulcers.

Pharmacological Study: Antimicrobial, antifertility, anticonvulsive, antihelmintic, antidiarrhoeal, antimicrobial, wound healing, antigiardiasis and hepatoprotective, antihypertenstive, antitumor, antidiabetic, anti-inflammatory, free radical scavenging activity.

Contraindications: It is contraindicated in Hypothyroidism, Pregnancy and lactation

Adverse Effects: Butin from Palash seeds have anti-conceptive, abortificiant and anti-implantation activity. The seeds must be used as medicine for short duration and in the recommended dosage. When seeds are given for a longer duration to rats, dogs and rabbits, nephrotoxicity, anemia, gross dilation of stomach, gastric inflammation, the liver enlargement and spleen enlargement (with congestion) occurred.

Precautions: It possesses antifertility propertiese. Precaution should be taken who are planning to conceive.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: 5-10 gm. of the drug in powder form for decoction.

Formulations: Krimighatini Batika, Kitari Ras.

Priyangu

Botanical Name: *Callicarpa macrophylla* Yahl.

Family: Verbenaceae

Vernacular name:

Bangla	: প্রিয়ংঙ্গু (Priyangu)
Hindi	: Priyangu
Sanskrit	: Phalini, Vanita
Urdu/Unani/Tibb	: Habb-ul-Mihlb
English	: Perfumed Cherry

Geographical Distribution: Callicarpa macrophylla Vahl. is an important less known medicinal plant found in the Indo-gangetic region and sub-Himalayan tracks upto an altitude of 2000 m and distributed throughout India, Nepal, Bhutan, Myanmar, Bangladesh, South East Asia and China. Within India, it has been recorded in Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Bihar, Sikkim and abundant in Bengal plains.

Plant Descriptions:

General Description: Callicarpa macrophylla is commonly known as Priyangu, the perennial deciduous shrub attaining 2.5 m height belongs to family Verbenaceae. In Ayurvedic system of medicine, the plant is also known as Phalawati and used for obstetric conditions. There are two varieties of the plant, described in Samhitas, as Priyangu and Gandha Priyangu. The plant grows in dry tropical forests including shaded places of ravines and scrub forests. It is flowering in August to November and fruiting from October to December. Due to its beautiful rose-pink flowers, the plant is popularly called as Beauty berry. Its ripen fruits are edible and leaves can also be used to make an herbal drink.

Fig. *Callicarpa macrophylla* Yahl.

Macroscopic Description: Priyangu is an erect, 1.2- 2.4 m high shrub. The fruit is a berry which is 2-3 mm in diameter and pink-purplish colour with glossy surface. Flower 0.5 cm long; brown, calyx, bell-shaped, 4 toothed covered with wooly hairs; corolla, brown, tubular, 4 lobbed spreading; stamens 4, equal in size, epipetalous, antherovate, basifixed; filament very long, hairy; ovary 2-4 celled; style, long; stigma minutelycapitate

Microscopic Description: Peduncle - Shows more or less wavy outline, epidermis single layered with stellate hairs; cortex composed of 10-18 layers of elliptical, thin-walled, parenchymatous cells, a few upper layers filled with reddish-brown contents; pericycle appears in the form of interrupted ring of pericyclic fibres; phloem composed of usual elements except phloem fibres; xylem consists of usual elements; vessels mostly solitary with spiral thickening; fibres aseptate.

Powder - Brown; shows abundant numbers of stellate hairs, spiral vessels, aseptate fibres, groups of thin-walled, elliptical, oval and round pollen grains with clear exine and yellowish in colour.

Used parts: Root, Bark, Leaves, Flowers, and Fruits.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Ruksa
Virya (Potency)	: Sita (cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Pittahara, Vatahara, Rakta, Prasadana, Daurgandhyahara, Purisasa, Mutravirajaniya, Sandhaniya

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 8% w/w
Acid insoluble ash	: Not more than 2% w/w
Alcohol soluble extractive	: Not less than 10% w/w
Water soluble extractive	: Not less than 14%w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: Thin layer Chromatography (TLC) of the alcoholic extract of fruit on Silica gel 'G' plate using n-butanol : acetic acid: water (4:1:5) shows under ultra violet (UV) light (366 nm) one conspicuous fluorescent spot at Rf 0.82 (sky blue). On exposure to iodine

vapours two spots appear at Rf 0.82 and 0.92 (both yellowish brown). On spraying with ferric chloride (10% aqueous solution) two spots appear at Rf 0.82 and 0.92 (both greyish brown).

Major Chemical Constituents: Priyangu contains Glycosides, Terpenes, Phenolic compound, Resin and Saponins. Two tetracyclic diterpenes, calliterpenone and calliterpenone monoacetate have been isolated from the petrol extract of the aerial parts. Ursolic acid, β- sitosterol and 5, 4′-dihydroxy 3'-7-3′-trimethoxy flavone has been isolated from the petroleum ether extract of leaves.

Therapeutic Usages: Cooling, refrigerant, deodorant and antipyretic, tones up the digestive system, checks excessive perspiration, disinfects intestines, controls diarrhoea and allays burning sensation during fevers, stomach disorders, dysentery, burning sensation, mouth and tongue sores, piles, ulcers, headache, blood disorders, leprosy, excessive sweating, rheumatism and female disorders, asthma, foul ulcers, catarrh, anorexia, arthritis etc.

Pharmacological Study: Analgesic, digestive, diuretic, antipyretic, antiemetic, antipoisoning, blood purifier and anti-burning. The plant is also reported to possess various biological activities like anti-inflammatory, antifungal, anti-arthritic and antidiabetic.

Contraindications: It is contraindicated in constipation.

Adverse Effects: The drug used traditionally in prescribed doses may be considered safe.

Precautions: Generally recommended as safe; but precaution should be advised during pregnancy.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: 1-3 g. of the drug in powder form.

Formulations: Brihat Purnachandra Ras, Sarpagandha Ghana Bati, Brihat Jirakadya Modak, Kushabaleha, Sirisarista, Mehabinas, Manjisthasav, Mahadraksarista.

Puskormul

Botanical Name: *Inula racemosa* Hook. f.

Family: Asteraceae

Vernacular name:

Bangla	: পুশকরমূল (Pushkara, Pushkaramula)
Hindi	: Pohakar Mul
Sanskrit	: Kasmira, Pouskara
Urdu/Unani/Tibb	:
English	: Orris Root

Geographical Distribution: Inula racemosa Hook. f. is commonly known as Pushkarmoola and grows in the hilly regions of northwestern Himalayas. The species occurs in temperate areas of Kashmir, Himachal Pradesh, and Uttarakhand in India. It extends up to Iran, Afghanistan, Baluchistan, and Europe, and is cultivated in temperate and sub-alpine regions of India. Generally, it is a well-known traditional medicine in East Asia, Europe and China. It is an oriental species in origin and distribution. Inula racemosa is a critically endangered species due to the fragile nature of its habitat, and its exploitation due to commercial medicinal properties. The species is facing the onslaught of indiscriminate over exploitation, habitat destruction and competition. The populations of the species in the entire north western Himalayan range are witnessing a speedy decline in density, dwindling both in size and number.

Plant Descriptions:

General Description: Pushkarmula commercially is a very important medicinal plant as described in Ayurveda. The conditions of temperate and sub-alpine regions are most suited for the cultivation of Inula species. Well-drained, clay-loam soils are ideal for the crop. It prefers open and sunny locations. Propagation can be done both by seeds and rootstocks. However, it is preferable to raise seedlings through seeds. The fruits (achenes) mature in winter and can be collected by the end of cold season (March–April) in high hills.

Macroscopic Description: The plant is a stout shrub, bearing large leaves arranged in a racemose manner. The stem is grooved and all vegetative parts are scabrid tomentose. Lower leaves are narrowed to a winged leaf stack. Upper leaves are lanceolate and stem clasping. The abaxial laminal face is densely tomentose. Radical leaves are broad and are elliptic lanceolate with long petioles. The cauline leaves are smaller, oblong and semi aplexicaule. The lowers are large, shady yellow daisies produced in mid to late summer. They are borne on apical spike like cluster. The fruits, slender achenes, 0.4 cm long, bearded with 0.75 cm long pappus hairs. Root stock branched; fresh roots are irregularly fusiform. Sometimes a number of roots are found in the collar zone, though usually few occur in each clump. These roots have a dull brownish skin with yellowish colour inside. They possess a sweet and somewhat camphoraceous odour and have a bitter taste.

Microscopic Description: Mature root shows a wavy outline due to development of rhytidoma; cork composed of 8 to 12 layers of thick-walled, tangentially elongated, rectangular cells, some filled with reddish-brown contents; secondary cortex 1 or 2 layers or absent; secondary phloem consists of sieve elements and parenchyma having secretory cavities and traversed by medullary rays; cambium not distinct; wood occupies bulk of root consisting of vessels, tracheids, fibres, parenchyma, secretory cavities and medullary rays; vessel have reticulate thickenings, a few fibres occur in small patches adjacent to

vessels and abundant in xylem parenchyma, thin-walled; a few small tracheids; parenchyma in general contain granular, slightly yellowish or colourless inulin granules Part and also a few

yellowish oil globules; starch grains either absent or very rarely seen in cortical and ray cells; yellowish resinous masses present in secretory canals.

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

Used parts: Roots

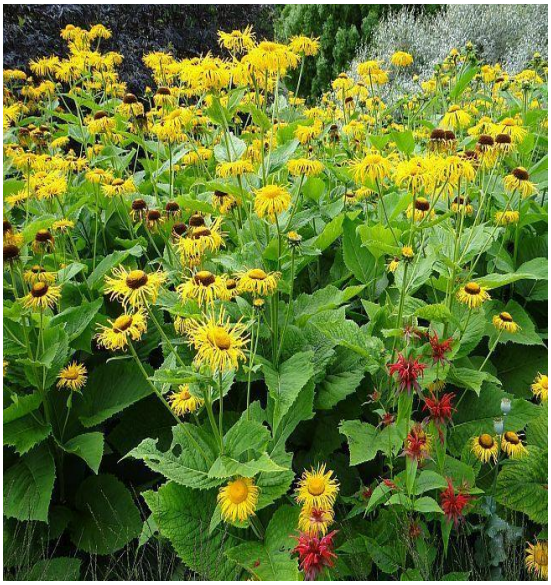

Fig. *Inula racemosa* Hook. f.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Katu (Pungent)
Guna (Attribute)	: Lagu (Light)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kaphavatajit

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 5 % w/w
Acid insoluble ash	: Not more than 0.6 % w/w
Alcohol soluble extractive	: Not less than 10% w/w
Water soluble extractive	: Not less than 20%w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for

crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of alcoholic extract on Silica gel 'G' plate using Benzene: Ethylacetate (9:1) shows on exposure to Iodine vapour nine spots at Rf. 0.23, 0.28, 0.34, 0.39, 0.48, 0.51, 0.64, 0.73 and 0.94 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for about ten minutes at 105o C eight spots appear at Rf. 0.11, 0.28, 0.34, 0.39, 0.48, 0.64, 0.73 and 0.94 (all violet).

Major Chemical Constituents: Alantolactone, Isoalantolactone, Inunolide- Germacranolide, Di hydroisoalantotolactone, B- Sitosterol, D- Mannitol, Dihydroi- nunolide, neo-Alantolactone, inunolise, sesquiterpene lactone- in- unol, Alantodiene etc. Investigation on the aerial parts of Inula royleana reported the presence of several other sesquiterpene lactones namely ivalin acetate, 2d-OH alantolactone, 1- desoxy-8-epi-ivangustin, 8-epi- isoivangustin, 9β-OH costunolide, 9 β-propionyl oxycostuno- lide, 9 β-(2-methylbutaryloxyl) costunolide, 4β-5α-epoxy-10 α, 14Hinuviscolide, 4β, 5α-epoxy-4,5-cis-inunolide, 4H-tomentosin, 4H carbrone.

Therapeutic Usages: Aruci (anorexia), Adhmana (flatulence), Hikka (hiccup), Jvara (fever), Kasa (cough), Swasa (asthma), Ardita (facial paralysis), Pandu (anaemia), Vatakapha Jvara (fever caused by Vatapitta imbalance), Sotha (swelling), Svasa (breathlessness) and Parsvasoola (pain in the sides of the chest).

Pharmacological Study: Cardio rotective, antiallergic, antimutagenic, antiapoptotic, anti-inflammatory, analgesic, anti-histaminic, anti-serotonergic effects, hypoglycaemic activity, anti-fungal properties.

Contraindications: Known allergy to the plants of the Asteraceae family. It is contraindicated in Low blood pressure.

Adverse Effects: It is important to state that the plant has no recorded antimutagenic practice.

Precautions: Do not use in a high dose or for longer periods of time. People with high blood pressure should take this herb only under medical supervision. High dose may casue low blood pressure.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: 1-3 gm of the drug in powder form.

Formulations: Pushkaradi Churna, Avya Lavana, Astangavaleha, Laudhrasav, Kumari Asav.

Raktachandan

Botanical Name: *Pterocarpus santalinus* Linn. f.

Family: Fabaceae

Vernacular name:

Bangla	: রক্তচন্দন (Raktachandana)
Hindi	: Raktachandanam, Lalchandana
Sanskrit	: Raktanga, Kudracndana, Raktasara
Urdu/Unani/Tibb	: Sandal Surkh
English	: Red Sanders, Red Sandal Wood

Geographical Distribution: Pterocarpus species are widely distributed in the tropics throughout the world especially India, Sri Lanka, Bangladesh, China, and Taiwan. In Bangladesh it is available in Hazarikhil, Chittagong.

Plant Descriptions:

General Description: Pterocarpus santalinus belongs to Fabaceae family, a butterfly-shaped red sandalwood flower, classified as rosewood mahogany, are medium arbor, has deep and white stripes, and is slightly fragrant. Physiographically, the most favorable altitude for P. santalinus is between 300 and 800 m, and grows on hilly terrain and slopes with very shallow to shallow brown, sandy loam or bouldery soils of a friable nature. In nature, two types of rakta chandan trees are observed—wavy grained and straight. The wavy grained wood is more in demand in trade and is preferred for commercial plantation. No commercially released varieties are available. Camphor is the substitute when sandal wood is not available. When both sandal wood and camphor are unavailable, red sandal wood can be used as substitute.

Fig. *Pterocarpus santalinus* Linn. f.

Macroscopic Description: *P. santalinus* Linn. belonging to family Fabaceae, is a small to medium sized deciduous tree, with an extremely hard, dark purple heart-wood with a bitter flavor Bark is blackish brown, 1-1.5 cm thick and deeply cleft into rectangular plates by deep vertical and horizontal cracks. Blaze is pale yellow with numerous pink streaks exuding copious red sticky thick gum. Branchlets are drooping and hairless. Leaves are 3 foliated, 10-18 cm long and rachis swollen at base. Generally, there are 3 leaflets (rarely more than 3), broadly egg-shaped or orbicular. Base is round or slightly heart-shaped. Apex is also rounded or deeply notched. Margin is entire, leathery, shiny, hairless, and distinctly stalked. Flowers are bisexual, stalked in auxiliary simple or sparingly branched racemes, yellow, about 2 cm long, fragrant. Pods are unequally

orbicular, flat about 5×4.5 cm including the wing, and gradually narrow into a short tip about 1-cm long. Seeds 1 or rarely 2, more or less kidney shaped, 1-1.5 cm long, smooth, reddish brown.

Microscopic Description: Heart wood shows alternating bands of darker and lighter zones; vessels large, mostly isolated and connected by fine, bright red rays, consisting of xylem parenchyma; prismatic crystals of calcium oxalate occur in a few celIs; red colouring matter present in a number of cells of vessels and other cells; fibres abundant; xylem rays mostly uniseriate.

Powder - Red or purplish-red; shows a number of fibres, vessels and xylem parenchyma cells and prismatic crystals of calcium oxalate.

Used parts: Heart wood (Kanda Sara), oil

Organoleptic Properties

Rasa (Taste)	: Madura (sweet), Tikta (Bitter),
Guna (Attribute)	: Guru (heaviness), Ruksa (Dryness)
Virya (Potency)	: Sita (cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Pittahara, Vrsya, Visaghna, Netraroga

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 2% w/w
Acid insoluble ash	: Not more than 0.3% w/w
Alcohol soluble extractive	: Not less than 3% w/w
Water soluble extractive	: Not less than 1%w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more

than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene: Ethylacetate (9:1) shows in visible light a spot at Rf. 0.37 (light pink). Under U.V. (366 nm) five fluorescent zones are visible at Rf. 0.07 (blue), 0.13 (grey), 0.3e (blue), 0.37 (grey), and 0.57 (blue). On exposure to Iodine vapour eight spots appear at Rf. 0.07, 0.13, 0.16, 0.26, 0.37, 0.43, 0.74 and 0.80 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C seven spots appear at Rf. 0.04 (violet), 0.07, 0.13 (both light violet), 0.37, 0.43 (both violet), 0.74 and 0.80 (both light violet).

