THE AYURVEDIC PHARMACOPEIA
OF
BANGLADESH

Part I

Volume II

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 HOMOEO AND TRADITIONAL MEDICINE
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(UNANI, AYURVEDIC & HOMEOPATHIC)

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Functions:

1. To prepare an Ayurvedic Pharmacopeia of single drugs and compound drugs.
2. Ayurvedic Pharmacopeia subcommittee will be carried out scientific works to generate data on monographs of single drugs in which lay down standards for compound formulations.
3. To 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. To prepare an Ayurvedic Pharmacopeia the subcommittee had carried out scientific works to generate data on various monographs of single drugs. Plant origin of Monograph is now being brought out. The Ayurvedic Pharmacopeia of Bangladesh Part II comprise of 50 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.II, is the book of standards for single drugs included therein and the standards prescribed in the The Ayurvedic Pharmacopeia of Bangladesh (A.P.B.), Part I, Vol.II, would be official. If considered these standards can be amended and the Chairman of the Ayurvedic Pharmacopeia Committee authorised to issue such amendments. Whenever such amendments are issued the The Ayurvedic Pharmacopeia of Bangladesh (A.P.B.), Part I, Vol.II, 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 (T.L.C.) 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 reported in research publications have been mentioned as a guide 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.

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

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

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

Percent 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 Ayurvedic Pharmacopeia of Bangladesh (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	:Meter
mm.	: Millimeter
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

Preface

Ayurved is the science of life and encyclopedia of ancient medical wisdom. The Ayurvedic system of medicine has been used in Indian subcontinent since the Vedic period and as early as the dawn of human civilization. Though Ayurved has under gone many changes in the course of its long history, it still remains the mainstay of medical relief to a large section of population of the nation. Bangladesh Government has included Ayurvedic medicine in national health & drug policy so that now mass production of medicines in the Ayurvedic Pharmaceutical units is running on commercial scale. In view of the new trend in Ayurvedic pharmaceutical field, Government of Bangladesh considered it expedient to utilize the existing Drug Act 1982 also control to a limited measure the Ayurvedic, Homeo and Unani drugs by amending the Act. The Act was accordingly amended to ensure control over the production and sale of these medicines namely:

1. The manufacture should be carried under prescribed hygienic conditions, under supervision of a person having a prescribed qualification.
2. The raw materials used in the preparation of drugs should be genuine and properly identified.
3. The formula or the true list of all the ingredients contained in the drugs should be displayed on the label of every container.

To start with, development of standards for the identity, purity and strength of single drugs and formulations at a later stage, assumed importance for the effective enforcement of the provision of the Act. If the raw materials to be used in a medicine and stage by stage processes of manufacturer standardized the final product namely, the compound formulation could be expected to conform to uniform standards. The requirements that the list of ingredients be displayed on the label will enable analysts in important cases to verify label claims and to that extent will bind the manufacture to a true claim. Arrangements to evolve and lay down physical, chemical and biological tests, where necessary, to identify the drugs and ascertain their quality and to detect adulterations are an urgent necessity of the profession. Setting up of drug standardization units, research centers, drug testing institutes and central crug laboratories for Ayurvedic Medicines both for this purpose are therefore, essential. The several Committees appointed by the Government of Bangladesh to assess and evaluate the status and practice of Ayurvedic Medicine have stressed the importance of preparing an Ayurvedic Pharmacopeia.

It is mentionable that Bangladesh National Formulary of Ayurvedic Medicine was first published in 1992 by the Bangladesh Board of Unani and Ayurvedic Systems of Medicine and after that it was edited in 2011. Many of medicinal plants were included in that formulary for preparing the Ayurvedic medicine. So it is needed for ensuring the quality of Ayurvedic medicine, the authentication of medicinal plants or raw materials. So department of Homeo & Traditional Medicine under DGHS was taken a step in 2003-2006 under Health, Nutrition and Population Sector Program (HNPSP) and

was prepared the Ayurvedic Pharmacopeia of Bangladesh, Part I, Volume I which was consist of 50 medical plants. In that continuation, the Ayurvedic Pharmacopoeia of Bangladesh Volume II is going to be published in June 2016 under Health, Nutrition and Population Sector Development Program (HNPSDP) which also consists of 50 monographs of single medicinal plants.

One monograph is exclusively devoted to the one part of the drug of plant origin which 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. All this work was carried out in Pharmacopeial Laboratory for Bangladesh. The data has been finalized after confirmation of various samples obtained from different agroclimatic conditions by the cross-section of experienced scientists in Ayurvedic Pharmacopeia Committee after careful scientific scrutiny. These standards have been consciously kept modest so that its implementation by the manufacturing companies becomes easily acceptable in order to maintain their quality control and avoid batch to batch variations.

Ayurvedic pharmacological properties like rasa, guna, virya, vipaka, karma are also mentioned 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.

Dr. Monowara Sultana
Chairman
Unani, Ayurvedic, Homeopathic Pharmacopeia National Committee

Introduction

Bangladesh, due to its unique variety of geographical and climatic factors, has had a rich and varied flora of the medicinal plants since the Vedic period. A major portion of our people are even used the plants as home remedies in the rural and remotest parts of the country since long but they do not know the scientific therapeutic value of the drugs according to the role of human body system and dosages as well as correct identification of the crude herbal drugs. Ayurveda had never been static, its practitioners had been innovative and dynamic in the therapeutic practice and carried on clinical trials out of the local flora and discovered newer medicine with same therapeutic values. The modern world has slowly started the appreciating value of herbal medicines and understanding the basic comprehensive philosophy of Ayurveda. Not only that, they have already been included traditional herbal medicine in their health programme and used for treatment of their patients randomly because its effectiveness, negligible adverse side effects, easily availability, inexpensiveness and environment friendly. There are three source of medicine in Ayurveda like herb/plant, animal & mineral etc. More than 90% of ingredients used in Ayurvedic medicine are plant based and 10% are from mineral and animal origin. 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. According to the demand of medical practitioner and science a standard general classification of Ayurvedic drugs, fixed recognized rules for the determination of dosage and preparation of Ayurvedic Pharmacopeia is essential as far best which will be regulated by the Government of Bangladesh. The demand for Ayurvedic & plant based medicine is growing up rapidly within the country and abroad. The Government of Bangladesh, Ministry of Health & Family Welfare appreciated the need to prescribe quality standards for Ayurvedic drugs and the drugs act was amended in 1982. A huge number of Ayurvedic practitioners practicing through the country by poly herbal Ayurvedic drugs manufactured by Ayurvedic pharmaceutical industries. But for developing standards of quality, purity and strength of Ayurvedic medicine, no Pharmacopeial laboratory for Ayurvedic medicine yet has been established in Bangladesh. Considering the necessity of legal document of standard quality of drugs Director, Homeo and Traditional Medicine had 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) & 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 in 06 January 2005 and three subcommittee (for Unani / Ayurvedic / Homeopathic) had been appointed by the National Committee. By a strong effort of that committee, the Ayurvedic Pharmacopeia of Bangladesh, Part I, Volume I was prepared and which was consist of 50 medical plants. In that continuation, on dated 19 April 2016 a meeting was held by National Committee

and was decided to prepare the Ayurvedic Phannacopoeia of Bangladesh, Volume II and also reformed the subcommittee. After a great attempt, the Ayurvedic Phannacopoeia of Bangladesh, Volume II is going to be published in June 2016 under HNPSDP which also consists of 50 monographs of single medicinal plants.

Anantamula

Botanical Name: *Hemidesmus indicus* Linn. R. Br.

Family: Asclepiadaceae

Synonyms

Bangla: অনন্তমূল (Anantamul)

Sanskrit: Sariva

Urdu/Unani/Tibbe: Ushba Hindi

English: Indian Sarasa Parilla

Geographical descriptions: It grows all over the Bangladesh.

Plant description:

General Description: It is a slender, laticiferous, twining, sometimes prostrate or semi-erect shrub. Roots are woody and aromatic. The stem is numerous, slender, terete, thickened at the nodes. The leaves are opposite, short-petioled, very variable, elliptic-oblong to linear-lanceolate. The flowers are greenish outside, purplish inside, crowded in sub-sessile axillary cymes.

Fig. *Hemidesmus indicus* Linn. R. Br.

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

Microscopic description: Transverse section of root shows periderm consisting of three layers of tissues, cork, cork cambium and secondary cortex. Cork cells are radially flattened and rectangular in appearance filled with dark brown contents giving reactions of tannins. Cork cambium is 2 or 3 layered,

compressed, and filled with deep brown contents. Secondary cortex is 3-4 layers of cells, similar to cork cells, with very little or no dark brown contents. Secondary phloem's diameter is 7-10µ.

Part Used: Root.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet)
Guna (Attribute)	: Guru (Heavy), Snighda (Unctuous)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Raktagodhaka, Vasaghna, Tridosanagana, Dipana, Jvarahara.

Purity and Safety Test

Total ash	: Not more than 4% w/w
Acid insoluble	: Not more than0.5% w/w
Water soluble extractive	: Not less than 13% w/w
TLC profile with marker constituents	: Thin layer chromatography is the separation of a mixture into individual components using a stationary and mobile phase. Ten TLC plates were spotted with 10 microlitre of ethanolic extract and placed in 10 separate TLC chambers with different solvent systems. When the mobile phase had risen to maximum height of the plate, they were removed and sprayed with the spraying reagent. The R_f value of the isolated compound was found to be 0.56. The blue colour developed confirms the presence of terpenoid in the root extract.
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.

Major Chemical Constituents: The roots contain coumarins and an essential oil consisting principally of hydroxymethoxybenzaldehydes. It also contains the coumarino-lignoids, hemidesmins I & II, sitosterols, hexatriacontane, lupeol its octacosanoate, α and β-amyrins and its acetate, triterpenes, tetracyclic triterpene alcohols, resin acids, fatty acids, tannins, saponins, a glycoside and ketone. The stems contain triterpene lactone, lupanone and its acetate derivative, lupeol, dehydrolupeol acetate, ketolupeneolide, hexadecanoic acid, 4-hydroxy-3-methoxybenzaldehyde and 3-hydroxy-4-methoxybenzaldehyde. Leaves contains significant amount of rutin.

Therapeutic Usages: Chronic skin disorders, autoimmune disease, rheumatoid arthritis, asthma, bronchitis, gonorrheal neuralgia, syphilis, venereal diseases, nephritic complaints, scrofula and chronic skin diseases.

Pharmacological Action: Anticancer, antihyperlipidaemic, renoprotective, hepatoprotective, antidiarrhoeal, antiulcerogenic, antiatherogenic, antileprotic, antioxidant, antiinflammatory, analgesic, antipyretic, antimicrobial and immunomodulatory activities.

Contraindications: It is strongly contraindicated in electrolyte imbalance patients.

Adverse reactions: It might cause stomach irritation, especially when used in larger amounts.

Warnings: Caution should be taken in kidney disease and in conjuction with diuretic medication.

During Pregnancy and lactation: Not enough is known about the use of sarsaparilla during pregnancy and breast-feeding. Stay on the safe side and avoid use.

Dosages: 20 to 30 gm of the drug for decoction.

Posology: 20 to 30 ml 2 to 3 times daily.

Formulations: Anantadi Kwath, Saribadi Churna, Sarivadi Bati, Sarabadi Kwath, Meharaj, Saribadyarista, Sarivaddyasava.

Bala

Botanical Name: *Sida cordifolia* Linn.

Family: Malvaceae

Synonyms

Bangla: বলা (Bala)

Sanskrit: Baladhya, Balini

Urdu/Unani/Tibb: Kanghi

English: Country Mallow

Geographical Descriptions: It is available throughout the country.

Plant Descriptions:

General Description: It grows well through the plains of India, especially, in damp climates. The shrub grows up to 0.75–1.5 meters in height. The root and the stem are stout and strong. They are heart shaped, serrate and truncate. The flowers are small, yellow or white in colour, solitary and axillaries. The seeds are called as Bijabanda in Ayurveda, are grayish black in colour and smooth.

Fig. *Sida cordifolia* Linn.

Macroscopic Description: Stems are stout and strong**.** Leaves are 2.5-7 cm long and 2.5-5 cm broad, with 7-9 veins. Flowers are small, yellow or white in colour, solitary and axillaries. Fruit is moong-sized, 6-8 mm in diameter**.** Seeds are grayish black in colour and smooth.

Microscopic Description: Transverse section of the leaf across the midrib showed an upper epidermis consisting of palisade cells in lamina portion and lower epidermis consist spongy parenchyma. The mid–rib bundle was surrounded by a zone of collenchyma on both surfaces. The lignified pericyclic fibre was present below vascular bundle. Stellate trichomes, glandular trichomes, multicellular as well as single glandular trichomes are present. Rossets were also present. Anisocytic stomata were found in the surface preparation of leaf.

Part Used: Seed, leaves, roots.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet)
Guna (Attribute)	: Laghu (Light). Snigdha, Picchila (Slimy)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Vat Pitta shamak.

Purity and Safety Test

Total ash	: Not more than 2.5 % w/w
Acid insoluble	: Not more than 1.28 % w/w
Water soluble extractive	: Not less than 1.13% w/w

TLC profile with marker constituents: A chromatography plate revealed with p-anisaldehyde/sulfuric acid/acetic acid and heat (0.5:9:0.5:0.1 mL, 10 min, 100 °C) showed abundant spots (0.3 -0.7 RFs), including some violet and purple hues. Using vanillin as chromogenic agent (2 % in ethanol, 5 min, 90 °C) and spraying again with acetic anhydride/sulfuric acid (12:1; 85-90 °C), revealed yellow-gray and blue-violet spots (indicative of saponins). Meanwhile, the plate revealed with silver nitrate in acetone (12:400 mL), dried and sprayed with NaOH (0.5 M in ethanol), showed reducing sugars (dark brown spots on a light background). Another plate was incubated in a glass chamber saturated with iodine vapor. In this case saponins appeared as yellow-brown spots. Steroidal saponins were observed at visible as yellow spots on a white-cream background. When a plate was sprayed with antimony trichloride (10 % in chloroform, 70-90 °C, and 40 min), saponins were observed as blue fluorescent spots at UV light. Specific chromatographic analysis for carbohydrates showed stains with similar to those from reference standards, and enabled identification of glucose, arabinose, galactose (carbohydrates commonly found associated with saponins), fructose and sorbose (reported as companions of saponins in plants).

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.

Major Chemical Constituents: The leaves of bala contain small quantities of ephedrine and pseudoephedrine, roots and seeds contain alkaloid ephedrine, vasicinol, vasicinone and N-methyl tryptophan and are extensively used as a common herbal drug. Other chemical constituents are malvalic and coronaric acid, fatty acids, saponine, betaphenethylamine, palmitic, stearic and β–sitosterol.

Therapeutic Usages: Rheumatism, muscular dystrophy, muscle weakness, asthma, allergies, blood, throat, and urinary system related troubles, piles, phthisis and insanity.

Pharmacological Action: Analgesic, antiinflammatory, antibacterial, antipyretic, antiprotozoal, hepatoprotective, bronchodilator, hypoglycemic, hypochoesteremic and immunomodulators**.**

Contraindications: Contraindicated in cardiac arrhythmia, tachycardia, heart disease, essential tremor, kidney stones and glaucoma.

Adverse Reactions: Insomnia, anxiety, nervousness, and increase in blood pressure, memory loss or even stroke.

Dosages Forms: Powder or decoction. Package in closed, light resistant containers.

Posology: Powder 1 to 2 gm per day, use mixed with milk or fruit juice.

Formulations: Masabaladi Kwath, Maharasnadi Kwath, Laksmi Bilash, Durlava Ras, Brihat Vat Gajangkush, Balarista, Uddyam, Goura Arista, Bala Taila.

Barun

Botanical Name: *Crataeva nurvala* Buch Ham.

Family: Capparidaceae

Synonyms:

Bangla: বরুন (Barun)

Hindi: Barna, Barun, Bila, Bilasi, Biliana

Sanskrit: Varana, Kumaraka, Setu, Tamalaka, Ajapa, Ashmarygna

Urdu/Unani/Tibbi: Barna

English: Three leaved caper, Holy garglic pear, lengam Tree, Triune leaf tree, sacred lingam tree.

Geographical Distribution: It grows throughout the country.

Plant Descriptions:

General Description: It is a medium sized, deciduous tree which may reach a height of 50 feet. The bark is smooth and brown while the branches have white patches tinged with purple and yellow. Its bark is gray, smooth with horizontal wrinkling. The leaves of the Varuna are trifoliate, 8-12 cm long, with oval leaflets. The flowers are greenish-white, light yellowish or creamy colored, and are fragrant. The fruits are ovoid berries, 2.5 cm in diameter, resembling a lemon and ripening to a red color.

Fig. *Crataeva nurvala* Buch Ham

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

Microscopic Description: Transverse section of mature stem bark shows, an outer cork composed of thinwalled, rectangular and tangentially elongated cells, phellogen single layered, thinwalled, tangentially elongated cells followed by a wide secondary cortex, consisting of thin-walled, polygonal to tangentially elongated cells with a number of starch grains, starch grains mostly simple,

occasionally compound with 2-3 components also present', large number of stone cells in groups of two or more, found scattered in secondary cortex, single stone cells not very common, stone cells vary in size and shape, being circular to rectangular or elongated with pits and striations on their walls, stone cells distributed somewhat in concentric bands in phloem region except in inner region of phloem which is devoid of stone cells, secondary phloem comparatively a wide zone, consisting of sieve tubes, companion cells, parenchyma and groups of stone cells, alternating with medullary rays, sieve elements found compressed forming ceratenchyma in outer phloem region, whereas in inner region of phloem, intact, medullary rays mostly multiseriate composed of thin-walled, radially elongated cells, tangentially elongated towards outer periphery, a number of starch grains similar to secondary cortex also present in phloem and ray cells, few rhomboidal crystals of calcium oxalate also found in this region, inner most layer is cambium.

Part Used: Root bark, stem bark, flower, and leaves.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Kashaya (Astringent)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Hot (Ushna)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha Vata hara, Dipana

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 13.0% w/w
Acid insoluble ash	: Not more than 1.0% w/w
Alcohol soluble extractive	: Not less than 1.0% w/w
Water soluble extractive	: Not less than 8.0% w/w
TLC profile with marker constituents	: The chloroform extract (10 gm) was fractionated by column chromatography over silica gel (Merck, mesh 80-230). Elution from the column first extracted with n-hexane, then increasing polarities of EtOAc in n-hexane and finally with EtOAc yielded 37 fractions. The proportion of solvent systems used to obtain fraction 5, 6, 7 and 10 were n-hexane -EtOAc (95:5), (94:6), (93:7) and (90:10) respectively. Fraction 5 gave stigmasterol (4, 23 mg) and fraction 6 gave betulinic acid (1, 20mg) upon multiple PTLC using n-hexane-EtOAc (95:5) and (94:6) respectively. Repeated crystallization of fraction 7 and fraction 10 using n-hexane-EtOAc afforded lupeol (2, 28 mg) and β-sitosterol (3, 99mg) respectively. Repeated chromatographic separation and

purification of the chloroform soluble materials of the cold rectified spirit extract of the stem bark of Crataeva nurvala provided a total of four com pounds (compound 1, 2, 3 and 4). The structures of which were determined by extensive 1H NMR spectral analysis as well as by comparison of their spectral data with previously reported values..

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.

Major Chemical Constituents: The key constituents of crataeva nurvala are alkaloids; triterpenes; tannins; saponins; flavonoids; plant sterols and glucosilinates.

Therapeutic Usages: Burning urination, urinary and kidney stones, hepatitis, edema, ascites, arthritis and urinary tract infections.

Pharmacological Action: Diuretic, antilithiatic, rubefacient, antiinflammatory, antioxidant, contraceptive, antiinflammatory, antimicrobial, laxative and lithinotriptic.

Contraindications: Contraindications have not been identified.

Adverse Effects: Not really known

Precautions: Not exactly known.

Dosage Forms: May be used externally as a poultice or taken internally in various forms either as a tea or a tincture.

Posology: Decoction: 12 to 50 ml per day

Formulations: Barunadya Louha, Barunadi Kwath, Gokhuradi Kwath, Narayan Ras.

Bhringarja

Botanical Name: *Eclipta alba* (L.) Hassk

Family: Asteraceae

Synonyms:

Bangla: ভৃঙ্গরাজ (Bhringaraj), Kesari

Hindi: Bhangara, Bhangaraiya

Sanskrit: Kesaraj

Urdu/Unani/Tibb: Bhangra

English: Trailing eclipta

Geographical Distribution: It grows throughout the country in fallow lands.

Plant Descriptions:

General Description: A slender, diffuse or suberect herb; stem and branches strigose with appressed white hairs. Leaves sessile, 2.5–7.5 cm long, oblong-lanceolate, subentire, acute, sparsely strigose with appressed hairs on both sides. Heads 6–8 mm diameter. solitary or 2 together on unequal axillary peduncles; ray-flowers ligulate, white.

Fig. *Eclipta alba* (L.) Hassk

Macroscopic Description: Root well developed, a number of secondary branches arise from main root, upto about 7 mm in dia., cylindrical, greyish. Stem is herbaceous, branched, occasionally rooting at nodes, cylindrical or flat, rough due to oppressed white hairs, node distinct, greenish, and occasionally brownish. Leaf is opposite, sessile to subsessile, 2.2-8.5 cm long, 1.2-2.3 cm wide, usually oblong, lanceolate, sub-entire, sub-acute or acute, strigose with appressed hairs on both surfaces. Flower is olitary or 2, together on unequal axillary peduncles; involucral bracts about 8, ovate, obtuse or acute, herbaceous, strigose with oppressed hairs; ray flowers ligulate, ligule small, spreading, scarcely as long as bracts, not toothed, white; disc flowers tubular, corolla often 4 toothed;

pappus absent, except occasionally very minute teeth on the top of achene; stamen 5, filaments epipetalous, free, anthers united into a tube with base obtuse; pistil bicarpellary; ovary inferior, unilocular with one basal ovule. Fruit is achenial cypsella, one seeded, cuneate, with a narrow wing, covered with warty excrescences, brown. Seed 0.2-0.25 cm long, 0.1 cm wide, dark brown, hairy and non endospermic.

Microscopic Description: Mature root shows poorly developed cork, consisting of 3-5 rows of thin-walled, tangentially elongated cells; secondary cortex consists of outer one or two rows of tangentially elongated or rounded cells with air cavities, inner secondary cortex of tangentially elongated to irregular shaped, parenchymatous cells with conspicuous air cavities; stone cells found scattered in secondary cortex and cork, in singles or in groups of various shape and size; pericyclic fibres in tangentially arranged bands of many cells or in singles; secondary phloem consists of sieve elements including phloem fibres traversed by multiseriate phloem rays; phloem rays broader towards periphery, consisting of rounded cells; xylem composed of vessels, fibre tracheids, fibres and xylem parenchyma, traversed by xylem rays; vessels numerous, found scattered throughout wood, in macerated preparation vessels small, drum shaped, cylindrical elongated with pitted walls and perforations, simple, rarely slightly oblique; fibre tracheids, pitted, with very pointed tips, xylem fibres long with pointed tapering ends and short lumen, a few fibres show peg-like outgrowths towards the tapering ends; xylem parenchyma sparse usually squarish to rectangular having simple pits on their walls, xylem ray distinct, run straight in tangential section, generally 5-32 cells in height and 3-5 cells in width although very rarely uniseriate and biseriate rays also found, ray cells pitted. Leaf shows single layered upper and lower epidermis consisting of tubular cells, covered with striated cuticle; trichomes of two types, non-glandular, uniseriate, 1-5 celled, warty, and with pointed apical cell; epidermis followed by wide cortex, consisting of 2-5 layered collenchyma on both, upper arid lower side with distinct angular thickening; parenchyma 4-6 layered on upper side and 5-8 layered on lower side consisting of isodiametric, thin-walled cells with intercellular spaces; five vascular bundles central one largest while four others small flanking to either side of central bundle, consists of xylem on dorsal side and phloem on ventral side; xylem vessels arranged in radial rows traversed by xylem rays. Midrib cut at basal region shows both upper and lower single layered epidermis, externally covered with cuticle, a few epidermal cells elongate outwards to form uniseriate hairs; epidermis followed by cortex, consisting of 3-5 layered collenehymatous cells on both sides; section cut at middle region shows 3-4 layered collenchymatous cells on dorsal and 1-3 layered on ventral side, while the section cut at apical region, shows 2 layered collenchymatous cells on both sides, similarly transverse section cut at a basal, middle and apical regions shows 4-6 layered parenchymatous cells on dorsal side and 6-9 layered parenchyma on ventral side, in section cut at basal region 4-6 layered parenchyma on both the sides in the middle region with thin walled cells and intercellular spaces, 2-3 layered parenchymatous cells on both side in the apical region; in the basal

region section shows vascular bundle similar to that of petiole while in the section cut at middle and apical region section shows 4 smaller bundles shifting towards lamina.

Part Used: Whole plant.

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter)
Guna (Attribute)	: Ruksha (Rough), Laghu (Light)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha Vata hara, Rasayan, Balya, Caksusya.

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 22.0% w/w
Acid insoluble ash	: Not more than 11.0% w/w
Alcohol soluble extractive	: Not less than 5.0% w/w
Water soluble extractive	: Not less than 15.0% w/w
TLC profile with marker constituents	: Thin layer chromatography was carried out to isolate the principle components that was present in most effective extracts of plant. The different solvent systems of different polarities were prepared and TLC studies were carried out to select the suitable solvent system for better resolution. 5 g of whole plant refluxed with 100 ml of alcohol for one hour and then evaporated with water bath to reduce the volume. Crude extract then diluted to 100 ml with alcohol. Finally the methanolic leaf extract of EA was performed by TLC using mobile phase's viz. Toluene: Acetone: Formic acid (11:6:1). The samples was visualized at 254 nm and 366 nm and identified the bands of similar R_f value. The results from TLC revealed that best resolution for the compounds with similar R_f value (0.67) for methanolic extracts with combined solvents of Toluene, Acetone and Formic acid (11:6:1), visualized at 254 and 366 nm for the sample.
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.

Major Chemical Constituents: The plant contains an alkaloid, ecliptine. Leaves contain saponins, including α-terthienylmethanol, β-amyrin, wedelolactone, demethyl wedelolactone, its 7-O-glucoside, triterpene glycosides, stigmasterol and a small amount of 2formylterthienyl. Aerial parts of Egyptian plant contain β-amyrin, wedelactone, luteolin7 glucoside, phytosterol A.

Therapeutic Usages: Spleen and liver enlargement, ringworm, alopecia, jaundice and hepatitis; cough, bronchitis, asthma, catarrh, indigestion, hemorrhage, vertigo, toothache, giddiness, leucoderma, anemia and itching.

Pharmacological Action: Antipyretic, stomachic, anthelmintic, antiasthmatic and antiinflammatory.

Contraindications: Strong dose of fresh decoction may cause digestion problem.

Precautions: Not to be used in pregnant, lactating mother and children.

Dosage Forms: Crude plant material, powder, and other galenic preparations. Store in a well closed glass or metal container, protected from light and moisture.

Posology: Powder 3 to 6 gm per day, juice 20 to 30 ml every day. For internal use, in powder form, 1 to 2 teaspoonfuls 2 times a day mixed with warm water, or in tablets, 1 to 2 tablets 2 times a day.

Formulations: Dasanga Kwath, Abhyarista, Kalomeghasav, Saribadyarista, Maha Briangaraj Taila**.**

Biranga

Botanical Name: *Embelia ribes* Burm F.

Family: Myrsinaceae

Synonyms

Bangla: বিড়ঙ্গ (Biranga), Krmighna

Sanskrit: Bidanga

Urdu/Unani/Tibb: Baobadang, Baobarang

English: Common Cress

Geographical Descriptions: In Bangladesh it is found in Chittagong and Sylhet.

