

Economic Botany

MEDICINAL PLANTS

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MEDICINAL PLANTS

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The history of medicinal plants is intimately connected with the history of civilization. Records of early civilization in all parts of the world reveal that a considerable number of drugs used in modern medicine were in use even in ancient times. The use of plants for curing various human ailments figured in ancient manuscripts such as 'The Bible', 'The Rig-Vedas'.

In India, the Ayurvedic system of medicine has been in use for over three thousand years. The '**Charaka Samhita**' and the '**Susruta Samhita**' are two of the earliest Indian esteemed treatise on Indian medicinal plants even today. The Greeks and Romans scholars like Hippocrates (460-370 B.C.), Aristotle (384-322 B.C.), Theophrastus (370-287 B.C.), Pliny the Elder (A.D. 23-79), Dioscorides (A.D. 50-100) and Galan (A.D. 131-201) wrote extensively about medicinal herbs, giving their names along with a description of each plant, illustrations, their putative healing properties and also complex descriptions for the preparation of medicines. Hippocrates, the '**Father of Medicine**', was the first to attempt a scientific explanation for diseases. Dioscorides treatise on medicinal plants '**De Materia Medica**' remained the supreme authority for over sixteen centuries.

The information on drugs and drug plants whose efficacy in medicine has been established is available in various authentic books known as '**pharmacopoeia**' and the drugs included therein are described as '**official**'. The most important of these pharmacopoeia are the '**United States Pharmacopoeia**', '**British Pharmaceutical Codex**'; '**Indian Pharmaceutical Codex**' and '**National Formulary**'. These works are constantly being revised and kept up-to-date.

The medicinal properties of drugs is due to the presence of substances such as alkaloids, glycosides, resins, volatile oils, gums, tannins, etc. Some of these are powerful poisons if administered indiscriminately, while others are dangerously habit-forming. Even the most dangerous drugs can be of value to human beings, if judiciously employed. The active principles of plant drugs are commonly more concentrated in storage organs. Roots, seeds, bark and leaves are much represented in the Materia Medica, flowers are less commonly used, while woods and woody parts are usually relatively inert.

There is no man on this earth who is incompetent and there is no plant which is of no medicinal use. Where every thing is present, in fact, a man to manage them properly is seldom available."

Development of synthetic drugs reduced the importance of medicinal plants. In the last few decades, however, interest in medicinal plants has increased considerably because of the success with the antibiotics, and other plant drugs such as '**rauwolfia**' (for the treatment of mental diseases), '**podophyllum**' (a cathartic, as well as for curing cancerous tumors in mice), aloe (a cathartic, as well as for the treatment of atomic radiation burn) and '**veratrum**' (hypertensive agent). Saponinins (from plants of Dioscoreaceae and Agavaceae) can be converted into

testosterone (male hormones) progesterone & estrogen (female hormones). Sapogenins are used in contraceptive pills.

India, being the treasure-house of biodiversity with its diverse ecological conditions, rich ethnic diversity and a strong traditional knowledge base, accounts for 45,000 plant species, out of which more than 8,000 species are used in some 10,000 herbal drug formulations. Ninety percent of the herbal industry's requirement is taken out from the forests, resulting into their destruction. Due to this reason many species have become endangered. There is urgent need to conserve our precious biowealth for sustainable utilization. Our knowledge about the aforesaid is still inadequate and needs further extensive and intensive investigations, so as to have full spectrum at hand. For this more elaborate and research-oriented informations are aptly required.

In spite of having strong traditional knowledge base and rich biodiversity, India has an insignificant share in the International Herbal Trade. Two possible reasons for this situation are: firstly, we have broken the chain by not doing advanced researches using the latest technologies on existing information's on herbal sciences in the past and secondly, we forgot to have a sustainable development of plant resources.

There are a number of well established indigenous or traditional systems like Ayurveda, Unani, Siddha, Homeopathy, Tibetan and Naturopathy that are practiced along with the modern medicine to provide the total healthcare system. In all these systems, a large number of plant drugs are used. In India, medicinal plants are an essential part of traditional healthcare systems as these are accessible and affordable. Medicinal plants are among the most important 'Non-Timber Forest Produce' in India. As per the WHO, 80% population in developing countries relies on traditional natural medicines, and almost 80% of the traditional medicines involve the use of plant extracts.

NUTRACEUTICAL – FOOD OR MEDICINE

Stephen De Felice (1979) coined the term 'nutraceuticals' for any product (other than tobacco) that contains vitamins, minerals, amino acids of herbs which is intended as supplement to the normal diet'.