Major Chemical Constituents: The phytochemical analysis of *Pterocarpus santalinus Linn*. showed that it contains various components, such as carbohydrates, steroids, anthocyanins, saponins, tannins, phenols, triterpenoids, flavonoids, glycosides and glycerides. Chemical structure of santalin (R=OH, santalin A; R=OCH3, santalin B). Pterocarpus species also contains isoflavonoids, terpenoids and phenolic compounds, β-sitosterol, lupeol, (-)epicatechin. In addition auron glycosides viz., 6-OH-1-methyl-3',4',5'- trimethoxyaurone-4-O-rhamnoside and 6,4'-dihyroxyaurone-4-O-neohesperidoside, and isoflavone glycoside 4',5-dihydroxy 7-methyl isoflavone 3'-O-beta-D-glucoside are present in Pterocarpus santalinus. The heartwood also contains pterocarpol, santalins A and B, pterocarptriol, ispterocarpolone, pterocarpo-diolones with β-eudeslol and cryptomeridol. Ether, alkalis and three other crystalline principles santal, pterocarpin, homopterocarpin, small quantity of tannin and kino-tannic acid are also found in the wood. Triterpene has reported to be present in the callus of stem cuttings.

Therapeutic Usages: Astringent and tonic, and is bitter, sweet, cooling, analgesic, anti-inflammatory, and febrifuge, chronic dysentery, burning sensation, vomiting, skin diseases, leprosy, ulcers, fistula, and haemorrhages, skin diseases, bone fracture, leprosy, spider poisoning, scorpion- sting, hiccough, ulcers, general debility, and metal aberrations.

Pharmacological Study: Antioxidative, antidiabetic, antimicrobial, anticancer, Hepatoprotective, Gastroportective and anti-inflammatory properties, and protective effects on the nervous system.

Contraindications: Known allergy to the plants of the Fabaceae family.

Adverse Effects: *P. santalinus* found to be well tolerated up to 2g/kg in acute toxicity study. The sub acute toxicity studies showed no significant alteration on any of the parameters. Hence *Pterocarpus santalinus* heart wood is safe and can be used in the treatment of diseases without any toxicity.

Precautions: Generally recommended as safe; but precaution should be advised during pregnancy.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: 3-6 gm of the drug (powder) in divided dose. Decoction 50 -100 ml in divided dose along with water in morning and evening.

Formulations: Pushyanug Churna, Mahabhringaraj Taila, Jouban Satadal, Brihat Jirakadya Modak, Saribadi, Majisthasav.

Sankhapuspi

Botanical Name: *Convolvulus pluricaulis* Choisy

Family: Convolvulaceae

Vernacular name:

Bangla	: শংখপুস্পি (Sankhapuspi)
Hindi	: Shankhapushpi
Sanskrit	: Sankhpuspa, Sankhahva
Urdu/Unani/Tibb	: Sankali

English : Type of Morning Glory or Bindweed/ Aloe weed

Geographical Distribution: Convolvulus pluricaulis is found in regions of Southern India, Myanmar, Nepal, Bangladesh, Sri Lanka, Malaysia, Tropical Africa and South-Eastern Asia. It is a horizontal-spreading, perennial wild herb commonly found on sandy or rocky land under xerophytic conditions and extensively grows on the wasteland in the plains of Punjab, Bihar and Chhota Nagpur in India. Flowering begins during September and October, and flowers vary from white to light pink in colour.

Plant Descriptions:

General Description: In Ayurveda, different plants are quoted under one common name Shankhpushpi visually C. prostratus, Evolvulus alsinoides, Canscora decussata, Clitorea ternatea and Lavendula bipinnata. Amongst these plants C. prostratus is considered by majority of authors as Shankhpushpi. Due to the color distinction in the flowers, it can be divided into three categories i.e white, blue and canscora decussate. This plant is also named as Shankhahuli. Convolvulus pluricaulis is a twining perennial herb considered as the most wonderful gift of nature to the mankind. In Ayurveda, it is mentioned as a rasayana which is commonly used as brain stimulator and memory enhancer. The herb has appearance like morning glory with blue flowers situated at alternate positions with flowers or branches.

Macroscopic Description: It is a perennial herb like morning glory and is a fulvous hairy herb. Branch: prostrate and can be more than 30 cm long, Stem: ascending or prostrate, 10-40 cm long, densely velvety with spreading hairs, Leaves: elliptic in shape (2 cm), linear to oblong, small and sub-sessile, nearly stalkless, lance-shaped or inverted lance-shaped, 0.8-3 cm long, 1.5-6 mm broad, wedge-shaped at the base, pointed/blunt at tip, velvety/hairy are located at alternate positions with branches, Flowers: bluish like a Shankh, giving it the name Shankhpushpi. 1-3 flowered cymes carried on stalks up to 2-3 cm long but often much shorter or absent. Style - 2-4 mm long, stigma - 3-5 mm long, seeds are 2-4, approximately 2-2.5 mm long, dark brown; Fruit: Nut oblong, trigonous, stramineous and stiptate.

Microscopic Description:

Root - Appears nearly circular in outline; cork composed of 10-15 layers of tangentially elongated, thick-walled cells; cortex composed of 6-10 layers of oval to elongated, elliptical, parenchymatous cells and yellowish-brown, tanniniferous, secretory cells present in this region; phloem composed of sieve elements, phloem parenchyma and phloem rays; xylem consisting of usual elements; vessels solitary or in groups of two with simple pits; fibres and tracheids aseptate and pitted; medullary rays 1-3 cells wide and multicellular in length; starch grains solitary or in groups, simple and composed of 2-3 components, round to oval in shape, measuring 3-8 µ in dia., present in cortex, phloem, xylem rays and parenchyma.

Stem - Shows single layered epidermis, covered with thick cuticle; at places unicellular hairs present; cortex differentiated in two zones, 2-3 upper collenchymatous and 1-2 lower parenchymatous layers, both having round to oval, elongated, thin- walled cells; endoderrnis single layered; pericycle present in the form of single strand of fibres; phloem a narrow zone, mostly composed of sieve elements and parenchyma; xylem consists of vessels, fibres and parenchyma; medullary rays and tracheids not distinct, vessels mostly solitary with spiral thickening; fibres aseptate having pointed ends and narrow lumen; strand of internal phloem present around the slightly lignified pith.

Leaf- Midrib - appears convex in lower and concave in upper side; epidermis single layered, covered with thick cuticle; lower epidermis followed by 2-3 layers of chlorenchymatous cells; vascular bundle bicollateral, composed of usual elements of phloem and xylem; rest of tissue between chlorenchyrna and vascular bundles composed of 4-5 layers of parenchymatous cells. Lamina - shows epidermis on both surfaces covered with thick cuticle; hairs unicellular, present on both surfaces, palisade two layered, spongy parenchyma 4-5 layered; a few bicollateral vascular bundles present in spongy parenchyma; palisade ratio 6-9; vein islet number 21-25 per sq. mm., stomatal index in lower surface 17-20 and in upper surface, 13.8-17.0; stomatal number in lower surface 184-248, and in upper surface 202-238 per sq. mm.

Powder - Light yellowish-green; shows groups of vessels with spria1 thickening and simple pits, fibres and tracheids, simple and compound starch grains, measuring 3 – 8 µin dia., unicellular hairs, mesophyll cells and gives positive test for tannin.

Used parts: Whole Plant

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Katu (pungent), Kasaya (astringent)
Guna (Attribute)	: Snigadh (Unctuous), Picchil (Sliminess)
Virya (Potency)	: Sita
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Balya, Ayusya, Kaphahara, Medhya, Pittahara, Rasayana, Mohanasaka

Fig. *Convolvulus pluricaulis* Choisy

Purity and Safety Test

Foreign matter	: Not more than 2 % w/w
Total ash	: Not more than 17 % w/w
Acid insoluble ash	: Not more than 8 % w/w
Alcohol soluble extractive	: Not less than 6 % w/w
Water soluble extractive	: Not less than 10 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: TLC of dry leaves extract of Convolvulus pluricaulis revealed the presence of 4 compounds in Diethyl ether having Rf value given in respectively in two fractions Di ethyl ether and Ethyl acetate. The Solvent system of benzene, acetic acid and water (125:72:3) was used for the development of the TLC system and following results were found with standard using Quercetin and Rutin. The presence of 1 compound having Rf value of 0.41, 0.33, 0.31 while 2 compound have the Rf value of 0.58. The 3 compound having the Rf value 0.41 and 4 compound 0.68, 0.63, 0.70 respectively.

Major Chemical Constituents: Chemical studies of whole plant have shown the presence of glycosides, coumarins, flavonoids and alkaloids. Shankhpushpi, (the alkaloid) has been identified as active principle B. sitosterol glycoside, Hydroxy Cinnamic acid, Octacosanol tetracosane along with glucose, sucrose also have been isolated from the plant drugs. The extract of this botanical contains the alkloids convolvine, convolamine, phyllabine, convolidine, confoline, convoline, subhirsine,

convosine and convolvidine along with scopoline and β- sitosterol as major phytoconstituents. Ethanol, extracted from CP, helps in reducing total serum cholesterol, phospholipids and some types of harmful fatty acids from body.

Therapeutic Usages: Sleeplessness, stress disorders, mental debility, vertigo, etc, schizophrenia, depression, epilepsy and aggressive behavior disorders, nervous debility, and loss of memory.

Pharmacological Study: Antidepressant, antidiabetic, antimicrobial, antihelmintic, anticonvulsant, anxiolytic, tranquillising, antistress, neuroprotective, antioxidant, hypolipidemic, immunomodulatory activity etc.

Contraindications: Known allergy to the plants of the Convolvulaceae family. Concurrent administration of CP with phenytoin in epilepsy in multiple-dose regimens showed beneficial pharmacokinetic as well as pharmacodynamic interaction leading to enhanced anti-epileptic activity and diminished untoward effect of the drug.

Adverse Effects: There are no side effects observed with the use of Convolvulus Pluricaulis (Shankhpushpi) within normal dose. The sedative effect of CP in mice was observed at doses greater than 200 mg/kg, and moderate to marked decrease in locomotor activity was observed for approximately 12 hours by lethal dose (LD50) of the whole extract of CP.

Precautions: It decreases blood pressure; people with low BP or people who are taking antihypertensive drugs should exercise precaution.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: 3-8 gm of the drug in powder form. In children above 3 years of age in small amount.

Formulations: Soma Grita, Srigopal Taila, Mahanarayan Taila.

Sirish

Botanical Name: *Albizzia lebbeck* Benth.

Synonyms:

Family: Fabaceae

Vernacular name:

Bangla	: শিরিষ (Sirish)
Hindi	: Siris, Shiris
Sanskrit	: Bhandi, Sitapuspa
Urdu/Unani/Tibb	: Siris
English	: Siris Tree, Lebbeck Tree

Geographical Distribution: The species is native to Bangladesh, India, the Andaman Island, Myanmar, tropical Africa, Asia and northern Australia and also distributed in tropical and subtropical areas also found in dense deciduous forests in tropical and subtropical countries of Asia, as Laos,

Cambodia, Malaysia, Indonesia, Vietnam, Africa, Australia, China, Thailand, Malaysia, Sri Lanka, the eastern islands of Indonesia.

Plant Descriptions:

General Description: *Albizia lebbeck* Benth. is a medium to large sized unarmed deciduous about 20 m in height with an umbrella-shaped crown and grey to dark brown rough, spreading tree belonging to the family Fabaceae formerly named Leguminosae, a subfamily of Mimosaceae. Albizia an Italian naturalist of the eighteenth century first identified it and hence, its scientific name is *Albizia lebbeck*. All parts of Shirish are extensively used as a general and universal antidote in traditional medicine like Himavana Agada, Panch Shirish Agada, and Mahagandhahasti Agada etc. The tree is a good substitute for Teak (Tectona grandis Linn) and Sala (Shorea robusta Gaertn.), The tree is very good nitrogen fixing plant.

Macroscopic Description: A medium to large sized plant. Bark is grey to dark brown rough irregularly cracked with longitudinal and transverse fissures on outer surface; inner surface whitish with fine longitudinal stations. Leaves are abruptly bipinnate, main rachis with a large gland above the base and one below the upper-most pair of pinnae, pinnae 2-4 pairs, leaflets, 5-9 pairs with glands ovate-oblong. The sapwood is white or yellowish white and the heartwood is dark brown, streaked with dark and white shades. Flowers are stalked, greenish yellow. Flowering and fruiting season starts from April to June. Pods yellowish brown with 6-10 seeds. Mature pods remain on the tree for long period and are available till May-July.

Microscopic Description: Mature bark about 2 cm thick, shows dead tissue of rhytidoma; cork consists of a few layers of thin-walled, transversely elongated and radially arranged cells; secondary cortex wide, composed of radially elongated to squarish, moderately thickwalled cells containing orange to reddish-brown contents; a few of the cells contain prismatic crystals of calcium oxalate; stone cells, variable in shape and size, present in singles or in groups throughout the region; secondary phloem consists of sieve elements, phloem parenchyma, phloem fibres and crystal fibres, traversed by phloem rays; prismatic crystals of calcium oxalate present in most of the phloem parenchyma cells; tangential bands of ceratenchyma present in middle and outer phloem region; phloem fibres. elongated, thick-walled, lignified, present in many concentric strips, mostly enclosed by crystals sheath throughout the middle and inner regions of phloem; crystal fibres having a number of septa, each chamber containing a single prismatic crystal of calcium oxalate; phloem rays numerous, radially elongated, somewhat wavy in outer phloem region and bi to multiseriate in the inner phloem region being 2 - 5 cells wide and 7 – 25 cells high.

Powder - Greyish-brown; shows large number of stone cells, prismatic crystals of calcium oxalate, crystal fibres and phloem fibres.

Used parts: Leaves, Bark, Flowers and Seed

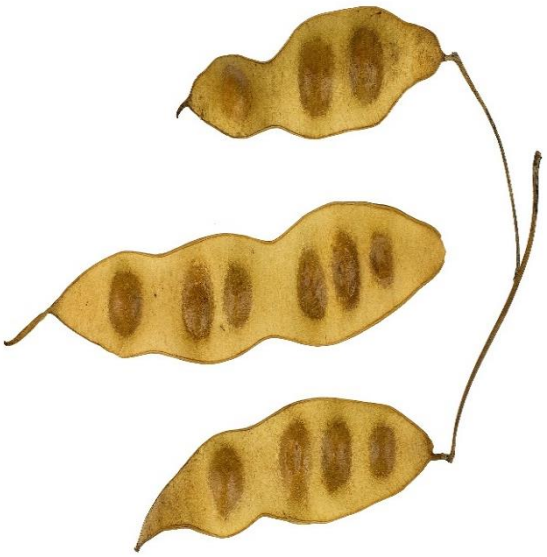

Fig. *Albizzia lebbeck* Benth.

Organoleptic Properties

Rasa (Taste)	: Madura (sweet), Tikta (Bitter), Katu (pungent), Kasaya (Astringent)
Guna (Attribute)	: Laghu (Light)
Virya (Potency)	: Anushna (Neither hot nor cold in potency)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Sothahara, Tridosahara, Visghna, Tvagdosa, Varnya

Purity and Safety Test

Foreign matter	: Not more than 1 % w/w
Total ash	: Not more than 8 % w/w
Acid insoluble ash	: Not more than 1 % w/w
Alcohol soluble extractive	: Not less than 12 % w/w
Water soluble extractive	: Not less than 6 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene: Ethylacetate (9: 1) shows under UV (366 nm) a fluorescent zone at Rf. 0.63 (blue). On exposure to Iodine vapour two spots appear at Rf. 0.07 and 0.21 (both yellow). On spraying with 5% Methanolic-Phosphomolybdic acid reagent and heating the plate at 105°C for ten minutes two spots appear at Rf. 0.07 and 0.21 (both light blue).

Major Chemical Constituents: The main phytoconstituents of plant are melacacidin, D-catechin, Bita sitosterol, albiziahexoside, betulnic acid and echinocystic acid glycosides. Lupeol, stigmasterol, 4-hydroxy-3-methoxycinnamic acid and trans-p-coumaric acid were isolated from the n-hexane and chloroform fractions of a methanol extract of the root.

Therapeutic Usages: In Ayurvedic literature, Shrish is described to use in Pama, Kustha, Kandu, Visarpa, Kasa, Vrana, Sotha, Svasa, Sita Pitta, Raktadusti, Pinasa, Vismajvara, Pratisyaya, Sarpdansa, Visadusti, Suryavarta, Ardhavabhedaka, Krmi Roga and Netrabhiasanda.

Pharmacological Study: Anti-asthmatic (exhibited potent activity against different inflammatory responses because of mast cell stabilization, lipoxygenase inhibition, hyaluronidase inhibition), anti-allergic, anti-tussive, and antidiarrheal, anti-microbial, anti-fertility, Anti-anxiety and anti-inflammatory activity.

Contraindications: Known allergy to the plants of the Fabaceae family. It is strongly contraindicated in pregnancy, lactation and low sperm count.

Adverse Effects: There is no known adverse effect.