Plant Descriptions:

General Description: It is a Climbing creeper shurb, flxible, and terete branches; bark studded with lenticels. Leaves are simple, coriaceous, smooth leaves gland dotted, short and obtusely acuminate, broad, entire perfectly glabrous. It is about 3 inch long and 1 ½ inches broad, shiny above and modulated. Petiolae is 1.0 cm to 0.8 cm margined, midrib is prominent. Flowers are small, greenish yellow to whitish-pink colored. In racemes at end of branches Small, globular Fruits about the size of white pepper, reddish–brown to blackish. It is found in bunches. The outer covering of the fruit is fragile and inside the seed is spotted. Stem is whitish grey in color with a mature girth of 45-72 cms. Root is brownish grey. Rootlest are hairy reddish.

Fig. *Embelia ribes* Burm F.

Macroscopic Description: Seeds are small, oval-shaped, pointed and triangular at one end, smooth, about 2-3mm long, 1-1.5 mm wide, reddish brown, a furrow present on both surfaces extending upto two thirds downward, a slight wing like extension present on both the edges of seed, when soaked in water seed coat swells and gets covered with a transparent, colourless mucilage, taste, mucilaginous**.**

Microscopic Description: Powder cream yellow with a number of reddish brown fragments of seed coats, under microscope shows pieces of seed coat, some showing red colouring matter and others with uniformly thick walls, endosperm oily.

Part Used: Fruit, leaves, root bark.

Organoleptic Properties

Organoleptic Properties

Rasa (Taste)	: Katu (Bitter)
Guna (Attribute)	: Ruksha (Rough), Teekshna (Sharp), Laghu (Light)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Krimigna

Purity and Safety Test

Total ash	: Not more than 6 % w/w
Acid insoluble ash	: Not more than 1.5 % w/w
Water soluble extractive	: Not less than 9 % w/w

TLC profile with marker constituents: Under the chroma tographic condition mentioned above, the Rf of Embelin was observed at above 0.65. The test sample shows a identical spot at the Rf of standard Embelin, which indicates The presence of Embelin in test sample. The calibration curve was found to be linear between 5.0 to 20.0ug. The method allows reliable quantification of Embelin from E. ribes Further recovery values were also satisfactory which showed the reliability and suitability of the method. The proposed method is rapid, simple and accurate and hence can be used for standardization and monitoring of Embelin in E. ribes.

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.

Major Chemical Constituents: The chief active constituent of the fruits (berries) is a hydroquinone, embelin (2,5-dihydorxy-3-lauryl-p-benzoquinone), a dimmer of embelin, vilangin. They also contain embolic acid, volatile and fixed oils, colouring matter, tannin, resin and an alkaloid.

Therapeutic Usages: Worm infestation, indigestion, hematemesis, gastritis**,** abdominal pain, nausea, vomiting, diarrhea, dysentery, erysipelas, bleeding piles, metrorrhagea, menorrhagia, excessive thirst, itching, sores, scabies, wounds, rheumatism, asthma, leprosy and cough.

Pharmacological Action: Anthelmintic, carminative, antibacterial, antiprotozoal, antiinflammatory, antipyretic, antioxidant, expectorant and anti spasmodic.

Contraindications: Not recommended during pregnancy.

Adverse Effects: There are no known side effects with this herb.

Precautions: Long term usage may cause infertility.

Dosages Forms: Powder or extract. Package in closed, light resistant containers.

Posology: 3 to 6 gm of the drug in powder form

Formulations: Sanjibani Bati, Nobayas Louha, Biranga Louha, Vidangarista, Kankarista, Vidangarista.

Chirata

Botanical Name: *Swertia chirata* (Wall.) C. B. Clarke

Family: Gentianaceae

Synonyms

Bangla: চিরতা (Chirata)

Sanskrit: Kirata, Chiratika

Urdu/Unani/Tibb: Chiraita shireen

English: Chiretta

Geographical Descriptions: In Bangladesh it is found in Sylhet, Shremongal, Moulobibazar and Some parts of the Chittagong and Khulna.

Plant Descriptions:

General Description: The plant is an erect annual. The stems are robust, branching, cylindrical below and 4-angled upwards, containing a large pith; the leaves are broadly lanceolate, 5-nerved and subsessile; the flowers occur in large panicles, are lurid greenish yellow, tinged with purple; the capsules are egg shaped, many sided, sharp pointed; the seeds are smooth and many angled. The drug (chiretta) is obtained from the dried plant.

Fig. *Swertia* chirata (Wall.) C. B. Clarke

Macroscopic Description: The dried raw drug sold in the market consists of bundle of long, more often leafless steems topped with flowering or turning branches with a short tapering root of light brown or rusty brown in color. Root shows oblique twisted and gradually tapering measured 5-10 cm long up to 1.25 cm diameter. Stem shows cylindrical, measuring 60-125 cm long, about 6 cm diameters. Leaves shows opposite decussate 3.5-10 x 1.5-4.0 cm.

Microscopic Description: In cross sectional view, the whole plant (root, stem and petiole) of *Swertia chirata* shows the following structural features. Root studied measures about 4.5 mm in diameter. It has

thin, less prominent periderm. The cortical zone is wide, homogeneous and parenchymatous. The cortical cells are polyhederal, thin walled and compact. The cortical zone is gradually transformed in to secondary phloem. The young stem has thin epidermal layer followed by a wide heterogeneous cortex. The outer part of the cortex consists of polyhedral collenchyma cells with wide air chambers. The inner part of the cortex consists of radially aligned rectangular cells.

Part Used: Whole plant.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Ruksha (Rough), Laghu (Light)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha Pitta hara.

Purity and Safety Test

Total ash	: Not more than 2.40%w/w
Acid insoluble	: Not more than 0.49% w/w
Water soluble extractive	: Not less than 3.12% w/w
TLC profile with marker constituents	: Thin layer chromatographic analysis of the ethanolic extract of *Swertia chirata* was carried out using Benzene: methanol: acetic acid (45:8:4) as solvent system. Rf values were calculated after the development of chromatogram. The Rf values in the given solvent are used to characterize the drugs identity and purity. The Rf value 1.1, 1.6, 2.4, 4.2, 5.1, 8.5 1.1, 1.6, 2.4, 4.2, 5.1, 8.5 2.0 (Brown color), 0.12, 0.38, 0.84, 0.92 0.12, 0.38, 0.84, 0.92 0.15(Brown), 0.38(LightBrown), 0.76(Brown), 0.84 (Dark Brown), 0.92 (Green) and 0.08, 0.4,0.5, 0.53, 0.91 0.08, 0.4, 0.5,0.53, 0.91 0.4 (Yellow), 0.5 (Light Yellow), 0.58 (Yellow), 0.8 (Orange) are obtained respectively.
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.

Major Chemical Constituents: A yellow bitter acid, ophelic acid**,** two bitter glucosides, chiratin and amarogentin, gentiopicrin, two yellow crystalline phenols, a neutral, yellow crystalline compound, and a new xanthone, swerchirin. The herb contains swertanone, swertenol, episwertinol, chiratenol, taraxerol, oleanolic acid, ursolic acid and pichierenol.

Therapeutic Usages: Chronic fever, malarial and intermittent fevers; jaundice, hepatitis, enlarged liver, indigestion, worm infestation, skin diseases including wounds, ulcers and itchiness.

Pharmacological Action: Antibacterial, antiviral, antifungal, antiinflammatory, antipyretic, **a**ntiprotozoal, hepatoprotective, hypoglycemic, hypochoesteremic and immunomodulators.

Contraindications: It is contraindicated in active gastric and duodenal ulcer and hypoglycemia.

Adverse Effects: Large oral doses may cause gastric discomfort, vomiting and loss of appetite due to the bitter taste.

Warnings: Should be avoided in gastric or duodenal ulcers. It lowers blood sugar levels. Hence precaution is required while administering it in diabetic patients.

During Pregnancy and lactation: It is safe to give in children and lactating mother. But the dose needs to be monitored carefully.

Dosages Forms: Powder or decoction. Package in closed and light resistant containers.

Dosages: Powder 1 to 3 gm in divided dose in a day. Decoction 50 to100 ml in divided dose per day.

Formulations: Bisam Jwarantak Louha, Dasanga Kwath, Ushirasav, Kalomeghasav, Saribadyarista, Jwarkeshari Rasayan.

Dalim

Botanical Name: *Punica granatum* Linn.

Family: Punicaceae

Synonyms:

Bangla: ডালিম (Dalim)

Hindi: Anar

Sanskrit: Dadima

Urdu/Unani/Tibb: Julnar

English: Pomegrante

Geographical Descriptions: It grows throughout the country

Plant Descriptions:

General Description: The Pomegranate is a partly deciduous and even evergreen tree in the tropics and sub-tropics. It is a small tree or bush, 3-4 metres, with many stems forming an irregular crown. They have glossy, green leaves and large, orange, hibiscus like blossoms which also make them desirable ornamentals.The fruits have a thick reddish-brown skin when ripe. Inside are many seeds which are all surrounded by a juicy pulp. The colour of this pulp varies from white to light red, deep red and sometimes purple. There are many cultivars with a lot of variation in fruit size and colour, juice content, taste, hardness of seed, and other characteristics.Pomegranate fruits are eaten fresh or are used to produce juice.

Fig.: *Punica granatum* Linn.

Macroscopic Descriptions: Seeds brown, angular, wedge shaped, 0.5-0.6 cm long, 0.1-0.2 cm wide; taste, sweetish-sour.

Microscopic Descriptions: Seed shows testa consisting of thin-walled, parenchymatous cells followed by stony tegmen consisting of lignified, round, oval, triangular and rectangular, thick-walled stone cells having narrow and wide lumen; beneath this, reddish-brown pigmented layer present; endosperm absent; cotyledons coiled, consisting of oval to polygonal, thin walled, parenchymatous cells, containing a few oil globules; starch grains present in testa, round to oval, simple, measuring 3-17 μ in diameter. Powder shows reddish-brown; shows stone cells, oil globules, and a few simple rounds to oval starch grains measuring 3-17 μ in diameter. Largeparenchyma cells. Small acicular crystals of calcium oxalate occur in the pithand cortical cells of stem and leaf.

Part Used: Flower, seed, fruit bark etc.

Organoleptic Properties

Rasa (Taste)	: Kasaya (Astringent), Madhura (Sweet), Amla (Sour)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Vatavardhaka, Kapha-pitta hara, Grahi

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 4.0% 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 35% w/w
TLC profile with marker constituents	: T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Chloroform: Ethylacetate: Formic acid (5:4:1) v/v three spots at Rf. 0.62, 0.87 (both grey) and 0.97 (pink) are seen in visible light. Under U.V. (366 nm) four fluorescent zones are visible at Rf. 0.12 (sky blue), 0.45 (sky blue), 0.62 (blue) & 0.87 (blue). On exposure to iodine vapour three spots appear at Rf. 0.62, 0.87 & 0.97 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110˚ C three spots appear at Rf. 0.62, 0.87 (both violet) & 0.97 (greyish blue).
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.

Major Chemical Constituents: Sugars, Vitamin C, sitosterol, ursolic acid, protein, fat and mineral matters, nicotinic acid, pectin, riboflavin, thiamine, delphinidin diglycoside, aspartic, citric, ellagic, gallic and malic acids; glutamine, isoquercetin, estrone, and punicic acid.

Therapeutic Usages: Diabetes, diarrhea, loss of appetite, dysentery, indigestion, vomiting, haematemesis, burning, anemia, etc.

Pharmacological Action: Anticancer, antidiarrhoeal, antiinflammatory, antibacterial, antifungal, neuroprotective and hypoglycemic.

Contraindications: Not to be used during pregnancy, lactation and for children.

Adverse Effects: itching, swelling, runny nose, and difficulty breathing.

Precautions: Possibly safe for pregnant and breast feeding women. Juice can slightly lower blood pressure.

Dosage Forms: Fruit juice, stem bark or root bark pulverized.

Posology: 5 to 10 gm of the drug in powder form

Formulations: Kutajadi Kwath, Somanth Ras, Pijushballi Ras, Meha Mudgar, Mritasanjibani.

Daruchini

Botanical Name: *Cinnamomum zeylanica* Blume

Family: Lauraceae

Synonyms:

Bangla: দারচিনি (Daruchini)

Hindi: Dalchini

Sanskrit: Darusitha, Tvak

Urdu/Unani/Tibb: Darchini

English: Cinnamon bark

Geographical Distribution: It is readily available as a commercial commodity everywhere in the country.

Plant Descriptions:

General Description: A moderate sized evergreen tree. Leaves coriaceous, 7.5-20 cm long, ovate or ovate-lanceolate, shining above, subacute or shortly acuminate. Flowers small, numerous, in lax panicles, usually longer than the leaves. Fruit 1.3-1.7 cm long, oblong or ovoid-oblong, dry or slightly fleshy, dark purple.

Fig. *Cinnamomum zeylanica* Blume

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

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

Part Used: Stem bark, leaf.

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter), Madhura (Sweet)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough), Teekshna (Sharp)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Vatapittahara, Sukrala, Balya, Varna, Grahi

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 3.0% w/w
Acid insoluble ash	: Not more than 2.0% w/w
Alcohol soluble extractive	: Not less than 2.0% w/w
Water soluble extractive	: Not less than 3.0% w/w
Volatile oil	: Not less than 1.0% w/w
TLC profile with marker constituents	: The extract (0.3 g) was dissolved in 3 ml of its mother solvent. The sample was applied on to TLC plate and different solvent systems, petroleum ether: diethyl ether: glacial acetic acid, (8:20:1), toluene: ethyl acetate in a ratio of 70:30 and 93:7, were used in order to determine the best suitable solvent for separation. Detection of the spots was carried out by mean of day light, UV lamp and iodine vapor. R_f values were then measured. It can be concluded that the best separation occurs when the mixture of petroleum ether: diethyl ether: glacial acetic acid in a ratio of 80:20:1 respectively was used as a solvent. Almost all extracts contain components of approximate similar R_f values.
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.

Major Chemical Constituents: The main chemical components of the essential oil, obtained from the leaves, are eugenol, eugenol acetate, cinnamic aldehyde and benzyl benzoate.

Therapeutic Usages: Indigestion, nausea, vomiting, loss of appetite, abdominal pain, diarrhea, dysentery, influenza, bronchitis, hiccup, piles, diarrhea, diabetes and heart diseases.

Pharmacological Action: Antioxidant, antidiabetic, antibacterial, antiinflammatory, hypochoesteremic and immunomodulators.

Contraindications: Contraindicated in cases of fever of unknown origin, pregnancy, stomach or duodenal ulcers and in patients with an allergy to cinnamon.

Adverse Effects: Heavy exposure may cause skin irritation and allergic reactions.

Precautions: It should be avoided in pregnancy. High dosages can cause convulsions.

Dosage Forms: Crude plant material, powder, volatile oil.

Posology: Powder 1 to 3 gm in divided dose per day, cinnamon oil 2 to 5 drops once or twice a day.

Formulations: Siopaladi Churna, Eladi Churna, Talishadi Churna, Mahagni Bati, Kamini Bidraban Ras, Ratibilash Bati, Dosomularista, Brihat Jirakadya Modak.

Daruharidra

Botanical Name: *Berberis aristata* DC

Family : Berberidaceae

Synonyms

Bangla: দারুহরিদ্রা (Daruharidra)

Sanskrit: Katamkateri, Darvi

Urdu/Unani/Tibbe: Darhald

English: Indian berberi

Geographical Descriptions: Daruharidra is found in the Himalayan ranges at an elevation of 1000-3000 m, and in the Nilgiri hills in South India and Bangladesh.

Plant Descriptions:

General Description: It is an erect, spinous, deciduous shrub, usually 1.8-3.6 m in height. It is an erect, glabrous, spinescent shrub with obovate to elliptic, subacute to obtuse, entire or toothed leaves. The flowers are yellow and in corymbose racemes. The fruits are oblong-ovoid or ovoid, bright red berries.

Fig. *Berberis aristata* DC

Macroscopic Description: Bark is about 0.4 - 0.8 cm thick, pale yellowish-brown, soft, closely and rather deeply furrowed, rough, brittle, xylem portion yellow, more or less hard, radiate with xylem rays, pith mostly absent, when present small, yellowish-brown when dried, fracture short in bark region, splintery in xylem; taste, bitter.

Microscopic Description: Shows rhytidoma with cork consisting of 3-45 rectangular and squarish, yellow coloured, thin-walled cells, arranged radially; sieve elements irregular in shape, thin walled, a few cells containing yellowish-brown contents; phloem fibres arranged in tangential rows, consisting

of 1-4 cells, each fibre short thick-walled, spindle-shaped, lignified having wide lumen; half inner portion of rhytidoma traversed by secondary phloem rays; phloem rays run obliquely consisting of radially elongated parenchymatous cells, almost all phloem ray cells having single prismatic crystals of calcium oxalate, and pointed tips; xylem rays quite distinct, straight, multiseriate, consisting of radially arranged rectangular cells, each ray 30-53 cells high, 8-12 cells wide, a few ray cells containing brown contents.

Part Used: Root and/or stem bark

Organoleptic Properties:

Rasa (Taste)	: Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Balances Kapha and Pitta Dosha. .

Purity and Safety Test

Total ash	: Not more than 14% w/w
Acid insoluble	: Not more than 5% w/w
Water soluble extractive	: Not less than 8% w/w
TLC profile with marker constituents	: TLC profile of Daruharidra is done on Ethanol extracts using solvent system of Cyclohexane: Chloroform: Glacial acetic acid (45:45:10) and Toluene: Ethylacetate: Diethylamine (70:20:10). The R_f value of Ethanol extracts are 0.70, 0.73 and 0.61, 0.67 respectively and ensure the presence of maximum no. of constituents.
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.

Major Chemical Constituents: The alkaloids in the bark and root bark are berberine, berbamine, aromoline, karachine, palmatine, oxyacanthine and oxyberberine

Therapeutic Usages: Liver diseases, diarrhoea, haemorrhoids, gynaecological disorders, osteoporosis, diabetes, ear infections, wound healing, jaundice, skin diseases and malarial fever.

Pharmacological Action: Antipyretic, antibacterial, antimicrobial, antihepatotoxic, antihyperglycaemic, anticancer, antioxidant and antilipidemic.

Contraindications: Itis contraindicated in diarrhea and early pregnancy.

Adverse reactions: None found in published literature.

Dosages: 5 to 10 ml of the drug in Katha form.

Formulations: Pitak Churna, Abla Sudha, Khadirarista, Punarnavasav, Brihat Haridra Khanda Khadiradi Gutika, Triphala Ghrta.

Dhaiphul

Botanical Name: *Woodfordia fruticosa* (L) Kurz.

Family: Lytheraceae

Synonyms

Bangla: ধাইফুল (Dhaiful)

Sanskrit: Dhatupushpi

Urdu/Unani/Tibb: Dhawa

English: Fire Flame Bush

Geographical Descriptions: It is commonly found in different part of the country.

Plant Descriptions:

General Description: A straggling leafy shrub, reaching 3.6 m high; branches long, spreading. Leaves 5-9 cm long, opposite or subopposite, sessile, ovate-lanceolate, acute. Flowers tubular, bright red, numerous, in short 2-15 flowered cymes from the axils of former, less commonly of present leaves.

Fig. *Woodfordia fruticosa* (L) Kurz.

Macroscopic Description: Flowers of Woodfordia are 1.2 cm long; occurs as single or in bunches. Calyx of a flower is 1 to 1.6 cm long, ridged, glabrous, bright red when fresh and fades on drying. Elongated calyx with campanulate base and oblique apex are characteristic of Woodfordia flowers. Apex of a calyx is having 6 triangular and acute teeth. Calyx tooth is attached with very minute accessory sepals which are deep in color. Pale rose or whitish, thin and papery petals are attached inside the mouth of calyx tube.

Microscopic Description: Stalk of flower: Transverse Section (TS) is elliptical in outline, shows an epidermis formed by thick walled cells with cuticle; 2 to 3 layers of collenchymas follows the epidermis; cortex formed by characteristically reticulate parenchyma in about 4 to 5 layers; inner to cortex

continuous ring of phloem followed by xylem with usual elements are seen; the centre of TS is occupied by pith formed by pitted parenchyma.

Part Used: Leaves and fruits, flowers and Gum

Organoleptic Properties

Rasa (Taste)	: Kashaya (Astringent)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Madaya

Purity and Safety Test

Total ash	: Not more than 1.72% w/w
Acid insoluble	: Not more than 0.099% w/w
Water soluble extractive	: Not less than 1.23% w/w
TLC profile with marker constituents	: The plates were developed over 7.5 cm. Solvent system used was toluene: chloroform: methanol (8:2:1) for all the three extracts. The chromatograms were evaluated directly under UV_{254} nm and UV_{365} nm after staining with anisaldehyde sulphuric acid spray (ANS) reagent poured the reagent over the plate and the plate was thereafter heated for 5-10 min at 100℃ within a hot air oven, and was then observed and documented. Lupeol standard marker was identified using TLC identity test. TLC profiles and fingerprints were developed for each of the three extracts using hexane chloroform and methanol in the ratio 8:2:1 and the retention factors for the separated compounds were calculated. Best separation was obtained in methanolic extract.
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.

Major Chemical Constituents: Flowers are very rich in tannins, particularly hydrolysable tannins. Cyanidin-3.5-diglucoside, octacosanol, β-sitosterol and chrysophenol-8-O-β-D-glucopyranoside have also been isolated from flowers. Leaves contain ellagic acid, polystachoside, myricetin-3-galactoside and pelargonidin-3, 5-diglucoside. Plant also contains woodfordins A, B, C, D, E and F, oenothein A and B, trimeric hydrolysable tannins, and tetrameric hydrolysable tannin.

Therapeutic Usages: Intestinal worms, loss of appetite, stomach disorders, diarrhoea, menorrhagia, bleeding piles, prolapse of rectum and leucorrhoea.

Pharmacological Activities: Antitumor, antimicrobial, hepatoprotective, antioxidant and antihyperglycemic.

Contraindications: Contraindicated in active CNS disease and hypoglycemia.

Adverse reactions: Over dosage may cause delirium.

During Pregnancy and lactation: It is not recommended during pregnancy, since the alcoholic extract showed promising abortifacient activity at 100 mg/kg.

Dosage Form: Powder or decoction. Package in well closed and light resistant containers.

Posology: Powder is 1 to 5 gm per day after meal and flower churna is about 3 to 6gm per day.

Formulations: Dhatakyadi Churna, Brihat Gangadhar Churna, Barunadya Louha, Amasayantak, Patrangasav, Jirakadyarista, Balarista.

Donia

Botanical Name: *Coriandrum sativum* Linn.

Family: Umbelliferae

Synonyms

Bangla: ধনিয়া (Donia), Dhane

Sanskrit: Dhanika

Urdu/Unani/Tibb: Kishneez

English: Coriander fruit

Geographical Descriptions: It is cultivated throughout the country.

Plant Descriptions:

General Description: An annual aromatic, erect herb, 40-50 cm high. Leaves of two kinds, the lower ones petioled, pinnatisect into 2-3 pairs of ovate-cuneiform, incised dentate segments, the upper ones short-petioled or subsessile, 2-3 pinnatisect into linear setaceous lobes. Flowers small, in compound umbels. Fruits subglobose.

Fig. *Coriandrum sativum* Linn.

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

Microscopic Description: Transverse section of fruit shows pericarp with outer epidermis, when present with slightly thickened anticlinal wall, a few stomata, many cells with small prisms of calcium oxalate, trichomes absent, outer layer of mesocarp parenchymatous with inner cells in wavy longitudinal rows and degenerated vittae as tangentially flattened cavities, middle layer of mesocarp sclerenchymatous forming a thick layer of fusiform, pitted cells in very sinuous rows, layers often

crossing at right angles with definite longitudinal strands in the secondary ridges, sinuous primary costae with some spiral vessel: inner cells of mesocarp, large, hexagonal with rather thin, lignified walls, inner epidermis of very narrow thin-walled cells slightly sinuous anticlinal wall showing parquetry arrangement, two or rarely more, normal vittae occurring on commissural side of each mesocarp containing volatile oil, endosperm of thick walled cellulosic parenchyma containing much fixed oil, numerous aleurone grains, about 4-8 in diameter containing micro rosettes of calcium oxalate , split carpophore passing at apex of each mericarp into raphe, adjacent to which a large cavity and on inner side of this a flattened vascular strand, carpophore consisting of fibres surrounded by spiral vessels.

Part Used: Whole green plant and ripe fruit.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Kashaya (Astringent), Madhura (Sweet), Katu (Pungent)
Guna (Attribute)	: Laghu (Light), Snigdha (Ununctous)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Tridoshanasak

Purity and Safety Test

Total ash	: Not more than 6% w/w
Acid insoluble	: Not more than 1.5% w/w
Water soluble extractive	: Not less than 19% w/w
TLC profile with marker constituents	: Glass plates (20x20 cm) were coated in our laboratory using Silica gel G (Merck, Germany), thickness 0.25 mm. Essential oil samples were dissolved in methylene chloride (ratio 1: 10) and essential oil solutions (about 20µL) were spotted on the plate as a start point or line. The mobile phase was toluene: ethylacetate (93:7; V/V). The development was performed at room temperature (about 20oC) in a glass chamber. Detection was done by spraying the plate with 1% vanillin solution (1 g of vanillin was dissolved in 99 g mixture of 95% ethanol and cc. sulphuric acid, ratio 9:1; w/w). After spraying, the plate was heated at 110oC for 5 -10 min. The Rf value 0.23 (Gray violet), 0.40 (Blue violet) and 0.75 (Gray blue) were obtained respectively.
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.

Major Chemical Constituents: Essential oil is the chief constituent of the fruits, which is composed of about 70% of coriandrol (linalool), cymene, pinene, limonene, geraniol and borneol, malic, oxalic and tannic acids. It also contains 1, 8-cineole, ß-caryophyllene, citronellol, thymol, linalyl acetate, geranyl acetate, caryophyllene oxide, elemol, methylheptenone, flavonoids, coumarins and phenolic acids.

Therapeutic Usages: Indigestion, flatulence, bloating, cramps, vomiting, diarrhea, dysentery, bronchitis, arthritis, hiccup, piles, inflammation, jaundice, stomatitis, bleeding from the gums, scabies and headache.

Pharmacological Action: Antiinflammatory, antioxidant, hepatoprotective, antibacterial, hypoglycemic, hypochoesteremic, anticonvulsant, sedative and aphrodisiac.

Contraindications: Might have allergic reactions to coriander.

Adverse reactions: Likely safe in food amounts.

Warnings: Might lower blood sugar levels and decreases blood pressure.

Dosages: Powder or decoction. Package in closed and light resistant containers.

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

Formulations: Brihat Gangadhar Churna, Dhanyakadi Kwath, Naranyan Churna, Labangadi Bati, Mahagni Bati, Brihat Haridra Khanda, Vaskar Lavana.

Elachi

Botanical Name: *Elettaria cardamomum* Linn.

Family: Zingiberaceae

Synonyms

Bangla: এলাচ (Elachi)

Sanskrit: Truta, Ela

Urdu/Unani/Tibbe: Heel Khurd

English: Cardamom

Geographical Descriptions: It is a stout large perennial herb, growing naturally in moist forests of western ghats up to 1500 m, also cultivated in many other parts of south India at an elevation from 750-1500m.

Fig. *Elettaria cardamomum* Linn.

Plant Descriptions:

General Description: It is a herbaceous perennial growing plants height up to 6 m tall, leaf-shoots arising from a stout rhizome and growing in a thick clump of up to 20 leafy shoots.