The Nutraceuticals are also known as functional food. These include foods, food ingredients or dietary supplements that demonstrate specific health or medical benefits, including the prevention and treatment of diseases beyond basic nutritional functions.

Food labelling regulations do not allow food labels to carry health claims in many countries. This makes it hard for companies marketing nutraceuticals to advertise the benefits of other products without a medical licence.

TYPES OF NUTRACEUTICALS

- ◆ Dietary supplements and vitamin products.
- ◆ Herbal and botanical products.
- ◆ Foods for vitality, functional food, medical foods.
- ◆ Health food, organic food, dietetic food.
- ◆ Sport and energy products.
- ◆ Natural cosmetics and body treatment products.
- ◆ Natural medicinal products with specific health benefits.
- ◆ Nutraceutical antioxidants.
- ◆ Vitamins (Vitamin C and Vitamin E)

- ◆ Carotenoids (Beta Carotene and Lycopene)
- ◆ Thiols (Alpha Lipoic Acid and Glutathione)
- ◆ Enzymes (Co-enzyme Q-10 and Superoxide)
- ◆ Dismastase (SOD)
- ◆ Minerals (Selenium, Chromium) etc.

These cover a large variety of product ranging from engineered grains to simple candy bars or cereals supplemented with vitamins or minerals and even beverages. In Japan, a vitamin C enhanced cola is enjoying wide popularity. Tomato and its products (e.g. ketchup, juices, soups and sauces) are the principal source of lycopene and β -carotene, which have been shown to be beneficial to health, especially in reducing chronic conditions such as coronary heart disease, certain cancers and muscular degeneration. An effort was made to enhance the carotenoid content using bacterial carotenoid gene, which was introduced into tomato plants by Agro- bacterium-mediated transformation. High protein and low calorie-mushroom have turned out to boon to diabetics.

Medicinal Plants

Botanical drugs have been variously classified depending upon,

- (a) the plant and plant parts from which they are derived
- (b) the disease for which they are used and (c) their chemical nature.

Glossary cum-index of terms employed in relation to medicinal uses of plants

ABORTIFACIENT : Inducing expulsion of foetus.

ACNE : A kind of skin eruptions.

AGUE : Periodic fever with shivering

ALTERATIVE : A drug which alters function of an organ.

AMENORRHOEA : Abnormal suppression or absence of menstruation.

ANAEMIA : Lowering of number of red blood corpuscles.

ANAESTHETIC :An agent to produce partial loss of the sense of pain, touch, temp., etc.

ANALGESIC : A drug that reduces or relieves pain

ANTIDOTE : An agent that counteracts the action or effect of poisons.

ANTIEMETIC : Agents which prevent or lessen tendency to vomit.

ANTIFERTILITY : A drug that inhibits formation of ova or sperms.

ANTHELMINTHIC : A drug that acts against helminths.

ANTIPYRETIC : Agents that reduce fever.

ANTISCORBUTIC : A drug that cures scurvy.

ANTISEPTIC : Agents that arrest development or reproduction of microorganism.

ANTISPASMODIC : Allays, relaxes and has a sedative effect on nerves.

APHRODISIAC : Stimulates sex desire or power.

APHTHA : A boil in mucus membrane, usually in mouth.

APPETISER : Agents that stimulates appetite.

AROMATIC : Substances having pleasant smell or flavour.

ARTHRITIS : Inflammation of joints.

ASCITES : Abnormal accumulation of serous fluid in peritoneal cavity of abdomen.

ASTHMA : A lung disease. (wheezing, coughing and feeling of suffocation)

ASTRINGENT : Contracts of tissues and checks secretions.

BILIOUSNESS : General condition of indigestion, constipation, headache, etc.

BLISTER : Thin vesicle on skin filled with serum caused by burn, friction, rubbing.

BLOOD PURIFIER : Agents believed to remove impurities or deficiencies from blood.

BLOOD SUGAR : The level of sugar in blood.

BODYACHE : Pain of body.

BOIL : A localised pyrogenic infection originating in a hair follicle.

BONE FRACTURE : The breaking of a bone.

BRONCHITIS : Inflammation of Bronchi.

CALCULUS : Deposit of solid matter like salts in any part of body.

CANCER : A malignant new growth or tumor in any part of the body.

CARBUNCLE : An extensive boil which discharges pus from multiple points.