Precautions: Generally recommended as safe; but precaution should be advised during pregnancy.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: 25-50 ml (Kwatha), 3-6 gm (Curna)

Formulations: Sirisarista, Devadarvadyarista, Eladyarista

Soti

Botanical Name: *Curcuma zedoaria* Rose

Family: Zingiberaceae

Vernacular name:

Bangla	: শটি/একাংঙ্গি (Soti/Ekangi)
Hindi	: Kacura
Sanskrit	: Kaccura, Dravida
Urdu/Unani/Tibb	: Zarambad

English : Zedoary

Geographical Distribution: The plant is found growing in damp shady places and very indigenous to Bangladesh, Sri Lanka and India. It is also widely cultivated in China, Japan, Brazil, Nepal, Bhutan and Thailand. In Bangladesh it can be found in the wild areas especially in Chittagong, Mymensing and Netrokona districts.

Plant Descriptions:

General Description: *Curcuma zedoaria Rosc* is known as white turmeric, zedoaria or gajutsu is a perennial rhizomatous herb that belongs to the Zingiberaceae family. It is also known as Karchura, Sathi, and Karchur in Ayurveda. This root is the source of 'Shoti Starch', which is used as a substitute for arrowroot and barley. It is mainly used to reduce kapha / phlegm, and increase circulation. It is warming, and demulcent. Zedoary is also used in the manufacture of liquors, stomach essences and bitters and for the production of perfumes and cosmetics.

Fig. *Curcuma zedoaria* Rose

Macroscopic Description: Zedoary closely resembles turmeric (*C. longa*) in appearance, bears green leaves with brownish purple veins and grows up to a height of 50 cm. Zedoaria is a herbaceous and rhizomatous perennial plant composed of an upright pseudostem, a corm and underground cylindrical branches or rhizomes and fleshy roots.The zedoary rhizomes color ranges from pale yellow to bright yellow and become brown on age maturity. Dried rhizomes have musky odor with slight camphor smell and a bitter pungent aftertaste. Some roots develop terminal storage structures (rounded to elongated tuber-like roots called t-roots). From March to April the axillary buds of the corm and apical buds of the third-order rhizomes emerge above the ground as inflorescences. This basal flower spike, which grows about 30 cm tall, appears just before the

foliage. On the node closest to the flower spike, a vegetative shoot always develops. No additional floral buds sprout but more vegetative shoots develop. New branches start to develop on corms of recently formed aerial shoots. By autumn, the above-ground foliage dies back. From November to December storage roots are formed, having a high (> 70%) carbohydrate content.

Microscopic Description: Shows a thin zone of cork composed of 4 to 7 layers of thin-walled, tangentially elongated, rectangular cells, sometimes epidermis intact with cork having uniseriate covering trichomes; ground tissue consist of thin-walled, circular, oval or polygonal, parenchymatous cells, mostly filled with simple starch grains but some cells also contain yellow oleo-resin; stelar region demarked from cortex by somewhat collapsed cells of endodermis and consists of rounded and oval to polygonal cells mostly filled with starch grains but some having yellow masses of oleo-resin; vascular bundles closed andcollateral, distributed throughout cortical and stelar region, consisting of a few xylem and phloem elements; vascular bundles found in the form of a ring in the cortical region and in the stelar region, just below endodermis; most of the vascular bundles in rest of the stelar region smaller in size and scattered; number of vessels in each bundle varies from 2 to 10, bundle with single vessels being very rare; starch grains round to oval, a few with slight projection at one end striations distinct, numerous; hilum cleft, indistinct at the narrow end, 20 to 70 µ in length and 15 to 35 µ in width.

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

Used parts: Rhizome

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Katu (pungent),
Guna (Attribute)	: Laghu (Light), Tiksna
Virya (Potency)	: Ushna (hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: DIpana, Kaphahara, Rucya, Vatahara, Mukhavaisadyakara

Purity and Safety Test

Foreign matter	: Not more than 2 % w/w
Total ash	: Not more than 7 % w/w
Acid insoluble ash	: Not more than 2 % w/w
Alcohol soluble extractive	: Not less than 4 % w/w
Water soluble extractive	: Not less than 10 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more

than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.

Heavy metals : In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues : According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

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

Major Chemical Constituents: It is well known that the medicinal properties of zedoary depend upon the presence of active chemical components such as terpenoids, flavonoids, phenylpropanoids and sesquiterpenes. Zedoary rhizomes consist of number of bioactive compounds namely zederone, curzerenone, 1,3– hydroxygermacrone, epicurzerenone, curcumol, zedoarol, curcolone, ar–turmerone, zedoarondiol, isocurcumenol, furanodiene, curdione, curcumenol, curcumanolide A, zingiberene, procurcumenol, curzeone, curcumin, curcumenone, curcumanolide B, dehydrocurdione, curzerene, β–turmerone and curcumadiol. The rhizome volatile oil possessed major components as curzerenone, germacrone, camphor and curcumenol. The odoriferous consitutent is said to be a sesquiterpene alcohol belonging to the tricyclic group.

Therapeutic Usages: Arsa, Jvara, Jvara, Kasa, Krmi, Kustha, Vrna, Svasa, Gulma, Pliha and Galaganda, cough, difficult breathing, asthma, hiccups, swellings, arthritis, rheumatism, diseases of the skin, and in low appetite.

Pharmacological Study: Antimicrobial, anticancer, antiamoebic (inhibit the growth of Entamoeba histolytica), larvicidal (effective against Aedes aegypti mosquitoes), antiallergic, analgesic, antinociceptive, antiulcer, hepatoprotective, antivenom, antimutagenic and antioxidant activity.

Contraindications: Known allergy to the plants of the Zingiberaceae family.

Adverse Effects: It increases Pitta / gastric acidity. Ethanol extracts and decoctions of zedoary rhizomes also have antifertility effects. Subsequent research shows a strong link between the embryotoxic effect of zedoary oil and its antiangiogenic action.

Precautions: Avoid use in heavy menstrual flow. Do not use in pregnancy.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: 1-3 gm of the drug in powder form.

Formulations: Narayan Churna, Brihat Yogaraj Guggul, Kumar Kalyan Grita, Soubhagyashunthi Modak, Brihat Jirakadya Modak, Saribadi, Laudhrasav, Rasnasav.

Til

Botanical Name: *Sesamum indicum* Linn.

Family: Pedaliaceae

Vernacular name:

Bangla	: তিল (Til)
Hindi	: Tila, Teel, Tili
Sanskrit	: Tila
Urdu/Unani/Tibb	: Kunjad

English : Sesame, Gingelly-oil Seeds

Geographical Distribution: Sesame is one of the oldest crops in the world, and cultivated in Asia for over 5000 years. The crop has early origins in East Africa and in India. Today, India and China are the world's largest producers of sesame, followed by Myanmar, Sudan, Uganda, Nigeria, Bangladesh, Pakistan, Tanzania, Ethiopia, Guatemala and Turkey.

Plant Descriptions:

General Description: Sesame is probably the oldest reported oil plant in the world. Sesame is known as the king of oil seeds due to the high oil content (50 – 60%) of its seed and is an erect annual plant grows best in sandy well-drained soil and a hot climate with moderate rainfall. The Bhāvaprakāśa Nighantu describes three varieties of sesame based on colour of seeds. They are 'Raktha (red), Krishna (black) and shweta (white)'. Krishna Tila or black sesame seeds are considered to have excellent medicinal properties and are recommended in Ayurveda for treatment purpose and as a rejuvenating drug, while white sesame seeds are supposed to be better for edible purpose. There is no major difference between the two. The white varity is hulled black sesame seed. Black contains more calcium than white. Black sesame is the best. White is of medium quality and rest of the sesame seed including red are of inferior quality.

Macroscopic Description: It is an annual plant growing 50 to 100 cm (1.6 to 3.3 ft) tall, with opposite leaves 4 to 14 cm (1.6 to 5.5 in) long with an entire margin; they are broad lanceolate, to 5 cm (2 in) broad, at the base of the plant, narrowing to just 1 cm (0.4 in) broad on the flowering stem. The flowers are yellow, tubular, 3 to 5 cm (1.2 to 2.0 in) long, with a four-lobed mouth. The flowers may vary in colour with some being white, blue or purple. Sesame fruit is a capsule, normally pubescent, rectangular in section and typically grooved with a short triangular beak. The length of the fruit capsule varies from 2 to 8 cm; its width varies between 0.5 to 2 cm, and the number of loculi from 4 to 12.

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

Powder - Blackish coloured; shows palisade-like cells in surface view, parenchyma cells, aleurone grains and oil globules.

Used parts: Seed, oil and whole plant

Organoleptic Properties

Rasa (Taste)	: Madura (sweet), Tikta (Bitter), Katu (pungent), Kasaya
Guna (Attribute)	: Vyavai, Guru, Snigdha, Suksma
Virya (Potency)	: Ushna (hot)

Vipaka (Metabolism)	: Madura (sweet)
Karma (Action)	: Balya, Kesya, Pittala, Rasayana, Sangrahi, Vataghna, Varnya, Visaghna, Snehana, Svarka, Snehopaga, Kushthakara, Vitbardhaka, Mutrabandhaka, Medhavardhala, Agnivardhaka, Avasadakara, Kesa

Purity and Safety Test

Foreign matter	: Not more than 2 % w/w
Total ash	: Not more than 9 % w/w
Acid insoluble ash	: Not more than 1.5 % w/w
Alcohol soluble extractive	: Not less than 20 % w/w
Water soluble extractive	: Not less than 04 %w/w

Fig. *Sesamum indicum* Linn.

Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of alcoholic extract on Silica gel 'G' plate using Toluene: Ethylacetate (9: 1) shows under UV (366 nm) three fluorescent zones at Rf. 0.57, 0.64 (both light blue) and 0.72 (blue). On exposure to Iodine vapour five spots appear at Rf. 0.08, 0.57, 0.64, 0.72 and 0.94 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110o C seven spots appear at Rf. 0.08, 0.57, 0.64, 0.72 (all violet), 0.76, 0.84 (both light violet) and 0.94 (violet).

Major Chemical Constituents: Chemical constituents in Krishna Tila (black sesame seeds) is – around 55% oils, sesamin, sesamolin, sesamol (3,4- methylenedioxy-phenol), Fatty oils are mainly composed of 48% of oleiic acid, 37% linoleeic acid, palmate acid, stearic acid, archidonic acid, and glycerol etc. which are supposed to poses antioxidant effects on the body. Krishna Tila (black sesame) also contains vitamin E, B-complex vitamins (especially niacin), phytosterols, proteins, sucrose, saccharides, sesamose, and trace amount of phosphorus, potassium and cytochrome C. Krishna Tila (black sesame) contains folic acid, nicotinic acid, planteose, pentosan and rich source of calcium.

Therapeutic Usages: Udavarta, Yonishula, Gulma, Udara, Anaha, Shira shula, Parasava shula, Amashula, Raktarsha, Gudabhrmsha, Kasa, swasa, Pravahika, Visarpa, Hikka, Pinasa, Vatarakta, Pradara, Ashmari, Nadi Vrana, Kushtha, svitra, Granthi, Upadamsha, Vidaraka, Alasa, Khalitya, Palitya, Akshiroga, Pratishyaya, sankhaka, shakuni Graha, Kumara, Kshaya, Krumi, Mutraghata, Dantaroga, Dantaharsha, Vatika Mukharoga, Atidagdha, Trusna, Pliharoga, Galaganda and Karnapali shotha.

Pharmacological Study: Antiarthritic, antiinflammatory, antiosteoporotic, antidiabetic, cholesterol lowering and antioxidant properties.

Contraindications: Known allergy to the plants of the Pedaliaceae family. It is contraindicated in diarrhea and during concomittent use of antidiabetic, lipid lowering drugs.

Adverse Effects: Excess consumption causes hiccup and shwasa. Sesame seeds or food products containing Sesame seeds/oil may cause allergic reactions in certain people. So it is advisable to consult your doctor if you experience allergic reaction after consuming Sesame seeds.

Precautions: Do not use in a high dose or for longer periods of time. Sesame may interfere with blood sugar level during or after surgery. So it is generally advised to avoid the use of Sesame seeds at least 2 weeks before undergoing a surgical procedure.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: Oil - 2-3 teaspoons once or twice a day. Powder: 5-10 gm.

Seed: Eat 1 tablespoon raw or toasted Sesame seeds a day.

Oil: Rinse your mouth with 2-3 teaspoon of Sesame seed oil for 5 minutes daily to reduce the risk of dental plaque. Or you can drizzle raw Sesame seed oil over baked or boiled vegetables or use it as salad dressing. You can use Sesame seed oil for general cooking purposes as well.

Powder: Take ¼-½ teaspoon Sesame powder. Swallow it with honey or water after lunch and dinner.

Formulations: Swetari Ras, Himsagar Taila, Sharabindu Taila, Sri Kameswar Modak.

Togor

Botanical Name: *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.

Family: Apocynaceae

Vernacular name:

Bangla	: টগর/চামেলী (Togor/Chameli)
Hindi	: Chameli, Chandini, Tagar
Sanskrit	: Nandeevriksha, Khsirika, Ksheeri, Vishnupriya
Urdu/Unani/Tibb	: Chaandni/Yasmeen
English	: East Indian rosebay/Jasmine

Geographical Distribution: Tabernaemontana divaricata is a glabrous, evergreen, dichotomously branched is a general garden plant, belonging to the family Apocynaceae and distributed throughout Bangladesh, India, Sri Lanka, Burma and other parts of the South East Asia.

Plant Descriptions:

General Description: Tabernaemontana divaricata, commonly known as pinwheel flower is a beautifully shaped evergreen shrub which blooms in spring but flowers may appear sporadically throughout the year, which are especially fragrant at night. It is called crape Jasmine in English which is two types, one type has a single blossom and the other has a clustered blossom. Both types have a white-colored flower. The flowers are cooling, fragrant and are useful for curing burning sensation, ophthalmitis and dermatopathy. Traditionally the bark and roots are used as an antidote for snake bite.

Fig. *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.

Macroscopic Description: It is a beautiful evergreen shrub, with large shiny leaves, may

appear sporadically throughout the year. The plant generally grows to a height of 5–6 feet and is dichotomously-branched. The large shiny leaves are deep green in color with shiny upper surface and about 6 inches (15 cm) in length and 2 inches (5.1 cm) in width. Shape is Lanceolate with pinnate venation. Petiole is 5-6 cm length. Stems are short, branched dark green to brown colored and while matures turns black. Both leaves and stem has characteristic odor and acrid in taste. The waxy blossoms are found in small clusters on the stem tips.

Microscopic Description:

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

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

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

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

Used parts: Root, Flowers, and Latex.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Katu (pungent)
Guna (Attribute)	: Laghu (light), Ruksha (Dry), Teeskhsna
Virya (Potency)	: Ushna (hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kaphahara Vatahara

Purity and Safety Test

Foreign matter	: Not more than 2 % w/w
Total ash	: Not more than 6 % w/w
Acid insoluble ash	: Not more than 0.5 % w/w
Alcohol soluble extractive	: Not less than 18 % w/w
Water soluble extractive	: Not less than 25 %w/w
Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.

Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

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

Major Chemical Constituents: Phytochemical studies on various parts reveal that this plant contains at least 66 indole alkaloids, non-alkaloidal constituents like tannins, resins, proteins, amino acids, enzymes, flavonoids, saponins, phenols, glycosides, steroids, triterpenoids, fixed oils and fats. Alkaloids, flavonoids and terpenoids are the main secondary metabolites that exhibit many physiological and pharmacological properties on living cells. T. divaricata flowers contain 3, 4, 14, 19 – tetrahydro-Olivacine, 11-methoxy-N-methyl dihydro-Pericyclivine, 19- epivoacangine, Apparicine, Isovoacangine, Isovoacristine, Tabernaemontanine, Tabersonine, Voaphylline, N-1-methyl-Voaphylline, Vobasine, α-amyrin acetate, β-amyrin acetate, lupeol β–sitosterol, stigmasterol and several other alkaloids.

Therapeutic Usages: Abdominal tumours, arthralgia, asthma epilepsy, eye infections, fractures, headache, inflammation, leprosy, mania, oedema, paralysis, piles, rabies, rheumatic pain, skin diseases, ulceration and vomiting.

Pharmacological Study: Antioxidant, antiinfection, anthelmintic, antihypertensive, aphrodisiac, diuretic, emmenagogue, hair growth promoter, anti-tumour action, analgesia and the enhancement of cholinergic activity in both peripheral and central nervous systems.

Contraindications: Known allergy to the plants of the Apocynaceae family. It is contraindicated during concomittent use of CNS depressant drugs.

Adverse Effects: There are no side effects observed with the use of T. divaricata within normal dose. TD was found to be safe at a dose of 2000 mg/kg, p.o.

Precautions: Do not use in a high dose or for longer periods of time. Precaution should be taken during pregnancy and lactation.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: 50 -70 ml of decoction. Powder: 5-10 mg/kg.

Formulations: Sri Khandasav, Pippaladyasav

Ulatchandal

Botanical Name: *Gloriosa superba* Linn.