Macroscopic Description: Fruits are 1-2 cm long ovoid or oblong and more or less three sided with rounded, angles, greenish to pale-buff or yellowish in colour, base rounded or with the remains of pedicle, apex shortly beaked, surface almost smooth or with slight longitudinal striations, small trilocular fruit, each containing about 15-20 seeds in a row of doubles, adhering together to form compact mass. Seeds are dark brown to black, about 4 mm long and 3 mm broad, irregularly angular.

Microscopic Description: Transverse section of seed shows flattened, aril, thin-walled parenchymatous cells, testa with outer epidermis of thick-walled, narrow, elongated cells, followed by a layer of collapsed parenchyma, becoming 2 or 3 layered in the region of raphe.

Part Used: Fruits and seed.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet), Katu (Pungent)
Guna (Attribute)	: Laghu (Light)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Anulomana, Dipana, Hrdya, Mctrala, Rocana

Purity and Safety Test

Total ash	: Not more than 6% w/w
Acid insoluble	: Not more than 4% w/w
Water soluble extractive	: Not less than 10% w/w
TLC profile with marker constituents	: Fifty microliters of phenols were toulerenced on glass plate (3×15 cm) coated by Silica Gel Butanol Acetic acid Water solvents were used as eluent with ratio (35: 5: 12). The separation time was 45 min, then the TLC was dried and the components were developed by iodine vapour, UV - lamp at 233 nm and (1%) ferric chloride. Rate of flow (Rf) values were measured for all spots. Result shows Pure compound, Presence of double bond conjugation system, Presence of organic compounds, Presence of phenolic compounds in response to the following spot and Rf value: Light green (Rf value, 0.38, 0.46, 0.72), Light violet (Rf value 0.38, 0.46, 0.72), Brown (Rf value 0.38, 0.46, 0.72;), Bluish-green (Rf value 0.38, 0.46, 0.72).
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.

Major Chemical Constituents: The main chemical components of cardamom oil are a-pinene, b-pinene, sabinene, myrcene, a-phellandrene, limonene, 1,8-cineole, y-terpinene, p-cymene, terpinolene, linalool, linalyl acetate, terpinen-4-oil, a-terpineol, a-terpineol acetate, citronellol, nerol, geraniol, methyl eugenol and trans-nerolidol.

Therapeutic Usages: Indigestion, nausea, vomiting, asthma, bronchitis, strangury, haemorrhoids, anorexia, dyspepsia, burning sensation, stomachaches, constipation and dysentery.

Pharmacological Action: Antiinflammatory, antimicrobial, antioxidant, antispasmotic, antiulcer and dermatological effects.

Contraindications: Avoid with known allergy or hypersensitivity to cardamom, its constituents, or related plants from the Zingiberaceae (ginger) family.

Adverse reactions: May cause allergic contact dermatitis.

During Pregnancy and lactation: Avoid in pregnant or breastfeeding women in amounts greater than those normally found in food, due to a lack of available scientific evidence.

Posology: 250 to 500 mg of the drug in powder form.

Formulations: Siopaladi Churna, Abipattikar Churna, Vat Kulantak, Eladyarista.

Ghritakumari

Botanical Name: *Aloe indica*

Family: Santalaceae

Synonyms

Bangla: ঘৃতকুমারী (Ghritakumari)

Sanskrit: Kumarirasasambhava, Sahasara

Urdu/Unani/Tibb: Musabbar, Ailiva, Siber

English: Indian Aloe

Geographical Descriptions: In Bangladesh, it is cultivated commercially in northern districts.

Plant descriptions:

General Description: Succulent, almost sessile perennial herb; leaves 30–50cm long and 10cm broad at the base; colour pea-green (when young spotted with white); bright yellow tubular flowers 25–35cm in length arranged in a slender loose spike; stamens frequently project beyond the perianth tube.

Fig. *Aloe vera*

Macroscopic Description: Aloe is marketed as opaque masses that range from reddish black to brownish black to dark brown in colour. Odour is characteristic and disagreeable and taste is somewhat sour, nauseating and very bitter.

Microscopic: Powdered aloes are yellowish brown to dark reddish brown. Microscopically, cape aloe appears as transparent brown or greenish brown irregular and angular fragments; curacao aloe shows fragments with numerous minute acicular crystals embedded in an amorphous matrix.

Part Used: Whole plant and Dried gel

Organoleptic Properties

Rasa (Taste)	: Katu (Bitter)
Guna (Attribute)	: Guru (Heavy), Snighda (Unctuous), Sara (Slimy)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Bhedi, Pittanirhara¸ Rajahpravartaka, Jvaranut.

Purity and Safety Test

Total ash	: Not more than 2% w/w
Acid insoluble	: Not more than 10% w/w
Water soluble extractive	: Not less than 50% w/w
TLC profile with marker constituents	: The phase for chromatography was ethyl acetate-methanol-water, 10:2:1.Vertical development of the plates was performed to a distance of 8.0 cm in chambers previously saturated for 5 min. Detection of barbaloin was performed in UV light at 340 nm before (gray spot) and after (yellow) treatment of the plate with 5% alcoholic H_2SO_4 and heat-ing at 105^0C for 5min. Plates were scanned with a Camag TLC scanner–III controlled by Cats4 software (4.05version). Extensive TLC studies on various extracts reveal that, the solvent systems ethyl acetate: methanol: water – 10:2:1 for Barbaloin gave well resolved spots with Rf 0.40. Although the compound was visualized in UV at 360 nm, different developing reagents have been used as per the following: i) 5% alcoholic–H_2SO_4 spray followed by heating at 105^0C for 5 min–yellow (Barbaloin).
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.

Major Chemical Constituents: Aloe contains as its major and active principles hydroxyanthrone derivatives, mainly of the aloe-emodin anthrone 10-*C*-glucoside type. The major constituent is known as barbaloin (aloin) (15–40%). It also contains hydroxyaloin (about 3%). Barbaloin (aloin) is in fact a mixture of aloin A (10*S*) and B (10*R*). Also contains aloinoside A and B. Aloin A and B interconvert through the anthranol form as do aloinoside A and B.

Therapeutic Usages: Constipation, constipation predominant irritable bowel syndrome, seborrhoeic dermatitis, peptic ulcers, tuberculosis, fungal infections, diabetes etc.

Pharmacological Action: Wound-healing effects, skin hydration actions, anti-aging, anti-inflammatory, antibacterial, antifungal, antiviral, effect on immune system, antioxidant, antitumor etc.

Contraindications: Should not be used in patients with intestinal obstruction or stenosis, atony, severe dehydration with electrolyte depletion, inflammatory intestinal diseases.

Adverse Reactions: Long term laxative abuse may lead to electrolyte disturbances (hypokalaemia, hypocalcaemia), metabolic acidosis, malabsorption, weight loss, albuminuria and haematuria.

Posology: 125 to 500 mg of the drug in powder form.

Formulations: Raja Prabartani Bati, Kumariasav, Rajakalyan, Vat Gajendra Singha.

Golmorich

Botanical Name: *Piper nigrum* Linn.

Family: Piperaceae

Synonyms

Bangla: গোলমরিচ (Golmorich), Kalimarich

Sanskrit: Pippali

Urdu/Unani/Tibb: Kali Mirch

English: Madagascar pepper

Geographical Descriptions: In Bangladesh it is cultivated in Chittagong, Chittagong Hill Tracts and Sylhet and sold in everywhere in the country.

Plant Descriptions:

General Description: It is a climber that grows to a height or length of 10 m or more. Once the main stem is established it grows many side shoots to create a bushy column. The plants form short roots, called adventitious roots, which connect to surrounding supports. Leaves are almond-shaped, tapering towards the tip, dark green and shiny above, paler green below, arranged alternately on the stems.

Fig. *Piper nigrum* Linn.

Macroscopic Description: Colour is blackish brown or grayish-black. Taste is pungent and aromatic and diameter 3.5-6 mm. Surface structure is coarsely reticulate wrinkled with remains of stigma at apex.

Microscopic Description: The Transverse section of drug shows tubular epidermal cells followed by thin walled parenchymatoushypodermis with rectangular stone cells. The inner pericarpic layer is brown colored and is made up of schlerenchyma. Seed coat layer is attached to it and is reddish brown.

Part Used: Fruit, root.

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent)
Guna (Attribute)	: Laghu (Light), Teekshna (Sharp)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Kapha Vata hara, Diapana, Krimigna.

Purity and Safety Test

Total ash	: Not more than 5.5% w/w
Acid insoluble ash	: Not more than 1.0% w/w
Water soluble extractive	: Not less than 4.5 % w/w
TLC profile with marker constituents	: T.L.C. of the alcoholic extract on silica gel 'G' plate using toluene: ethylacetate (7:3) shows in visible light four spots at Rf. 0.05, 0.08 (both light green), 0.27 (light yellow) and 0.52 (yellow). Under UV (366 nm) ten fluorescent zones are visible at Rf. 0.05, 0.08 (both light brown), 0.20 (light blue), 0.46 (blue), 0.52 (greenish yellow), 0.57 (bluish yellow), 0.66 (light blue), 0.74 (light pink), 0.82 and 0.97 (both blue). On exposure to Iodine vapour eleven spots appear at Rf. 0.05, 0.08, 0.14, 0.20, 0.27, 0.34, 0.46, 0.57, 0.66, 0.74 and 0.97 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic-Sulphuric acid reagent nine spots appear at Rf. 0.05 (lightorange), 0.14, 0.20, 0.27 (all orange), 0.46, 0.57 (both yellowish orange), 0.66, 0.74 (both orange) and 0.97 (light orange). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 110°C twelve spots appear at Rf. 0.05, 0.08, 0.20, 0.27, 0.46, 0.52, 0.57, 0.66, 0.74, 0.82, 0.90.and 0.97 (all violet).
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.

Major Chemical Constituents: Major constituents of the fruits are alkaloids. They contain up to 9% alkaloids, which include chavicine, β-methyl pyrroline, piperine, piperidine, dependine and piperovatine. They also contain a balsamic essential oil with β-bisabolene, camphene, β-caryophyllene and many other terpenes and sesquiterpenes, a pungent resin, chavicin, piperetine, lignin, gum piperyline, piperole A and B, piperanine monoterpenes, sesquiterpenes, starch and fat.

Therapeutic Usages: Indigestion, loss of appetite**,** rheumatism, chills flu, colds, increase circulation, muscular aches, nerve tonic and fevers.

Pharmacological Action: Antispasmodic, antiinflammatory, hepatoprotective, antibacterial, antiallergic, antidarrhoea and antiasthamatic.

Contraindications: May have negative effects on fertility, autoimmune disorders, thyroid disorders, lower blood pressure, hypoglycemia.

Adverse Effects: May cause gastric irritation, respiratory irritation, edema (swelling), and even respiratory arrest, severe anoxia (lack of oxygen), and death.

Precautions: Caution is advised in patients with bleeding disorders that may increase the risk of bleeding.

During Pregnancy and lactation: It can be used in lactating mothers in lower doses. For use in pregnancy, medical advice is required.

Dosages Form: Powder and tinctures. Store the dried flowers in a closed container, protected from light and moisture.

Posology: The recommended dose is 250 mg –1 gm powder, along with milk and ghee.

Formulations: Ushanadi Churna, Abipattikar Churna, Pippaladya Kwath, Drakshadi Kwath, Mahagni Bati, Nobayas Louha, Agnikumar Ras Pippali Rasayan.

Gokkhur

Botanical Name: *Tribulus terrestris* Linn.

Family: Zygophyllaceae

Synonyms

Bangla: গোক্ষুর (Gokshura), Gokkhur

Sanskrit: Goksuraka

Urdu/Unani/Tibb: Khar-e-Khasak Khurd

English: Caltrops fruit

Geographical Descriptions: It grows throughout the country.

Plant Descriptions:

General Description: A much-branched procumbent herb; stem and branches pilose. Leaves opposite, abruptly pinnate; leaflets 3-6 pairs, 6-12 mm long, oblong, mucronate, sericeo-villous. Flowers axillary or leaf-opposed, solitary; petals 1 cm long, oblong-obovate. Fruit globose, consisting of 5 hairy or nearly glabrous woody cocci, each with 2 pairs of hard sharp spines.

Fig. *Tribulus terrestris* Linn.

Macroscopic Description: Fruit stalked, light or greenish yellow, five ribbed or angled, more or less spherical in structure and covered with short stiff or pubescent hairs, 1 cm in diameter with five pairs, of prominent short stiff spines, pointed downwards, about 0.5 cm in length, tips of spines almost meet in pairs whole together forming pentagonal framework around fruit, ripe fruit separates into five segment, of each cocci and each appears as single-fruit, each coccus semi-lunar or plano-convex in structure one chambered, armed with a pair of spines, starting from its middle, containing four or more seeds, taste, slightly astringent.

Microscopic Description: Transverse section of fruit shows small epidermal cells of each coccus rectangular, unicellular trichomes in abundance, mesocarp 6-10 layers of large parenchymatous cells, rosette of calcium oxalate crystals abundantly present, mesocarp followed by 3-4 compact layers of small cells containing prismatic crystals of calcium oxalate.

Part Used: Fruits, Roots and Whole Plant

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Madhura (Sweet)
Guna (Attribute)	: Guru (Heavy), Snighda (Unctuous)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Kapha Pitta shamak.

Purity and Safety Test

Total ash	: Not more than 1.72% w/w
Acid insoluble	: Not more than 0.099% w/w
Water soluble	: Not more than 1.23% w/w
TLC profile with marker constituents	: TLC is mentioned as a primary tool for identification as part of monographs on all medicinal plants. Alkaloid fraction was used for the spotting of the TLC plate (Silica gel G Precoated plates). Then the spotted TLC was run with the solvent systems (Toluene (8 ml), Ethyl acetate (2 ml), Glacial acetic acid (0.5 ml)) separately. And the resulting TLC pattern was viewed under long wave ultra violet light at 366 nm or Short wave ultra violet light at 254 nm. Then after spraying with the Anisaldehyde Sulphuric acid reagents and drying in a hot air oven and the number of spots viewed under daylight.TLC of alcoholic extract of drug on silica get "G" plate using Toluene (8 ml): Ethyl acetate (2 ml): Glacial acetic acid (0.5 ml) shows five spots Under 366 nm U.V. at hRf 15, 43, 50, 72 and 97. Where as in 254 nm three zones visible at h Rf 15, 72, 97.
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.

Major Chemical Constituents: The herb contains harman and water-soluble polysaccharides. Diosgenin, ruscogenin and a dihydroxy sapogenin have also been isolated from aerial parts. Flowers contain diosgenin, hecogenin, ruscogenin and spirosta-3, 5-diene. Fruits contain steroidal saponins and the sapogenins, diosgenin, ruscogenin, chlorogenin, gitogenin and tigogenin. Fruits also contain traces of an alkaloid, a fixed oil, an essential oil and glycosides of tigogenin, hecogenin and gitogenin, flavone glycoside and quercetin. Roots contain hecogenin, neotigogenin, campesterol, β-sitosterol, stigmasterol and diosgenin. Seeds contain harmine.

Therapeutic Usages: Urinary retention, renal colic, headache, hepatitis, kidney problems, impotence, spermatorrhea, neurasthenia, vertigo and stomatitis.

Pharmacological Action: Diurteics, antioxidant, hepatoprotective, antiinflammatory, antibacterial, hypoglycemic, hypochoesteremic, antiproliferative and aphrodisiac**.**

Contraindications: Might decrease blood sugars to dangerously low levels. It is also contraindicated in hypotension or in conjunction with antihypertensive drugs as well as electrolyte imbalance patients.

Adverse Reactions: Sleeping trouble and irregular periods in women, electrolyte imbalance in prolong use.

Warnings: Should be taken in prostate problems, diarrhea, vomiting. It may increase the effect of certain heart and blood pressure medicines.

During Pregnancy and lactation: It is not recommended during pregnancy or breastfeeding.

Dosages: Powder or decoction. Package in well closed, light resistant containers.

Posology: Powder 3 to 6 gm daily with water after meal. Liquid 20 to 30 ml daily after meal.

Formulations: Goksuradi Churrna, Alambusadya Churna, Gikhuradi Kwath, Shir Suladri Bajraras, Meha Mudgar, Punarnavasav, Goksuradi Guggulu, Dasamularista.

Isaphgol

Botanical Name: *Plantago ovate* Forsk

Family: Plantaginaceae

Synonyms:

Bangla: ইসবগুল (Isaphgol)

Hindi: Isabgol

Sanskrit: Asvagola

Urdu/Unani/Tibb: Barhang, Ispaghul

English: Psyllium Husk

Geographical Descriptions: It grows throughout the country

Plant Descriptions:

General Description: The flowers are on short, rounded, terminal flower spikes. The individual flowers have 4 round-ovate lobes and 4 stamens. The leaves are green, basal, and narrowly linear in shape. The plants are covered in fuzzy, white hair at right angles to the stems and leaves.

Fig. *Plantago ovate* Forsk

Macroscopic Descriptions: Seeds are ovate to ovate-elongate, concavo-convex; mostly from 1.3 to 2.7 mm in length, rarely up to 3 mm, and from 600 µm to 1.1 mm in width. It is light brown to moderate brown, darker along the margin, and very glossy; the convex dorsal surface exhibiting a lighter colored longitudinal area extending nearly the length of the seed and representing the embryo lying beneath the seed coat, and showing a sometimes indistinct transverse groove nearer the broader end. The concave ventral surface has a deep cavity, in the center of the base of which is an oval, yellowish white hilum.

Microscopic Descriptions: Seed is reniform in median transverse sections. Its seed coat has a colorless epidermis of mucilaginous cells whose radial and outer walls break down to form layers of mucilage when brought into contact with water, and a reddish brown to yellow pigment layer in the seeds of, a broad endosperm with thick-walled outer palisade cells, and irregular inner endosperm

cells; and a straight embryo extending lengthwise through the center. The endosperm and embryo cells contain fixed oil and aleurone grains, the latter being rounded, oval, pyriform, or irregularly shaped, from 2 to 8 µm in diameter.

Part Used: Seeds and seed husks

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet)
Guna (Attribute)	: Guru (Heaviness), Snigdha (Unctuous), Picchila (Slimy)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Kapha pitta hara, Mutrala, Grahi, Balya

Purity and Safety Test

Total ash	: Not more than 4.0% w/w
Acid insoluble ash	: Not more than 1.0% w/w
Alcohol soluble extractive	: Not less than 3.0% w/w
Water soluble extractive	: Not less than 14.0% 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.

Major Chemical Constituents: Ascorbic acid, aucubin, beta-carotene, beta-sitosterol, calcium, chromium, cobalt, fiber, linoleic acid, magnesium, manganese, mucilage, niacin, oleic acid, oxalic acid, phosphorous, potassium, riboflavin, selenium, sodium, stigmasterol, thiamine, tin, zinc.

Therapeutic Usages: Chronic constipation, dysentery, enteritis, urethritis, diarrhea, gonorrhea, dry cough, rheumatic swellings, fever, thirst, laryngitis and urinary burning sensation,

Pharmacological Action: Antiasthmatic, antidiarrheal, antidysenteric, antigonorrheal, antihypertensive, antiinflammatory, antirheumatic, bacteriostatic, diuretic, laxative and sedative.

Contraindications: No contraindication information is available.

Adverse Effects: Might cause gas, stomach pain, diarrhea, constipation, and nausea.

Precautions: In excessive doses may cause nervous weakness, joints pain, and decreased appetite.

Dosage Forms: Husk powder and cold infusion.

Posology: Powder 5 to 10 gm.

Formulations: Grahani Ballav.

Jaiphal

Botanical Name: *Myristica fragrans* Houtt.

Family: Myristicaceae

Synonyms:

Bangla: জায়ফল (Jaiphal)

Hindi: Jaiphala

Sanskrit: Jatiphala

Urdu/Unani/Tibbi: Jauzbuwa, Jaiphal

English: Nutmeg

Geographical Distributions: It is very rarely seen in some part of the country.

Plant Descriptions:

General Description: A small evergreen tree, usually 5–13 m tall, but occasionally reaching 20 m. The alternately arranged leaves are dark green 5–15 cm long by 2–7 cm wide with petioles about 1 cm long. The fruit has smooth yellow ovoid or pear-shaped 6–9 cm long with a diameter of 3.5–5 cm. The fruit has a fleshy husk. When ripe the husk splits into two halves along a ridge running the length of the fruit. Inside is a purple-brown shiny seed, 2–3 cm long by about 2 cm across, with a red or crimson covering (an aril).

Fig. *Myristica fragrans* Houtt.

Macroscopic Description: Seed ellipsoid, 20-30 mm long and about 20 mm broad, externally greenishbrown sometimes marked with small irregular dark brown patches or minute dark points and lines slightly furrowed reticulately, a small light-coloured area at one end indicating the position of the radicle a groove running along the line of raphe to the darker chalaza at the opposite end, surrounded by a thin layer of peri sperm with infoldings appearing as dark ruminations in the abundant greyish-brown endosperm, embryo, in an irregular cavity, small with two widely spreading crumpled cotyledons and a small radicle odour, strong and aromatic, taste, pungent and aromatic.

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

Part Used: Seed, seed coat.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Katu (Pungent)
Guna (Attribute)	: Laghu (Light), Teekshna (Sharp)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha Vata hara

Purity and Safety Test

Foreign matter	: Not more than 1.0% w/w
Total ash	: Not more than 3.0% 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 7% w/w
Volatile oil	: Not less than 5% w/w
TLC profile with marker constituents	: TLC plates were prepared by using silica gel G mixed with distilled water to make slurry. After preparing the slurry is poured into the glass slides, then allowed to air dry for half an hour and fixed by drying in oven at 110°C for half an hour. The methanol extract of Myristica fragrans was loaded gradually with capillary tube over the TLC pl ates and air dried. The plates were developed with petroleum ether: Ethyl acetate: n-Hexane: Methanol (20:5:5:5), hydromethanolic extract of Myristica fragranswas loaded on TLC plate and developed with Ethyl acetate: Methanol (4:6) and the aqueous extract of Myristica fragrans was loaded on TLC plates and developed with Acetic acid: Ethyl acetate: Methanol: n-Hexane (10:4:3:3). All solvents showed different

Rf values of plant extracts. TLC of methanolic extract of M. fragrans revealed the presence of 7 spots having Rf values of 0.18, 0.24, 0.28, 0.46, 0.56, 0.66 and 0.76 respectively when a solvent phase of Petroleum ether: Ethyl acetate:Hexane: methanol (20:5:5:5) solvent system was used. Whereas in hydro alcoholic and aqueous extract 5 and 4 spots were obtained having different Rf value 0.133, 0.216, 0.500, 0.760, 0.800 and 0.061, 0.122, 0.163, 0.61 respectively.

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.

Major Chemical Constituents: Pinene, camphene, b-pinene, sabinene, myrcene, a-phellandrene, a-terpinene, limonene, 1,8-cineole, y-terpinene, linalool, terpinen-4-ol, safrole, methyl eugenol and myristicin, which render the herb its therapeutic properties. The main chemical components of Mace are a-pinene, camphene, b-pinene, sabinene, myrcene, a-phellandrene, a-terpinene, limonene, 1,8-cineole, y-terpinene, linalool, terpinen-4-ol, safrole, methyl eugenol and myristicin, which render the herb its therapeutic properties.

Therapeutic Usages: Bloating, abdominal pain, irritable bowel syndrome, diarrhea, cough, asthma, COPD, diabetes, urinary tract infection, improves digestion and aphrodisiac.

Pharmacological Action: Antioxidant, antiinflammatory, improvement of memory**,** antiepiletic effect, anticaries effect, antimalarial activities**,** anticancer and antialzheime's.

Contraindications: Contraindications have not been identified. The excessive use of nutmeg or mace is not recommended in people with psychiatric conditions.

Adverse Effects: Over dosage may cause convulsions, palpitation, weak pulse, hypothermia, disorientation, giddiness, nausea and vomiting.

Precautions: In very small doses, it may be used safely in pregnancy and lactation.

Dosage Forms: Powder, decoction for oral use. Package in well closed, light resistant containers.

Posology: 0.5 to 1.0 gm of the drug in powder form.

Formulations: Balabhadra Churna, Sanjiban Bati, Maha Pittantak Ras, Sri Ramban Ras, Labangadi Bati, Vat Gajendra Singha, Biranga Louha, Ahiphenasav, Jirakadyarista.

Jaipal

Botanical Name: *Croton tiglium* Linn.

Family: Euphorbiaceae

Synonyms:

Bangla: জয়পাল (Jaipal)

Hindi: Jamalgota

Sanskrit: Mukula

Urdu/Unani/Tibb: Jamalgota

English: Croton

Geographical Distributions: It is available in different part of the country specially Chittagong division.

Plant Descriptions

General Description: A small evergreen tree. Leaves 5-10 cm long, oblong to ovate-lanceolate, minutely and remotely repand-toothed. Flowers small, on terminal glabrous racemes at the end of branchlets. Capsules 17-25 mm long, oblong and obtusely 3- lobed.

Fig. *Croton tiglium* Linn.

Macroscopic Description: Seed albuminous, ovate, oblong, slightly quadrangular, convex on dorsal and somewhat flattened on ventral surface, about 12 mm in length and resemble castor seed in shape, dull cinnamon-brown, often mottled with black due to abrasion in testa, caruncle easily detached and usually absent, hilum on ventral side less distinct than that of castor seed, raphe runs along ventral surface of seed, terminating in a dark chalaza at opposite extremity, kernel yellowish and oily, consisting of a large endosperm, enclosing papery cotyledons and a small radicle, no marked odour; kernel gives at first oily taste followed by an unpleasant acridity.

Microscopic Description: Seed shows a hard testa, consisting of an epidermal layer, covered externally with a thick cuticle and composed of oval and tangentially elongated cells, filled with brownish content; epidermis followed by a layer of radially elongated cells, slightly bent at middle, upper half portion filled with reddish-brown and lower half filled with yellow contents; inner most zone consists of tangentially elongated, thin-walled cells;61 endosperm consists of polygonal parenchymatous cells filled with oil globules, a few cells having rosette crystals of calciwn oxalate; central region of endosperm shows a dicotyledonous embryo consisting of thin-walled parenchymatous cells. Powder - White with black particles of testa; under microscope shows elongated cells containing reddish-brown and yellow contents, oil globules and a few rosette crystals of calcium oxalate.

Part Used: Roots, seeds, fresh leaves

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet)
Guna (Attribute)	: Guru (Heaviness), Snigdha (Unctuous)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Kaphahara, Pittahara, Recana

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 3.0% w/w
Acid insoluble ash	: Not more than 0.5% w/w
Alcohol soluble extractive	: Not less than 15.0% w/w
Water soluble extractive	: Not less than 7.0% w/w
TLC profile with marker constituents	: T.L.C. of alcoholic extract of the drug on silica gel 'G' plate using n-Butanol : Acetic acid : Water (4: 1 :5) shows under U.V. (366 nm) three spots at Rf. 0.34, 0.54 and 0.84 (all violet). On exposure to Iodine vapour six spots appear at Rf. 0.10, 0.29, 0.39, 0.49, 0.63 and 0.90 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for ten minutes three spots appear at Rf. 0.34 (grey), 0.54 (yellow), 0.84 (brown).
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.

Major Chemical Constituents: Seed oil contains inflammatory and carcinogenic compounds, phorbol-12, 13-diesters, a series of toxic, irritating co-carcinogenic di-esters of tigliane type of diterpene ploiyol, phorbol with simple acids such as acetic methylbutyric, tiglic and myristic acids. Seeds contain ß-sitosterol and haemolytic proteins, crotin I and II and an alkaloid, ricinine and two tumour-promoting principles of which one is phorbol 12-tiglate, 13-decanoate in seed oil. The oil also contains a vesicant non-purgative and non-vesicant purgative compound.

Therapeutic Usages: Constipation, fever, abdominal diseases, itching, scabies, carbuncles, eczema etc.