CARDIAC COMPLAINTS : Ailments of heart. (palpitation of heart, angina)

CARIES : Rottenness or ulceration of bone, often used in relation to teeth.

CARCINOGEN : Any agent that causes cancer.

CATARACT : Opacity or clouding of lens of eye.

CATARRH : Inflammation of mucus membranes, specially of air passages in nose and throat.

CEREBRAL AFFECTION : Ailments of the cerebral region

CHANCER : Sores caused by syphilis.

CHILBLAIN : Localised inflammation of skin in cold weather.

CIRRHOSIS : Diminution and deformity of liver.

COLD : Exposure to cold, indicated by sneezing or blowing of nose.

COLIC : Pain due to contraction of muscles in walls of intestines, caused by gas, etc.

CONJUNCTIVITIS : Inflammation of conjunctiva (mucus membrane lining inner surface of eyelids).

CONSTIPATION : Condition of bowels when defecation of faeces is irregular.

CONSUMPTION : Wasting of tissues, including tuberculosis. **CONTRACEPTIVE** : A drug or device to stop conception

CONTUSION : Injury to tissue by blow, without causing break in skin.

CONVULSION : Violent irregular motion of limb or body.

COOLING : Reducing temperature or thirst.

COUGH : To expel air with a sudden opening of the glottis

CUT : Breaking of skin due to external means.

DANDRUFF : Scurf, dead skin in small scales among the hair.

DEHYDRATION : Removal of constitutional water.

DEMULCENT : Substances to soothe surfaces, particularly mucus membranes.

DERMATITIS : Inflammation of skin causing discomforts like eczema.

DIABETES : A metabolic disorder resulting in elevated blood glucose, and discharge of large amount of glucose-containing urine.

DIAPHORETIC : Causes sweating or perspiration.

DIARRHOEA : A gastro-intestinal disease cause in frequent discharge of watery stool.

DIGESTIVE DISORDERS : Includes conditions caused by eating indigestible food, excessive or irregular eating, imbalanced diet, etc. resulting in symptoms like abdominal pain, acidity, biliousness, colic, constipation, dyspepsia, flatulence, gastric, indigestion, loose motions and stomachache.

DIPHTHERIA : Disease of throat in which air passages covered and impeded by leathery membrane.

DISINFECTANT : A substance which destroys harmful germs, bacteria, viruses, etc.

DIURETIC : An agent that induces or stimulates flow of urine.

DYSENTERY : A disease caused by bacteria or protozoa, resulting in painful diarrhoea, the stool often accompanied by mucus or blood.

DYSPEPSIA : Indigestion

ECZEMA : Acute or chronic non-contagious inflammation of skin, often itching.

ELEPHANTIASIS : Enlargement of cutaneous and subcutaneous tissues, obstruction of lymphatics.

EMETIC : AGENT Causing vomiting

EPILEPSY : A nervous disorder involving temporary loss of consciousness.

ERUPTIONS : List includes plants for acne, blisters, feckles, pimples, and vesicants.

ERYSIPELAS : An acute inflammation of skin and subcutaneous tissues.

EXPECTORANT : Controls cough by regulating bronchial secretions.

FERTILITY : Capability to conceive or cause conception.

FISTULA : A pipe-like sore with a narrow opening.

FIT : A sudden attack by convulsions.

GANGRENE : Loss of vitality in some part of the body due to inadequate blood supply.

GOITRE : Enlargement of thyroid gland.

GONORRHOEA : A venereal disease causing infectious inflammation of mucus membranes of urethra and adjacent cavities.

GOUT : Painful inflammation of joints and other symptoms.

GYNECOLOGICAL COMPLAINTS : Ailments of women related to conception and delivery.

HAEMATOMA : Collection of blood at some part of body.

HAEMATURIA : Discharge of urine containing red blood corpuscles.

HAEMOPTYSIS : Spitting of blood from bronchi, larynx, lungs or trachea.

HAEMORRHAGE : Discharge of blood from blood vessels.

HAEMOSTAT : Agents that arrest bleeding.

HAIR CARE : Includes fall of hair, baldness, lice problem, dandruff, hair tonic.

HALLUCINOGENIC : A drug or substance that produces hallucinations.

HEMIPLEGIA : Paralysis of one half side of body.

HERNIA : Abnormal protrusion of an organ through its containing wall.

HYDROCELE : Accumulation of serum fluid in the testes.

HYDROPHOBIA : Dread of water with convulsions, from bite of a rabid animal.