Family: Liliaceae

Vernacular name:

Bangla	: উলট চন্ডাল (Ulatchandal)
Hindi	: Kalihari
Sanskrit	: Kalihari, Garbhanut, Halini, Agnisikha
Urdu/Unani/Tibb	: -

English : Glory Lily

Geographical Distribution: Gloriosa superba Linn., (Liliaceae), is a glorious herbaceous climber with underground tuberous rhizome is found throughout India, upto an altitude of 2000 m in Khasia hills. Its natural distribution spreads mainly in tropical Asia, viz., Bangladesh, Sri Lanka, Malaysia and Myanmar. It is often cultivated in tropical, and South Africa, Madagascar, Indonesia, Malaysia, and Myanmar. In Africa, its distribution is from Senegal east to Ethiopia and Somalia, and south to South Africa. Nowadays it is distributed widely throughout the tropics, and worldwide as a pot plant.

Plant Descriptions:

General Description: Gloriosa superba is often referred to as Malabar glory, and it is a perennial creeper within the Liliaceae family and is a common ayurvedic herb used for hundreds of years for the treatment of muscular pain, joint inflammation and pain disorders. The first description of its use in History appears in Charaka Samhita. In Ayurveda, Kalihari or Agnishikha is kept in the Upvish varg category. It is one of the seven minor poisons. Gloriosa superba is the state flower of Tamil Nadu, and the national flower of Zimbabwe. The corms of *Colchicum autumnale L*. and *Iphigenia spp.* (also Colchicaceae) are traditional sources of colchicine. An increase in demand for colchicine stimulated the search for an alternative source, leading to Gloriosa superba.

Macroscopic Description: Climbing, sometimes erect herb up to 4 m long; stem annual, glabrous and sparsely branched; tuber perennial, horizontal, abruptly bent in a V or L shape, roots fibrous. Leaves in whorls of 3–4, opposite or alternate, simple, sessile; blade ovate to lanceolate, 6–15(–20) cm × 1.5–4 cm, base obtuse, apex of upper leaves with or without 1–2 cm long tendril, parallel-veined. Flowers axillary, solitary, bisexual, regular, 6-merous, 4.5–7 cm in diameter, showy, pendulous; pedicel 4–20 cm long; perianth segments free, lanceolate or oblanceolate, 5–7(–9) cm × 1(–2) cm, often with undulate margins, strongly reflexed when mature, persistent, usually yellow and red, less often yellow, red or white; stamens with filaments 2–5 cm long, spreading, anthers 7–10 mm long, opening by longitudinal slits; ovary superior, 3-celled, carpels coherent only by their inner margins, style filiform, 2–4(–5.5) cm long, bent at a right angle basally. Fruit a loculicidal, oblong capsule 4–6 cm × 1–2 cm, containing up to 20(–40) seeds. Seeds ovoid, 4–5 mm in diameter, surrounded by a fleshy, red sarcotesta.

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

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

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

Used parts: Rhizomes, leaves, and seeds (for extraction of Thiocolchicoside, and Colchicine).

Fig. *Gloriosa superba* Linn.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Katu (pungent), Kasaya
Guna (Attribute)	: Laghu (light), Tiksna (strong)
Virya (Potency)	: Ushna (hot)
Vipaka (Metabolism)	: Katu (pungent)
Karma (Action)	: Kaphahara, Pittahara, Vatahara, Garbhapatana

Purity and Safety Test

Foreign matter	: Not more than 2 % w/w
Total ash	: Not more than 6 % w/w
Acid insoluble ash	: Not more than 1 % w/w
Alcohol soluble extractive	: Not less than 5 % w/w
Water soluble extractive	: Not less than 15 %w/w

Microbial contamination	: In accordance with National guideline and WHO guideline the maximum permissible microbial load of *E.coli*, total *yeast* and *mould* count, total enterobacteriaceae are not more than 10^4 $cfug^{-1}$, 10^3 $cfug^{-1}$and 10^4 $cfug^{-1}$respectively for crude plant materials. The load of total viable aerobic count, total *enterobacteriaceae*, *Salmonellae spp*, *S.aureus*, *Pseudomonas aeruginosa* and *Coliforms* will be absent.
Heavy metals	: In the final dosage form of the plant material the lead, mercury, arsenic and cadmium levels are not more than 10, 0.5, 5 and 0.3mg/kg, respectively.
Pesticides residues	: According to WHO guideline, normally the maximum permissible residue limit of aldrin and dieldrin (sum of), azinphosmethyl, bromopropylate, chlordane (sum of *cis*, *trans*and oxythlordane), chlorfenvinphos, chlorpyrifos-methyl, diazinon, endrin and hexachlorobenzeneare not more than 0.05, 1.0, 3.0, 0.05, 0.5, 0.1, 0.5, 0.5 and 0.1 mg/kg respectively and to be established National guideline.

Thin Layer Chromatography: T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform: Methanol (9: 1) shows under UV (366 nm) three fluorescent zones at Rf. 0.24 (blue), 0.88 and 0.94 (both black). On exposure to Iodine vapour eight spots appear at Rf. 0.09, 0.16, 0.24, 0.38, 0.59, 0.75, 0.88 and 0.94 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid two spots appear at Rf. 0.88 and 0.94 (both orange).

Major Chemical Constituents: *G. superba* tubers contain colchicines, benzoic and salicylic acid, sterols and resinous substances like as colchicines, 3-demethyl colchicine, 1,2-didemethyl colchicine, 2,3-didemethyl colchicine, N-formyl, N-deacetyl colchicines, colchicocide, gloriosine, tannins and superbine. Colchicine is the major compound isolated from the seed and rhizome of this plant and other important compound is gloriosine. In addition, G. superba tubers hold 0.25% colchicine apart from containing sitosterol, glucoside, β-and gamma lumicolichicines, β-sitosterol, flucoside and 2-H-6-MeO benzoic acid and flowers contain luteolin and N-formylde-Me-Colchicine reported that new colchicine glycoside, 3-0-demethyl colchicine 3-O-alpha-D-glucopyranoside found in G. superba seeds.

Therapeutic Usages: Parasitic skin diseases and as a cataplasm in urological pains, useful in colic, chronic ulcers, piles and gonorrhoea. Forehead and neck are reported to cure asthma in children. The leaf juice is used against head lice, gout, a common disorder in the temperate parts of the world.

Pharmacological Study: Antimicrobial and anticancer, Antibacterial, antifungal, mutagenic, anthelmintic, antioxidant, antihaemolytic, anticoagulant, larvicidal, and nematicidal activities.

Contraindications: Known allergy to the plants of the Liliaceae family. It is strongly contraindicated in pregnancy, hypertension and diarrhea.

Adverse Effects: Excess consumption may cause diarrhea, vomiting and increase blood pressure. Side effects increases in older patients or in those affected by liver or kidney failure. Just after ingestion of toxic levels of colchicine, the symptoms develop within two hours. The first signs of toxicity include vomiting, numbness and severe effects on throat as well as diarrhea leading to dehydration. Alopecia and dermatitis are the major symptoms that develop after two to three weeks after poisoning. Multi-organ failure can develop 24 to 72 h after ingestion. These include bone marrow depression, hemolytic anemia, liver damage, renal failure, respiratory distress syndrome, arrhythmias, neuromuscular disturbances, paralysis and disseminated intravascular coagulation. Over dosage may frequently lead to a cholera-like syndrome associated with dehydration, shock, acute renal failure, alopecia, hyperthermia, hepatocellular failure, epileptic seizures, coma and death.

Precautions: Do not use in a high dose or for longer periods of time. The roots are never used without purification (purification: see appendix). It must not be used in breastfeeding, ulcer, and planning to concieve.

Dosage Forms: Crude drug, capsules, tablets and pills as powder form. Store in a well-closed container, protected from light and moisture.

Posology: 125-250 mg. of purified drug.

Formulations:

APPENDIX I

PRINCIPAL FORMS OF AYURVEDIC (VEGETABLE) MEDICATION AND METHODS OF THEIR PREPARATION AND USES IN BRIEF

"Ayurvedic Materia Medica includes not only crude drugs property, but also a large number of preparations made from them: e.g., as given in this Appendix."

“As different parts of plants contain different properties, only those parts which contain efficient properties are used in the below-mentioned forms of preparation. Whole plants are used in the case of herbs which are very small and possess one uniform Rasa in all their parts. Each variety of preparation has its own value in therapeutics. The Churns are rather bulky preparations and on account of their complex nature take more time to act. It is, therefore, desirable that only those drugs whose principles are easily soluble or separable should be chosen in the preparation of Churna. Sugar, common salt, rock salt, etc. are generally mixed with these powders in order to make them more active and palatable. Water, milk, honey and ghee are some of the common vehicles. In some cases, the juices of fruits like the lemon or pomegranate are used, as the organic acids, which they contain, facilitate the actions of the Churna. Before using the powders of the whole drugs, it is therefore necessary to ascertain which drugs are water-soluble and which are not. In modern Pharmacopeia, alcohol, ether and the like are used as solvents to help the easy solution of the constituents, which are insoluble in water. (Tinctures are instances of such processes). This is because modern Pharmacologists are in favour of availing themselves of the important constituents only and not all the parts of the drugs. Ayurvedic scientist, on the other hand, has attached more importance to the clinical findings and has based the pharmacological value of the whole drugs on the results of experience. In the place of tinctures, they have used decoctions and infusions. They have again used extract occasionally, evidently for the purpose of portability and adaptability and also for the facility of concentration, which they afford. Similarly methods of maceration, percolation and precipitation have been used to separate the soluble from the insoluble constituents of the drugs. Satvas are instances of such preparations. Whole drugs were used by the Ayurvedists of the olden times for reasons not only pharmacological and economical but also social i.e. relating to the tastes, habits, customs and social conditions, obtaining then in the country. It must be admitted that strides of civilization have always something to do with the turn of mind of particular generations; yet we cannot ignore the fact that the system had grown in Indian Subcontinent on account of both extraneous circumstances and intrinsic virtues. So far as the scientific methods are concerned, it may be said that the Pancha-bhautika character of dravyas prominently occupied the minds of the Ayurvedists, and not the analytic and synthetic methods of the West, as the latter, though practical could not satisfy the basic theories of the Orientals. "It is the character of the Western intelligence to analyze, separate and combine,” but this process is sometimes too elaborate and the results obtained are sometimes time-serving. There is also a tendency to artificialise, which makes the subject more and more complex. The motto of the West is to find out drugs or remedies, which have a specific property capable of a sure and rapid action. These tendencies, though useful in serving one purpose, are not free from the faults of commission and omission.” (Dr. H. V. Savnur’s A Handbook of Ayurvedic Materia Medica, etc. (1950).

1. **Arka** is a distilled essences or liquors, made by soaking drugs in water for 24 to 48 hours and then extracting their essence by distillations; the essence or liquors thus obtained are Arkas. Araks are

usually equivalent to aquae or `waters' of the British Pharmacopeia, and they are prepared in the same way. They are used in fevers, dyspepsia and externally as cooling lotions.

2. **Arista** is a weak alcoholic preparation prepared by making a decoction of the drugs and then allowing them to undergo fermentation by the help of raw sugar or honeys. Fermentation is allowed to go on for a period of 7-10 days in hot weather, for 15 to 30 days in cold weather.

3. **Asavas and Aristas** are medicated spirituous liquors. They are prepared with honey and treacle and various medicinal substances, such as roots, leaves, barks, etc., of plants cut into pieces and steeped in water and laid aside in air-tight earthen jars for vinous fermentation for at least one month. The proportion of the different ingredients is generally as follows: Water 32 Kg., treacle or jaggery 12.5 kg, and honey 6.25 Kg., medicinal substances 1.25 Kg., in powder or decoction. When raw vegetable juices are used for fermentation, the resulting fluid or liquid is called Asava. In other words, Asavas are weak alcoholic preparations prepared by infusing the drugs, in cold water and allowing undergoing fermentation with the help of raw sugar or jaggery or honey. "The above difference in Arishtas and Asavas is not true in all cases. Some Asavas are prepared by decoction and some Arishtas from infusion. When the decoction of drugs only is used for fermentation, the fermented product is called Arishta. These preparations combine the virtues or properties of spirituous drinks and those of the drugs used in preparing them. Many of these are stomachic, stimulants, tonics, astringents, alternatives, febrifuges, etc.

4. **Avalehas** are lehas, linctuses or confections or thickened extracts: These are equivalent to confections, electuaries or conserves of the B.P. To prepare them, decoction, after being strained, again boiled down to a thick soft consistency with sugar or honey. If sugar is to be used in this preparation, its quantity should be four times that of the drugs, and in the case of jaggery, it should be double that of the drugs. If water or milk is to be added, the quantity to be added should be four times that of the drugs used. These extracts or confections, when properly made, should sink in water, do not readily dissolve in water, can be drawn out into threads or wires, and, if made thicker, will receive impressions of coins on their surface. They should show a good colour and emit sweet smell. Extracts are generally administered with the addition of milk, sugarcane juice, sugar or any other infusions or decoctions or powders, in 48 gm. desirable under the circumstances. Avalehas are used for digestive troubles, respiratory affections and for general tonic effect on the body.

5. **Bati /Vatikas/Tablets/Pills** are usually prepared by reducing a decoction of vegetable substances to a thick consistency and then adding some powders, or drugs or articles such as, water, treacle, raw sugar, honey, gum, guggul, as the case may be, for making a pill mass. Water or honey is usually the only anupans for administering pills where none else are mentioned.

6. **Bhasmas or Bhasms** is called alkaline ashes and are prepared from vegetable and mineral substances. Vegetable ashes in the case of Vegetable, the drugs containing more or less alkalies are at first made into a coarse powder or pieces, and then burnt till they are completely reduced to ashes. Mineral ashes: In preparing these, metals are first subjected to a process of purification. The purified

mass is then oxidized. The oxidized product is then subjected to a process of roasting. Finally, the roasted mass is reduced to a fine powder, when it is fit for use. Ashes are also prepared from various animal products, such as, Bons, horns, pearls, cowries, etc.

7**. Bhavana** is a process in which powders are soaked in various fluids, such as the expressed juice of herbs, decoctions etc., and then dried. For this purpose the quantity of juice added to the powder should be sufficient to cover it. The mixture is then allowed to dry in a shaded place. This process is repeated twice, thrice, seven or as many times, as is necessary.

8. **Churna** is powder mixtures prepared by pounding dry vegetable, mineral or animal substances in a mortar with a pestle and passing the powder through cloth or linen, or fine sieve. "If jaggery is to be mixed with the powder, it should be equal to the Churna and in the case of sugar; it should be double the Churna. Usually powders are taken with milk or hot water etc., and are often used four times in quantity. Sometimes with ghee, oil, honey or sugar, their proportion is just sufficient to mix the dose, or even double the Churna in quantity. Where no directions are given, hot water is the only 'Anupan' or vehicle. Churna prepared without the aid of machinery are considered more effective. Powders are particularly useful in later stages of severe maladies after the well-known Bhasmas and Rasayan are used and the morbid process has been brought to the minimum. These are required to be given in bulk, and their action, though quick, is only temporary. These are the least toxic and dangerous, and their efficacy depends on timing their administration in relation to the disease and the hour of the day, meals, etc.

9. **Dravas or Dravakas** or distilled mineral acids, several formulae are given in different works for their preparation. A number of mineral substances or salts are heated in a retort and the distilled fluid collected in a glass receiver. The acids are tested and regarded as well-made by their property of dissolving a cowrie or shell thrown into them. There are two varieties of Dravaka, called Swalpa-Dravaka and Shanka-Dravaka.

10. **Phantas** is infusion prepared in hot water by steeping (for 12 hours) in an earthen vessel, pounded drugs 1 part, in 4 or 8 parts of fresh boiled water, till it becomes cold. The fluid decanted from this vessel after the stated period is called "phanta". It should be used in the same way as decoction. The dose is 96 ml in a day.

11. **Gudikas or Gulikas** (Pills) are large pills or boluses. The method of preparation is just the same as in the case of 'Vatikas' or 'Vataka'. These are intended to be swallowed whole by chewing or without. These including Guggulu, are very much milder than the Bhasmas and Rasayan, with a very few exceptions. These are, as a general rule, less durable and deteriorate on exposure to the atmosphere, and hence require to be kept well protected. These are useful to the run-down and weak patients suffering from chronic complaints and sensitive to any medicament hot in nature. Similarly these are required to be continued for days together, as action on the systematic tissues is very slow and mild in nature. But they have one very great advantage, viz., they can be administered to children and the aged, and during pregnancy, where Bhasmas and Rasayanas cannot be tolerated.

12. **Himams** is cold infusions prepared by steeping for one whole night 1 part of powdered drugs in 6 parts of cold water. The dose and the method of preparation are the same as in the case of 'phanta'.

13. **Kalkas** (pounded mass) is paste prepared by grinding dry or fresh whole vegetable substances, moistened with water, if necessary, on a flat stone or slab with a miler into thin paste, ball, or a vicious lump. When honey, ghee or oil is to be added to the mass, it should be double the quantity of the drug. But in the event of the addition of sugar or jaggery, the proportion should be equal, and when liquids are to be added, they should be four times the mass.

14. **Kalpa** is, when it is very hard to procure genuine and fresh medicinal herbs, some Ayurvedic pharmacy in order to overcome this practical difficulty, have prepared different Kalpas from genuine and fresh herbs, which keep well for a long time wutgiyt any deteruiratuib as to their therapeutic value; they are said to have been manufactured under expert supervision with scientific technique, and are guaranteed against adulteration or impurity. The great advantage of these Kalpas is the small dosage in which these can be therapeutically administered.