Pharmacological Action: Antidiabetic, antihyperlipidemic, antihypercholesterolemic, anticancer, antibacterial, antifungal, antiviral, woundhealing, antispasmodic and antidiarrhoeal and antiinflammatory.

Contraindications: During pregnancy, bleeding disorders, gastritis, acute abdomen, ulcerative colitis, endometritis, before and after surgery.

Adverse Effects: Diarrhea, abdominal cramps, ulceration in mouth, vomiting, stupor, dizziness, burning in abdomen.

Dosage Forms: Powder for oral use. Package in well closed and light resistant containers.

Posology: 6 to 12 mg of the drug in powder form.

Formulations: Abhaya Bati, Icchabhedi Ras, Narach Ras, Sarbanga Sundar Ras.

Jam

Botanical Name: *Syzygium cuminii* Linn.

Family: Myrtaceae

Synonyms

Bangla: কালোজাম (Kalajam)

Sanskrit: Jambu

Urdu/Unani/Tibbe: Jamun

English: Black Berry

Geographical Descriptions: In Bangladesh, the plant is available throughout the courntry.

Plant Description: A large evergreen or semi-deciduous tree. Leaves elliptic-oblong, 6-15 cm long, acuminate, entire, secondary veins closely parallel. Flowers greenish white, sessile in compound trichotomous cymes on previous years branches. Fruit a berry, about 2.5 cm long, oblong, black, juicy.

Fig. *Syzygium cuminii* Linn.

Macroscopic Description: More than 2-5 seeds, compressed together into a mass resembling a single seed, the whole seed enclosed in a cream coloured, coriaceous covering, smooth, oval or roundish, 1 cm long, 1 cm wide, brownish black; taste, astringent.

Microscopic Description: Seed shows cotyledons consisting of single layered epidermis, mesophyll composed of isodiametric, thin-walled, parenchymatous cells fully packed with simple starch grains, oval, rounded measuring 7-28 μ in dia., a few schizogenous cavities are also found.

Part Used: Seed.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet), Amla (Sour), Kasaya (Astringent)
Guna (Attribute)	: Guru (Heavy), Ruksha (Rough)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)

Karma (Action)	: Grahi, Kaphahara, Pittahara, Vistambhi, Vatala

Purity and Safety Test

Total ash	: Not more than 5% w/w
Acid insoluble	: Not more than 1% w/w
Water soluble extractive	: Not less than 15% w/w
TLC profile with marker constituents	: T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Toluene: Ethylaceate (90: 10) shows under U.V. light (366 nm) one fluorescent zone at Rf. 0.30 (blue). On exposure to Iodine vapour four spots appear at Rf. 0.12, 0.20, 0.30 and 0.95 (all yellow). On spraying with Vanillin-Sulphuric acid reagent and heating the plate for ten minutes at 105°C, three spots appear at Rf. 0.20, 0.30 and 0.95 and 0.95 (all violet).
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.

Major Chemical Constituents: Fruit pulp contains proteins, fat, carbohydrates and vitamins A, C, thiamin, riboflavin, nicotinic acid, folic acid and its conjugates, minerals and a number of anthocyanins. Seeds contain a pale yellow essential oil, tannins, a glycoside, jambolin, flavonoids, phenolic constituents, gallic, ellagic, caffeic, ferulic and hexahydroxydiphenic acids and ellagitannins. Stem bark contains kaempferol, kaempferol glucoside, quercetin, β-sitosterol glucoside, betulinic aid, friedelin, eugenin and tannins, resins, starch and proteins.

Therapeutic Usages: Cough, diabetes, arthritis, dysentery, inflammation and ringworm.

Pharmacological Action: Antibacterial, antifungal, antiviral, antiinflammatory, antiulcerogenic, cardioprotective, antiallergic, anticancer, radioprotective, antioxidant, hepatoprotective, antidiarrheal and hypoglycemic effects.

Contraindications: There is no known strong contraindication.

Adverse reactions; No health hazards or side effects are known.

During Pregnancy and lactation: Not enough is known about the use of Jam during pregnancy and breast feeding.

Dosages: Decoction 56 to 112 ml, bark powder 0.5 to 1 gm, seed powder 1 to 3 gm

Formulations: Pushyanug Churna, Somanth Ras, Jambaddarishta, Usirasava.

Jira

Botanical Name: *Cuminum cyminum* Linn.

Family: Umbelliferae

Synonyms:

Bangla: জীরা (Jira)

Hindi: Jira, Safed jira

Sanskrit: Jiraka

Urdu/Unani/Tibb: Zirah, Zirasafed

English: Cumin seed. Cumin

Geographical Distribution: Cultivated in small scale in North Bengal.

Plant Descriptions:

General Description: A slender annual. Leaves twice or thrice 3-partite, ultimate segments filiform. Flowers small, white, in compound umbels. Fruit cylindric, ridged, tip narrowed, aromatic.

Fig. *Cuminum cyminum* Linn.

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

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

Part Used: Fruit

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough), Teekshna (Sharp)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Dipana

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 8.0% w/w
Acid insoluble ash	: Not more than 1.0% w/w
Alcohol soluble extractive	: Not less than 7.0% w/w
Water soluble extractive	: Not less than 15.0% 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.

Major Chemical Constituents: Essential oil, protein, carbohydrates, calcium, iron, phosphorus, potassium, sodium, zinc, vitamin A, vitamin B complex, vitamin C, vitamin E and vitamin K. They also contain 2-4% volatile oil, the chief constituent of which is cumaldehyde.

Therapeutic Usages: Flatulence, dyspepsia**,** diarrhea, colic, bowel spasms, urinary insufficiency and menstrual problem.

Pharmacological Action: Antioxidant, antimicrobial, anticarcinogenic, antidiabetic, diuretic, immunomodulators, antiosteoporotic and gastrointestinal effect.

Contraindications: Contraindications have not yet been identified.

Adverse Effects: The oil may have photosensitizing effects. Cumin may also cause hypoglycemia.

Precautions: Safety and efficacy in pregnancy and lactation is lacking.

Dosage Forms: Dried seeds (actually the fruit) whole or ground as a spice tea or tincture Fresh seed as an essential oil.

Posology: 3 to 6 gm.

Formulations: Amlapittantak Churna, Hingastak Churna, Mahagni Bati, Yogaraj Guggul, Jirakadyarista,Brihat Jirakadya Modak, Mustaksrista.

Jasthimadhu

Botanical Name: *Glycyrrhiza glabra* Linn.

Family: Fabaceae

Synonyms:

Bangla: যষ্টিমধু (Jashtimadhu)

Hindi: Mulethi

Sanskrit: Yashtimadhuka

Urdu/Unani/Tibb: Mulethi

English: Licorice, Liquorice

Geographical Distribution: Very rarely cultivate in the coastal regions of Bangladesh.

Plant Descriptions:

General Description: A perennial plant, up to more than 1m in height, erect, with highly developed stoloniferous roots. Leaves compound, 9–17 alternate imparipinnate leaflets, oblong to elliptical-lanceolate, acute or obtuse; racemes loose, shorter than the leaves or a little longer. Flowers 1 cm long. Flat pods oblong to linear, 1–3 cm long by 6 mm wide, more or less densely echinate glandular, many-seeded or abbreviated, 2- or 3-seeded.

Fig. *Glycyrrhiza glabra* Linn

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

Microscopic Description: Transverse section of stolon shows cork of 10-20 or more layers of tabular cells, outer layers with reddish-brown amorphous contents, inner 3 or 4 rows having thicker, colorless

walls, secondary cortex usually of 1-3 layers of radially arranged parenchymatous cells containing isolated prisms of calcium oxalate, secondary phloem a broad band, cells of inner part cellulosic and outer lignified, radially arranged groups of about 10-50 fibres, surrounded by a sheath of parenchyma cells, each usually containing a prism of calcium oxalate about 10-35 μ long, cambium form tissue of 3 or more layers of cells, secondary xylem distinctly radiate with medullary rays, 3-5 cells wide, vessels about 80-200 μ in diameter with thick, yellow, pitted, reticulately thickened walls, groups of lignified fibres with crystal sheaths similar to those of phloem, xylem parenchyma of two kinds, those between the vessels having thick pitted walls without inter-cellular spaces, the remaining with thin walls, pith of parenchymatous cells in longitudinal rows, with inter-cellular spaces. Root-transverse section of root shows structure closely resembling that of stolon except that no medulla is present, xylem tetrarch , usually four principal medullary rays at right angles to each other, in peeled drug cork shows phelloderm and sometimes without secondary phloem all parenchyrnatous tissues containing abundant, simple, oval or rounded starch grains, 2-20 μ in length.

Part Used: Rhizomes and tuberous roots.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet)
Guna (Attribute)	: Guru (Heavy), Snigdha (Unctuous)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Tridoshahara, Rasayana, Vrsya, Caksusya

Purity and Safety Test

Total ash	: Not more than 10.0% w/w
Acid insoluble ash	: Not more than 2.5% w/w
Alcohol soluble extractive	: Not less than 10.0% w/w
Water soluble extractive	: Not more than 20.0% w/w
TLC profile with marker constituents	: Samples were applied as bands 6 mm wide and 8 mm apart by Linomat IV sample applicator. The application rate of sample on plate was 160 nL/s. The plates were developed in previously saturated 20 cm x 10cm twin-trough glass chamber [at room temperature (25 x 2)°C and relative humidity (60 x 5)%], using green solvents ethyl acetate: glacial acetic acid: MeOH: H2O(4:3:1:0.5, v/v/v/v) as mobile phase. The plates were dried at room temperature and then heated to identify compact bands. Glycyrrhizin was well resolved at Rf 0.280 x 0.001 from GGRMe and LRCMe sample in the solvent system as is the case with standard.

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.

Major Chemical Constituents: The principal constituent is glycyrrhizin. Other constituents are glucose, sucrose, mannite, starch, asparagine, bitter principals, resins, a volatile oil and coloring matter, which collectively give its pharmacological properties.

Therapeutic Usages: Peptic ulcers, asthma, pharyngitis, malaria, abdominal pain, insomnia, and infections etc.

Pharmacological Action: Antibacterial, antioxidant, enzyme inhibitory activity, antifungal, antihyper glycemic, antiviral and immunostimulatory effects; expectorant, antispasmodic, anti ulcerative, antiinflammatory and anticarcinogenic effects.

Contraindications: Contraindicated in high blood pressure, heart failure, kidney disease, liver cirrhosis and cholestatic liver disorders.

Adverse Effects: Prolonged use (more than 6 weeks) of excessive doses (50g/day) can lead to pseudoaldosteronism, which includes potassium depletion, sodium retention, edema, hypertension, and weight gain. In rare cases, myoglobinuria and myopathy can occur.

Precautions: Should not be taken concurrently with corticosteroid treatment. If sore throat or cough persists for more than 3 days, the patient should consult a physician.

Dosage Forms: Crude plant material, dried extract and liquid extract. Store in a closed container, protected from light and moisture

Posology: Adult dose 3 to 5 gm.

Formulations: Eladi Gudika, Madhukadi Kwath, Dhatri Louha, Saribadi Bati, Bamanamrita Ras, Shir Siladra Bajraras, Kankasav, Dshanga Pralepa.

Kalmegh

Botanical Name: A*ndrographis paniculata* (Burm.f.) Wall. Nees.

Family: Acanthaceae

Synonyms:

Bangla: কালোমেঘ (Kalmegh)

Hindi: Kirayat

Sanskrit: Kalamegha, Bhunimba

Urdu/Unani/Tibb: Naine-havandi

English: Green chirayta, Creat, King of bitters, Andrographis

Geographical Distribution: It grows wild in waste places throughout the country, particularly in Chittagong and Chittagong Hill Tracts, and occasionally planted in gardens.

Plant Descriptions:

General Description: It is erect plant with height of 30-110 cm. Its stem is slender dark green, squared in cross section with longitudinal furrows and wings along the angles. The lance shaped leaves have hairless blades measuring up to 8 cm long by wide 2.5 cm wide. The small flowers are borne in spreading racemes. The fruit is a capsule around 2 cm long and a few mm wide. It contains many yellow brown seeds.

Fig. A*ndrographis paniculata* (Burm.f.) Wall. Nees.

Macroscopic Description: Mixture of broken, crisp, mainly dark green lanceolate leaves and quadrangular stems; capsule fruit and small flowers occasionally found. Stem texture fragile, easily broken; leaves simple, petiole short or nearly sessile, lanceolateor ovate-lanceolate, with acuminate apex and cuneate-decurrent base, lamina crumpled and easily broken.

Microscopic Description: Leaf of upper epidermis shows absent stomata, glandular trichomes present, unicellular and multi cellular trichomes rare, cystoliths fairly large; lithocysts large (27–30 mm thick, 96–210 mm long and up to 49 mm wide); columnar palisade cells; collenchyma in midrib

beneath epidermis; parenchyma cells spongy; vascular bundles of lignified xylem in the upper part and lignified phloemin the lower part; spiral, scalariform and reticulate vessels. Leaf of lower epidermis shows a layer of wavy-walled cells; stomata diacytic; trichomes up to 36 mm in diameter and 180 mm long, and cystoliths present. In stem epidermis has glandular and non-glan-dular trichomes. Collenchyma dense at the corners of stems; parenchyma contains chloroplastids. Endodermis composed of a layer of thick walled cells. Wood with spiral, scalariform and pitted xylem vessels; pith composed of largeparenchyma cells. Small acicular crystals of calcium oxalate occur in the pit hand cortical cells of stem and leaf.

Part Used: Whole plant.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Pittanasaka, Rechana, Raktashodhaka, Sothahara and Dipana.

Purity and Safety Test

Foreign matter	: Not more than 2% w/w
Total ash	: Not more than 11% w/w
Acid insoluble ash	: Not more than 2% w/w
Alcohol soluble extractive	: Not less than 13% w/w
Water soluble extractive	: Not less than 18% w/w
TLC profile with marker constituents	: The amorphous residue was subjected to TLC analyses along with reference standard of andrographolide where a mixture of chloroform, methanol and ethyl acetate at ratio of 7:2:1 was used as the mobile phase. The analyzed TLC plates were then sprayed with 3, 5-dinitrobenzoic acid in ethanol (2% w/v solution) 16 and KOH in ethanol (6% w/v solution) 16 for visualizing spot position. The Rf value of residue (0.38) and standard andrographolide (0.37) matched completely, which indicated the presence of andrographolide in amorphous residue.
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.

Major Chemical Constituents: Andrographolides, andrographin, andrographidine A, B, C, D, E & F; andrographoside, oroxyline A, wogonin, neoandrographolide and paniculides.

Therapeutic Usages: Chronic fever, malarial and intermittent fevers; jaundice, hepatitis, enlarged liver, influenza and other viral respiratory infections; cough, bronchitis, flatulence, diarrhea, dysentery, hemorrhoids, skin diseases including wounds, ulcers and itchiness.

Pharmacological Study: Antibacterial, antiviral, antifungal, antiinflammatory, antipyretic, antiprotozoal**,** hepatoprotective, hypoglycemic, hypochoesteremic and immunomodulators.

Contraindications: Should not be used during pregnancy or lactation and known allergy to the plants of the Acanthaceae family.

Adverse Effects: Large oral doses may cause gastric discomfort, vomiting and loss of appetite due to the bitter taste of andrographolide.

Precautions: May have a synergistic effect with isoniazid.

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

Posology: Powder 3 to 6 gm daily.

Formulations: Kalameghasav, Meharaj, Jwarkeshari Rasayan Saribaryarista.

Kakmachi

Botanical Name: *Solanum nigrum* Linn.

Family: Solanaceae

Synonyms

Bangla: কাকমাচি (Kakmachi)

Sanskrit: Dhvankaamaci

Urdu/Unani/Tibb: Makoh

English: Garden Night Shade

Geographical Descriptions: It is found everywhere in Bangladesh.

Plant Descriptions:

General Description: An annual herb; stem much divaricately branched. Leaves 2.5-9 cm long, ovate-lanceolate, subacute or acuminate, entire or sinuate-toothed. Flowers small, white, in extra-axillary, subumbellate, 3-8 flowered cymes. Berry 6 mm diam., globose, purplish black when ripe.

Fig. *Solanum nigrum* Linn.

Macroscopic Description: Root is externally smooth, pale brown in color; bark is thin, easily peeled off exposing pale yellow wood. Stem is Erect, glabrous or pubescent, green, rounded at the basal region and angular at the apical region, slightly woody and branched. Leaf is simple, 2.5-8.5 cm long and 2.5 cm wide, ovate or oblong sinuate, toothed or lobed, narrowed at both ends; petiolate, thin. Flower is yellowish, oblong, obtuse notched at apex; ovary globose, glabrous; style cylindric, hairy in lower part.

Microscopic Description: Root shows cork consisting of 2-4 rows of tangentially elongated cells; cortex of large, slightly elongated, thin-walled cells having patches of lignified sclerenchyma fibres, most of the cortical cells contain oval to round, starch grains, measuring 2.5-11 μ in dia., single or with

two or rarely 3 components; a few parenchyma cells contain microsphenoidal crystals of calcium oxalate. Phloem consists of thin-walled, polygonal cells filled with starch grains. Xylem composed of vessels and parenchyma. Stem shows single layered, epidermis of cubical to barrel-shaped cells, covered with thick, slightly striated cuticle; trichomes multicellular, uniseriate; secondary cortexcomposed of 2-4 layered collenchymas. Leaf shows single layered epidermis of oval or tangentially elongated cells, covered with striated cuticle.

Part Used: Whole plants and fruits.

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter),
Guna (Quality)	: Laghu, Sara, Snigdha
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha Pitta shamak.

Purity and Safety Test

Total ash	: Not more than 16% w/w
Acid insoluble	: Not more than 7% w/w
Water soluble extractive	: Not less than 1.5% w/w
TLC profile with marker constituents	: T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Toluene: Ethylacetate (90: 10) shows two spots at Rf. 0.06 & 0.34 (both brown) in visible light. Under U.V. light (366 nm) two fluorescent zones are visible at Rf. 0.06 & 0.34 (both pink). On exposure to Iodine vapour three spots appear at Rf. 0.06, 034 and 0.97 (all yellow).
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.

Major Chemical Constituents: Leaf is a rich source of riboflavin. It also contains nicotininic acid and vitamin C, β-carotene, citric acid, protein, fat, steroidal glycol-alkaloids, solasonine and solamargine. Fruits contain saponins and the steroidal glycol-alkaloids, solanine, solamargine, solasonine, α -& β - solanigrine and the aglycone, solasodine, steroidal genin, trigogenin. Seeds contain solanine, protein, greenish-yellow oil consisting of linoleic, oleic, palmitic and stearic acids and sitosterol.

Therapeutic Usages: Chronic enlargement of the liver and spleen, jaundice, fever, piles, dysentery, skin diseases, heart diseases, hiccup, asthma and bronchitis.

Pharmacological Action: Antioxidant, hepatoprotective, analgesic, antiinflammatory, antibacterial, bronchodilator, hypoglycemic, hypochoesteremic, antiproliferative and immunomodulators**.**

Contraindications: Known hypersensitivity against Solanaceae species.

Adverse reactions: Nausea, vomiting, diarrhea, headache, dizziness, loss of speech, fever, sweating, tachycardia, pupil dilation, blindness, mental confusion, convulsions, coma and death.

Warnings: Caution is advised for women wishing to conceive.

During Pregnancy and lactation: Not to be used during pregnancy and lactation without professional advice.

Dosages Form: Powder or decoction. Package in well closed and light resistant containers.

Posology: The usual average dose is about 20 to 200 mg/ kg daily per orally and 5 to10 ml of the drug in decoction form.

Formulations: Sankar Bati, Saribadi Bati, Brihat Sarvajwara Louha.

Karalla

Botanical Name: *Momordica charantia* Linn.

Family: Cucurbitaceae

Synonyms:

Bangla: করলা (Karalla)

Hindi: Karela, Kerela, Tita kerala

Sanskrit: Karvellaka

Urdu/Unani/Tibb: Karela

English: Bitter gourd

Geographical Descriptions: It cultivate throughout the country

Plant Descriptions: It is annual creeper. Leaves are 1-3 inch in width and are parted in 5-7 parts. Flowers are yellow in color and monoceous. Fruit is 2-10 inch long having green color and is barrel shape having thick middle part sharp at the edges. Seeds are half inch long, brown and flattened.

Fig. *Momordica charantia* Linn

Macroscopic Description: Fruit 2.5-25 cm long, oblong, pendulous, fusiform, usually pointed or beaked, ribbed and bearing numerous triangular tubercles, 3 valved at the apex when mature, surface rough; light green to green in color containing numerous seeds; taste, extremely bitter.

Microscopic Description: Powdered materials consists of fragments of spiral vessels thickening, with short or long vessels, sometimes embedded in parenchyma; prismatic calcium oxalate crystals; fragments of the parenchyma cells in surface view, with rounded cells and triangular spaces; abundant starch granules, simple, oblong, oval or irregular, found in agglomerated, and may be free or included in parenchymatous cells; fragment of fibers, isolated or sometimes found in group; isolated oil globules; isolated sub-rectangular sclereid and slightly thickened walls.

Part Used: Whole plants

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Pitta kapha hara, Deepana.

Purity and Safety Test

Total ash	: Not more than 8.5.% w/w
Acid insoluble ash	: Not more than 0.6% w/w
Alcohol soluble extractive	: Not less than 6.0% w/w
Water soluble extractive	: Not less than 28.0% w/w
TLC profile with marker constituents	: T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Chloroform: Methanol (90:10) shows under U.V. (366 nm) four fluorescent zones at Rf. 0.23 (red), 0.61 (light sky blue), 0.96 (sky blue), 0.98 (red & sky blue). On exposure to Iodine vapour four spots appear at Rf. 0.17, 0.46, 0.67 and 0.98 (all yellow). On spraying with 5% Methanolic Phosphomolybdic acid reagent nine spots appear at Rf. 0.03, 0.16, 0.34, 0.43, 0.50, 0.60, 0.75, 0.81 and 0.98 (all blue).
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.

Major Chemical Constituents: Sterols, triterpenes and bioactive proteins (A and B momorcharins; sterols (e.g. daucosterol); triterpenes, goyaglycosides a–h, goyasaponins I,II, III, cucurbitacins and their glycosides such as momordicosides E1, F1, F2, F–K. Gallic acid, gentisic acid, catechin, chlorogenic acid and epicatechin are the most frequently found low-molecular-weight phenolics.

Therapeutic Usages: Fever, diabetes, anemia, jaundice, worm infestation, gout and cholera.

Pharmacological Action: Antioxidant, antidiabetic, antipyretic, antitumorous, antimicrobial, antihelmintic and immunomodulators.

Contraindications: Contraindication in pregnant or lactating mother.

Adverse Effects: May cause nausea, vomiting and diarrhea.

Posology: Fresh juice 10 to 20 ml.

Khetpapra

Botanical Name: *Hedyotis corymbosa* Linn.

Family: Rubiaceae

Synonyms:

Bangla: ক্ষেতপাপড়া (Khetpapra)

Hindi: Pitpapra

Sanskrit: Parpatah, Parpatakah

Urdu/Unani/Tibb: Roghan

English: Diamond flower

Geographical Distributions: All over Bangladesh in fallow lands.

Plant Descriptions:

General Description: A flaccid, usually diffuse, sometimes erect herb, 7.5-38 cm long. Leaves 2-4.5 cm long, subsessile, linear or linear-lanceolate, acute. Flowers very small, white, on filiform pedicels, longer than the calyx, usually 2-3 on the top of a very slender, axillary, solitary peduncle. Capsules globose or sometimes slightly pyriform, somewhat didymous.

Fig. *Hedyotis corymbosa* Linn

Macroscopic Description: Root is buff or cream coloured, branched, about 3 mm thick, cylindrical; taste, bitter. Stem is light green, smooth, diffused, hollow, about 2 to 4 mm thick; taste, bitter and slightly acrid. Leaf is compound, pinnatifid, 5 to 7 cm long, divided into narrow segments; segments 5 mm long and about 1 mm broad, linear or oblong, more or less glaucous, acute or subacute; petiole, very thin, 2.5 to 4.0 cm long; taste, bitter. Flowers racemes with 10 to 15 flowers, peduncle upto 3 mm, pedicels about 2 mm, flowers about 7 mm long, bract much longer than the pedicels; sepals 2, white, minute, about 0.5 mm long, triangular ovate, acuminate; corolla in 2 whorls with very small 4 petals, each about 4 mm long; inner petals with a purple or green tip; outer petals with narrow spur,

without purple spots stamens 3+3 , staminal sheath subulate above, about 4 mm long, stigma 2 lipped. Fruit is 2 mm long and slightly broader, subrotund, obovate, obtuse or subtruncate, obscurely apiculate, rugose when dry; nutlets globose, upto 2 mm long, single seeded.

Microscopic Description: It is quadrangular in shape with swollen laterals. The four angles appear blunt horn shaped. The detailed structure shows one layer of epidermis as outermost covering enveloped with cuticle. The cells of epidermis are hexagonal to polyhedral and radially elongated. Unicellular dome shaped trichomes are present as extension of epidermis. Hypodermal cells are filled with chlorophyll. 5-8 layers of oval oblong shaped parenchymatous cells of various sizes constitute the cortex and are present under the hypodermal region. The central stele is differentiated by phloem cells composed of sieve tubes, companion cells and parenchyma fibres. The xylem is exarch type, composed of tracheids and xylem parenchyma.

Part Used: Whole plant

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Laghu (Light)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha Pitta hara.

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 30.0% w/w
Acid insoluble ash	: Not more than 10.0% w/w
Alcohol soluble extractive	: Not less than 7.0% w/w
Water soluble extractive	: Not less than 29.0% w/w
TLC profile with marker constituents	: Thin layer chromatograms of 0.25mm thickness were prepared by using 30 gm silica gel and 60 ml water while 0.5 mm silica gel chromatoplate were prepared by using 60 gm silica gel and 120ml water. These plates were activated at 105^{o}C for two hours. A known weight of oil (10% solution in cloroform) was loaded in a straight line about 3cm above the lower edge of chromatogram. The developing media for neutral and polar lipids were hexane: ether: acetic acid (80:20: 2 v/v) and chloroform: methanol: 30 % ammonium hydroxide: water (60: 35: 5: 2.5 v/v) respectively. The saturated solution of antimony trichloride in chloroform was used for the identification of sterol and sterol ester. Appearance of red violet spot on TLC plate when kept at 100^{o}C for 10 min., confirmed the

presence of these compounds. The reagent molybdenum blue dragendorff and ninhydrin were also used for the identification of phospholipids, phosphatidylcholine and lysophosphatidylethanolamine which showed blue, strand orange and red violet spot, respectively on thin layer chromatography. Two plates of 0.5mm thickness were used for neutral and one for polar lipid for preparative TLC in order to collect different fractions. These fractions in the form of bands were scratched from TLC plates in order to convert them into methyl ester. The neutral and polar lipids were identified by comparing their Rf values with those of standards and further confirmed by spraying specific reagents which gave spot tests in thin layer chromatography. After classification the neutral lipids found were hydrocarbon and wax (2%) sterol ester (25%) triglycerides (55%), free fatty acid (10%), 1,3 diglycerides (1%), and monoglycerides (2%). Polar lipids were 4% which were further fractioned by using polar solvent system.

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.

Major Chemical Constituents: The plant contains the alkaloids, biflorine and biflorone, which are interconvertible. Concentration of biflorone increases at the cost of biflorine in stored plants. Both the alkaloids gradually disappear. It also contains β-sitosterol, oleanolic acid and ursolic acid and chloride salts of sodium, potassium and calcium.

Therapeutic Usages: Ascites, jaundice, liver diseases, giddiness, dyspepsia, flatulence, colic, constipation, helminthiasis, leprosy and bronchitis.