HYPERTENSION : High blood pressure.

HYPOGLYCEMIA : Low level of sugar in blood.

HYPOTENSIVE : Agents to reduce blood pressure.

HYSTERIA : Disturbance of the nervous system, of psychoneurotic origin. Includes fits.

IMPOTENCE : Inability to engage in sexual intercourse.

INFERTILITY : Incapability to conceive or cause conception.

INSOMNIA : Sleeplessness.

INTOXICATION : State of being drunk ; high excitement or elation.

JAUNDICE : Yellowness of skin, tissues and secretions (like urine), due to deposition of bile pigments in the blood.

LAXATIVE : A mild purgative.

LEUCODERMA : A skin condition characterised by defective whitish pigmentation, specially a congenital absence of pigments in spots or bands.

LEUCORRHOEA : A white or yellowish mucopurulent discharge from the vagina.

LUNG DISEASES : Pulmonary diseases like cough, pleurisy, pneumonia, respiratory complaints.

MAGGOTICIDE : A substance that destroys maggots. (Intestinal worm).

MASTICATORY : Substances chewed or sucked to increase salivation and improve local conditions in mouth.

MELANCHOLIA : A disease of mind causing sadness, depression.

MENORRHAGIA : EXCESSIVE FLOW OF BLOOD DURING menstruation,

MIGRAINE: A recurring and very painful headache often accompanied by dizziness, vomiting.

MISCARRIAGE : Premature involuntary expulsion of foetus.

NARCOTIC : Agents which tend to paralyse nervous system, producing stupor or even death.

NAUSEA : Sensation of sickness of stomach, which may result in vomiting.

NEPHRITIS : Inflammation of kidney.

NEURALGIA : Sudden severe pain radiating along the course of a nerve.

NEUROSIS : A nervous disease ; functional derangement through disordered nervous system.

OEDEMA : Flow of excessive clear fluid from blood into tissues.

PHTHISIS : Pulmonary tuberculosis

PILES (HAEMORRHOIDS) : Enlarged or dilated blood vessels or veins of anal canal.

PSORIASIS : Inflammatory skin disease shows reddish patches covered with white scales.

PSYCHOSOMIMETIC : An agent which produces mimic mental disorders.

PULMONARY COMPLAINTS : Lung and chest disorders.

PURGATIVE : An agent that causes evacuation of bowels.

PYORRHOEA : A purulent discharge that contains or consists of pus.

REFRIGERANT : Having cooling properties on surface of body.

RENAL DISEASES : Disorders in function of kidneys.

RHEUMATISM : Diseases of muscle, tendon, joint, bone or nerve resulting in discomfort and disability.

RHINITIS : Inflammation of the mucus membrane of the nose.

RUBEFACIENT : Agent that causes reddening of skin and increases flow of blood in that part.

SCABIES : A contagious parasitic disease of the skin caused by the mite Sarcoptes scabi.

SCIATICA : Nerves disease.

SCURVY : A nutritional disorder caused by deficiency of ascorbic acid (vit. C), resulting in weakness, spongy gums, and tendency to bleed under the skin and from the mucus membrane.

SEDATIVE : Soothes or allays irritability.

SPASMOLYTIC : A drug or agent that prevents or relieves spasm or the involuntary and irregular contractions of the body muscles.

SPERMATORRHOEA : The involuntary discharge of semen without an orgasm.

STIMULANT : An agent that increases functional activity of an organ or whole body.

SYPHILIS : A venereal disease.

TONSILITIS : Inflammation of the tonsils.

TRANQUILIZER : A drug used to calm or soothe a person without directly inducing sleep.

ULCER : An open sore discharging pus.

URETHRITIS : Inflammation of urethra, the canal carrying urine from the bladder.

URTICARIA : A particular type of eruptions on skin with intense itching.

VAGINAL COMPLAINTS : Diseases of vagina, the canal or passage leading from the external orifice to the uterus.

VERMIFUGE : A drug which kills or causes expulsion of intestinal worms.

VERTIGO : Giddiness, dizziness.

VESICANT : Any agent that causes blisters.

The details of the most outstanding some of important and common medicinal plants are given below. In the text, first of all drug name is given which is followed by hindi name, botanical name, family name in parentheses, brief taxonomic notes and finally uses of the plants are given.