15. **Kanjee or Kanjika** is a sour liquid produced from the acetous fermentation of powdered paddy and other grains. Two (2) kg of powdered paddy (grown in rainy season) are steeped in 8 kg,' of water and laid aside in a covered earthen pot for 15 days and upwards, so that it may undergo acetous fermentation. The resulting fluid is' called Kanjika or Dhanya1mla, that is, the acid produced from paddy. Kanjika is a clear transparent fluid with an acid taste and vinous smell. It is cooling, refrigerant, and useful as a drink in fever, burning of the body, etc. Other grains besides paddy are some- times used for acetous fermentation. If mustard or the seeds of Raphanus sativus are used instead of baddy, the resulting fluid is called Sintaki. If the husked grains of barley are boiled and steeped in water, the resulting acid liquor is called Sauvira.

16. **Khandapaka** means Confections. These are made by adding to syrup, medicines in fine powder and gently stirring them over a slow fire till intimately mixed and reduced to proper consistence, i.e., that of an extract. Honey is usually subsequently added to confections.

17. **Ksharas (Alkalis)** is wholly or completely burnt and medicinal plants or herbs, or specified parts of their ashes allowed dissolving or mixing in water allowed to stand, and which after filtration, is evaporated. The residue thus left is a white fine powder, which is called Kshar, is a very useful preparation, effectively acting on the complaints of liver and spleen. As a rule, Ksharas are very active, costic and corrosive, and hence should be used with discretion and caution. These are stimulating to digestive secretion, anti-fermentative, and useful in cases of ascites and abdominal tumors. An overdose or indiscriminate use leads to decay and falling of teeth, stomatitis and destruction of body tissues. In cases of pregnant women tuberculous patients, the aged and Young children, ksharas should be prescribed very judiciously.

18. **Kshirapaka** is decoction in milk. One part of medicine or drug is boiled in 8 parts of milk and thirty-two of water, till the water is evaporated and the milk alone remains; the decoction is then strained.

19. **Kwaths or decoctions** is generally prepared by boiling 1 part of vegetable substances or drugs, (roots, woods, barks and leaves of fresh plants), previously pounded into coarse powder or cut or sliced into small pieces, and then boiled over a slow fire with 8 or 16 parts of water, till the whole is reduced to one-fourth, or 1/8, or' 1/16 of the total water is left. The decoction is then strained through cloth. When decoctions are prepared with dry substances, 8 parts of water are used. Decoctions are administered with (anupans) vehicles like salt, honey, sugar, treacle, alkalies, (alkaline ashes) ghee, oil or some medicinal powders, as the case may require. The principal drug should be taken or mixed with the decoction. Every day, the decoction should be prepared fresh, in several doses for the whole day, for administration; it should under no circumstances be kept overnight. Always prepare fresh decoction. Decoctions are of different, strengths, as under:

- Paachan is a decoction in which the solution is reduced to one-half of the total quantity. It digests the Aamadosha.
- Deepan is a decoction in which the solution is reduced to one-tenth. It stimulates excretion.
- Shodhana is that type of decoction in which the solution is reduced to one-twelfth of the total quantity. It eliminates excretion.
- Shamana is a decoction in which the solution is reduced to one-eighth. It modifies the severity of the disease.
- Tarpana is a decoction in which the solution is boiled till it reaches the boiling-point. In nourishes the Dhatus.
- Kledana is a decoction in which the solution is reduced to one-fourth. It causes disquietude-distress to the heart.
- Vishoshee is also a decoction in which the solution is reduced to one-sixteenth. It causes thirst.

  General instructions regarding the preparation of decoctions:

  A decoction should not be allowed to evaporate after the proper strength is reached, nor should it be boiled again after being once taken off the fire and placed on the ground. A decoction should be rejected when (a) it assumes a dark, blue or red color; (b) it becomes thick, slimy or weak; (c) it is over-boiled; & (d) it emits a raw or rotten fleshy smell. The odour of the decoction should be of the nature of the drugs used, and its appearance pure or lustrous. (A Hand Book of Ayurvedic Materia Medica, (1950). “Famous Ayurvedic Ltd., concerns are preparing decoction s in concentrated liquor form, wherein all the properties of the crude decoction have been fully preserved. These liquid decoction, although free from alcohol remain well-preserved for a long time. Though rather slow in action, these have penetrating properties and are very useful in chronic cases.

20. **Malama (Ointments)** is semisolid or soft preparations acting chiefly as local anodynes and sedatives, for local application for various lesions, containing active drugs mixed with ghee, bees-wax, cocoanut or coconut oil, vaseline etc., either alone or in combination form, the bases of all

ointments. Strict precaution should be taken to protect the eyes from these ointments as they cause irritation. Similarly contamination of the ointment with dirty and soiled fingers should be avoided during application. The lesion where one particular ointment is intended to be applied should first be cleaned with soap or antiseptic lotion and the part dried with clean and sterilized linen. Ointment just sufficient for one application should be taken separately and carefully applied to the part. Strict cleanliness is in itself the first essential measure towards recovery.

21. **Manda** is prepared 14 parts of water and one part of the cereal, usually rice or 'Laj' (Khai), Manda when ready, is completely free from the grain (rice).

22. **Mantha** is also a variety of cold infusion: all emulsion prepared in an earthen vessel; of one part of drugs in fine powder with four parts of cold water. The dose is 96 gm. in a day.

23. **Modaka** is boluses, larger than gutika, prepared by adding powders of medicinal substances to cold syrup and stirring them together till uniformly mixed. No boiling is required in this preparation. Syrups should be made with sugar and water, or with sugar and decoction of the prescribed drugs.

24. **Muramba** (Confections) is liquid preparations of drugs or fruits made by soaking them in syrup or honey.

25. **Nasya** is a preparations used in the treatment of cold, headaches or nervous diseases.

26**. Paya or Yoosha** or decoction is prepared in 14 parts of water, and 1 part of the cereal, and the preparation is allowed to boil till the consistency gets thicker than that of 'Manda'. Peya is a little mixed with the grain. Yoosha is a bit thicker than Peya.

27. **Putapaka** means roasting, or roasted mass within a closed cover. In this process, vegetable drugs are reduced to a paste which is wrapped up in the leaves of either *Eugenia jambolana* of *Ficus bengalensis,* or *Gmelina arborea,* firmly tied with thread, string or fibres of some sort, preferably vegetable, covered with a layer of clay from half to one inch in thickness and roasted in or over a fire made of dried cow-dung-cakes. When the layer of clay assumes a brick-red colour on the surface, roasting is known to be complete, the ball should be withdrawn from the fire and broken-open, and the juice of the roasted drug expressed. This juice is administered, with the addition of honey, sugar or such other adjuncts, as may be directed. Sometimes the roasted drug itself is given in the form of a powder or pills. Thus, 'Putapakas' contain some more principles of the drugs than 'Svarasas', owing to the action of fire. The dose is 1 to 4 tolas, and is generally recommended to be taken with milk.

28. **Rasayana** is a major mercurial preparation which forms in Ayurved the chief part of the most important preparations. Every Rasayan contains mercury and sulphur in combination called "Kajjali", (or mercury in different forms, e.g., metallic, sulphide, subsulphide, black sulphate, oxide,. etc.). But, a few are exceptions, as they contain no mercury, and yet they have got action similar to mercury-containing Rasayan. Rasayan should be stored in glass bottles to keep them active and free from atmospheric contamination. Some Rasayan are also known as Matras, Both the constituents are first purified by an elaborate process, and also are required to be imbibed with the properties of fresh juices of different indigenous plants, whereby the preparations become more potent. Different

Bhasmas, which form the constituents of Rasayan, are first carefully prepared fully in accordance with the formulae and process of Ayurvedic Science. These preparations retain the therapeutic properties and potency for any length of time. A skilful and experienced practitioner may find various different marvelous results when used through different Anupama or Vehicles. Rasayan promote different secretary organs and endocrine glrolds, and build up all body tissues, and for fulfilling these objects, Rasayan require to be thoroughly triturated. Titration is a process by itself, which allows effective combination of different constituents of a particular preparation and divides it into finest particles, thus increasing its assimilative power and therapeutic effect. Kupistha Rasayan or (Sindura Kalpa Rasayan) differ from simple Rasayan, only in one respect, viz., that they are required in addition to trituration to be heated with other suitable minerals in hard glass, in a red hot furnace, from 24 to 72 hours. These being stronger than simple Rasayan are more effective and useful in prolonging the life of the patient in the last stage, even when injections fail to have the desired effect! But, being very active and powerful they demand a judicious and timely usage in medical practice. These are meant for momentary application and are contra-indicated for a prolonged usage. They should be always prescribed in combination with adjuncts and correctors, and greatest precaution should be taken to ascertain that they are genuine and prepared scientifically and correctly, so that mercury is well combined with other ingredients. Otherwise there is a great risk of mercurial poisoning.

29. **Satvas or Satwa** denote the fresh herb is crushed into a coarse mass and allowed to remain in a basin of water for about 12 hours. The whole thing is churned vigorously and starained through muslin. The strained fluid is allowed to stand for some hours, during which time, the active ingredients settle at the bottom. The upper column of the clear water is siphoned off and the sediment is dried into a fine powder, which contains all the properties of the respective medicinal herb in an altered form and taste. All such essences are cool in action and very handy for administration.

30. **Sitakashaya** is cold infusion prepared by steeping one part of the powdered drug in 6 of cold water for the night and straining the fluid in the morning.

31. **Sneha** is prepared with either water or some such fluid as decoction, expressed juice, milk, and butter-milk etc. the proportions being as under:

Kalka (Pasty mass)	**Medicated oil or ghee**	**Fluid**
1	4	16 water
1	6	24 Decoction
1	8	32 Meat juice
1	8	32 Milk, Curds etc.

N. B. In the case of the last two, additional water to the extent of four times the (Sneha) may be added, if necessary.

When more than one variety of fluids are required, then up to four such sorts the usual proportion of four parts of fluid to one of Sneha should be taken, and the varieties should be boiled separately. But

when the number of fluids required exceeds four, each of the fluids should be equal in quantity to the Sneha, and all should be mixed and boiled together. When the Sneha is intended to be prepared in decoction only, the pounded mass, left after the decoction is strained, may also be added to the mixture before it is boiled. But when it is expressly desired that the remains (kalka) of decoction are not wanted, they should be discarded.

32. **Swarasas** are fresh expressed juices (succus) prepared by pounding green fresh medicinal plants in a mortar and expressed and strained through a clean cloth or linen. One should see beforehand that the plant is not infested with worms and/or injured by inclemency's of weather. The Svarasas contain only those principles, which are dissolved in the sap. (When fresh drugs are not available, and in the cases of plants like "Guduchi", whose juice- cannot be extracted, water should be added to the pounded drug in the proportion of 2:1, and kept for a day and night; the mixture should then be strained and the solution used).

APPENDIX-1I

TESTS AND DETERMINATIONS

Microscopic Identification

Microscopic identification of the botanical ingredients is a standard for statutory purposes in several solid and semisolid compound formulations. Microscopic identification tests are confined to those formulations where the botanical ingredients are not more than ten, and where they are added 'in situ' in powder form as 'Praksepa Dravy¢s'. Such comminuted ingredients lend themselves for microscopic identification, as they are not drastically changed in cell structure or contents while processing, and appear intact in microscopic slide preparations, after proper treatment. Appropriate processing for separation and isolation of botanical debris from a formulation without loss of debris, by hand picking, shifting, washing, sedimentation, density separation or by floatation etc., are the preliminary steps. This is followed by clearing the debris in chemical reagents, reacting it with suitable reagents and stains and finally mounting a little part on a slide in a medium of suitable refractive index (see later part) that helps to show the unit structures in good relief. Identification of the discrete, but disoriented units from the botanical ingredients in a formulation will not be possible without proper isolation, and should not be attempted. Monographs where the test is prescribed give both a relevant method of isolation and diagnostic features specific to the expected ingredients in that formulation. Only a brief method and a few of the characteristics for each ingredient are given, but an analyst may use other methods of isolation and choose more characteristics to draw a correct conclusion. Although monographs prescribe standards only for the 'Praksepa Dravyas', characteristics from other ingredients that are processed into extracts or decoctions prior to their addition to a formulation may also be seen in a slide preparation, giving rise to recognisable unique characteristics. In addition, cell or tissue structures common to several ingredients added to a formulation, and therefore not specific to any one of them, would also be present. Caution should therefore be exercised so that such features are not construed as parts from adulterants or substitutes or foreign parts. Proper study of the individual ingredients using authentic material and reference to their monographs in the Ayurvedic Pharmacopeia for Single Drugs would help avoid errors of this nature. Skill in the recognition of discrete and disoriented tissue components and the knowledge required to ascribe them to their correct source should be acquired by the analyst.

Stains and reagents for micro chemical reactions: The Ayurvedic Pharmacopeia volumes on single drugs already include micro chemical reactions for ergastic substances and may be consulted in addition to the following for use on isolated debris:

Acetic acid: Dilute 6 ml of glacial acetic acid with 100 ml of distilled water; used for identification of cystoliths, which dissolve with effervescence.

Aniline chloride solution: Dissolve 2 g in a mixture of 65 ml of 30 per cent ethyl alcohol and 15 ml distilled water and add 2 ml of conc. Hydrochloric acid. Lignified tissues are stained bright yellow.

Bismarck brown: Dissolve 1 g in 100 ml of 95 per cent of ethyl alcohol; used as a general stain for macerated material (with Schultze's).

Breamer's reagent: Dissolve 1 g of sodium tungstate and 2 g of sodium acetate in sufficient quantity of water to make 10 ml yellowish to brown precipitates; indicate the presence of tannin.

Chlorinated soda solution (Bleaching solution): Dissolve 75 g of sodium carbonate in 125 ml of distilled water; triturate 50 g of chlorinated lime (bleaching powder) in a mortar with 75 ml of distilled water, adding it little by little. Mix the two liquids and shake occasionally for three or four hours. Filter and store, protected from light. Used for lighting highly coloured material, by warming in it and washing the tissues thoroughly.

Canada balsam (as a Mountant): Heat Canada balsam on a water bath until volatile matter is removed and the residue sets to a hard mass on cooling. Dissolve residue in xylene to form a thin syrupy liquid. Used for making permanent mounts of reference slides of selected debris.

Chloral hydrate solution: Dissolve 50 g of chloral hydrate in 20 ml of distilled water. A valuable clarifying agent for rendering tissues transparent and clear, by freeing them from most of the ergastic substances, but leaving calcium oxalate crystals unaffected.

Chloral iodine: Saturate chloral hydrate solution with iodine, leaving a few crystals undissolved; useful for detecting minute grains of starch otherwise undetectable.

Chlorziniciodine (Iodinated zinc chloride solution): Dissolve 20 g of zinc chloride and 6.5 g of potassium iodide in 10 ml of distilled water. Add 0.5 g of iodine and shake for about fifteen minutes before filtering. Dilute if needed prior to use. Renders cellulosic walls bluish violet and lignified walls yellowish brown to brown.

Chromic acid solution: 10 g of dissolved in 90 ml of dilute sulphuric acid: macerating agent similar to Schultze's.

Corallin soda: Dissolve 5 g of corallin in 100 ml of 90 per cent ethyl alcohol. Dissolve 25 g of sodium carbonate in 100 ml distilled water; keep the solutions separate and mix when required, by adding 1 ml of the corallin solution to 20 ml of the aqueous sodium carbonate solution. Prepare fresh each time, as the mixture will not keep for long. Used for staining sieve plates and callus bright pink and imparts a reddish tinge to starch grains and lignified tissues.

Ammoniacal solution of Copper oxide (Cuoxam): Triturate 0.5 g of copper carbonate in a mortar with 10 ml of distilled water and gradually add 10 ml of strong solution of ammonia (sp. gr. 0.880) with continued stirring; used for dissolving cellulosic materials.

Eosin: 1 per cent solution in 90 per cent ethyl alcohol; stains cellulose and aleurone grains red.

Ferric chloride solution: A per cent solution ferric chloride in distilled water. Taninn containing tissues coloured bluish or greenish black.

Glycerin: Pure or diluted as required with one or two volumes of distilled water. Used as a general mountant.

Haematoxylin, Delafield's: Prepare a saturated solution of ammonia alum. To 100 ml of this add a solution of 1 g of Haematoxylin in 6 ml of ethyl alcohol (97 per cent). Leave the mixed solution exposed to air and light in an unstopped bottle for three or four days. Filter and add to

the filtrate 25 ml of glycerin and 25 ml of methyl alcohol. Allow the solution to stand exposed to light, till it acquires a dark colour (about two months). Refilter and store as a stock solution. Dilute it 3 or 4 times volumes with distilled water. Stains cellulosic fibers blue; used only on water washed material.

Iodine water: Mix 1 volume of decinormal iodine with 4 volumes of distilled water. Stains starch blue, and reveals crystalloids and globoids when present in aleurone grains.

Iodine and potassium iodide solution: Dissolve 1 g of potassium iodide in 200 ml of distilled water and 2 g of iodine; stains lignified walls yellow and cellulosic walls blue.