Pharmacological Action: Hepatoprotective, antimicrobial, immunocompetent activity, antioxidant, antipyretic, antiinflammatory and tumor inhibition activity.

Contraindications: Contraindications have not yet been identified.

Adverse Effects: Non toxic at suggested doses.

Precautions: Avoid this herb or use with caution in case of cold, stomach and spleen disorders, and pregnant women.

Dosage Forms: Powder for oral use. Package in well closed and light resistant containers.

Posology: Powder 3 to 6 gm. Decoction 50 to100 ml in divided dose per day.

Formulations: Bisam Jwarantak Louha, Chandanadi Kwath, Dasanga Kwath, Gulma Kalanal Ras, Parpatadyarista, Kalomeghsav, Saribadyarista.

Kismis

Botanical Name: *Vitis vinifera*

Family: Vitaceae

Synonyms:

Bangla: কিসমিস (Kismis)

Sanskrit: Draksha, Mrudvika, Gosthana, Svaduphala, Amritaphala, Karavi

Urdu/Unani/Tibbe: Munaqqa

English: Grape

Geographical Descriptions: It is not grown in Bangladesh but in some parts of the country trying for cultivation.

Plant Descriptions:

General Description: It is a vigorous climber, growing to a height of 16 to 20 m if left unpruned. It climbs by means of forked tendrils produced intermittently at two out of three vegetative nodes. Its leaves are 9 to 28 cm wide, long-stalked, palmately lobed, and coarsely toothed. The petals of the small greenish flowers are joined at the tips. The fruits are (technically) berries, with or without seeds.

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

Fig. *Vitis vinifera*

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

composed of angular parenchymatous cells containing oil globules and cluster crystals of calcium oxalate, measuring 11-16 μ in diameter.

Part Used: Seed, fruit

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet), Kasaya (Astringent)
Guna (Attribute)	: Guru (Heavy), Snighda (Unctuous), Sara,
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Caksusya, Vusya, Vstapittahara, Svarya

Purity and Safety Test

Total ash	: Not more than 3% w/w
Acid insoluble	: Not more than 0.2% w/w
Water soluble extractive	: Not less than 70% w/w
TLC profile with marker constituents	: T.L.C of the alcoholic extract on Silica gel 'G' plate using n-Butanol: Acetic acid: Water (4:1: 5) shows under UV (366 nm) a fluorescent zone at Rf. 0.29 (blue). On exposure to Iodine vapur four spots appear at Rf. 0.08, 0.29, 0.69 and 0.85 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate for about ten minutes at 110°C three spots appear at Rf. 0.08 (black), 0.29 (black) and 0.98 (violet).
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.

Major Chemical Constituents: Grapes contain 70 to 80% water and numerous organic and inorganic compounds. These are sugars, organic acids, phenolic compounds, nitrogenous compounds, aroma compounds, minerals, pectic substance. They are also good source of bioflavonoids.

Therapeutic Usages: Asthma, abdominal disorders, loss of appetite, purpura, capillary bleeding in diabetes, edema, radiation damage, atherosclerosis, and throat infections.

Pharmacological Action (in vitro): Antioxidants, hepatoprotective, promote hair growth and prevent ischemic processes hypolipidemic.

Contraindications: Hypersensitivity to the active substance.

Adverse reactions: It is reported that there is no observed adverse effect of the dietary concentration of grape seed extract or grape skin extract.

Posology: Daily oral recommended dose of powder or solid extract form is 270 to 350 mg.

Formulations: Drakshadi Churna, Drakshasav, Draksharista, Maha Draksharista, Arjunarista, Vasakarista.

Kuchila

Botanical Name: *Strychnos nux-vomica*

Family: Loganiaceae

Synonyms

Bangla: কুচিলা (Kuchila)

Sanskrit: Nirmali, Payah Prasadisa

Urdu/Unani/Tibb: Kuchla muddabir

English: Snake wood

Geographical Descriptions: In Bangladesh it is mostly found in Cox's Bazar and Chittagong.

Plant Descriptions:

General Description: It is a small deciduous tree, up to 30 m high, often with short, sharp, strong, axillary spines. Leaves are 7.5-15 cm long, broadly elliptic, acute, obtuse or shortly acuminate, glabrous, base usually rounded. Flowers are numerous, in terminal, pedunculate, pubescent, compound cymes; corolla up to 1.3 cm long, greenish. Fruit globose, 2.5-7.5 cm across, shining, orange-red when ripe.

Fig. *Strychnos nux-vomica*

Macroscopic Description: Seed is about 8 mm dia., circular, bluntly lenticular, shiny with short, appressed silky hairs; cream-white in color with a slightly prominent ridge round the border, and bitterness.

Microscopic Description: Shows testa, consistmg of 2 or 3 layers, thick-walled, elongated, lignified sclerenchymatous cells covered with numerous, cylindrical, unicellular, lignified, trichome is pitted, bulbous, ramified with a projection normally elongated and thick-walled; 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.

Part Used: Dried ripe seeds.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet), Tikta (Bitter), Kasaya (Astringemt)
Guna (Quality)	: Guru (Heavy)
Vipaka (Metabolism)	: Madhura (Sweet)
Veerya (Potency)	: Usna (Hot)
Karma (Action)	: Caksusya, Vatahara, Slesmahara, Vicagh¸ Pittala,

Purity and Safety Test

Total ash	: Not more than 2% w/w
Acid insoluble	: Not more than 0.5% w/w
Water soluble extractive	: Not less than 5% w/w
TLC profile with marker constituents	: 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).
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.

Shodhana (Purification) **:** Ayurveda recommended the administration of Kuchila only after purification in different media like cow's milk (Go dugdha), cow's ghee (Go ghrita), Kanji (sour gruel), and so on. Apart from the classical methods some other methods are also adopted by the traditional practitioners using castor oil (Eranda taila), ginger juice (Ardraka swarasa), in the purification of Kupeelu seeds.

Major Chemical Constituents: Contains strychnine and brucine as main constituents. Minor alkaloids present in the seeds are protostrychnine, vomicine, *n*-oxystrychnine, pseudostrychnine, isostrychnine, chlorogenic acid, and a glycoside.

Therapeutic Usages: Stomach disorders, vomiting, abdominal pain, constipation, intestinal irritation, heartburn, insomnia, certain heart diseases, circulatory problems, eye diseases, depression, migraine headaches, nervous conditions, problems related to menopause, and respiratory diseases.

Pharmacological Action: Antiinflammatory, antioxidant, anti-arthritic, anti-asthmatic, anticholera, antidysenteric, antiepileptic, aphrodisiac, blood Purifier, expectorant, nervine tonic, purgative and stimulant.

Contraindications: The strychnine in nux vomica can cause liver damage or make liver disease worse. It is contraindicated in paediatric patients, since it crosses the blood brain barrier.

Adverse reactions: Restlessness, anxiety, dizziness, neck and back stiffness, spasms of jaw and neck muscles, convulsions, seizures, breathing problems, liver failure and death.

Poisoning and Antidotes: In cases of poisoning by strychnine an emetic or the stomach pump should be used at once and tannin or potassium permanganate given to render the strychnine inactive. Urethane in large doses is considered an antidote. Amyl nitrite is also useful owing to its rapid action during the convulsion, and in absence of respiration 3 to 5 minims may be hypodermically injected.

Warnings: Strychnine should not be administered in liquid form combined with bromides, iodides or chlorides, there being a risk of formation of the insoluble hydrobromide, etc.

During Pregnancy and lactation: It is not recommended during pregnancy and lactation.

Dosages: The average daily dose of purified powder is 0.3 to 0.9 gm.

Formulations: Krimi Mudgar Ras.

Lobonga

Botanical Name: *Syzygium aromaticum* Linn.

Family: Myrtaceae

Synonyms:

Bangla: লবঙ্গ (Lobonga)

Hindi: Lavanga, Laung

Sanskrit: Devapu Àpa

Urdu/Unani: Qarnful, Laung

English: Clove

Geographical Descriptions: It cultivate as an experiment in some part of the country.

Plant Descriptions:

General Description: Small evergreen trees, 10-20 metre high. Leaves opposite, petiolate, lanceolate, pinkish to dark green, with translucent, aromatic glands, have a pungent odor when young. Inflorescence occurs as racemes panicles and bears buds that take o the form of nails before blossoming. Flowers red with four concave, overlapping, petals that drop off as soon as the flower opens-stamens numerous-four calyx lobers, fruit dark red, fleshy drupe, buds readily exude oil when pressed or scratched with a fingernail.

Fig. *Syzygium aromaticum* Linn

Macroscopic Description: Flower bud measuring 10-17.5 mm in length, dark brown or dusty red, consisting of a sub-cylindrical, slightly flattened, four sided hypanthium, readily exuding oil when pressed hypanthium containing in its upper portion a two celled inferior ovary with numerous ovules attached to a axile placenta, surmounted by four thick, divergent sepals and covered by unopened corolla consisting of four membranous imbricate petals, frequently detached, enclosing numerous incurved stamens and one erect-style, odour, strongly aromatic, taste, pungent, aromatic followed by slight tingling of the tongue.

Microscopic Description: Transverse section of hypanthium shows epidermis and calyx teeth composed of straight walled cells, With thick cuticle having large anomocytic stomata, hypanthium tissue spongy, clusters of calcium oxalate crystals varying in size from 6-20 µ in diameter, small number of stone cells and prismatic crystals of calcium oxalate present in stalk, stamens, each with an oil gland in the apex of the connective, triangularly centricular pollen grains, 15-20 µ in diameter anther walls showing a typical fibrous layer, schizolysigenous glands found in all parts of clove, occasional isolate pericyclic fibres present. Power-Dark brown, fragments of parenchyma showing large oval, schizolysigenous oil cavities, spiral tracheids and a few rather thick-walled, spindle shaped fibres, calcium oxalate crystals in rosette aggregates, 10-15 µ in diameter, fragments of anther walls with characteristic reticulated cells pollen grains numerous, tetrahedral, 15-20 µ. in diameter**.**

Part Used: Whole plant

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Katu (Pungent)
Guna (Attribute)	: Laghu (Light), Snigdha (Unctuous)
Veerya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	:Kaphapittahara

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 7.0% w/w
Acid insoluble ash	: Not more than 1.0% w/w
Alcohol soluble extractive	: Not less than 3.0% w/w
Water soluble extractive	: Not less than 9% w/w
Volatile oil	: Not less than 15% w/w
TLC profile with marker constituents	: Chromatographic separation was done using Sigma-Al-drich silica gel plates (10x2.5cm). Samples of the oil obtained were taken with a capillary and various standard compounds which were placed on the plate in three replicates were sub-sequently moved with various eluent systems and dried on silica, judging the presence of the main components in the oil by identifying the fractions revealed with cobalt cloride ($CoCl_2$) and 254nm ultraviolet (UV) light. In the comparative chromatography using hexane-acetone 9:1 as mobile phase, analogy between relationships of fronts (R_f) was identified between the first fraction and the standard eugenol, corresponding to 0.65, confirming the presence of this compound.

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.

Major Chemical Constituents: The major constituent (up to 20%) is an essential oil, which is characterized by the pressure of eugenol (60-95%), eugenol acetate (2-27%), and alpha and beta caryophyllene (5-10%).

Therapeutic Usages: Bloating, indigestion, vomiting, abdominal colic pain, diarrhea, cough, cold, asthma, hiccups, ringworm and toothache.

Pharmacological Action: Antimicrobial, antiviral, antiinflammatory, antioxidant and antispasmodic.

Contraindications: No information available.

Adverse Effects: There are no known side effects of clove. So it can be used during pregnancy, lactation period and in childhood.

Dosage Forms: Crude drug, extracts, tincture, lozenges and mouthwash. Store in a well closed container, protected from light.

Posology: Powder 1 to 2 grams per day. Clove oil dose 1 to 2 drops.

Formulations: Abipattikar Churna, Labangadi Bati, Mahagni Bati, Vat Kulantak, Vat Gajendra Singha, Biranga Louha, Himasagara Taila.

Manjishta

Botanical Name: *Rubia cordifolia* Linn.

Family: Rubiaceae

Synonyms

Bangla: মঞ্জিষ্ঠা (Manjishta)

Sanskrit: Lohitalata, Manjishta

Urdu/Unani/Tibb: Majitha, Majith

English: Indian Madder

Geographical descriptions: It grows wild in waste places throughout the country, particularly in Chittagong and Chittagong Hill Tracts, and occasionally planted in gardens.

Plant Descriptions:

General Description: R cordifolia is a branched climber with bristles plats. The stem is slender and four angled. The leaves are rough, and arranged in whorl of four per node and oval to heart shaped with long leaf stalk. The leaves have 5-7 main nerves. It can grow to 1.5 m in height. The evergreen leaves are 5–10 cm long and 2–3 cm broad, produced in whorls of 4-7 star like around the central stem. It climbs with tiny hooks at the leaves and stems. The flowers are small (3–5 mm across), with five pale yellow petals, in dense racemes, and appear from June to August, followed by small (4–6 mm diameter) red to black berries. The roots can be over 1 m long, up to 12 mm thick.

Fig. *Rubia cordifolia*

Macroscopic Description: Stem is quadrangular, divaricately branched, glabrous or prickly-hispid, especially on the angles. C.S of the stem showed rectangular outline. It has a single layered epidermis covered with cuticle. Pyramidal hairs are present on the epidermis. Sclerenchymatous hypodermis is present only at the corners of the stem. The cortex is chlorenchy matous, hence photosynthetic. Phloem is arranged in 4 -6 layers. Leaves are 3.8-9 X 1.6-3.5 cm long, arranged in a whorl of four, cordate-ovate to ovate-lanceolate, 3-9 palmately veined, upper surface mostly glabrous and rough. Lower

leaves are larger than the upper, and all are scabrous above. Leaf base is slightly cordate. Root is long, cylindrical, flexuose, smooth and reddish in color.

Microscopic Description: Leaf peelings from both abaxial and adaxial side showed paracytic (rubiaceous) type of stomata where the stoma is surrounded by two subsidiary cells, the long axis of which are parallel to the stoma. The palisade ratio (1.78), stomatal index (16.67) and vein islet number (1.48) to be calculated as a part of quantitative microscopy with coral pink color. The stem and leaf powders were somewhat grayish. Stem powder was moderately coarse and fibrous. All the samples were with mouldy smell. The root samples were acrid and bitter in taste. The cross section of well-developed roots showed an outer 5-7 layer of cork tissue, which occasionally contains tannin.

Part Used: Mainly root is the prime interest part, but it may be used the whole plant.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Kashaya (Astringent), Madhura (Sweet)
Guna (Attribute)	: Guru (Heavy), Ruksha (Rough)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha Pitta shamak.

Purity and Safety Test

Total ash	: Not more than 12% w/w
Acid insoluble	: Not more than 0.5% w/w
Water soluble extractive	: Not less than 2.2% w/w
TLC profile with marker constituents	: T.L.C. was carried out on precoated aluminum plates of silica gel 60 F_{254}. The mobile phase used was toluene: ethyl acetate: formic acid (85:14:1). The plate was developed over a distance of 6 cm and visualized under visible and UV lights after spraying and R_f values were calculated. The Rf value 0.40, 0.65 (Greish purple in UV Short) and 0.20, 0.40, 0.65 (light blue brown black in UV long) are obtained respectively and The result obtained from isolates of marker compound rubiadin was found.
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.

Major Chemical Constituents: Purpurin (trihydroxy anthraquinone) and munjistin (xanthopurpurin-2-carboxylic acid) are the main colouring principles in root. Besides this small amount of xanthopurpurin or purpuroxanthin and pseudopurpurin, garacin, alizarin (orange red) and xanthine (yellow).

Therapeutic Usages: Skin disease, menstrual disorder, snake bite, eye disease, haemorrhoids and fracture.

Pharmacological Action: Antibacterial, antiviral, antifungal, antiinflammatory, antipyretic, antiprotozoal, hepatoprotective, hypoglycemic, hypochoesteremic and immunomodulators.

Contraindications: Not to be used in kidney and liver disease.

Adverse reactions: Nausea and mildly elevated blood pressure response have been observed.

During Pregnancy and lactation: It is not recommended during pregnancy and lactation.

Dosages Forms: Powder or decoction. Package in closed and light resistant containers.

Posology: Powder 1 to 3 gm and decoction 20 to 50 ml in divided doses.

Formulations: Brihat Manjisthadi Kwath, Darbadi Kwath, Manjisthasav, Aravindasav, Goura Arista, Aswagandharista.

Mistikumra

Botanical Name: *Cucurbita maxima* Duch. Ex Lamk.

Family: Cucurbitaceae

Synonyms:

Bangla: মিষ্টিকুমড়া (Mistikumra)

Hindi: Lalkumra, Kaddu

Sanskrit: Peetakusmanda

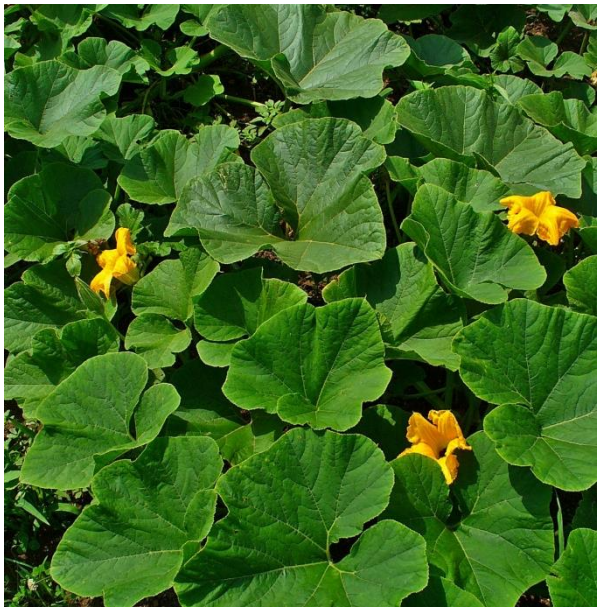
Urdu/Unani/Tibb: Karela

English: Halva kaddu, Mitha kaddu

Geographical Descriptions: It cultivate throughout the country

Plant Descriptions:

General Description: It is a coarse, prostrate or climbing, annual, herbaceous vine, reaching a length of 4 meters or more. Leaves are hispid, rounded, 15 to 30 centimeters in diameter, heart-shaped at the base, shallowly 5-lobed, with finely toothed margins, and often mottled on the upper surface. Flowers are bell-shaped, erect, yellow and about 12 centimeters long, the corolla limb is about as wide, and 5-toothed. Fruit is large, variable in shape, fleshy, with a yellow pulp. Seeds are ovoid or oblong, compressed, and about 1.3 centimeters long.



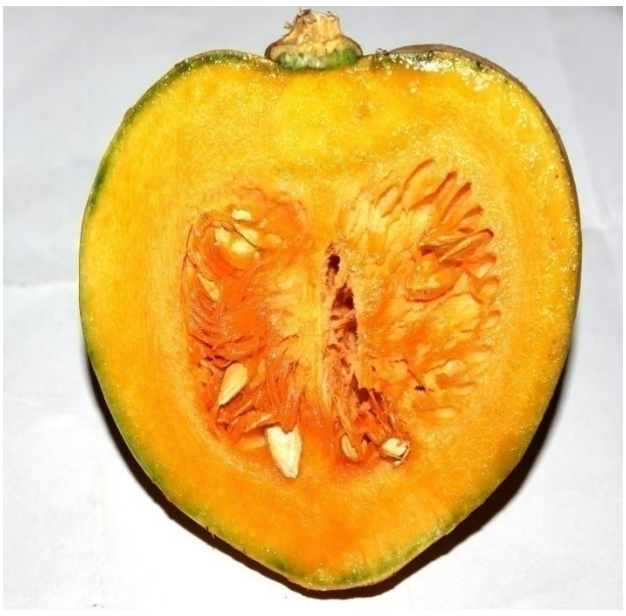


Fig. *Cucurbita maxima* Duch. Ex Lamk.

Microscopic Descriptions: Seed coat shows is three-dimensional structure cells. The lumpy appearance of the spongy parenchyma cells indicated that localized wall growth must have occurred. Also of particular interest were the reticulate secondary wall thickenings in the hypodermal and spongy parenchyma regions of the seed coat. The developing squash seed coat may prove to be a good model system in which to study the cell wall deposition process.

Part Used: Fruits, seeds, stalk

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Pitta kapha hara, Deepana.

Purity and Safety Test

Total ash	: Not more than 1.0% w/w
Acid insoluble ash	: Not more than 7.0% w/w
Alcohol soluble extractive	: Not less than 6.0% w/w
Water soluble extractive	: Not less than 28.0% w/w
TLC profile with marker constituents	: TLC plates were prepared by using silica gel G for TLC, were left overnight for air drying. These plates were activated by hot air oven at 100ºc for 1hr. Cold alcoholic extract was plotted on TLC plates 12. The plates were dried and developed in suitable solvents for rapid screening. Pure ethylacetate, 50% chloroform/ methanol, 1:1 ethylacetate/methanol. The plates were run in the above solvent systems and dried at room temperature. Derivatisation of TLC plates was done by spraying 10% H_2SO_4 in methanol. The presence of phytoconstituents was further confirmed by thin layer chromatography and their Rf values have been presented as 0.7. The components were best resolved in screening system using pure ethyl acetate, 50% chloroform/ methanol, 1:1 ethyl acetate/methanol.
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.

Major Chemical Constituents: Fruits contain vitamin A, starch, protein and sugar. Flowers contain flavonoids. Seeds yield 30% unsaturated fixed oil containing sterols and triterpenes; linoleic, oleic, linolenic acids; carotenoides – luteolin, ß-carotene and a-carotene; cryptoxanthin and flavoxanthin. Seeds also contain stigmasta-dienol, stigmasta-dienol acetate, euglobulins, cucurbitacins, vitamins and minerals and yield a resin having vermicidal properties. Plants contain saponins.

Therapeutic Usages: Intestinal worms, urinary disorders, hypertension, carbuncles, boils, ulcers, stomach pain and fever.

Pharmacological Action: Antioxidant, antimicrobial, antidiabetic, antihyperlipidemic, antipyretic, diuretics, anticarcinogenic, antihelmintic and immunomodulators.

Contraindications: Contraindications have not been identified.

Adverse Effects: May cause oral allergy syndrome, nausea, diarrhea and pruritus.

Precautions: Not yet known.

Dosage forms: Crude drug and extracts.

Posology: Seed 10 gm orally daily.

Mouri

Botanical Name: *Foeniculum vulgare* Mill.

Family: Umbelliferae

Synonyms:

Bangla: মৌরী (Mouri)

Hindi: Sounf

Sanskrit: Mishreya, Sanuf

Urdu/Unani/Tibb: Saunf

English: Fennel

Geographical Distribution: Cultivated as a spice in many areas of the country.

Plant Descriptions:

General Description: Tall, glabrous, aromatic herb, 1-2 m high. Leaves 3 or 4 times pinnate, with very narrow, linear or subulate segments. Umbels rather large, of 15, 20 or more rays, more or less glaucous. Flowers small, yellow. Fruits about 6 mm long, oblong ellipsoid, the vittae very conspicuous.

Fig. *Foeniculum vulgare* Mill.

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

Microscopic Description: Transverse section of fruit shows pericarp with outer epidermis of quadrangular to polygonal cells with smooth cuticle and a few stomata, trichomes, absent vittae, 4 dorsal and 2 commissural extending with length of each mericarp, intercostal with an epithelium of brown cells and volatile oil in cavity, mesocarp, with much reticulate lignified parenchyma, costae, 5 in each mericarp, each with 1vascular strand having inner xylem strand and 2 lateral phloem strands

separated by a bundle of fibres inner epidermis of very narrow, thin-walled cells arranged parallel to one another in groups of 116 5-7, many of these groups with longer axis of their cells at angle with those of adjacent groups (Parquetry arrangement), endosperm consists of thick-walled, cellulosic parenchyma containing much fixed oil, micro-rosette crystals of calcium oxalate, and numerous aleurone grains up to 5 μ in diameter, carpophore with very thick-walled sclerenchyma in two strands, often unsplit with two strands very close to each other.

Part Used: Fruits.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet), Katu (Pungent), Tikta (bitter)
Guna (Attribute)	: Laghu (Light), Snigdha (Unctuous)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Kapha Vata hara, Dipanpachana

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 12.0% w/w
Acid insoluble ash	: Not more than 15.0% w/w
Alcohol soluble extractive	: Not less than 4.0% w/w
Water soluble extractive	: Not less than 1.0% w/w
Volatile oil	: Not less than 1.4%/w
TLC profile with marker constituents	: Applied specific quantity of the each sample and standard solution with the help of Linomat V (Camag's) as bands on the TLC plate and developed with solvent system up to 90 mm. The developed chromatoplate was dried through hot air. The spots were found to be visible under UV 256 nm. Then the plate was sprayed with vanillin spraying reagent and dried in hot oven at 105ºC for 5-10 min under observation. Then photo documented with the help of photo-documentation system (Camag's). R_f value of each sample was then calculated. TLC studies revealed that the solvent system toluene:ethyl acetate (93:07) was ideal and gave a single spot with Rf 0.74 for anethole and well resolved spots for the test samples.
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.

Major Chemical Constituents: Fruits and seeds contain 1.5-3% essential and 9-21% fixed oils. The essential oil is rich in polymers of anethone, coumarin, xanthotoxin, bergapten, psoralen, scoparone and vanillin. Essential oil also contains α-pinene, camphene, α-phellandrene, limonene, fenchone, methylchavicol, anethole, anisaldehyde and p-anisic acid. Seed fat contains an octadecenoic acid and arachidic esters. Leaves and fruits contain flavonoids. Root contains essential oil, coumarins, including umbelliferone and bergapten.

Therapeutic Usages: Flatulance, gastritis, abdominal pain, jaundice, insomnia and infections.

Pharmacological Action: Antioxidant, antimicrobial, antiviral, anti-inflammatory, hepatoprotective**,** anxiolytic, gastrointestinal effect, cytoprotection and antitumor activity; hypolipidemic, hypoglycemic and antispasmodic.

Contraindications: Contraindicated in cases of known sensitivity to plants in the Apiacaeae family. Should not be used in pregnancy. Pure essential oils should not be given to infants and young children owing to the danger of laryngeal spasm, dysponea and central nervous system excitation.

Adverse Effects: In rare cases, allergic reactions such as asthma, contact dermatitis and rhino conjunctivitis have been reported in sensitive patients.

Precautions: Should not be used in large doses, as it may have a narcotic effect. It should be avoided altogether in pregnancy and cases of epilepsy.

Dosage Forms: Dried fruits, syrup and tinctures. Store the dried fruits in a closed container, protected from light and moisture

Posology: Fruits 3 to 6 gm as an infusion or similar preparations, higher doses more than 7 gm. Oil 5 to10 drop and distillate 20 to 40 ml.

Formulations: Rajanyadi Churna, Shatapuspi Arka, Bomihara Jog, Niabaran Bati, Maha Rasnadi Kwath, Eladyarista, Meharaj, Brahmi Rasayan.

Nagesar

Botanical Name: *Mesua ferrea* Linn.

Family: Calophyllaceae

Synonyms:

Bangla: নাগেশ্বর (Nagesar)

Hindi: Nagkesara, Pila Nagkesara

Sanskrit: Kesara, Nagapuspa, Naga, Hema, Gajakesara

Urdu/Unani/Tibb: Narmushk, Nagkesar

English: Cobras Saffron

Geographical Distributions: It grows in the hills and planted gardens in many parts of the country.