Lactophenol (Amman's Fluid): Phenol 20 g, lactic acid 20 g, glycerin 40 g, distilled water 20 ml dissolve; reveals starch grains in polarised light with a well marked cross at hilum, and also minute crystal of calcium oxalate as brightly polarising points of light.

Methylene blue: A solution in 25 ml of ethyl alcohol (95 per cent). A general stain for nucleus and bacteria.

Millon''s reagent: Dissolve 1 volume of mercury in 9 volumes of fuming nitric acid (sp. Gr. 1.52), keeping the mixture well cooled during reaction. Add equal volume distilled water when cool. Stains proteins red.

Naphthol solution: Dissolve 10 g of Naphthol in 100 ml of ethyl alcohol; a specific stain for detection of inulin; cells containing inulin turn deep reddish violet.

Pholorglucinol: 1 g of phloroglucinol dissolved in 100 ml of 90 per cent ethyl alcohol; mount debris in a few drops, allow to react for a minute, draw off excess of reagent with a filter paper strip, and add a drop of conc. hydrochloric acid to the slide; lignified tissues acquire a deep purplish red colour; very effective on water washed material but not in chloral hydrate washed debris.

Picric acid solution (trinitrophenol solution): A saturated aqueous solution made by dissolving 1 g of picric acid in 95 ml of distilled water; stains animal and insect tissues, a light to deep yellow; in a solution with ethylalcohol, aleurone grains and fungal hyphae are stained yellow.

Potash, Caustic: A 5 per cent aqueous solution; used to separate tenacious tissues of epidermis and also laticiferous elements and vittae, both of which are stained brown.

Ruthenium red: Dissolve 0.008 g of ruthenium red in 10 ml of a 10 per cent solution of lead acetate; (to be freshly prepared) used for identification of most kinds of mucilage containing tissues, which turn pink. A 0.0008 g ruthenium red dissolved in 10 ml of distilled water and used immediately stains cuticular tissues in debris to a light pink.

Safranin: A 1 per cent solution in ethyl alcohol 50 per cent; used to stain lignified cell walls deep red, even after clearing with choral hydrate.

Schultze's Maceration fluid: Add isolated debris to 50 per cent conc. nitric acid in a test tube and warm over water bath: add a few crystals of potassium chlorate while warming, till tissues

soften; cool, wash with water thoroughly and tease out for mounting hard tissues; isolated cell structures are clearly revealed, but the structures are not useful for measurement of dimensions.

Sudan Red III: Dissolve 0.01 g of sudan red III in 5 ml of ethyl alcohol (90 per cent) and 5 ml of pure glycerin; suberised walls of cork cells, and fatty material in cells are stained bright red.

Sulphovanadic acid (Mandelin's reagent): Triturate 1 gm of ammonium vandate with 100 ml conc. sulphuric acid. Allow the deposit to subside and use the clear liquid. This is to be prepared fresh; useful for identification of alkaloids, particularly strychnine which turns violet in the cells containing it.

Refractive indices of certain mountants

Water 1.333

Lactophenol 1.444

Chloral Hydrate solution 1.44 to 1.48

Olive oil 1.46 to 1.47

Glycerol 1.473

Castor oil 1.48

Clove oil 1.53

Cresol 1.53

Cassia oil 1.6

Xylol 1.49

Alcohol 1.36

Chloroform 1.44

Microscopical methods of examining crude vegetable drugs

Methods of preparing specimens of crude materials of vegetable drugs for microscopical studies vary, depending on the morphological groups of drugs to be examined and also on the natures of the material i.e., entire, cut or powdered.

LEAVES, HERBS AND FLOWERS

For examining leaves, herbs and flowers (entire or cut) under microscope, following methods are employed for clarification:

A. Entire and cut materials

(i) Entire materials: When examining entire leaves, herbs and flowers, take pieces of leaf (margin and vein of leaves only), herbs (only leaf) and flowers (only calyx and corolla) in test tube. Add a solution of caustic alkali or nitric acid to the test tube and boil for 1-2 minutes, pour the contents into a porcelain dish, drain off the liquid, wash the material with water and leave for sometimes. Remove the pieces of the material from the water with a spatula and put on the slide, add a few drops of the solution of glycerol or chloral hydrate. Crush the material with scalpel and cover with cover slip before examining.

(ii) Cut materials–For examining cut leaves, herbs and flowers, take several pieces in a test tube and employ the same methods as described for entire materials. Other methods employed for clarification of the material (leaf and stem) are described below:-

(a) Leaf–Boil pieces of leaves in a test tube with chloral hydrate for several minutes until completely clarified and then examine them in chloral hydrate solution. After clarification, leaf pieces are divided into two parts with the help of a scalpel or needle, and carefully turn one part. The leaf can be examined from both the dorsal and ventral surfaces.

(b) Stem–To examines stem material (without leaf) boil pieces in a solution of caustic alkali or in nitric acid. Remove the epidermis with a scalpel or a needle for examining the surface. For examining pressed specimen of stem, take separate tissue and press them with a scalpel on the slide.

B. Powder: For examining characters of the powder take sufficient amount of powder in Chloral-hydrate solution on a slide and cover it with a cover slip, warm over a low flame for a short time.

II. FRUITS AND SEEDS

A. Entire materials

For microscopical examination of fruit and seed take the specimens or outer coat of seed or fruit and examine as described below:

(i) Outer Coat–For examining the outer coat boil 3 or 4 seeds or fruits in caustic alkali solution in a test tube for 1-2 minutes (outer coat specimens with intensive pigmentation are boiled for longer period). After boiling, place the pieces on slide, remove the layers of the coat and examine them after mounting in glycerol solution.

(ii) Section–If fruits or seeds are too hard to cut then boil them for 15-30 minutes or more depending on their hardness or keep them in moistening chamber or absorb in water and chloroform solution or soften them with stem and then cut the specimen for examining purpose. For cutting small, flat seeds (which are difficult to hold) place them in a pith or potato slit for section cutting. Small, round or smooth seeds cannot be cut into section in the pith, then in such cases, they may be embedded in paraffin wax blocks for section cutting. For this, a block of paraffin (0.6 × 0.5 × 1.5 cms. in size) is made and the seed is embedded in the block by making a cavity or a pit in the block with a hot teasing needle. Cut the section with a sharp razor (through the object) together with the paraffin, place them on to the slide, remove paraffin with a needle or wash it with xylene and examine the section in chloral-hydrate solution.

B. Powder: For examining the structure of the cells of the seed coat and the cells of the embryo take a small amount of powder of the material on a slide in glycerol and cover it with a cover slip and examine.

1. Starch–For examining the presence of starch in the seed, take two specimens, one in iodine solution and the other in water. With iodine solution starch turns blue. Shape and the structure of

starch grains can be seen in water and their size is measured. When examining objects containing starch, prepare specimen by slightly warming in chloral-hydrate solution.

2. Fixed Oil–For examining the presence of fixed oil, prepare a specimen in a solution of Sudan III droplets of fixed oil are coloured orange pink. When examining objects containing small amount of fixed oil, prepare a specimen by slightly warming in chloral-hydrate solution, and when examining objects containing large amount of fixed oil, then the powder is de-fatted and clarified as follows: Place 0.5 g. of the powder in a porcelain dish, add 5-10 ml. of dilute nitric acid and boil for 1 minute, then strain off the liquid through a cloth, wash the residue with hot water and return it to the porcelain dish with a spatula, boil it with 5-10 ml of caustic alkali solution for 1 minute and again strain it through the cloth and wash with water. Examine the residue in a glycerol solution, after the treatment the structure of the layers of the coat and their cells can be seen very distinctly.

3. Mucilage–Prepare a specimen in Ruthenium Red and examine it under a low power microscope or under dissecting microscope. Mucilage appears as pinkish-red or yellow coloured masses.

III. BARKS

A. Entire material: Prepare transverse or longitudinal section of bark. To soften bark break it into pieces of about 1-2 cm long and 0.5-1 cm wide and boil with in a test tube for 1-3 minutes. Soft pieces are then straightened with a scalpel so as to have a exact transverse or longitudinal direction. Cut the section with razor; moisten the surface of the bark with glycerol solution. Remove the sections with a brush and place them on the slide. Thin pieces of the bark are cut by placing them in the pith (potato or carrot). The sections are treated with various reagents before examining.

1. Lignified elements–For testing lignin add several drops of phloroglucinol and a drop of concentrated hydrochloric acid to the section on a slide then draw off the liquid, immerse the section in chloral hydrate solution and cover with a cover slip (the specimen should not be heated); the lignified elements are coloured crimson. Phloroglucinol can be substituted by saffranine, and the lignified elements are coloured pink. The excessive stain can be washed out with acidified alcohol.

2. Starch–Starch is detected by treating with iodine solution.

3. Tannin–Tannin is detected by treating with ferric ammonium sulphate solution (blue-black or green black colour shows the presence of Tannin) or with potassium-bichromate solution (brown colour indicates the presence of Tannin).

4. Anthraquinone derivatives–Anthraquinone derivatives are detected by treating with alkali solution (blood-red colour shows the presence of anthraquinone derivatives).

B. Cut materials: Prepare small pieces or scraping of bark and boil them for 3-5 minutes in a solution of caustic alkali or potassium hydroxide or in nitric acid solution and then mount in glycerin for examination on a slide covered with a cover slip.

C. Powder: Prepare specimen for examination by placing a little amount of powder on a slide, add 1-2 drops of phloroglucinol and a drop of concentrated hydrochloric acid, cover it with a cover

slip, draw off the liquid from one side of the slide with filter paper, and then apply 1-2 drops of chloral-hydrate solution from the other side of the slide, lignified elements are stained crimson-red. Specimen may also be prepared with caustic alkali or ferric ammonium sulphate for this purpose.

IV. ROOTS AND RHIZOMES

A. Entire materials: For anatomical examination of entire roots and rhizomes cut transverse and longitudinal sections. For this, soften small pieces of roots without heating in glycerol solution for 1-3 days, depending on their hardness. The softened roots are straightened with the help of a scalpel in the right direction and then cut a section with the razor. First, cut thicker entire slices and then make thin, smaller sections. Stain the entire slices with phloroglucinol and concentrated hydrochloric acid or with safranin examine the specimen under a dissecting microscope. For microchemical test the small and thin sections are examined under microscope, as follows:

1. Starch–Starch is detected with iodine solution. For this, prepare specimen with water to measure the granule of starch with an occular micrometer.

2. Inulin–Inulin is detected with Molish's reagent. For this place a little powder on a slide and apply 1-2 drops of naphthol and a drop of concentrated sulphuric acid, if inulin is present, the powder will appear reddish-violet coloured. Starch also gives this test, so the test for inulin can be done in the absence of starch.

3. Lignified elements–Lignified elements (fibrovascular bundles, mechanical tissue etc.) are detected with phloroglucinol and concentrated hydrochloric acid or safranine solution as mentioned above for barks.

4. Fixed oil –For fixed oil detection use Sudan IV, as mentioned above for fruits and seeds.

If required for tannin, anthraquinone derivatives test as mentioned above.

B. Cut material

Make small pieces or scrapping of roots or rhizomes and boil them for 3-5 minutes in caustic alkali or in nitric acid and then make pressed specimen and immerse them in glycerol. Microchemical tests can be performed with scrapings for various chemicals as mentioned above.

C. Powder

Prepare several specimens of the powder on slides in chloral hydrate solution and perform the above mentioned standard tests for detection of starch, fixed oil, inulin, lignified elements, anthraquinone derivatives, tannins, mucilage, etc.

Types of Stomata: There are several types of stomata, distinguished by the form and arrangement of the surrounding cells. The following descriptions apply to mature stomata.

Anomocytic (irregular-celled)–Previously known as ranunculaceous. The stoma is surrounded by a varying number of cells in no way differing form those of the epidermis generally.

Anisocytic (unequal-celled)–Previously known as cruciferous or solanaceous. The stoma is usually surrounded by three subsidiary cells, of which one is markedly smaller than the others.

Diacytic (cross-celled) -previously known as caryophyllaceous. The stoma is accompanied by two subsidiary cells whose common wall is at right angles to the guard cells.

Paracytic (parallel-celled)–Previously known as rubiaceous. The stoma has one each side one or more subsidiary cells parallel to the long axis of the pore and guard cells.

Determination of stomatal index

The stomatal index is the percentage of the number of stomata formed by the total number of epidermal cells, including the stomata, each stoma being counted as one cell. Place leaf fragments of about 5 × 5 mm in size in a test tube containing about 5 ml of chloral hydrate solution and heat in a boiling water-bath for about 15 minutes or until the fragments become transparent. Transfer a fragment to a microscopic slide and prepare the mount, the lower epidermis uppermost, in chloral hydrate solution and put a small drop of glycerol-ethanol solution on one side of the cover-glass to prevent the preparation from drying. Examine with a 40x objective and a 6x eye piece, to which a microscopical drawing apparatus is attached. Mark on the drawing paper a cross (x) for each epidermal cell and a circle (o) for each stoma. Calculate the result as follows:

$$\text{Stomatal index} = \frac{S \times 100}{E + S}$$

Where

S = the number of stomata in a given area of leaf; and

E = the number of epidermal cells (including trichomes) in the same area of leaf.

For each sample of leaf make not fewer than ten determinations and calculate the average index.

Determination of palisade ratio: Palisade ratio is the average number of palisade cells under one epidermal cell. Place leaf fragments of about 5 × 5 mm in size in a test-tube containing about 5 ml of chloral hydrate solution and heat in a boiling water-bath for about 15 minutes or until the fragments become transparent. Transfer a fragment to a microscopical slide and prepare the mount of the upper epidermis in chloral hydrate solution and put a small drop of glycerol solution on one side of the cover-glass to prevent the preparation from drying. Examine with a 40x objective and a 6x eye piece, to which a microscopical drawing apparatus is attached. Trace four adjacent epidermal cells on paper; focus gently downward to bring the palisade into view and trace sufficient palisade cells to cover the area of the outlines of the four epidermal cells. Count the palisade cells under the four epidermal cells. Where a cell is intersected, include it in the count only when more than half of it is within the area of the epidermal cells. Calculate the average number of palisade cells beneath one epidermal cell, dividing the count by 4; this is the"Palisade ratio".

Determination of vein-islet number: The mesophyll of a leaf is divided into small portions of photosynthetic tissue by anastomosis of the veins and veinlets; such small portions or areas are termed "Vein-Islets". The number of vein-islets per square millimeter is termed the "Vein-Islet number". This value has been shown to be constant for any given species and, for fullgrown leaves, to be unaffected

by the age of the plant or the size of the leaves. The vein-islet number has proved useful for the critical distinction of certain nearly related species. The determination is carried out as follows:

For whole or cut leaves–Take pieces of leaf lamina with an area of not less than 4 square millimeters from the central portion of the lamina and excluding the midrib and the margin of the leaf. Clear the pieces of lamina by heating in a test tube containing chloral hydrate solution on a boiling water-bath for 30 to 60 minutes or until clear and prepare a mount in glycerol-solution or, if desired, stain with safranin solution and prepare the mount in Canada Balsam. Place the stage micrometer on the microscope stage and examine with 4x objective and a 6x eye piece. Draw a line representing 2 mm on a sheet of paper by means of a microscopical drawing apparatus and construct a square on the line representing an area of 4 square millimeters. Move the paper so that the square is seen in the centre of the field of the eyepiece. Place the slide with the cleared leaf piece on the microscope stage and draw in the veins and veinlets included within the square, completing the outlines of those vein-islets which overlap two adjacent sides of the square. Count the number of vein-islets within the square including those overlapping on two adjacent sides and excluding those intersected by the other two sides. The result obtained is the number of vein-islets in 4 square millimeters. For each sample of leaf make not fewer than three determinations and calculate the average number of vein-islets per square millimeter.

For leaf fragments having an area less than 4 square millimeters–Take fragments of leaf lamina each with an area of not less than 1 square millimeter, excluding the midrib and the margin of the leaf. Clear and prepare amount as stated above. Use a 10x objective and a 6x eyepiece and draw a line representing 1 mm on a sheet of paper by means of a microscopial drawing apparatus and construct a square on this line representing an area of 1 square millimetre. Carry out the rest of the procedure as stated above. The result obtained is the number of veinislets in 1 square millimetre. For each sample of leaf make no less than 12 determinations and calculate the average number.

Determination of stomatal number: Place leaf fragments of about 5x5 mm in size in a test tube containing about 5 ml of chloral hydrate solution and heat in a boiling water-bath for about 15 minutes or until the fragments become transparent. Transfer fragments to a microscopic slide and prepare the mount the lower epidermis uppermost, in chloral hydrate solution and put a small drop of glycerol-ethanol solution on one side of the cover glass to prevent the preparation from drying. Examine with a 40 x objective and a 6x eye piece, to which a microscopical drawing apparatus is attached. Mark on the drawing paper a cross (x) for each stomata and calculate the average number of stomata per square millimeter for each surface of the leaf.

DETERMINATION OF QUANTITATIVE DATA

Net content: The content of the final or retail pack shall not be less than 98 percent of the declared net content.

Foreign matter: The sample shall be free from visible signs of mold growth, sliminess, stones, rodent excreta, insects or any other noxious foreign matter when examined as given below.

Take a representative portion from a large container, or remove the entire contents of the packing if 100 g or less, and spread in a thin layer in a suitable dish or tray. Examine in daylight with unaided eye. Transfer suspected particles, if any, to a petri dish, and examine with 10x lens in daylight.

Determination of total ash: Incinerate about 2 to 3 g accurately weighed, of the ground drug in a tared platinum or silica dish at a temperature not exceeding 4500 until free from carbon, cool and weigh. If a carbon free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the residue on an ashless filter paper, incinerate the residue and filter paper, add the filtrate, evaporate to dryness, and ignite at a temperature not exceeding 4500.

Determination of acid insoluble ash: To the crucible containing total ash, add 25 ml of dilute hydrochloric acid. Collect the insoluble matter on an ashless filter paper (Whatman 41) and wash with hot water until the filtrate is neutral. Transfer the filter paper containing the insoluble matter to the original crucible, dry on a hot-plate and ignite to constant weight. Allow the residue to cool in a suitable desiccator for 30 minutes and weigh without delay. Calculate the content of acid-insoluble ash with reference to the air-dried drug.

Determination of water soluble ash: Boil the ash for 5 minutes with 25 ml of water; collect insoluble matter in a Gooch crucible or on an ashless filter paper, wash with hot water, and ignite for 15 minutes at a temperature not exceeding 4500. Subtract the weight of the insoluble matter from the weight of the ash; the difference in weight represents the water soluble ash. Calculate the percentage of water-soluble ash with reference to the air-dried drug.

Determination of sulphated ash: Heat a silica or platinum crucible to redness for 10 minutes; allow cooling in a desiccator and weighing. Put 1to 2 g of the substance, accurately weighed, into the crucible, ignite gently at first, until the substance is thoroughly charred. Cool, moisten the residue with 1 ml of sulphuric acid, heat gently until white fumes are no longer evolvedand ignite at 8000 ± 250 until all black particles have disappeared. Conduct the ignition in a place protected from air currents. Allow the crucible to cool, add a few drops of sulphuric acid and heat. Ignite as before, allow cooling and weighing. Repeat the operation until two successive weighing do not differ by more than 0.5 mg.

Determination of alcohol soluble extractive: Macerate 5 g of the air dried drug, coarsely powdered, with 100 ml of alcohol the specified strength in a closed flask for twenty-four hours, shaking frequently during six hours and allow to stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 1050, to constant weight and weigh. Calculate the percentage of alcohol-soluble extractive with reference to the air-dried drug.

Determination of water soluble extractive: Proceed as directed for the determination of alcohol-soluble extractive, using chloroform-water instead of ethanol.

Determination of ether soluble extractive (fixed oil content): Transfer a suitably weighed quantity (depending on the fixed oil content) of the air-dried, crushed drug to an extraction thimble, extract

with solvent ether (or petroleum ether, b.p. 400 to 600) in a continuous extraction apparatus (Soxhlet extractor) for 6 hours. Filter the extract quantitatively into a tared evaporating dish and evaporate off the solvent on a water bath. Dry the residue at 1050 to constant weight. Calculate the percentage of ether-soluble extractive with reference to the air-dried drug.

Determination of moisture content (loss on drying): Procedure set forth here determines the amount of volatile matter (i.e., water drying off from the drug). For substances appearing to contain water as the only volatile constituent, the procedure given below, is appropriately used. Place about 10 g of drug (without preliminary drying) after accurately weighing (accurately weighed to within 0.01 g) it in a tared evaporating dish. For example, for unground or unpowderd drug, prepare about 10 g of the sample by cutting shredding so that the parts are about 3 mm in thickness. Seeds and fruits, smaller than 3 mm should be cracked. Avoid the use of high speed mills in preparing the samples, and exercise care that no appreciable amount of moisture is lost during preparation and that the portion taken is representative of the official sample. After placing the above said amount of the drug in the tared evaporating dish, dry at 1050 for 5 hours, and weigh. Continue the drying and weighing at one hour interval until difference between two successive weighing corresponds to not more than 0.25 per cent. Constant weight is reached when two consecutive weighing after drying for 30 minutes and cooling for 30 minutes in a desiccator, show not more than 0.01 g difference.

Determination of water insoluble matter: Take 10 gm of sample, add 200 ml hot distilled H2O and bring to boiling. Allow to cool to room temperature. Filter through a tared gooch crucible having a bed of asbestos or sintered glass filter Wash the residue with hot water till the filtrate is sugar-free (perform Molisch test). Dry the gooch crucible or sintered glass filter at 135 20 C and weigh. Express as % insoluble matter.

Determination of volatile oil in drugs: The determination of volatile oil in a drug is made by distilling the drug with a mixture of water and glycerin, collecting the distillate in a graduated tube in which the aqueous portion of the distillate is automatically separated and returned to the distilling flask, and measuring the volume of the oil. The content of the volatile oil is expressed as a percentage v/w. The apparatus consists of the following parts . The clevenger's apparatus described below is recommended but any similar apparatus may be used provided that it permits complete distillation of the volatile oil. All glass parts of the apparatus should be made of good quality resistance glass.

The apparatus is cleaned before each distillation by washing successively with acetone and water, then inverting it, filling it with chromic sulphuric acid mixture, after closing the open end at G, and allowing to stand, and finally rinsing with water.

Methods of determination: A suitable quantity of the coarsely powdered drug together with 75 ml of glycerin and 175 ml of water in the one litre distilling flask, and a few pieces of porous earthen ware and one filter paper 15 cm cut into small strips, 7 to 12 mm wide, are also put in the distilling flask, which is then connected to the still head. Before attaching the condenser, water is run into the graduated receiver, keeping the tap T open until the water overflows, at P. Any air bubbles in the

rubber tubing a—b are carefully removed by pressing the tube. The tap is then closed and the condenser attached. The contents of the flask are now heated and stirred by frequent agitation until ebullition commences. The distillation is continued at a rate, which keeps the lower end of the condenser cool. The flask is rotated occasionally to wash down any material that adheres to its sides. At the end of the specified time (3 to 4 hours) heating is discontinued, the apparatus is allowed to cool for 10 minutes and the tap T is opened and the tube L1 lowered slowly; as soon as the layer of the oil completely enters into the graduated part of the receiver the tap is closed and the volume is read. The tube L1 is then raised till the level of water in it is above the level of B, when the tap T is slowly opened to return the oil to the bulb. The distillation is again continued for another hour and the volume of oil is again read, after cooling the apparatus as before. If necessary, the distillation is again continued until successive readings of the volatile oil do not differ. The measured yield of volatile oil is taken to be the content of volatile oil in the drug. The dimensions of the apparatus may be suitably modified in case of necessity.

Special Processes Used in Alkaloidal Assays

Continuous extraction of drug: Where continuous extraction of a drug of any other substance is recommended in the monograph, the process consists of percolating it with suitable solvent at a temperature approximately that of the boiling point of the solvent. Any apparatus that permits the uniform percolation of the drug and the continuous flow of the vapour of the solvent around the percolator may be used. The type commonly known as the Soxhlet apparatus (see fig. 2) is suitable for this purpose.

Tests for complete extraction of alkaloids: Complete extraction is indicated by the following tests:

When extracting with an aqueous or alcoholic liquid-After extracting at least three times with the liquid, add to a few drops of the next portion, after acidifying with 2 N hydrochloric acid if necessary, 0.05 ml of potassium mercuri-iodide solution or for solanaceous alkaloids 0.05 ml of potassium iodobismuthate solution; no precipitate or turbidity, is produced.

When extracting with an immiscible solvent-After extracting at least three times with the solvent, add to 1 to 2 ml of the next portion 1 to 2 ml of 0.1 N hydrochloric acid, remove the organic solvent by evaporation, transfer the aqueous residue to a test tube, and add 0.05 ml of potassium mercuri-iodide solution for solanaceous alkaloids 0.05 ml of potassium iodobismuthate solution or for emetine, 0.05 ml of iodine solution; not more than a very faint opalescenece is produced.

Thin-Layer Chromatography (TLC): Thin-layer chromatography is a technique in which a solute undergoes distribution between two phases, stationary phase acting through adsorption and a mobile phase in the form of a liquid. The adsorbent is a relatively thin, uniform layer of dry finely powdered material applied to a glass, plastic or metal sheet or plate. Precoated plates are most commonly used. Separation may also be achieved on the basis of partition or a combination of partition and adsorption, depending on the particular type of support, its preparation and its use with different solvent. Identification can be effected by observation of spots of identical Rf value and about equal magnitude

obtained, respectively, with an unknown and a reference sample chromatographed on the same plate. A visual comparison of the size and intensity of the spots usually serves for semi-quantitative estimation.

Apparatus

(a) Flat glass plates of appropriate dimensions which allow the application at specified points of the necessary quantities of the solution being examined and appropriate reference solutions and which allow accommodation of the specified migration path-length. The plates are prepared as described below; alternatively, commercially prepared plates may be used.

(b) An aligning tray or a flat surface on which the plates can be aligned and rested when the coating substance is applied.

(c) The adsorbent or coating substance consisting of finely divided adsorbent materials, normally 5 μm to 40 μm in diameter is suitable for chromatography. It can be applied directly to the plate or can be bonded to the plate by means of plaster of paris (Hydrated Calcium Sulphate) or with any other suitable binders. The adsorbent may contain fluorescing material to help in visualising spots that absorb ultra-violet light.

(d) A spreader which, when moved over the glass plate, will apply a uniform layer of adsorbent of desired thickness over the entire surface of the plate.

(e) A storage rack to support the plates during drying and transportation.

(f) A developing chamber that can accommodate one or more plates and can be properly closed and sealed. The chamber is fitted with a plate support rack that supports the plates, back to back, with lid of the chamber in place.

(g) Graduated micro-pipettes capable of delivering microlitre quantities say 10 μl and less.

(h) A reagent sprayer that will emit a fine spray and will not itself be attacked by the reagent.

(i) An ultra-violet light, suitable for observation at short (254 nm) and long (365 nm) ultra-violet wavelengths.

Preparation of Plates: Unless otherwise specified in the monograph, the plates are prepared in the following manner. Prepare a suspension of the coating substance in accordance with the instructions of the supplier and, using the spreading device designed for the purpose, spread a uniform layer of the suspension, 0.20 to 0.30 mm thick, on a flat glass plate 20 cm long. Allow the coated plates to dry in air, heat at 1000 to 1050 for at least 1 hour (except in the case of plates prepared with cellulose when heating for 10 minutes is normally sufficient) and allow to cool, protected from moisture. Store the plates protected from moisture and use within 3 days of preparation. At the time of use, dry the plates again, if necessary, as prescribed in the monographs. Now a days pre coated plates of silica gel on glass/aluminium/ plastic sheets are also available.

Methods: Unless unsaturated conditions are prescribed, prepare the tank by lining the walls with sheets of filter paper; pour into the tank, saturating the filter paper in the process, sufficient of the mobile phase to form a layer of solvent 5 to 10 mm deep, close the tank and allow to stand for 1 hour

at room temperature. Remove a narrow strip of the coating substance, about 5 mm wide, from the vertical sides of the plate. Apply the solutions being examined in the form of circular spots about 2 to 6 mm in diameter, or in the form of bands (10 to 20 mm x 2 to 6 mm unless otherwise specified) on a line parallel with, and 20 mm from, one end of the plate, and not nearer than 20 mm to the sides; the spots should be 15 mm apart. If necessary, the solutions may be applied in portions, drying between applications. Mark the sides of the plate 15 cm, or the distance specified in the monograph, from the starting line. Allow the solvent to evaporate and place the plate in the tank, ensuring that it is as nearly vertical as possible and that the spots or bands are above the level of the mobile phase. Close the tank and allow to stand at room temperature, until the mobile phase has ascended to the marked line. Remove the plate and dry and visualise as directed in the monograph; where a spraying technique is prescribed it is essential that the reagent be evenly applied as a fine spray. For two-dimensional chromatography dry the plate after the first development and carry out the second development in a direction perpendicular to the first. When the method prescribed in the monograph specifies 'protected from light' or 'in subdued light' it is intended that the entire procedure is carried out under these conditions.

Visualisation The phrases ultra-violet light (254 nm) and ultra-violet light (365 nm) indicate that the plate should be examined under an ultra-violet light having a maximum output at about 254 or at about 365 nm, as the case may be. The term secondary spot means any spot other than the principal spot. Similarly, a secondary band is any band other than the principal band.

Rf Value: Measure and record the distance of each spot from the point of its application and calculate the Rf value by dividing the distance travelled by the spots by the distance travelled by the front of the mobile phase.

Starch estimation (Mont Gomery, 1957) [Spectrophotometric method]: Prepare 10 per cent homogenate of the plant tissue in 80 per cent ethanol. Centrifuge at 2000 rpm for 15 minutes. To the residue thus obtained, add 4 ml of distilled water, heat on a water bath for 15 minutes and macerate with the help of glass rod. To each of the samples, add 3 ml of 52 per cent perchloric acid and centrifuge at 2000 rpm for 15 minutes. The supernatant thus obtained is made upto known volume (generally upto 10 ml or depending on the expected concentration of starch). Take 0.1 ml aliquot, add 0.1 ml of 80 per cent phenol and 5 ml conc. sulphuric acid, cool and then read the absorbance at 490 nm.

Sugar estimation (Mont Gomery, 1957) [Spectrophotometric Method]: Prepare 10 per cent homogenate of the plant tissue in 80 per cent ethanol. Centrifuge at 2000 rpm for 15 minutes. The supernatant obtained is made upto known volume (generally upto 10 ml or depending on the expected concentration of sugar). Take 0.1 ml aliquot, add 0.1 ml of 80 per cent phenol and 5 ml conc. sulphuric acid, cool and then read the absorbance at 490 nm.

Fatty oil estimation: To estimate fatty oils, extract accurately weighed air-dried powdered plant material with petroleum ether (40-600) in a Soxhlet apparatus. Dry the extract over anhydrous sodium

sulphate and remove the solvent under vacuum at 400. Weigh the residue and calculate the percentage with reference to the weight of plant material used.

Test for argemone oil (Mustard oil): Take 2-3 drops of the oil in a dry test tube and mix successively with one drop of liquid phenol and 2-4 ml of conc. Sulphuric acid and shake. A deep red colour develops with in 10-20 seconds if argemone oil is present as adulterant.

Test for the presence of cottonseed oil (Halphen test): Take about 5ml of the oil in a test tube and add equal amount of Sulphur solution (1% solution of Sulphur in carbon disulphide and then add an equal volume of amyl alcohol). Mix thoroughly by shaking and heating gently in a water bath (70-80º) for a few minutes with occasional shaking until the carbon disulphide has boiled off and the sample stops foaming. Place the tube in an oil bath or a saturated brine bath maintained at 110 to 115º, and hold for 1 to 2 hours. A red colour at the end of this period indicates the presence of cottonseed oil. This test is sensitive to the extent of 0.5 percent of cottonseed oil in other oils.

Test for clove oil, alkali soluble matter: Place 80 ml of a 5 per cent w/v solution of potassium hydroxide in a 150-ml flask with a long neck, which is graduated in tenths of an ml and is of such diameter that not less than 15cm in length has a capacity of 10ml. The flask before use is cleaned with Sulphuric acid and well rinsed with water. Add 10ml of the oil, cleared by filtration if necessary, and shake thoroughly at five-minute intervals for half an hour, at ambient temperature. Raise the undissolved portion of the oil into the graduated part of the neck of the flask by gradual addition of more of the potassium hydroxide solution; allow standing for not less than twenty-four hours, and read off the volume of the undissolved portion of the oil. The undissolved portion of the oil measures not less than 1.0 ml and not more than 1.5 ml.

APPENDIX-1II

HEAVY METAL TESTS

Determination of lead (Pb) (Graphite Oven Method):

Determination conditions: Reference condition: dry temperature: 100-1200, maintain 20 seconds; ash temperature: 400-7500, maintain 20-25 seconds; atomic temperature: 1700-21000, maintain 4-5 seconds; measurement wavelength: 283.3 nm; background calibration: deuterium lamp (D lamp) or Zeeman effect.

Preparation of lead standard stock solution: Measure accurately a quantity of lead single-element standard solution to prepare standard stock solution with 2 per cent nitric acid solution, which containing 1 μg per ml, stored at 0-50.

Preparation of calibration curve: Measure accurately a quantity of lead standard stock solutions respectively, diluted with 2 per cent nitric acid solution to the concentration of 0, 5, 20, 40, 60, 80 ng per ml, respectively. Measure respectively accurately 1 ml the above solution, add respectively 1 ml of 1 per cent ammonium dihydrogen phosphate and 0.2 per cent magnesium nitrate mix well, pipette accurately 20 μl to inject into the atomic generator of graphite oven and determine their absorbance, then draw the calibration curve with absorbance as vertical axis and concentration as horizontal ordinate.