Plant Descriptions:

General Description: It is a an evergreen tree, about 15-18 m high, often buttressed at the base with a trunk up to 2 meters in diameter. It has simple, narrow, oblong, dark green leaves 7–15 cm long, with a whitish underside; the emerging young leaves are red to yellowish pink and drooping. The flowers are 4–7.5 cm diameter, with four white petals and a center of numerous yellow stamens. Leaves lanceolate, coriaceous, generally covered with a waxy bloom underneath, red when young. Flowers large, white, fragrant, solitary or in clusters of 2-3.Fruits ovoid, 2.5-5.0 cm long with persistant calyx, seed 1-4, dark brown, cotyledons fleshy, oily.

Fig. *Mesua ferrea* Linn.

Macroscopic Description: Stamen consists of anther, connective and filament; coppery or golden brown; filament united at base forming a fleshy ring; each stamen 0.9-1.9 cm long; anther about 0.5 cm long, linear, basifixed, containing pollen grains; filament 0.8-1.0 cm long; slender, filiform, more or less twisted, soft to touch, quite brittle; connective not visible with naked eye; odour, fragrant; taste, astringent.

Microscopic Description: Androecium-Anther shows golden-brown, longitudinally dehiscent anther wall, consisting of thin-walled, parenchymatous cells, pollen grains numerous in groups or in

single, yellowish and thin-walled, many pollen grains having 1-3 minute, distinct protuberances on walls, thick-walled, exine and intine distinct. Powder - Brown; shows elongated cells of filament, connective and numerous golden yellow pollen grains having 1-3 protuberances.

Part Used: Stamens

Organoleptic Properties

Rasa (Taste)	: Kashaya (Astringent) Tikta (Bitter)
Guna (Attribute)	: Ruksha (Rough), Teekshna (Sharp), Laghu (Light)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha Pitta hara, Grahi, Pachana, Sothahara.

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 6.0% w/w
Acid insoluble ash	: Not more than 3.0% w/w
Alcohol soluble extractive	: Not less than 15.0% w/w
Water soluble extractive	: Not less than 12.0% w/w
TLC profile with marker constituents	: The solvent system for *Mesua ferrea* was developed by the help of Nyiredy's prism system. Multiwave length scanning was conducted separately for Mesua ferrea. It was done at 200, 240, 280, 320 and 400 nm. The measurement type was remission and measurement mode was absorption. The solvent system Chloloroform: Methanol:: 9:1 had shown good separation of spots. The prominent Rf and area % obtained were 0.89 and 20.73 at 200 nm; 0.89 and 15.70 at 240 nm; 0.78 and 15.98, 0.90 and 12.58 at 280 nm; 0.15 and10.68, 0.30 and 22.37 at 320 nm; 0.29 and 20.49 at 400 nm.
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.

Major Chemical Constituents: Alpha and beta amyrin, beta sitosterol, biflavonoids, mesuaferrones A and B, and mesuanic acid.

Therapeutic Usages: Hematemesis, gastritis**,** abdominal pain, nausea, vomiting, diarrhea, dysentery, erysipelas, bleeding piles, metrorrhagea, menorrhagia, excessive thirst, itching, sores, scabies, wounds, rheumatism, asthma, leprosy and cough.

Pharmacological Action: Antibacterial, antiprotozoal, antiinflammatory, antioxidant, expectorant, anti spasmodic, anti ulcerative and CNS depression activity.

Contraindications: Not recommended during pregnancy.

Adverse Effects: Yet not known.

Precautions: No drug herb interactions known.

Dosage Forms: Powder, syrup and tinctures. Store the dried flowers in a closed container, protected from light and moisture.

Posology: 1 to 3 gm powder of dried stamens.

Formulations: Pranada Gudika, Vaskar Lavana, Mahagni Bati, Kankasav, Jambadyarista, Jirakadyarista, Unmadi, Drakshasav, Pippaladyasav, Mahadraksarsita, Mahanarayan Taila.

Nayatanra

Botanical Name: *Catharanthus roseus* (L). G. Don**.**

Family: Apocynaceae

Synonyms:

Bangla: নয়নতারা (Nayantara)

Hindi: Sadabahar

Sanskrit: Sadapushpi

Urdu/Unani/Tibb: Ratanjot, Hamesh Bahar, Sada Bahar

English: Cayenne jasmine, Periwinkle

Geographical Descriptions: It grows throughout the country

Plant Descriptions:

General Description: A tender, perennial plant which grows as a herb or sub shrub sprawling along the ground or standing erect 30 cm to 1 m height. Flowers are attractive white or pink color comprising five petals spreading from a long, tubular throat. Leaves are leathery, dark green and arranged in opposites pairs. Each fruit is made up of two narrow, cylindrical follicles which keep numerous grooved seeds.

Fig. *Catharanthus roseus* (L). G. Don**.**

Macroscopic Descriptions: Stem near the base and can get 0.6-0.9 m tall and spread out just as wide. It has opposite glossy leaves about 5.1-7.6 cm long, borne on fairly rigid stems. The five petaled flowers are typically rose pink, but among the many cultivars are those with pink, red, purple and white flowers. The flowers are tubular, with a slender corolla tube about 2.5 cm long that expands to about 3.8 cm across.

Microscopic Description: Upper epidermis shows single layered with more or less rectangular cells, the outer walls of which are circularized. Only covering trichomes are unicellular, long and dagger shaped, warty and with a bulbous base. Sometimes very short trichomes are also seen. A few stomata are seen on the upper epidermis. Mesophyll is differentiated into palisade and spongy parenchyma.

Palisade is single layered cells elongated and compact. Spongy parenchyma is 5-9 layered, loosely arranged with intercellular spaces. Calcium oxalate crystals of any kind are totally absent. Vascular strands are seen here at times. Lower epidermis shows like as upper epidermis but the number of stomata are more. Epidermal layers of lamina are continuous in the midrib region also. Strips of collenchyma appear below the upper epidermis and above the lower epidermis. This is followed by cortical parenchyma. A well developed vascular bundle is seen in the centre of midrib.

Part Used: Whole plants

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Vata pitta hara, Use in Arbuda.

Purity and Safety Test

Total ash	: Not more than 0.4.% w/w
Acid insoluble ash	: Not more than 0.68% w/w
Alcohol soluble extractive	: Not less than 4.8% w/w
Water soluble extractive	: Not less than 6.34% w/w
TLC profile with marker constituents	: The aqueous and methanol extracts were using capillary tubes on the one end of the thin layer plate at above 1 cm. Plate was allowed it for air dry, then it was placed in a beaker containing solvent Ethyl acetate: Methanol in the ratio of 6: 4. The samples were allowed to run towards the other end of the plate. The sheet was removed and allowedit to air dry and 2% of ninhydrin was sprayed and again allowed to air dry for 10 minutes. The plate was then visualized under the UV light and violet colour spot was absorbed on the plate. Compound identification was done using silica gel coated thin layer chromatography in water and methanol extracts. Light violet colour at visible light mode was present in the tracks of paper identified as compound in the sample.
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.

Major Chemical Constituents: The plant contains more than 100 indole alkaloids which are distributed in all parts, most important bis-indole alkaloids, vinblastine (vinleukoblastine), vincristine (vinleurocristine), vinleurosine and vinrosidine having leukopenic activity and vincarodine, vincoline, vincathicine, vincubine and the antimitotic alkaloids leurocolombine, vinamidine.

Therapeutic Usages: Leukemia, Hodgkin's disease, malignant lymphomas, neuroblastoma, improve cerebral blood flow, high blood pressure, indigestion, dyspepsia and constipation.

Pharmacological Action: Antibacterial, anticancerous, antidiabetic, antihypertensive, sedative and antimitotic.

Contraindications: No contraindication information is available.

Adverse Effects: May cause stomach pain, diarrhea, constipation, and nausea.

Dosage forms: Leaves powder and decoction.

Posology: Dried leaves 6 to 12 gm.

Formulations: Saribadyarista.

Pan

Botanical Name: *Piper betle* Linn.

Family: Piperaceae

Synonyms

Bangla: পান (Pan)

Sanskrit: Tambuli

Urdu/Unani/Tibb: Pan

English: Betel Leaf

Geographical Descriptions: It is usually cultivate in different parts of the country.

Plant Descriptions:

General Description: A stout climber and leaves are 15-20 cm long, broadly ovate, ovate oblong or rounded, cordate at base, shortly acuminate, acute, entire, and shining on both sides. Spikes dense, cylindrical, female 2.5-5 cm long, pendulous. Fruits sparingly produced, quite immersed in the fleshy spike, which is about 5 cm long, red.

Fig. *Piper betle* Linn.

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

Microscopic Description: Cells are covered with thick, striated cuticle; epidermal cells elongate to form uni to bicellular, occasionally multicellular hairs; epidermis followed by a discontinuous collenchymatous zone in the form of arcs, and a multilayered parenchymatous zone; vascular bundles

arranged in the arcs, phloem surrounds xylem; vascular bundles usually of two sizes larger ones 7 in number and smaller ones 2 in number.

Part Used: Leaf

Organoleptic Properties

Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Slesmahara, Balya, Sramahara
Rasa (Taste)	: Katu (Pungent), Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Laghu (Light), Sara, Tiksna (Sharp)

Purity and Safety Test

Total ash	: Not more than 17% w/w
Acid insoluble	: Not more than 3% w/w
Water soluble extractive	: Not less than 20% w/w
TLC profile with marker constituents	: T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene: Ethylacetate (9 : 1) shows in visible light five spots at Rf. 0.11 (green), 0.18 (light green), 0.23 (yellow), 0.34 (grey) and 0.61 (greyish green). Under U.V. (366 nm) seven fluorescent zones are visible at Rf. 0.11, 0.16 (both pink), 0.23 (brown), 0.34 (pink), 0.43 (pink), 0.61 (pink) and 0.76 (grey). On exposure to Iodine vapour seven spots appear at Rf. 0.08, 0.11. 0.18. 0.34, 0.61, 0.76 and 0.88 (all yellow). On spraying with Vanillin- Sulphuric acid reagent and heating the plate for ten minutes at 110°C seven spots appear at Rf. 0.08, 0.11, 0.18 (all the three greenish grey), 0.34 (grey), 0.43 (violet), 0.61 and 0.76 (both light green).
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.

Major Chemical Constituents: Leaves contain up to 1% of an essential oil with burning taste, composed of cadinene, chavicol, chavibetol and cineole. They also contain an alkaloid, arakene, tannins, starch, sugars and diastases. In addition, they contain β-carotene and α-tocopherol. Roots contain diosgenin and β-sitosterol.

Therapeutic Usages: Indigestion, colic, diarrhoea, cough, asthma, dyspnoea, arthritis, mastitis, eczema, and lymphangitis.

Pharmacological Action: Antibacterial, antifungal, larvicidal, antiprotozal, anticaries, gastroprotective effects, free radical scavenging, antioxidant, antiinflammatory, hepatoprotective, immunomodulatory, antiulcer and chemopreventive activities.

Contraindications: It is contraindicated in asthma, bradycardia, gastrointestinal tract blockage, ulcers, seizures and urinary tract obstruction.

Adverse reactions: Vomiting, diarrhea, gum problems, increased saliva, chest pain, abnormal heart beats, low blood pressure, shortness of breath, rapid breathing, heart attack, coma and death.

Dosages: 10 to 20 ml of Swarasa.

Formulations: Naradiya Mahalaksmi Bilash, Labangadi Bati, Sanjiban Bati, Makaradhwaj Ras Lokanatha Rasa.

Pathurkuchi

Botanical Name: *Bryophyllum pinnatum* Lam.

Family: Crassulaceae

Synonyms:

Bangla: পাথরকুচি (Pathukuchi)

Hindi: Patharchur

Sanskrit: Pashanabheda

Urdu/Unani/Tibb: Haemsager, Kopata

English: Miracle Leaf

Geographical Distributions: It grows wild in waste places throughout the country, particularly in Chittagong and Chittagong Hill Tracts, and occasionally planted in gardens.

Plant Descriptions:

General Description: An erect succulent, glabrous herb, 0.3-1.2 cm high. Leaves variable, the lower usually simple, occasionally compound, the upper usually 3-5 or sometimes 7 foliolate. Leaflets ovate or elliptic, crenate or serrate. Flowers long, reddish-purple, pendent, in large spreading panicles with opposite stout branches.

Fig. *Bryophyllum pinnatum* Lam.

Macroscopic Description: Rhizome, solid, barrel shaped, cylindrical, 1.5-3 cm long and 1-2 cm in diameter with small roots, ridges, furrows and root scars distinct, transversely cut surface shows outer ring of brown colored cork, short middle cortex, vascular bundles and large central pith, odour, aromatic, taste, astringent.

Microscopic Description: Transverse section of rhizome shows cork divided into two zones, outer a few layers of slightly compressed and brown colored cells, inner zone multilayered consisting of thin-

walled tangentially elongated and colorless cells, followed by a single layered cork cambium and 2-3 layers of secondary cortex composed of thick-walled, tangentially elongated, rectangular cells with intercellular spaces, some cells contain rosette crystals of calcium oxalate and simple starch grains cortex a narrow-zone of parenchymatous cells containing a number of simple starch grains, most of cortical cells also contain large rosette crystals of calcium oxalate, endoderm is and pericycle absent. Vascular bundles, arranged in a ring, collateral, conjoint and open, phloem tissues cormposed of sieve elements and parenchyma, in outer region found as compressed masses while in inner region intact. a number of rosette crystals of calcium oxalate also found as crystal fibres, cambium present as continuous ring composed of 2-3 layers of thin walled, tangentially elongated cells, xylem consist of fibres, tracheids, vessels and parenchyma, with centre occupied by large pith composed of circular to oval, parenchymatous cells, varying in size and containing starch grains with crystals of calcium oxalate similar to those found in cortical region.

Part Used: Whole plant.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Laghu (Light)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	:Katu (Pungent)
Karma (Action)	: Bhedana, Vastosodhana, Asmarighna, Mutravirechana

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 13.0% w/w
Acid insoluble ash	: Not more than 0.5% w/w
Alcohol soluble extractive	: Not less than 9.0% w/w
Water soluble extractive	: Not less than 15.0% w/w
TLC profile with marker constituents	: Suitably diluted stock solution of methanolic extract was spotted on a pre-coated Silica gel 60 F254 TLC plate (E.Merck) using CAMAG Linomat IV Automatic Sample Spotter and the plate was developed in the solvent system of Toluene :Ethyl acetate : Formic acid : Methanol (3 : 3 :0.8 : 0.2). The plate was dried at room temperature and scanned using CAMAG TLC Scanner 3 at UV 254 nm and Rf values, spectra, λmax and peak area of the resolved bands were recorded. Relative percentage area of each band was calculated from peak areas. The TLC plate was derivatised by spraying with 5% methanolic ferric chloride solution for the detection of phenolic compounds. TLC of methanolic extract showed 6

	bands in UV 254 nm. After spraying with 5% methanolic ferric chloride solution, 5 bluish coloured bands were observed out of which three bands at Rf 0.18, 0.42, 0.51were found to be major.
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.

Major Chemical Constituents: P-coumaric, ferulic, syringic, caffeic and p-hdroxybenzoic acids, quercetin and kaempferol have been detected in leaves. Wax hydrocarbons (C25-35), wax alcohols (C26-36) and fatty acids are obtained from wax of leaves. They have also been reported to contain fumaric acid, lipids, phenolic substances and a cytotoxic bufadienolide orthoacetate.

Therapeutic Usages: Urinary insufficiency, kidney stones, bronchial infections, blood dysentery, gout, jaundice, burns and scalds.

Pharmacological Action: Nephroprotective, hepatoprotective, antiurolithiatic, immunomodulatory, CNS depressant, analgesic, antiinflammatory, antiallergic, antitumorous, antiulcer, antibacterial, antifungal, antiviral, febrifuge, gastroprotective, insecticidal, sedative and muscle relaxant.

Contraindications: Contraindicated in pregnant, puerperal diseases, lactating mothers and children.

Adverse Effects: No documentations**.**

Precautions: Do not use more than 15 days in a row.

Dosage Forms: Infusion or extract (liquid or ointment) for oral use. Package in well closed, light resistant containers.

Posology: 3 to 6 gm of the drug in powder form. 20 to 30 gm of the drug for decoction.

Formulations: Pushyanug Churna, Aranda Saptak Kwath, Val Jakridari Louha

Patol

Botanical Name: *Trichosanthes diocia* Linn.

Family: Cucurbitaceae

Synonyms

Bangla: পটল (Patol)

Sanskrit: Patola

Urdu/Unani/Tibbe: Parora

English: Pointed gourd

Geographical Descriptions: It is cultivated throughout the plain of Bangladesh.

Plant descriptions:

General Description: The plant is a perennial, dioecious, and grows as a vine. Vines are pencil thick in size with dark green cordate, ovate, oblong, not lobed, rigid, leaves. Roots are tuberous with long tap root system. Flowers are tubular white with 16–19 days initiation to anthesis time for pistillate flowers and 10–14 days for staminate flowers. Stigma remains viable for approximately 14 hours and 40–70% of flowers set fruit.

Microscopic Description: Midrib shows the following characterstics: Presence of multicellular covering and glandular trichomes, bicollateral vascular bundle (xylem cells covered with phloem cells by both side), polygonal epidermal cells with cuticle, pericycle at outside of phloem and parenchyma and collenchyma cells

Part Used: Leaves fruit and root.

Fig. *Trichosanthes diocia* Linn.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Katu (Pungent)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Ushan (Hot)

Vipaka (Metabolism) : Katu (Pungent)

Karma (Action) : Kapha Pitta shamak.

Purity and Safety Test

Total ash : Not more than 10.45 % w/w

Acid insoluble : Not more than2.53 % w/w

Water soluble extractive : Not less than 28.60 % w/w

TLC profile with marker constituents: TLC profile of patol is done on Pet ether, Chloroform and Ethanol extracts using solvent system of Toluene: Ethyl acetate and Toluene: Ethyl acetate Diethylamine. Spraying Agent Anisaldehyde: - H_2SO_4 reagent (0.5%), Anisaldehyde: - H_2SO_4 reagent (0.5%) and Dragendorffs reagent are used at a ratio of 9:1, 8:2 and 6:3:1 for 3, 6 and 4 spots respectively. The R_f value of Pet ether extract, Chloroform and Ethanol extracts are 0.12, 0.47, 0.91; 0.07, 0.22, 0.42, 0.70, 0.73, 0.85; and 0.59, 0.70, 0.75, 0.88 respectively and ensure the presence of maximum no. of constituents.

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.

Major Chemical Constituents: Leaves and roots contain glycosides, which include osyritin, rutin and tephrosin, deguelin, isotephrosin and rotenone, three crystalline compounds, maxima substance A, B and C, which are chemically related to the isoflavonic compound rotenone. Leaves also contain rutin, β-sitosterol, and lupeol. Roots also contain pongamol, rotenone, rotenolone, methyl pongamol, elliptone

and a new flavanone. Pods contain purpurin A, purpurin B, maximin and lanceolatin-A. Aerial parts have been reported to contain lanceolatin B, α -toxicarol, O-methylobovatin, dehydro-deguelin, pongamol, β-sitosterol, ursolic acid and spinasterol. Caffeic acid isolated from seeds. Seeds also contain pongamol, solonchcarpin, karanjin, lanceolatin-B, kanjone, sitosterol, a new flavone purpurine, two new prenylated flavonoids pupuritenin and purpureamethide. Delphinidin chloride and cyanidin chloride have been isolated from flowers.

Therapeutic Usages: Liver disorders, constipation, fever, skin infection, wounds, loss of appetite, oedema and alopecia.

Pharmacological Action: Antiulcer, antiinflammatory, analgesic, antimicrobial, anthelmintic, anticancer, antihyperglycemic and antioxidant.

Contraindications: There is no strong contraindication.

Adverse reactions: Execessive use (more than 2000 mg/kg/day) may cause behavioral changes, locomotor ataxia, and diarrhea and weight loss.

During Pregnancy and lactation: Should be used cautiously in pregnancy and lactation.

Dosages: Fresh juice 10 to 20 ml per day. Decoction 25 to 50 ml per day.

Formulations: Patoladi Kwath, Amritadi Kwath, Guruchyadi Kwath.

Prasarani

Botanical Name: *Paederia foetida* Linn.

Family: Rubiaceae.

Synonyms:

Bangla: প্রসারনী / গন্ধভাদুলে (Prasarini, Gandhabhadule)

Hindi: Gandha Prasarini

Sanskrit: Prasarini, Sarani

Urdu/Unani/Tibbi:

English: Chinese Flower Plant, Chinese Moon-creeper, Kings Tonic.

Geographical Distribution: In most of the district on fences and bushes.

Plant Descriptions:

General Description: An extensive, foetid climber. Leaves opposite, ovate or lanceolate, acute or cuspidate, 2.5-3.8 cm long. Flowers violet, shortly pedicelled in slender tricholomous, often scorpioid paniculate cymes, about 15 cm long; corolla funnel shaped. Fruit orbicular, wings pale, 1.1 cm across.

Fig. *Paederia foetida* Linn.

Macroscopic Description: Root 2-4 cm long, 0.5-2 cm thick, cylindrical or sub cylindrical, tortuous, having a number of branches and rootlets; dark brown; surface rough due to longitudinal wrinkles, ridges and fissures; remnants of rootlet, thin scars and numerous horizontal lenticels also present; fracture, short in bark region and somewhat fibrous in wood; odour, disagreeable and foetid more marked in fresh samples; taste, indistinct. Stem - Slender, sub-erect with diffuse branching, upto 4 cm thick; subcylindrical showing a dumb-bell shaped appearance in transverse view due to presence of two prominent furrows running opposite each other on both surfaces, externally dark brown, longitudinal anatomizing wrinkles, ridges and a few transverse cracks and circular lenticels, fracture, fibrous; odour, foetid more marked in fresh samples; taste, indistinct. Leaf simple, petiolate,

stipulate; 10-15 cm long, 5-6 cm broad; somewhat glabrous; ovate, entire, base narrow or broad, apex acute or cuspidate; stipule ovate, lanceolate, bifid, entire, acute, base broad with hairy surface, texture, thin; odour, foetid more distinct in fresh samples; taste, indistinct. Flower is violet to pink; bracteate, pedicellate, bisexual, calyx campanulate, acutely, toothed; corolla funnel-shaped, usually pubescent, somewhat gibbous and wooly inside, limb narrow, divided into five cordate crenulate segments, lobes short; filament short, inserted irregularly about the middle of the tube, anther erect within the tube; ovary turbinate, two celled containing one ovule, each attached to the bottom of the cell; style, simple; stigma two cleft with lobes bent amongst the anther. Fruit is berry, orbicular, ellipsoid, compressed, smooth with five lines on each side, one celled, two seeded, 1.1 cm across, red or black. Seed is compressed, smooth, enlarged with somewhat membranous ring all round.

Microscopic Description: Root shows 6-13 layers of cork, composed of tangentially elongated cells, in outer few layers somewhat collapsed, lignified and filled with brown content; cork cambium 1-2 layers; secondary cortex 5-16 layers of thin-walled; somewhat radially arranged parenchymatous cells; secondary phloem appears as wedge-shaped conical masses consisting of sieve elements and parenchyma traversed by phloem rays; major portion of phloem element thick-walled, sieve elements form collapsed masses of ceratenchyma in outer region and intact in inner most region; uni to biseriate phloem rays composed of usually thick-walled cells in outer and middle phloem region; multiseriate phloem rays composed of thin-walled parenchymatous cells showing funnel-shaped dilatation in outer phloem region; in tangential section through inner phloem region sieve cells shows beaded thickening; cambium 1-3 layered; secondary xylem consists of wide zope of lignified and non-lignified tissue traversed by xylem rays; lignified tissue consists of vessels, tracheids and fibres; non-lignified tissue consists of thin-walled parenchymatous cells; xylem vessels distributed singly or in groups of two to three having variable shape and bordered pits; tracheids long and narrow having bordered pits; fibres long, narrow having simple pits; xylem parenchyma have simple pits or reticulate thickening; xylem ray cells thin-walled, circular to somewhat radially elongated in non-lignified zone and thick-walled, lignified and radially elongated in lignified zone having simple pits; starch grains as granular masses, oil globules as small circular bodies and raphides of calcium oxalate present in a few cells of secondary cortex, phloem, xylem and medullary rays. Stem - Mature stem shows 7-11 layers of cork composed of rectangular cells, a few outer layers lignified; secondary cortex 6-9 layers consisting of thin-walled parenchymatous cells; pericyclic fibres present in singles or in groups of two to three, much elongated and septate with very narrow lumen; secondary phloem much similar to that of root having thick-walled phloem elements, arranged in wedged-shaped conical masses, with ceratenchyma, two types of phloem rays, sieve cells with beaded thickening; cambium 1-2 layers; secondary xylem represented by lignified and nonlignified tissues; inner most xylem composed of thin compact band of 8-9 layers of lignified tissue with primary xylem attached towards pits, xylem vessels associated with tracheids, fibres and lignified or non-lignified parenchyma; a few xylem vessels show tyloses; all elements have similar pittings as described in

case of root; uni and biseriate rays thin-walled but lignified; in lignified region, multiseriate rays usually thin-walled; centre of stem occupied by small pith and a few sclereids; a few cells of secondary cortex, phloem, xylem, medullary rays and pith contain starch grains, oil globules and raphides of calcium oxalate. Leaf shows similar structure as midrib but differs in possesing trichomes comparatively smaller, as well as two more somewhat spherical accessory bundles, one flanking on each side of median vascular bundle close to lateral extensions where they further split after reaching distal end of petiole; starch grains, oil globules and raphides of calcium oxalate similar to those of root and stem also present in parenchymatous cells of petiole, midrib and in mesophyll cells of leaf. Lamina shows a dorsiventral structure; epidermis single layered covered externally with striated cuticle; uniseriate covering trichomes and paracytic stomata present on both surfaces; mesophyll composed of single layered palisade cells and 3-4 layered spongy tissue; in margin of leaf mesophyll replaced by thick- walled cells; veins usually surrounded by bundle sheath, larger veins transcurrent and smaller ones embedded; vein islet number 5-10 per sq. mm., palisade ratio 6.75-14.2. Powder shows dark green; shows fragments of cork cells, palisade cells, raphides of calcium oxalate, oil globules and starch grains

Part Used: Root, leaf

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Guru (Heaviness), Sara (Mobile)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha vata hara.

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 21.0% w/w
Acid insoluble ash	: Not more than 6.0% w/w
Alcohol soluble extractive	: Not less than 2.0% w/w
Water soluble extractive	: Not less than 9.0% 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.

Major Chemical Constituents: Leaves are rich in carotene and vitamin C; and also contain high amount of protein consisting of arginine, histidine, lysine, tyrosine, tryptophan, phenylalanine, cystine, methionine and valine. Aerial parts also contain a crystalline keto alcohol paederolone, a keto compound, paederone, β-and δ-sitosterols and two volatile alkaloids, paederine and paederenine. Leaves contain a volatile oil of an offensive odour due to the presence of methyl mercaptan.

Therapeutic Usages: Rheumatoid arthritis, abdominal pain, improves strength and immunity; fever, diarrhea, dysentery and wound healing.

Pharmacological Action: Antiinflammatory, antiarthritic, anthelmintic, hepatoprotective, antispasmodic**,** antidiabetic, antihyperlidemic and antioxidant.

Contraindications: Contraindications have not yet been identified.

Adverse Effects: Not really known.

Precautions: Safety and efficacy in pregnancy and lactation is lacking.

Dosage Forms: Powder, decoction for oral use. Package in well closed, light resistant containers.

Posology: Fresh juice 10 to 20 ml, decoction 50 to 100ml.

Formulations: Prasarani Sandhan, Meharaj, Prasarani Taila.

Pudina

Botanical Name: *Mentha arvensis* Linn.