Preparation of test solution

Method: Weigh accurately 0.5 g of the coarse powder of the substance being examined, transfer into a casparian flask, add 5-10 ml of the mixture of nitric acid and perchloric acid (4 : 1), add a small hopper on the flask-top, macerate overnight, heat to slake on the electric hot plate, keep somewhat-boiling, if brownish-black, add again a quantity of the above mixture, continuously heat till the solution becomes clean and transparent, then raise temperature, heat continuously to thick smoke, till white smoke disperse, the slaked solution becomes colourless and transparent or a little yellow, cool, transfer it into a 50 ml volumetric flask, wash the container with 2 per cent nitric acid solution add the washing solution into the same volumetric flask and dilute with the same solvent to the volume, shake well. Prepare synchronously the reagent blank solution according to the above procedure.

Determination: Measure accurately 1 ml of the test solution and its corresponding reagent blank solution respectively, add 1 ml of solution containing 1per cent ammonium dihydrogen phosphate and

0.2 per cent magnesium nitrate, shake well, pipette accurately 10-20 μl to determine their absorbance according to the above method of "Preparation of calibration curve". Calculate the content of lead (Pd) in the test solution from the calibration curve.

Determination of Cadmium (Cd) (Graphite Oven Method)

Determination conditions: Reference condition: dry temperature: 100-1200, maintain 20 seconds; ash temperature: 300-5000, maintain 20-25 seconds; atomic temperature: 1500-19000, maintain 4-5 seconds; measurement wavelength: 228.8 nm; background calibration: deuterium lamp (D lamp) or Zeeman effect.

Preparation of Cd standard stock solution: Measure accurately a quantity of Cd single-element standard solution to prepare standard stock solution Cd with 2 per cent nitric acid, which containing 0.4 μg per ml Cd, stored at 0-50.

Preparation of calibration curve: Measure accurately a quantity of cadmium standard stock solutions, diluted to the concentration of 1.6, 3.2, 4.8, 6.4 and 8.0 ng per ml with 2 per cent nitric acid, respectively. Pipette accurately 10 μl the above solutions respectively, inject them into the graphite oven, determine their absorbance, and then draw the calibration curve with absorbance as vertical axis and concentration as horizontal ordinate.

Preparation of test solution: Reference to "Preparation of test solution" of Pb in the above.

Determination: Pipette accurately 10-20 μl of the test solution and its corresponding reagent blank solution respectively; determine their absorbance according to the above method of "Preparation of calibration curve. If interference occurs, weigh accurately respectively 1 ml of the standard solution, blank solution and test solution, add 1 ml of a solution containing 1per cent ammonium dihydrogen phosphate and 0.2 per cent magnesium nitrate, shake well, determine their absorbance according to the method above, calculate the content of Cd in the test solution from the calibration curve.

Determination of Arsenic (As) (Hydride Method)

Determination conditions: Apparatus: suitable hydride generator device, reducing agent: a solution containing 1per cent sodium borohydride and 0.3 per cent sodium hydroxide; carrier liquid: 1 per cent hydrochloric acid; carrier gas: nitrogen; measurement wavelength: 193.7 nm; background calibration: deuterium lamp (D lamp) or Zeeman Effect.

Preparation of As standard stock solution: Measure accurately a quantity of As single-element standard solution to prepare standard stock solution with 2 per cent nitric acid solution, which containis 1.0 μg per ml As, stored at 0-50.

Preparation of calibration curve: Measure accurately proper quantity of arsenic standard stock solutions, diluted with 2 per cent nitric acid to the concentration of 2, 4, 8, 12 and 16 ng per ml respectively. Accurately transfer 10 ml of each into 25 ml volumetric flask respectively, add 1 ml of 25 per cent potassium iodide solution (prepared prior to use), shake well, add 1 ml of ascorbic acid solution (prepared prior to use), shake well, dilute with hydrochloric acid solution (20-100) to the volume, shake well, close the stopper and immerse the flask in a water bath at 800 for 3 minutes.

Cool, transfer proper quantities of each solution respectively into the hydride generator device, determine the absorbance, then plot the calibration curve with peak area (absorbance) as vertical axis and concentration as horizontal ordinate.

Determination: Pipette accurately 10 ml of the test solution and its corresponding reagent blank solution respectively, proceed as described under "Preparation of calibration curve" beginning at the words "add 1 ml of 25 per cent potassium iodide solution". Calculate the content of As in the test solution from the calibration curve.

Determination of Mercury (Hg) (Cold Absorption Method)

Determination conditions: Apparatus: suitable hydride generator device; reducing agent: a solution containing 0.5 per cent sodium borohydride and 0.1 per cent sodium hydroxide; carrier liquid: 1 per cent hydrochloric acid; carrier gas: nitrogen; measurement wavelength: 253.6 nm; background calibration: deuterium lamp (D lamp) or Zeeman effect.

Preparation of mercury standard stock solution: Measure accurately a proper quantity of mercury singleelement standard solution to prepare standard stock solution with 2 per cent nitric acid solution, which containing 1.0 μg per ml Hg, stored at 0-50.

Preparation of calibration curve: Measure accurately 0, 0.1, 0.3, 0.5, 0.7 and 0.9 ml of mercury standard stock solution, transfer into a 50 ml volumetric flask respectively, add 40 ml 4 per cent sulphuric acid solution and 0.5 ml of 5 per cent potassium permanganate solution, shake well, drop 5 per cent hydroxylamine hydrochloride solution until the violet red just disappears, dilute with 4 per cent sulfuric acid solution to the volume, shake well. A quantity of each solution is injected to the hydride generator device, determine the absorbance, then plot the calibration curve with peak area (absorbance) as vertical axis and concentration as horizontal ordinate.

Preparation of test solution

Method: Transfer 1 g of the coarse powder of the substance being examined, accurately weighed, into a casparian flask, add 5-10 ml of the mixture solution of nitric acid and perchloric acid (4 : 1), mix well, fix a small hopper on the flask-top, immerse overnight, heat to slake on the electric hot plate at 120-1400 for 4-8 hours until slaking completely, cool, add a quantity of 4 per cent sulfuric acid solution and 0.5 ml of 5 per cent potassium permanganate solution, shake well, drop 5 per cent hydroxylamine hydrochloride solution until the violet red colour just disappears, dilute with 4 per cent sulphuric acid solutions to 25 ml, shake well, centrifugate if necessary, the supernatant is used as the test solution. Prepare synchronally the reagent blank solute based on the same procedure.

Determination: Pipette accurately a quantity of the test solution and its corresponding reagent blank solution, respectively, proceed as described under "Preparation of calibration curve" beginning at the words "add 1 ml of 25 per cent potassium iodide solution". Calculate the content of mercury (Hg) in the test solution from the calibration curve.

APPENDIX 1V

MICROBIAL LIMIT TESTS

The following tests are designed for the estimation of the number of viable aerobic micro-organisms present and for detecting the presence of designated microbial species in pharmaceutical substances. The term 'growth' is used to designate the presence and presumed proliferation of viable micro-organisms.

Preliminary Testing: The methods given herein are invalid unless it is demonstrated that the test specimens to which they are applied do not, of themselves, inhibit the multiplication under the test conditions of micro-organisms that can be present. Therefore, prior to doing the tests, inoculate diluted specimens of the substance being examined with separate viable cultures of Escherichia coli, Salmonella species, Pseudomonas aeruginosa and Staphylococcus aureus. This is done by adding 1 ml of not less than 10-3 dilutions of a 24 h broth culture of the micro-organisms to the first dilution (in buffer solution pH 7.2, fluid soyabean-casein digest medium or fluid lactose medium) of the test material and following the test procedure. If the organisms fail to grow in the relevant medium the procedure should be modified by (a) increasing the volume of diluent with the quantity of test material remaining the same, or (b) incorporating a sufficient quantity of a suitable inactivating agent in the diluents, or (c) combining the aforementioned modifications so as to permit growth of the organisms in the media. If inhibitory substances are present in the sample, 0.5 per cent of soya lecithin and 4 per cent of polysorbate 20 may be added to the culture medium. Alternatively, repeat the test as described in the previous paragraph, using fluid casein digest-soya lecithin-polysorbate 20 medium to demonstrate neutralization of preservatives or other antimicrobial agents in the test material. Where inhibitory substances are contained in the product and the latter is soluble, the Membrane filtration method described under Total Aerobic Microbial Count may be used. If in spite of incorporation of suitable inactivating agents and a substantial increase in the volume of diluent it is still not possible to recover the viable cultures described above and where the article is not suitable for applying the membrane filtration method it can be assumed that the failure to isolate the inoculated organism may be due to the bactericidal activity of the product. This may indicate that the article is not likely to be contaminated with the given species of micro-organisms. However, monitoring should be continued to establish the spectrum of inhibition and bactericidal activity of the article.

Media: Culture media may be prepared as given below or dehydrated culture media may be used provided that, when reconstituted as directed by the manufacturer, they have similar ingredients and / or yield media comparable to those obtained from the formulae given below. Where agar is specified in a formula, use agar that has a moisture content of not more than 15 per cent. Where water is called for in a formula, use purified water. Unless otherwise indicated, the media should be sterilized by heating in an autoclave at 1150 for 30 minutes. In preparing media by the formulas given below, dissolve the soluble solids in the water, using heat if necessary, to effect complete solution and add solutions of hydrochloric acid or sodium hydroxide in quantities sufficient to yield the required pH in the medium when it is ready for use. Determine the pH at 250 ± 20.

Total Aerobic Microbial Count: Pretreat the sample of the product being examined as described below.

Water soluble products: Dissolve 10 g or dilute 10 ml of the preparation being examined, unless otherwise specified, in buffered sodium chloride-peptone solution pH 7.0 or any other suitable medium shown to have no antimicrobial activity under the conditions of test and adjust the volume to 100 ml with the same medium. If necessary, adjust the pH to about 7.

Products insoluble in water (non fatty): Suspend 10 g or 10 ml of the preparation being examined, unless otherwise specified, in buffered sodium chloride-peptone solution pH 7.0 or any other suitable medium shown not to have antimicrobial activity under the conditions of the test and dilute to 100 ml with the same medium. If necessary, divide the preparation being examined and homogenize the suspension mechanically. A suitable surface-active agent such as 0.1 per cent w/v of polysorbate 80 may be added to assist the suspension of poorly wettable substances. If necessary, adjust the pH of the suspension to about 7.

Fatty products: Homogenise 10 g or 10 ml of the preparation being examined, unless otherwise specified, with 5g of polysorbate 20 or polysorbate 80. If necessary, heat to not more than 400. Mix carefully while maintaining the temperature in the water-bath or in an oven. Add 85 ml of buffered sodium chloride-peptone solution pH 7.0 or any other suitable medium shown to have no antimicrobial activity under the conditions of the test, heated to not more than 400 if necessary. Maintain this temperature for the shortest time necessary for formation of an emulsion and in any case for not more than 30 minutes. If necessary, adjust the pH to about 7.

Examination of the sample: Determine the total aerobic microbial count in the substance being examined by any of the following methods.

Membrane filtration: Use membrane filters 50 mm in diameter and having a nominal pore size not greater than 0.45 μm the effectiveness of which in retaining bacteria has been established for the type of preparation being examined. Transfer 10 ml or a quantity of each dilution containing 1 g of the preparation being examined to each of two membrane filters and filter immediately. If necessary, dilute the pretreated preparation so that a colony count of 10 to 100 may be expected. Wash each membrane by filtering through it three or more successive quantities, each of about 100 ml, of a

suitable liquid such as buffered sodium chloride-peptone solution pH 7.0. For fatty substances add to the liquid polysorbate 20 or polysorbate 80. Transfer one of the membrane filters, intended for the enumeration of bacteria, to the surface of a plate of casein soyabean digest agar and the other, intended for the enumeration of fungi, to the surface of a plate of Sabouraud dextrose agar with antibiotics. Incubate the plates for 5 days, unless a more reliable count is obtained in shorter time, at 300 to 350 in the test for bacteria and 200 to 250 in the test for fungi. Count the number of colonies that are formed. Calculate the number of micro-organisms per g or per ml of the preparation being examined, if necessary counting bacteria and fungi separately.

Plate count for bacteria: Using Petri dishes 9 to 10 cm in diameter, add to each dish a mixture of 1 ml of the pretreated preparation and about 15 ml of liquefied casein soyabean digest agar at not more than 450. Alternatively, spread the pretreated preparation on the surface of the solidified medium in a Petri dish of the same diameter. If necessary, dilute the pretreated preparation as described above so that a colony count of not more than 300 may be expected. Prepare at least two such Petri dishes using the same dilution and incubate at 300 to 350 for 5 days, unless a more reliable count is obtained in a shorter time. Count the number of colonies that are formed. Calculate the results using plates with the greatest number of colonies but taking 300 colonies per plate as the maximum consistent with good evaluation.

Plate count for fungi: Proceed as described in the test for bacteria but use Sabouraud dextrose agar with antibiotics in place of casein soyabean digest agar and incubate the plates at 200 to 250 for 5 days, unless a more reliable count is obtained in a shorter time. Calculate the results using plates with not more than 100 colonies.

APPENDIX V

PESTICIDE RESIDUE

Definition: For the purposes of the Pharmacopeia, a pesticide is any substance or mixture of substances intended for preventing, destroying or controlling any pest, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport or marketing of vegetable drugs. The item includes substances intended for use as growth-regulators, defoliants or desiccants and any substance applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.

Limits: Unless otherwise indicated in the monograph, the drug to be examined at least complies with the limits indicated in Table -1, The limits applying to pesticides that are not listed in the table and whose presence is suspected for any reason comply with the limits set by European Community directives 76/895 and 90/642, including their annexes and successive updates. Limits for pesticides that are not listed in Table.-1 nor in EC directives are calculated using the following expression:

$$\frac{ADI \times M}{MDD \times 100}$$

ADI = Acceptable Daily Intake, as published by FAO-WHO, in milligrams per kilogram of body mass,

M = body mass in kilograms (60 kg),

MDD = daily dose of the drug, in kilograms.

If the drug is intended for the preparation of extracts, tinctures or other pharmaceutical forms whose preparation method modifies the content of pesticides in the finished product, the limits are calculated using the following expression:

$$\frac{ADI \times M \times E}{MDD \times 100}$$

E = Extraction factor of the method of preparation, determined experimentally.

Higher limits can also be authorised, in exceptional cases, especially when a plant requires a particular cultivation method or has a metabolism or a structure that gives rise to a higher than normal content of pesticides. The competent authority may grant total or partial exemption from the test when the complete history (nature and quantity of the pesticides used, date of each treatment during cultivation and after the harvest) of the treatment of the batch is known and can be checked precisely.

Sampling

Method: For containers up to 1 kg, take one sample from the total content, thoroughly mixed, sufficient for the tests. For containers between 1 kg and 5 kg, take three samples, equal in volume, from the upper, middle and lower parts of the container, each being sufficient to carry out the tests. Thoroughly mix the samples and take from the mixture an amount sufficient to carry out the tests. For containers of more than 5 kg, take three samples, each of at least 250 g from the upper, middle and lower parts of the container. Thoroughly mix the samples and take from the mixture an amount sufficient to carry out the tests.

Size of sampling: If the number (n) of containers is three or fewer, take samples from each container as indicated above under Method. If the number of containers is more than three, take n+1 samples for containers as indicated under Method, rounding up to the nearest unit if necessary. The samples are to be analysed immediately to avoid possible degradation of the residues. If this is not possible, the samples are stored in air-tight containers suitable for food contact, at a temperature below 00, protected from light.

Reagents: All reagents and solvents are free from any contaminants, especially pesticides, which might interfere with the analysis. It is often necessary to use special quality solvents or, if this is not possible, solvents that have recently been re-distilled in an apparatus made entirely of glass. In any case, suitable blank tests must be carried out.

Apparatus: Clean the apparatus and especially glassware to ensure that they are free from pesticides, for example, soak for at least 16 h in a solution of phosphate-free detergent, rinse with large quantities of distilled water and wash with acetone and hexane or heptane.

Substance Limit (mg/kg)

Alachlor 0.02

Aldrin and Dieldrin (sum of) 0.05

Azinphos-methyl 1.0

Bromopropylate 3.0

Chlordane (sum of cis-, trans – and Oxythlordane) 0.05

Chlorfenvinphos 0.5

Chlorpyrifos 0.2

Chlorpyrifos-methyl 0.1

Cypermethrin (and isomers) 1.0

DDT (sum of p,p-‘DDT, o,p-‘DDT, p,p-‘DDE and p,p-‘TDE 1.0

Deltamethrin 0.5

Diazinon 0.5

Dichlorvos 1.0

Dithiocarbamates (as CS2) 2.0

Endosulfan (sum of isomers and Endosulfan sulphate) 3.0

Endrin 0.05

Ethion 2.0

Fenitrothion 0.5

Fenvalerate 1.5

Fonofos 0.05

Heptachlor (sum of Heptachlor and Heptachlorepoxide) 0.05

Hexachlorobenzene 0.1

Hexachlorocyclohexane isomers (other than) 0.3

Lindane (-Hexachlorocyclohexane) 0.6

Malathion 1.0

Methidathion 0.2

Parathion 0.5

Parathion-methyl 0.2

Permethrin 1.0

Phosalone 0.1

Piperonyl butoxide 3.0

Pirimiphos-methyl 4.0

Pyrethrins (sum of) 3.0

Quintozene (sum of quintozene, pentachloroaniline and methyl pentachlorophenyl sulphide) 1.0

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