Family: Lamiaceae

Synonyms

Bangla: পুদিনা (Pudina)

Sanskrit: Putiha, Rocani, Podinakah

Urdu/Unani/Tibb: Pudinchkohi

English: Spear-Mint, Garden Mint

Geographical Descriptions:

Plant Descriptions:

General Description: A small herb of erect habit. Stem short, branched, square and creeping rhizomes. Leaves narrow below stalked, oblong, lanceolate toothed, 3-6 cm long. Small lilac flowers are in whorls.

Fig. *Mentha arvensis* Linn.

Macroscopic Description: Drug consists of small chopped twigs; leaves opposite, decussate, shortly petiolate, petioles 2-mm long; mature leaves 2.5 to 3.5 cm long and 1.5 to 2.0 cm broad, very minutely hairy, ovate, apex acute, coarsely dentate, comparatively smoother and darker upper surface; stem square, minutely hairy, light brown to brown; flowers in loose cylindrical, slender spikes; awl like, throat of calyx naked, corolla smooth; seeds small, mucilaginous; aromatic odour and slightly pungent taste.

Microscopic Description: Transverse section of stem shows quadrangular outline with corner ridges and thin cuticle; epidermal cells tabular, multicellular uniserate trichomes present, cortex 8 to 9 cells deep below ridges, while 2 to 3 cells deep elsewhere, variable in size; endodermis single layer;

pericycle broken, consisting of sclerenchymatous cells; phloem 2 to 4 cells deep and made up of irregular shaped cells; xylem vessels 26 to 46 μ in dia; pith present.

Part Used: Whole plant

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent)
Guna (Attribute)	: Laghu (Heavy), Ruksha (Rough), Tikshana (Sharp)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	:Balya, Dipana, Kaphahara, Mutrala, Vatahara, Rocana

Purity and Safety Test

Total ash	: Not more than 14 % w/w
Acid insoluble	: Not more than 4% w/w
Water soluble extractive	: Not less than 7 % w/w
TLC profile with marker constituents	: T.L.C. of essential oil on silica gel 'G' plate using hexane: ethyl acetate (90:10) shows eight spots at Rf 0.28, 0.33, 0.38, 0.49, 0.55, 0.66, 0.80 and 0.88 on spraying with Vanillin-Sulphuric acid reagent and heating the plate for 15 minutes at 110^{o}C.
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.

Major Chemical Constituents: Major chemical constituent is essential oil (0.2 to 0.8 percent) containing terpene such as carvone (60%) and limonene (10%).

Therapeutic Usages: Dyspepsia, flatulence, gastritis, enteritis, diarrhea, bronchitis, bacillary dysentery, diabetes, diarrhoea, dysmenorrhoea, fevers, hypertension, jaundice, nausea and urinary tract infections.

Pharmacological Action: Antispasmodic, carminative, diuretic, expectorant, sedative, stimulant and stomachic.

Contraindications: Use of decoction is contraindicated in children.

Adverse reactions: Peppermint can cause some side effects including heartburn, and allergic reactions including flushing, headache, and mouth sores.

Warnings: The oil may cause allergic reactions. Large quantities of herb or its active ingredients are not advised for internal use in children.

Dosages: Decoction, ark, oil etc.

Posology: Decoction 5 to 10 ml and oil 1 to 3 drops.

Formulations: Pudinarka, Pudina Syrup.

Rohitaka

Botanical Name: *Aphanamixis polystachya* (Wall.) R.N. Parker

Family: Meliaceae

Synonyms:

Bangla: রয়না (Royna)

Hindi: Rohida

Sanskrit: Rohitakah

Urdu/Unani/Tibb: Brahmi Buti

English: Rohituka tree

Geographical Distribution: It grows throughout all over the country in forest and village thickets.

Plant Descriptions:

General Description: A medium sized, evergreen tree with a dense, spreading, crown. Leaves large, 30-90 cm long, imperipinnate; leaflets 9-15, more or less elliptic or ovate-acuminate, 7.5-22.5 cm long. Male flowers small, in solitary axillary spikes, much shorter than the leaves. Fruits globular, 2.5-3.8 cm diam., yellow when ripe.

Fig. *Aphanamixis polystachya* (Wall.) R.N. Parker

Macroscopic Description: Bark in curved pieces, measuring 5 to 8 mm in thickness; outer surface greyish brown with longitudinal furrows, transverse irregular cracks and vertically elongated lenticels; inner surface smooth, buff to light brown; fracture tough; fractured surface horny; taste and odour indistinct.

Microscopic Description: Bark shows wide cork consisting of rectangular and tangentially elongated cells, rhytidoma present; phelloderm not distinguishable; phloem a wide zone comprising of sieve tubes, companion cells, phloem parenchyma and fibres, being traversed by uniform to multi seriate medullary rays, fibres arranged in tangential rows extending from one medullary ray to another

alternating with bands of ceratenchyma; fibres long, thick walled, lignified with tapering or peg like or bifurcated ends and measure upto 1680 in length; rosettes of calcium oxalate crystals present in a large number of parenchyma cells; occasionally parenchyma cells also contain prismatic crystals of calcium oxalate and circular to oval starch grains measuring 2 to 5 in diameter with hilum like a point in the centre. Powder shows fragments of cells of ceratenchyma, fibres with tapering or peg like or bifurcated ends, parenchyma cells containing prismatic and rosettes of calcium oxalate crystals and starch grains; isolated rosettes and prismatic crystals of calcium oxalate crystal and starch grains.

Part Used: Bark, fruits.

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha Pitta hara, Rakta prasadhana.

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 12.0% w/w
Acid insoluble ash	: Not more than 1.0% w/w
Alcohol soluble extractive	: Not less than 10.0% w/w
Water soluble extractive	: Not less than 15.0% w/w
TLC profile with marker constituents	: T.L.C. of alcoholic extract on precoated silica gel 'G' plate using toluene: ethyl acetate: methanol: acetic acid (4:5:2:0:2) as mobile phase under UV 254 nm shows spots at Rf. 0.15, 0.27 (both blue), 0.56 (light green), 0.62, 0.70, 0.74 and 0.82 (all fluorescent white).
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.

Major Chemical Constituents: Fruit shell contains triterpenes, aphanamixin. Bark contains tetranortriterpene, aphanamixinin. Leaves contain diterpene, alcohol, aphanamixol and ß-sitosterol. Seeds yield a limonoid, rohitukin, polystachin and others, an alkaloid, a glycoside and a saponin.

Therapeutic Usages: Spleen and liver diseases, rheumatism, tumors, abdominal complaints, colds and chest pain.

Pharmacological Action: Antiulcer, antimicrobial, hepatoprotective, analgesic, CNS depressant, ant mutagenic, antiproliferative and antioxidant activities.

Contraindications: There is no absolute contraindication and should be avoided in pregnancy.

Adverse Effects: Not yet known.

Precautions: Not yet known.

Dosage Forms: Crude plant material, powder, and other galenic preparations. Store in a wellclosed glass or metal container, protected from light and moisture.

Posology: Powder 3 to 6 gm and decoction 50 to100 ml.

Formulations: Rohitakarista, Rohitak Louha, Unmadi, Kalameghasav, Saribadyarista.

Sajina

Botanical Name: *Moringa oleifera* Lam.

Family: Moringaceae

Synonyms:

Bangla: সজিনা (Sajina), Sajna, Sajne

Hindi: Shajoma, Mungna

Sanskrit: Shigru, Shobhanjana

Urdu/Unani/Tibb: Sehjan

English: Horse Radish Tree, Drum Stick Tree

Geographical Distribution: It is usually planted all over the country.

Plant Descriptions:

General Description: It is generally considered a small to medium-size tree with long strangling branches. Imparipinnate compound leaves are feathery with green to dark green elliptical leaflets 1–2 cm (0.4–0.8 in) long. Conspicuous, lightly fragrant flowers are borne on inflorescences 10–25 cm (4–10 in) long, and are generally white to cream colored, although they can be tinged with pink in some varieties. The fruits are tri-lobed capsules, and are frequently referred to as pods. Immature pods are green and in some varieties have some reddish color. Pods are brown and dry at maturity and contain 15–20 seeds. Seeds are large with three papery wings. Seed hulls are generally brown to black, but can be white if kernels are of low viability. Viable seeds germinate within 2 weeks. The tree produces a tuberous tap root which helps explain its observed tolerance to drought conditions.

Fig. *Moringa oleifera* Lam

Macroscopic Description: Leaves trip innate compound, available in the form of leaflets and some broken pieces of rachis, slender, thickened, and articulated at the base; leaflet 1.2-2 cm long and 0.5-1 cm wide, entire, elliptic, ovate or obovate, rounded or narrowed at base and obtuse at apex; smooth and greenish-grey to pale green; odor and taste not distinct.

Microscopic Description: Rachis shows single layered epidermis, followed by single layer of pigmented colleen chymatous hypodermis; cortex consisting of 5-10 layered, oval to elliptical, thin

walled, parenchymatous cells; pericycle forming a broken ring, consisting of pericyclic fibres; vascular bundle collateral; pith composed of wide zone of thin-walled, parenchymatous cells; rosette crystals of calcium oxalate present in cortex, pith and phloem parenchyma. Leaflet shows dorsiventral structure; epidermis and unicellular hairs present on both the surfaces; palisade single layered; spongy parenchyma 2-3 layers; central region occupied by a crescent-shaped, collateral vascular bundle surrounded by 2-4 layers of collenchymatous cells; rosette crystals of calcium oxalate present in mesophyll and collenchymatous cells; stomata anornocytic, present on both surface but more on lower surface; palisade ratio 6-11; stomatal index 10-15 stomatal number 100-137 upper surface and 290-350 lower surface per mm square; vein islets number 50-65. Powder shows greyish-green; shows groups of spongy parenchyma, palisade cells; spiral vessels, unicellular hairs with blunt tip; pieces of polyhedral epidermal cells in surface view, stomata and rosette crystals of calcium oxalate.

Part Used: Root bark, stem bark, leaves, fruits and seeds.

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough), Teekshna (Sharp)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kapha Vata hara, Diapana, Krimigna, Caksusya.

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 16.0% w/w
Acid insoluble ash	: Not more than 4.0% w/w
Alcohol soluble extractive	: Not less than 8.0% w/w
Water soluble extractive	: Not less than 22.0% w/w
TLC profile with marker constituents	: T.L.C. of the alcoholic extract on Silica gel 'G' using Toluene: Ethylacetate (9:1) shows under U.V. (366 nm) two fluorescent zones at Rf. 0.06 and 0.52 (both green). On exposure to Iodine vapour seven spots appear at Rf. 0.06, 0.33, 0.43, 0.54, 0.70, 0.78 and 0.87 (all yellow). On spraying with Vanillin-Sulphuric aeid reagent and heating the plate at 105°C for ten minutes six spots appear at Rf. 0.33, 0.43, 0.54, 0.70, 0.78 and 0.87 (all violet).
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.

Major Chemical Constituents: Main chemical components are pterygospermin, moringine, moringinine spirochin, behenic acid, moringic acid, niazinin A & B, niazimicin, campesterol, stigmasterol, beta sitosterol and amino acids.

Therapeutic Usages: Arthritis, stomach disorders, liver disease, eye protection, high blood pressure, anemia, edema, bone health, uroliathiasis, wound healing, healthy hair and skin diseases.

Pharmacological Action: Antioxidants, antiinflammatory, hepatoprotective, antidiabetics, antibacterial, antiallergic, antifungal, immune stimulator, hypolipidemic and antianemic.

Contraindications: Not recommended during pregnancy.

Adverse Effects: May contain a toxic substance that can cause paralysis and death. Used safely in doses up to 6 grams daily for upto 3 weeks. Large quantity may cause stomach upset, abdominal distension and diarrhea.

Precautions: It can be used during pregnancy. Leaves, root bark and flowers are not indicated during pregnancy.

Dosage Forms: Powder, syrup and tinctures. Store the dried flowers in a closed container, protected from light and moisture.

Posology: 1 to 3 gm.

Formulations: Manikya Ras, Darbyadi Taila, Maha Dasamul Taila.

Sarpaganda

Botanical Name: *Rauwolfiae serpentine* Linn.

Family: Apocynaceae

Synonyms:

Bangla: সর্পগন্ধা (Sarpaganda)

Sanskrit: Sarpagandha, Chandrika, Patalguruda

Urdu/Unani/Tibb: Asrel

English: Snake-root

Geographical descriptions: The plant is found in most of the places of Bangladesh found as under growth.

Plant Descriptions:

General Description: A small erect shrub, up to 0.9 m high. Leaves in whorls of 3, 7.5-18 cm long, lanceolate, acute or acuminate, glabrous. Flowers white, in many-flowered irregular corymbose cymes; pedicels and calyx, bright red. Corolla 1-1.3 cm long; tube slender, swollen a little above the middle. Drupes single or didymous, about 6 mm diam, purplish black when ripe.

Fig. *Rauwolfiae serpentine* Linn.

Macroscopic Description: Pieces of roots mostly about 8 to 15 cm long and 0.5 to 2 cm in thickness, subcylindrical, curved, stout, thick and rarely branched; outer surface greyish-yellow to brown with irregular longitudinal fissures; rootlets 0.1mm in dia; fracture, short, slight odour and bitter taste.

Microscopic Description: A transverse section of the root shows externally 2 – 8 alternating strata of cork cells, the strata with larger cells alternating with strata made up of markedly smaller cells. Each stratum composed of smaller cells includes 3–5 tangentially arranged cell layers. In cross-sectional

view, the largest cells of the larger cell group measure 40 – 90 μm radially and up to 75 μm tangentially, while the cells of the smaller group measure 5 – 20 μm radially and up to 75 μm tangentially. The walls are thin. The secondary cortex most densely filled with starch grain. Sclerenchyma cells are absent in root (a distinction from other Rauvolfia species).

Part Used: Root

Organoleptic Properties:

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Ruksha (Rough)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Vata pitta shamak.

Purity and Safety Test

Total ash	: Not more than 10% (2) w/w
Acid insoluble	: Not more than 2.0% (1, 2) w/w
Water soluble extractive	: Not less than 2% (2) w/w
TLC profile with marker constituents	: T.L.C. of the methanol and Ammonia extract of root powder on silica gel 'G' plate using Toluene: Ethyl acetate: Diethylamine (70 : 20: 10) shows eight spot on spraying with Dragendorff reagent at Rf. 0.11, 0.13, 0.25, 0.37, 0.47, 0.51, 0.61 and 0.82 (all reddish brown). The spot at Rf. 0.82 is of reserpine.
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.

Major Chemical Constituents: Roots contain some 50 indole alkaloids including the therapeutically important reserpine, deserpidine, rescinnamine and yohimbine. Some of the other alkaloids are ajmaline, ajmalinine, ajmalicine (δ-yohimbine), serpentine, serpentinine, isoajmaline and neoajmaline. Besides the alkaloids substantial amounts of rutin have been found in the roots (8.3%), stem bark (2.8%) and leaves (1.5%) of this plant. Oleoresin and a sterol, serpasterol, oleic acid and unsaturated alcohols have also been found in this plant. Root also contains 0.22% essential oil with chief terpene constituent serpoterpine.

Therapeutic Usages: Anxiety, schizophrenia, insanity, insomnia, epilepsy, diarrhoea, dysentery, cholera and fever.

Pharmacological Action: Antihypertensive, sedative, tranquilizer, antioxidant, hepatoprotective and anticonvulsant.

Contraindications: Peptic ulcer, sinus node disorders, ulcerative colitis; epilepsy; or decreased renal function; and in patients receiving electroconvulsive therapy. It is also contraindicated in edemas patients.

Adverse reactions: Possible adverse reactions are bradycardia, arrhythmias, water retention with oedema, depression, paradoxical anxiety, nightmares, nervousness, headache, dizziness, drowsiness, purpura, pruritus, rash, dysuria, muscular aches, weight gain, breast engorgement, pseudolactation, impotence or decreased libido, gynaecomastia.

Doseges Form: Powder or decoction. Package in well closed and light resistant containers.

During Pregnancy and lactation: It is not recommended during pregnancy and lactation.

Posology: Powder 200 mg may be given daily in divided doses for 1–3 weeks; maintenance dose is 50 to 300 mg daily.

Formulations: Sarpagandha Ghana bati, Nidrakar Bati, Unmadi.

Satamuli

Botanical Name: *Asparagus racemosus* Wild.

Family: Liliaceae

Synonyms:

Bangla: শতমূলী (Satamuli)

Hindi: Satavari

Sanskrit: Satavari

Urdu/Unani/Tibb: Satawari

English: Asparagus

Geographical Distributions: It is cultivated in all over the country.

Plant Descriptions:

General Description: A tall, much branched, prickly climber with fascicle of fusiform roots. Cladodes 1.3-2.5 cm long, curved, in tufts of 2-6. Flowers small, white, in solitary or fascicled, simple or branched racemes. Berry small and red.

Fig. *Asparagus racemosus* Wild.

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

Microscopic Description: Shows an outer layer of piliferous cells, ruptured at places, composed of small, thin-walled, rectangular asymetrical cells, a number of cells elongated to form unicellular root hairs; cortex comprises of 25 to 29 layers, distinct in two zones, outer and inner cortex; outer cortex consists of 6 or 7 layers, compactly arranged, irregular to polygonal, thick walled, lignified cells; inner cortex comprise of 21 to 23 layers, oval to polygonal, thin-walled, tangentially elongated cells with intercellular spaces; stone cells, either singly or in groups, form a discontinuous to

continuous ring in the upper part of this region; raphides of calcium oxalate also present in this region; 2 or 3 layers of stone cells encircle the endodermis; endodermis composed of thin-walled parenchymatous cells; pericycle present below endodermis; stele ex arch and radial in position; xylem consist of vessels, tracheids and parenchyma; xylem vessels have pitted thickening; phloem patches consists of usual element; pith composed of circular to oval parenchymatous cells, a few cells slightly lignified. Powder is yellowish-cream; fragments of lignified, thick-walled cells; vessels with simple pits, pieces of raphides, numerous, lignified, rectangular elongated' stone cells having clear striations with wide as well as narrow lumen and groups of parenchyma.

Part Used: Tuberous roots.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet), Tikta (Bitter)
Guna (Attribute)	: Guru (Heaviness), Snigdha (Unctuous)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Vatapitta hara, Rasayan, Vrsya

Purity and Safety Test

Foreign matter	: Not more than 1.0% w/w
Total ash	: Not more than 5.0% w/w
Acid insoluble ash	: Not more than 0.5% w/w
Alcohol soluble extractive	: Not less than 10.0% w/w
Water soluble extractive	: Not less than 45.0% w/w
TLC profile with marker constituents	: T.L.C. of alcoholic extract on Silica gel 'G' plate using n-butanol : Acetic acid: Water (4:1:5) v/v shows on exposure to Iodine vapour three spots at Rf. 0.07, 0.50 and 0.67 (all yellow). On spraying with 5% methanolic sulphuric acid reagent and heating the plate for ten minutes at 110 °C four spots appear at Rf. 0.07 (black), 0.41 (grey), 0.50 and 0.83 (both brownish yellow).
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.

Major Chemical Constituents: Steroidal glycosides (asparagosides), bitter glycosides, asparagin and flavonoids. Fresh leaves yield diosgenin and other saponins such as shatavarin I to IV. Flowers and fruits contain glycosides of quercetin, rutin, and hyperoside. Ripe fruit contains cyanidin 3-glycosides. Presence of sitosterol, stigmasterol, their glucosides and sarsasapogenin; two spirostanolic and two furostanolic saponins have been reported in the fruits. Tubers and roots contain saccharine matters and mucilage.

Therapeutic Usages: Hyperacidity, dysentery, diarrhea, sexual debility, infertility in sexes, menopausal symptoms and increases milk secretion during lactation.

Pharmacological Action: Antioxidant, antiulcer, antitussive, adaptogenic, antibacterial, antiprotozoal, anti-inflammatory, aphrodisiac activity, cardiovascular effects, antineoplastic and immunomodulators.

Contraindications: Contraindications have not yet been identified.

Adverse Effects: Symptoms of allergy, including rhinitis, occupational asthma, oral allergic syndrome, allergic contact dermatitis, and anaphylaxis, are well documented.

Precautions: Generally recognized as safe when used as food.

Dosage Forms: Powder or extract for oral use. Package in well closed and light resistant containers.

Posology: Powder 3 to 6 gm, fresh juice 10 to 20 ml, decoction 50 to 100 ml in divided doses.

Formulations: Saribadi Churna, Satamuladi Louha, Laksmi Bilash, Manmathavra Ras, Brahmi Rasayan, Sanjivani Rasayan, Manjisthasav, Brihat Bisnu Taila.

Shapla

Botanical Name: *Nymphaea alba* Linn.

Family: Nymphaeaceae

Synonyms:

Bangla: শাপলা (Shapla)

Hindi: Kui, Kanval, Kokka

Sanskrit: Kumudam, Sitolpalam,

Urdu/Unani/Tibb: Kamal

English: Indian Blue Water Lily

Geographical Descriptions: It grows wild in a perennial aquatic herb, very common in ponds, streams and fresh water lakes and upto 1800.m

Plant Descriptions:

General Description: A large aquatic herb; leaves 15- 30 cm broad, sagittate to cordate, sharply sinuate-toothed, floating, petiode very long. Flowers 5-15 cm across; petals linear or ovate-oblong, white, rose or red. Fruit a globose berry with persistent stamens.

Fig. *Nymphaea alba* Linn.

Macroscopic Descriptions: Flower shows white, solitary, 10-13 cm across; sepals 4, outside greenish to brownish, inside whitish; petals about 10, white; stamens many, outer ones being transformed successively from petals; anthers linear small without appendages; pistil syncarpous, carpels 10-16, sunk in fleshy disk, ovary multicellular and crowned by a large stigma with 16 rays, each with a cylindrical appendages, ovules many, fruit a berry. Powder shows light-brown; shows polygonal, thin-walled epidermal cells in surface view, stellate hairs and spherical or trigonal pollen grains, measuring 11-24 μ in dia.

Part Used: Rhizome, Flower, Seeds, Whole plant

Organoleptic Properties

Rasa (Taste)	:Madhura (Sweet), Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	:Laghu (Light), Picchila (Slimy), Snigdha (Unctuous)
Virya (Potency)	:Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Balya, Hrdya, Pittahara, Stambhana, Vatahar

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 18% w/w
Acid insoluble ash	: Not more than 9.0% w/w
Alcohol soluble extractive	: Not less than 3.0% w/w
Water soluble extractive	: Not more than 20 % w/w
TLC profile with marker constituents	: T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform: Methanol (85: 15) shows under U.V. (366 nm) three fluorescent zones at Rf. 0.66 (red), 0.77 (blue) and 0.88 (blue). On exposure to Iodine vapour three spots appear at Rf. 0.66, 0.92 and 0.96 (all brown). Microbial contamination
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..

Major Chemical Constituents: Roots and rhizomes contain protein, tannic and gallic acids, starch, gum, resin, glucosides and the alkaloids, nupharine and nymphaeine. Leaves contain a flavone glucoside, myricitrin, tannic acid, phytosterin, steroids and flavonoids. Flowers contain a cardiac glycoside,

nymphalin having digitalis-like action. Flowers and rhizome also yield two alkaloids, both showing sedative action in small doses.

Therapeutic Usages: Burning sensation, jaundice, skin diseases, heart diseases and haematemesis.

Pharmacological Action: Antioxidant, antibacterial, analgesic, diuretic, hepatoprotective, sedative and antipyretic.

Contraindications: Contraindication not yet known.

Adverse Effects: It may affects nervous system.

Dosage Forms: Crude drug, fresh juice, powder. Store in a well closed container and protected from light and moisture

Posology: Fresh juice of rhizome 10 to 20 ml, seed powder 3 to 6 gm.

Formulations: Aravindasav, Dravadi Kwath, Ushirasav, Ashokarista.

Sonapata

Botanical Name: *Cassia angustifolia* Vahl.

Family: Fabaceae

Synonyms:

Bangla: সোনাপাতা (Sonapata)

Hindi: Sanaya, Senai

Sanskrit: Swarnapatri

Urdu/Unani/Tibb: Sena, Barg-e-Sana

English: Senna, Cassia Senna

Geographical Distribution: It is not available everywhere of the country but somewhere grows in small extent.

Plant Descriptions:

General Description: A small erect shrub height of about 2 to 3 feet. Its stem is pale green, smooth and erect. The spread out branches possess around 4 to 5 pairs of leaves. These leaves are pale yellowish-green in color, elongated spear shaped with pointed apex, about 1 to 2-inch in length and about 0.2 to 0.3-inch in breadth. The plantar surface is shiny green and dorsal surface is yellowish green. The plant has small yellow flowers. The brown pod contains 5 to 7 seeds that are dark brown in color.

Fig. *Cassia angustifolia* Vahl.

Macroscopic Description: Leaflets, 2.5-6 cm long and 7-15 mm wide at centre, pale yellowish green, elongated lanceolate, slightly asymmetric at base, margins entire, fiat apex acute with a sharp spine, both surfaces smooth with sparse trichomes, odour, faint but distinctive, taste mucilagenous and disagreeable but not distinctly bitter.

Microscopic Description: Transverse section of leaflet through midrib shows an isobilateral structure, epidermal cells, straight walled containing mucilage, both surfaces bear scattered,

unicellular hair, often conical, curved near base, thick-walled, non-lignified, warty cuticle, stomata, paracytic, numerous on both surfaces, mesophyll consists of upper and lower palisade layers with spongy layer in between, palisade cells of upper surface longer than those of lower surface the latter having wavy anticlinal walls, prismatic crystals of calcium oxalate present on larger veins and clusters of calcium oxalate crystals distributed throughout the palisade and spongy tissues, midrib biconvex, bundles of midrib and larger veins, incompletely surrounded by a zone pericyclic fibers and a crystal sheath of parenchymatous cells containing prismatic crystals of calcium oxalate.

Part Used: Dried leaves

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter), Madhura (Sweet)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough), Teekshna (Sharp)
Virya (Potency)	: Ushna (Hot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Pitta shodhaka, Vata anulomaka.

Purity and Safety Test

Foreign matter	: Not more than 1.0% w/w
Total ash	: Not more than 14.0% w/w
Acid insoluble ash	: Not more than 2.0% w/w
Alcohol soluble extractive	: Not less than 3.0% w/w
Water soluble extractive	: Not less than 25.0% w/w
TLC profile with marker constituents	: Chromatography was performed on 20 cm x 20 cm aluminium foil plates coated with 0.2 mm thickness silica gel 60 F 254 HPTLC layers. The standard and samples were applied on the plates as 8 mm wide bands. The space between two spots was made 6 mm (10 mm from the bottom and 10 mm from the sides) by means of an automated TLC sample applicator under a flow of nitrogen gas providing delivery speed 150 µL/s from the syringe using Camag Linomat 5 automated TLC applicator (ATS5) . 10 µl of the solution were spotted on the plate. After development, the plates were removed from the chamber, dried in air for 5 min and spots were visualized under UV light using a Camag UV viewer cabinet. The Rf of 0.52 and 0.32 showed the presence of sennoside A and B, respectively in all samples. The identification of sennosides A and B was confirmed by superimposing the UV spectra of samples and standards within the same Rf window.

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.

Major Chemical Constituents: It contains a family of hydroxyanthracene glycosides, the most plentiful of which are sennosides A and B. There are also small amounts of aloeemodin and rhein 8-glucosides, mucilage, flavonoids, and naphthalene precursors.

Therapeutic Usages: Constipation, indigestion, anemia, dysentery, hemorrhoids, jaundice, fever, bronchitis, skin diseases, ringworms and wound healing.

Pharmacological Action: Hepatoprotective, anti inflammatory, antipyretic, anthelmintic, antimicrobial, antidiabetic, wound healing, hypochoesteremic and immunomodulators.

Contraindications: Contraindicated in intestinal obstruction, ulcerative colitis, appendicitis, and crohn's disease. Not recommended for children younger than 2 years of age.

Adverse Effects: May cause diarrhea, loss of fluids, hypokalemia and abdominal pain or cramping. The longterm use may result in reversible finger clubbing, cachexia and dependency on the laxative.

Precautions: Use of this drug known to deplete potassium such as diuretics, should be limited or avoided. Because sonapata may cause diarrhea, caution is warranted in patients receiving warfarin, because diarrhea can reduce the absorption of vitamin K and increase the risk of bleeding.

Dosage Forms: Crude plant material, powder, oral infusion and extracts.

Posology: 500 mg to 2 gm of the powder of leaf or pod.

Formulations: Ananatadi Kwath, Harritaki Khanda, Saribadi, Saribadyasav, Harritaki Khanda.

Susnishak

Botanical Name: *Marsilea quadrifolia* Linn.

Family: Marsiliaceae

Synonyms:

Bangla: শুষনী শাক (Susnishak)

Hindi: Caupatiya, Sunsuniya

Sanskrit: Sunishanna, Chatuspatri

Urdu/Unani: Chatuspatri

English: Water clover

Geographical Descriptions: It grows follow land in Bangladesh

Plant Descriptions:

General Description: A creeping perennial herb with slender long dichotomously branching rhizome; rooting at the nodes. Leaves quadrifoliate, circinate, when young, petioles long, slender, flexible, lamina divided into four leaflets, sporocarps are bean like, born on short or long stalks inserted a short distance above the base of the petiole.

Fig. *Marsilea quadrifolia* Linn.

Part Used: Whole plant

Organoleptic Properties

Rasa (Taste)	: Madhura (sweet), Kasaya (Astringent)
Guna (Attribute)	: Guru (Heavy), Snigdha (Unctuous)
Virya (Potency)	: Sita (cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Pittanashak

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 18% w/w
Acid insoluble ash	: Not more than 9.0% w/w
Alcohol soluble extractive	: Not less than 3.0% w/w
Water soluble extractive	: Not more 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 0.3 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.

Major Chemical Constituents: Sugars, tannins, phenolics compounds, flavonoids, alkaloids and phytosterols.

Therapeutic Usages: Cough, bronchitis, diabetes, psychiatric diseases, eye diseases, diarrhea and skin diseases.

Pharmacological Action: Antioxidant, antiinflammatory, diuretic, depurative, hepatoprotective, sedative and antipyretic.

Contraindications: Contraindication not yet known.

Adverse Effects: It may affects nervous system.

Dosage forms: Crude drug, fresh juice, powder. Store in a closed container and protected from light and moisture.

Posology: Fresh juice of rhizome 10 to 20 ml, seed powder 3 to 6 gm.

Sweta Chandan

Botanical Name: *Santalum album*

Family: Santalaceae

Synonyms:

Bangla: শ্বেতচন্দন Sweta Chandan

Sanskrit: Svetacandana

Urdu/Unani/Tibb: Sandal Safed

English: Sandal Wood

Geographical Descriptions: Very rarely it is seen in some forest of Bangladesh.

Plant Descriptions:

General Description: An evergreen, semi parasitic tree, 8 to 18 m in height and 2 to 4 m in girth.

Fig. *Santalum album*

Macroscopic Description: Color is yellowish-brown to pale-reddish orange and wood is heavy, dense, hard but split easily; transversely smooth surface shows alternating light and dark concentric zones with numerous pores, traversed by very fine medullary rays; odour, persistently aromatic; taste, slightly bitter.

Microscopic Description: Wood consists of tracheids, vessels, fibres, xylem parenchyma and traversed by medullary rays; vessels numerous scattered singly throughout the region, rarely two together, barrel-shaped, pitted and with transverse to oblique pen oration with tail-like projections, at one or both ends; a few tracheids elongated with tapering ends and possess bordered pits on their walls; fibres many, lignified with pointed tips; xylem parenchyma mostly rectangular, a few of them contain prismatic crystals of calcium oxalate; xylem rays numerous, run straight, uni to triseriate,

mostly biseriate, thickwalled, radially elongated having golden yellow to brownish contents and contain a few prismatic crystals of calcium oxalate.

Part Used: Wood

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter), Madhura (Sweet)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Hrdya, Krmighna, Kaphahara, Pittahara, Varya, Vasghna, Durgandhahara.

Purity and Safety Test

Total ash	: Not more than 1% w/w
Acid insoluble	: Not more than 0.2% w/w
Water soluble extractive	: Not less than 1% w/w
TLC profile with marker constituents	: T.L.C. of the alcoholic extract on silica gel 'G' plate using Toluene: Ethylacetate (93 : 7) shows on exposure to Iodine vapour six spots at Rf 0.05, 0.10, 0.27 (all yellowish brown), 0.60 (dark brown), 0.82 and 0.91 (both yellowish brown). On spraying with Anisaldehyde-Sulphuric acid reagent- and heating the plate for about ten minutes at 1I0·C six spots appear at Rf. 0.05, 0.10, 0.27 (all bluish violet), 0.60 (violet), 0.82 and 0.91 (both bluish violet).
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.

Major Chemical Constituents: The most prominent compounds were palmitic and oleic acids, representing about 40-70% of the total oil. Many fragrant constituents and biologically active components, such as alpha- and beta-santalol, cedrol, esters, aldehydes, phytosterols, and squalene were present in the pericarp oils.

Therapeutic Usages: Common colds, burns, headaches, bronchitis, fever, urinary tract infection, inflammation of the mouth and pharynx, liver and gallbladder complaints.

Pharmacological Action: Antipyretic, diuretic, expectorant, stimulant, expectorant, carminative, antispasmodic and aphrodisiac.

Contraindications: Known of allergy or hypersensitivity to sandalwood.

Adverse reactions: There is no available information.

Posology: Powder 3 to 4 gm in divided dose per day, decoction 50 to 100 ml in divided dose. Oil 5 to10 drops, in divided dose per day.

Formulations: Chandanadi Churna, Ushiradi Churna, Chandanasav, Shrikhandasav, Mehabajra Rasayan Asvagandhadyarista.

Talmakhna

Botanical Name: *Hygrophila auriculata* (Schum) Heyne.

Family: Acanthaceae

Synonyms

Bangla: তালমাখনা (Talmakhna)

Sanskrit: Kokilaksha, Ikshura, Talimakhana

Urdu/Unani/Tibb: Taalmakhaanaa.

English: Starthorn

Geographical Descriptions: It is available in Wet-lands in different parts of the country.

Plant Descriptions:

General Description: A stout herb with numerous fasciculate usually unbranched, subquadrangular, erect, stems, 0.6-1.5 m high, thickened at the nodes. Leaves oblong-lanceolate or oblanceolate, sparsely hispid on both sides, six at a node, the outer 2 large, reaching 15 cm long, each leaf bear straight, sharp, yellow, spines in its axil. Flowers purple-blue, 3.5 cm long, in a whorl of 8 at each node. Capsuls 8 mm long, linear-oblong, pointed.

Fig. *Hygrophila Auriculata* (Schum) Heyne.

Macroscopic Description: Samples of the root vary in size as well as in thickness. The thin pieces of the root are usually 2-4 mm in diameter with brownish exterior. The stem is white and tomentose in young stages. The lower surface of the leaf is entirely covered with hair, which gives the leaf a

silvery soft wooly appearance; the upper surface is green, glabrous and shows the markings of nerves by slight depressions.

Microscopic Description: The root shows an epidermis composed of small cubical parenchymatous cells. The mature root possesses a narrow periderm of 6 - 8 layers of cork cells, a single layer of phellogen and 10-12 layers of phelloderm cells. The young stem microscopically, shows nonglandular hairs, which are uniseriate, multicellular and usually 3-celled. Resin canals are distributed throughout the cortex. The transverse section of the leaf near the apex shows a prominent ridged midrib on the lower surface and a small groove on the upper surface, while a section through the basal region presents a small ridge on the upper side as well.

Part Used: Root, stem and seed.

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter), Kasaya (Astringent)
Guna (Attribute)	: Laghu (Light), Snighda (Unctuous)
Virya (Potency)	: Usna (Hot)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Vatakaphahara, sukravardhaka, vrsya, balya, rasayana, Medhya, swarakantikara

Purity and Safety Test

Total ash	: Not more than 2% w/w
Acid insoluble	: Not more than 0.5% w/w
Water soluble extractive	: Not less than 5% w/w
TLC profile with marker constituents	: Thin layer chromatography of the petroleum ether, chloroform, alcoholic and aqueous extracts was carried out using Toluene: Ethyl acetate, Toluene: Diethylether: Cyclohexane, Toluene: Ethyl acetate: Pyridine and Methanol: Chloroform: Pyridine as mobile phase respectively and the Rf values were recorded. The results of Rf value in response to number of spots and solvent are 0.13, 0.54, 0.63, 0.89; 0.40, 0.58, 0.66, 0.74; 0.08, 0.44, 0.53, 0.75, 0.89; 0.37, 0.67 respectively and ensure the presence of marker constiturents.
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.

Major Chemical Constituents: Aerial parts contain alkaloids, phytosterol, essential oil, mucilage, triterpene alcohol, lupeol, stigmasterol and hydrocarbons. Seeds contain fixed oil, enzymes and sterol. Asterol I, II, III and IV and asteracanthine & asteracanthicine have also been isolated form the seeds. Flowers contain apigenin glucuronide. Roots contain an essential oil. Palmitic, stearic, oleic and linoleic 80.1%) acids have been detected in seed oil.

Therapeutic Usages: Rheumatism, urinary tract infection, inflammation, jaundice, hepatic obstruction and pain.

Pharmacological Action: Antitumor, antioxidant, hepatoprotective, hypoglycemic, haematinic, diuretic, free radical scavenging, anthelmintic, antiinflammatory, antipyretic, anabolic and androgenic activities.

Contraindications: It is contraindicated in severe renal disease, hyponatrimia, and hypoglycaemia and concomittent use of antihypertensive and hypoglycaemic medication.

Adverse reactions: A few of the ergoline alkaloids reported in this plant are hallucinogic.

During Pregnancy and lactation: Women should not use seed because it may lead to uterine bleeding and muscle contractions in the uterus, which could cause miscarriage.

Dosages: Powder: 3 to 6 gm per day.

Formulations: Punarnavadi Kashayam

Telakucha

Botanical Name: *Coccinia indica* W. & A.

Family: Cucurbitaceae

Synonyms:

Bangla: তেলাকুচা (Telakucha)

Hindi: Kundaruki-Bel

Sanskrit: Bimbi, Tundika

Urdu/Unani/Tibb: Kunduru

English: Ivy-Gourd

Geographical Descriptions: It grows throughout the country.

Plant Descriptions:

General Description: It is an aggressive climbing vine that can spread quickly over trees, shrubs, fences and other supports. The stem is a herbaceous climber or perennial slender climber with occasional adventitious roots forming where the stem runs along the ground. The tendrils are long, elastic with coil-like springy character that can wrap around the host to the entire length. The leaves are classified as palmately simple with five lobes while the shape varies from the heart to pentagon form. The size of the leaves is approximately 5 10 cm in width and length. The flower is large and white about 4 cm in diameter and contains five long tubular petals. The ivy gourd fruit belongs to the berry type: oval and hairless with thick and sticky skin. The raw fruit is green in color and turns bright red when it is ripe. The mature fruit is usually from 25 to 60 mm long by 15-35 mm in diameter.

Fig. *Coccinia indica* W. & A.

Macroscopic Descriptions: Root available in cut pieces with a few lateral roots, surface rough due to longitudinal striations and lenticels, cylindrical, 0.5 -2.5 cm in dia., greyish-brown. Stem is slender, soft, 0.3-1.5 cm in dia., branched, longitudinally grooved, glabrous, nodes swollen, whitish dots over external surface, a few tendrils attached with nodes, greyish coloured externally and cream to light yellow internally, fracture, fibrous; no odour and taste. Leaf is petiolate, petiole cylindrical, simple 2-3.2 cm long, 3.8-9 cm or rarely 10 cm long, palmately lobed, with 3 to 5 lobes or angles, lobes broad, obtuse or acute, more or less sinuate, occasionally constricted at the base, often with circular patches of glands between nerves; lamina bright green above, paler beneath, surface studded and sometimes rough with papillae. Flower is ebracteate, pedicellate, incomplete, unisexual, actinomorphic, pentamerous. Male flower pedicel 2-3.8 cm long, subfiliform, calyx tube glabrous, broadly campanulate, 4.5 mm long linear; corolla 2.5 cm long, white, veined, pubescent inside, glabrous outside, segments 4.5 -7.5 mm long, triangular, acute, staminal column glabrous, capitulum of anthers subglobose; Female flower pedicel 1.3 - 2.5 cm long, calyx and corolla as in male flowers; staminodes 3, subulate, 3 mm long, ovary fusiform, glabrous, slightly ribbed, stigma 3, bifid. Fruit is a pepo, ovoid, glabrous, 3.5 - 4.5 cm long and 1.5-2 cm thick, greenish-brown to yellowish-brown with white linings; no odour and taste. Seed somewhat obovoid, 0.7 cm long and 0.2-0.3 cm wide rounded at apex, much compressed, yellowish-grey.

Microscopic Descriptions: Root shows 7 or more rows of thin-walled cork cells having lenticels at places; secondary cortex 4-7 layered, oval to elliptical, tangentially elongated, thin-walled, parenchymatous cells having groups of oval to rectangular, elongated stone cells in lower region; secondary phloem composed of usual elements; phloem fibres absent; secondary xylem consists of usual elements; vessels mostly solitary with simple pits; tracheids simple pitted; fibres simple pitted with pointed tips and arranged around the vessels; medullary rays 6-10 or more cells wide; starch grains abundant, simple, round to oval, measuring 3-11 μ in dia., and compound having 2-4 components present in secondary cortex, phloem and xylem parenchyma and ray cells. Leaf shows single layered epidermis, consisting of flattened, tangentially elongated cells, covered externally with, striated cuticle; cortex differentiated into 2-5 layered collenchyma and 2-6 layered circular, thin-walled, parenchymatous cells with conspicuous intercellular spaces; vascular bundles bicollateral, arranged in a single ring, usually nine, seven larger and two smaller, traversed by wide parenchymatous cells of medullary rays; some bundles capped by one or two layered, thick-walled, lignified, polygonal pericyclic sclerenchyma; centre occupied by very wide pith composed of large isodiametric parenchymatous cells. Midrib is single layered epidermis, on either side, externally covered with striated cuticle, followed by 1-3 layers of well developed collenchyma on the dorsal side and 3-5 layers on the ventral side; vascular bundles, bicollateral, three, ventral larger and two dorsal

smaller; layers of collenchymatous cells gradually reduce to 2 or 3 towards dorsal side, 1 or 2 on ventral side and ultimately towards apex of leaf, collenchyma reduces to 1 layer on ventral side and 2 layers on dorsal side; parenchyma 2-3 layered on both sides; vascular bundles single, semicircular; vessels arranged in radial rows. Lamina dorsiventral structure with single layered upper and lower epidermis, externally covered with striated cuticles; epidermal cells show almost straight walls and anomocytic stomata in surface view; below upper epidermis palisade single layered; spongy parenchyma represented by 3-6 layers of loosely arranged cells, a number of veins surrounded by parenchyma, present in mesophyll. Fruit is epicarp single layered; mesocarp composed of a wide zone of thin-walled parenchymatous cells differentiated into two regions, outer 5-6 layers rectangular to polygonal, smaller in size, while inner region composed of oval to polygonal cells of larger size; a few fibro-vascular bundles present in this region. Seed show ridges and furrows at a few places, more prominent at lateral sides, and consisting of oval to polygonal, thin-walled parenchymatous cells, upper most layer forms radially elongated thin-walled colourless cells; tegmen consists of single layered radially elongated, thin walled, lignified cells, followed by a layer of thin-walled, collapsed parenchymatous cells; a few starch grains 3-6 μ in dia. scattered in this region; embryo consists of hexagonal to polygonal, thin-walled cells having a few oil globules.

Part Used: Flower, seed, fruit bark etc.

Organoleptic Properties

Rasa (Taste)	: Madhura (Sweet), Tikta (Bitter)
Guna (Attribute)	: Guru (Heaviness), Ruksha (Rough)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Vata hara, Pittahara, Lekhana etc.

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 21.0% w/w
Acid insoluble ash	: Not more than 2.0% w/w
Alcohol soluble extractive	: Not less than 3.0% w/w
Water soluble extractive	: Not less than 14.0% w/w
TLC profile with marker constituents	: T.L.C. of the alcoholic extract on Silica gel 'G' plate using Chloroform: Methanol: Ammonia (90:18:2) shows under UV (366 nm) three fluorescent zones at Rf. 0.23 (blue), 0.47 (red) and 0.61 (blue). On spraying with Dragendorff reagent one spot appears at Rf. 0.38 (orange).
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.

Major Chemical Constituents: Roots contain resins, certain alkaloids, starch, glucose, gum fatty acids, carbonic acid, and ash that constitute about 16%. Besides these contains minerals like calcium, iron and phosphorus.

Therapeutic Usages: Diabetes, stomatitis, indigestion, liver diseases, dysentery, jaundice, blood disorders, cough, cold, asthma, urinary tract infections and gonorrhea.

Pharmacological Action: Hypoglycemic, antioxidant, antipyretic, hepatoprotective, hyolipideamic, antiinflammatory, antibacterial and antifungal.

Contraindications: Not to be used during pregnancy, lactation and for children.

Adverse Effects: No toxic effect was seen human body.

Precautions: Possibly safe for pregnant and breast feeding women. Juice can slightly lower the blood pressure.

Dosage Forms: Juice of root, leaves**,** fruit stem.

Posology: Fresh juice 10 to 20 ml.

Formulations: Jambadyarista, Saribadyarista, Amritaprash Ghrita.

Thankuni

Botanical Name: *Centella asiatica* Linn.

Family: Apiaceae

Synonyms:

Bangla: থানকুনি (Thankuni)

Hindi: Brahma Manduki, Brahmi

Sanskrit: Mandukaparni

Urdu/Unani/Tibb: Brahmi Buti

English: Indian Pennywort

Geographical Distributions: It grows throughout the Bangladesh in damp places.

Plant Descriptions:

General Description: A slender creeping herb. Leaves with long petiole, 1-3 from each node of the stems, lamina 1.3-6.3 cm diam., orbicular-reniform, rather broader than long, shallowly crenate. Flowers in fascicled umbel, consisting of 3-4 pink, small, sessile flowers. Fruit 4 mm, ovoid, hard, flat.

Fig. *Centella asiatica* Linn.

Macroscopic Description: Small creeping herb with slender stem, rooting at nodes giving rise to thin, brownish-grey, roots of about 2.5 to 6.0 cm in length; leaves 1 to 3 from each node, orbicular-

reniform, crenate, base cordate, petioles channelled with adnate stipules; flowers fascicled umbels each carrying 3 or 4 flowers, short stalked; fruits cremocarp, ovoid, with laterally compressed seeds.

Microscopic Description: Greyish green with stomata on both surfaces of the leaf, 30 by 28μm, mostly rubiaceous type. Palisade cells differentiated into 2 layers of cells, 45 by 25μm; spongy parenchyma of about 3 layers of cells with many intercellular spaces, some with crystals of calcium oxalate; midrib region shows 2 or 3 layers of parenchymatous cells without chloroplastids; petiole shows epidermis with thickened inner walls; collenchyma of 2 or 3 layers of cells; a broad zone of parenchyma; 7 vascular bundles within parenchymatous zone, 2 in projecting arms and 5 forming the central strand; vessels 15–23μm in diameter. Some parenchymatous cells contain crystals of calcium oxalate. Fruits, epidermis of polygonal cells, trichomes similar to the leaves, sheets of elongated parquetry layer cells, bundles of narrow annular vessels, and parenchymatous cells contain single large prisms of calcium oxalate.

Part Used: Whole plant.

Organoleptic Properties

Rasa (Taste)	: Tikta (Bitter)
Guna (Attribute)	: Laghu (Light)
Virya (Potency)	: Sita (Cold)
Vipaka (Metabolism)	: Madhura (Sweet)
Karma (Action)	: Kapha Pitta hara, Medhya, Vayahstahapana

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 17.0% w/w
Acid insoluble ash	: Not more than 5.0% w/w
Alcohol soluble extractive	: Not less than 9.0% w/w
Water soluble extractive	: Not less than 20.0% w/w
TLC profile with marker constituents	: T.L.C was carried out to isolate the principle components that were present in most effective extracts of plant. The different solvent systems of different polarities were prepared and TLC studies were carried out to select the solvent system capable of showing better resolution. The developed TLC plates were air dried and observed under ultra violet light UV at both 254 nm and 366 nm. They were later sprayed with different spraying reagents and some were placed in hot air oven for 1 min for the development of color in separated bands. The movement of the analyze was expressed by its retention factor. The (Rf). values 0.68, 0.18, 0.38 and 0.35 showed the presence of Alkaloid, Flavonoid, Saponin and Terpenoid.

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.

Major Chemical Constituents: Major bioactive constituents are pentacyclic triterpenoid saponins (1–8%). The main saponines are asiaticoside (ester of the asiatic acid and a trisaccharide) and madecasoside (ester of the madecassic acid and a trisaccharide). The trisaccahride chain is formed by a rhamnose and two glucoses. Other minor saponines are centelloside, bramoside, braminoside and centellosaponines B, C and D.

Therapeutic Usages: Improves appetite, peptic ulcer, voice and memory; cures dysentery, haemorroids, leucoderma, urinary discharges, bronchitis, fevers, convulsive disorders, insanity and syphilitic skin diseases.

Pharmacological Action: Antioxidant, anti ulcerative, antiinflammatory, antimicrobial, antineoplastic, anxiolytic; antialzheimer's, neuroprotective, vascular and wound healing effects.

Contraindications: Should avoid if hypersensitive.

Adverse Effects: Side effects are rare but may include skin allergy and burning sensations with external use, headache, stomach upset, nausea, dizziness and extreme drowsiness incase of internal use.

Precautions: May cause possible skin carcinogen in rodents after repeated topical application.

Dosage Forms: Dried drug for infusion. Powder or extract (liquid or ointment) for topical application.

Posology: Powder 3 to 6 gm, juice extracts 10 to 30 ml.

Formulations: Thankuni Churna, Kshudhabarti Gudika, Jamdadyarista.

Ulatkambal

Botanical Name: *Abroma augusta* Linn F

Family: Sterculiaceae

Synonyms:

Bangla: উলটকম্বল (Ulatkambal)

Hindi: Ulat Kambal

Sanskrit: Pisacha karpus, Pivari, Ritumati, Ucchat, Yonipushpa

Urdu/Unani: Ulat kambal

English: Devil's cotton

Geographical Distribution: It grows wild in waste places throughout the country, particularly in Chittagong and Chittagong Hill Tracts, and occasionally planted in gardens.

Plant Descriptions:

General Description*:* It is a large shrub. Leaves large, 10-15 by 10-12.5 cm, repand-denticulate, upper smaller, narrower, entire. Flowers solitary, axillary, pendulous, peduncle up to 4 cm long; sepals 2.5 cm, lanceolate; petals scarcely exceeding the sepals, dark red.

Fig. *Abroma augusta* Linn F

Macroscopic Description: Leaves alternate, simple, highly variable but two main forms exist (heterophylly): lobed (often on orthotropic branches) or unlobed (often on plagiotropic branches); lobed form with petiole up to 40 cm long, blade 3–5 lobed, cordate-ovate in outline, up to 30–40 cm ×

30–40 cm, base palmately 3–7-veined, margin irregularly dentate; unlobed form with petiole up to 1.5 cm long, blade lanceolate, 10–23 cm × 9–12 cm, cordate at base, margin denticulate, palmate-pinnately veined. Inflorescence a leaf-opposed or terminal 1(–4) flowered cyme; peduncle 1–3 cm long; bracts 6–8 mm long. Flowers bisexual, pendent, 3–5 cm in diameter, 5-merous; bracteoles 2, pedicel 1–3.5 cm long, articulate; calyx deeply divided into 5 lobes, lobes entire, triangular, 15–20 mm × 6 mm, greenish; petals 5, spoon-shaped, 2–3.5 cm ×1 cm, base concave and white, blade dark purple, red or yellow, ciliate; staminal tube short, apically with 5 fascicles of anthers alternating with 5 petal-like staminodes, each fascicle with 3 (–4) anthers; ovary superior, 2–3 mm long, 5-lobed, 5-celled, style 1–2.5 mm long, with 5 branches. Fruit an obconical capsule 4–5 cm × 3–4 cm, base rounded, top truncate, 5-winged and angled, sometimes beaked, enveloped by the slightly enlarged calyx, densely prickly hairy, apical portion loculicidal, lateral parts septicidally dehiscent, with numerous seeds. Seed cylindrical to obovoid, 3–4 mm × 2 mm, without wings or aril, black. Seedling with epigeal germination.

Microscopic Description: The fiber is located in the secondary phloem. The fibre content of fresh, defoliated stems is 4–8 %. The ultimate fibre cells are 2–3 mm long and 12–20μm wide, with the lumen diameter being about one third of the total diameter. The ends of the ultimate fibre cells are tapered and sometimes forked. The fibre contains 75–78% cellulose and c. 7% lignin. The extracted fibres, consisting of connected ultimate fibre cells, are 0.5–2.5 m long. Properly prepared fibre is fine, creamy white to golden brown, lustrous, rather silky in appearance, strong and supple

Part Used: Root/ root bark.

Organoleptic Properties

Rasa (Taste)	: Katu (Pungent), Tikta (Bitter)
Guna (Attribute)	: Laghu (Light), Ruksha (Rough)
Virya (Potency)	: Ushna Hhot)
Vipaka (Metabolism)	: Katu (Pungent)
Karma (Action)	: Kastavrata, Yoniroga, Rajadusti.

Purity and Safety Test

Foreign matter	: Not more than 2.0% w/w
Total ash	: Not more than 11.0% w/w
Acid insoluble ash	: Not more than 2.0% w/w
Water soluble extractive	: Not more than 18% w/w
TLC profile with marker constituents	: For compound separation using thin layer chromatography (TLC), 100 µl of plant extract was spotted onto the heat activated TLC plate made in the laboratory. Different solvent systems were used as mobile phase and finally ethylacetate: n-hexane (2:1) was selected and used on the basis of best separation obtained. After separation, TLC plate was undertaken

to various phytochemical tests using spray technique and the presence of polyphenolic compound in one bioactive fraction was confirmed by treating the fraction with FeCl3 which turned the color of compounds to black.

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.

Major Chemical Constituents: Leaves contain taraxerol, its acetate and β-sitosterol. Stem bark contains friedelin and β-sitosterol. Root and root bark contain gum, fixed oil, resin, alkaloids, abromine, choline and betaine, β-sitosterol, stigmasterol, digitonide, magenesium salts of hydroxyl acids and polysaccharide. Seeds contain 20.2% fixed oil with 71.5% linoleic acid. Augustic acid an oleanane derivative and a stigmasterol glycoside have been isolated from the roots.

Therapeutic Usages: Menstruation disorders, gonorrhea, diabetes, skin problems, infertility and aphrodisiac.

Pharmacological Action: Hypoglycemic, hypolipidemic, antibacterial, antifungal, cytotoxic, antiinflammatory, antimicrobial and wound healing.

Contraindications: It is best to avoid its usage during pregnancy.

Adverse Effects: No documentations**.**

Precautions: Should not use long time.

Dosage Forms: Powder or extract for oral use. Package in well closed and light resistant containers.

Posology: Powder: 1 to 3 gm; fresh juice 5 to 10 ml.

APPENDIX I

PRINCIPAL FORMS OF AYURVEDIC (VEGETABLE) MEDICATION AND METHODS OF THEIR PREPARATION AND USES IN BRIEF

"Ayurvedic Vegetable 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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