DRUGS OBTAINED FROM UNDERGROUND PARTS

1. Aconite (Mithazahar,) *Aconitum napellus* (Ranunculaceae)

Tax. note : Plant is a native of Europe and Asia, and widely cultivated both as ornamental and a drug plant. Plant is perennial herb with palmatisect leaves, flowers zygomorphic, dark violet-blue in colour, fruits an etaerio of 3-5 follicles. Propagation is done mainly by tubers because seeds are often sterile.

Uses : Tuberous roots are collected for drug preparation in autumn season. Roots are used as astringent, in the treatment of diarrhoea, dyspepsia, cough, externally they are used for rheumatism and internally to

relieve pain and fever, in inflammatory diseases. Aconite contains many alkaloids of which aconitine is main.

2. **Garlic** (Lahsun) - *Allium sativum* (Liliaceae)

Tax. note : A perennial, 1 feet high, strong smelling glabrous, bulbous-rooted, bulbs are, short, compressed with a black with large tubular, fleshy, green leaves. Cultivated throughout India & Pakistan.

Uses : Bulbs are stimulant, carminative, diuretic, stomachic, appetizer and aphrodisiac. Juice is used in skin diseases, earache, dyspepsia, colic etc. Garlic is of great medicinal value. It is also used as anthelmintic, externally as rubefacient, vesicant and disinfectant. Garlic is given in fevers, disorders of nervous system, pulmonary phthisis, whooping cough and dilated bronchitis. A decoction of garlic made with milk and water is given in small doses in hysteria, flatulence, sciatica etc. Garlic fried in oil useful as liniment for rheumatic pains, scabies and maggot infected wounds Raw garlic bulbs are eaten raw (2-4) at the time of paralytic attack.

3. **Asparagus** (Satawar)- *Asparagus adscendens* (Liliaceae)

Tax. note : Straggling species, leaves modified in recurved spines cladodes, roots long fascicled, tuberous.

Uses : Roots used as stimulant, demulcent and given in diarrhoea, and dysentery. Roots are eaten, used medicinally in cutaneous diseases.

4. **Jalap** *Exogonium purga* (Convolvulaceae)

Tax. note : Plant is cultivated in India & Mexico.

Uses : A resinous drug 'Jalap' obtained from fleshy root, is used as a purgative .

5. **Kulh** (Kaliziri) - *Saussurea lappa* (Asteraceae)

Tax. note :- Perennial herb, mainly confined to Kashmir. Roots are collected in October.

Uses : The drug, obtained from roots , contains the essential oil, glucosides and alkaloids. It is used to cure cough, asthma, skin diseases. The roots are also used as tonic stomachic, carminative and stimulant. In Kashmir, it is used for protecting shawls from insects.

6. **Colocynth** (Indrayan) - *Citrullus colocynthis* (Cucurbitaceae)

Tax. note : It is a trailing herb. Native of Asia and Africa, commonly, found in central parts of India.

Uses : Roots are bitter in taste, pungent, cooling, antipyretic, carminative and anthelmintic. They are given in jaundice, bronchitis, asthma, leucoderma, tumours, dropsy, constipation, elephantiasis and rheumatism. Roots are also used to control liver enlargement and urinary problems.

7. **Liquorice** (Mulhetti or sweetwood) - *Glycyrrhiza glabra* (Papilionaceae)

Tax. note : Perennial herb. Native of Mediterranean region but grown extensively in Jammu and Kashmir and in Punjab.

Uses : Root contains glycyrrhizic acid which is sweet demulcent , emollient, pectoral, laxative, and expectorant . Root is given in cough, bronchitis and urinary disorders , catarrhal condition of bowels, asthma, hoarseness of voice. Its infusion is given in sore throat. Roots are used in dried condition. Nauseous drugs are also prepared from it.

8. **Belladonna** (Sagangur) - *Atropa belladonna* (Solanaceae)

Tax. note : Tall erect herb, native of Europe, now cultivated in Kashmir.

Uses : The roots are used as sedative, stimulant and antispasmodic, used externally to relieve pain, internally to check excessive sweat, cough.

9. **Pareria** (Harjori) *Cissampelos pareira* (Menispermaceae)

Tax. note : It is shrubby climber, most commonly found in Madhya Pradesh, Uttar Pradesh and South India.

Uses : Dried roots are diuretic, stomachic, antilithic and astringent. Roots are used in diarrhoea, dysentery, cough, catarrhal disorders, bowel complaints and urinary troubles. Decoction of roots is given in the treatment of skin diseases and syphilis. Paste of roots is also applied in skin diseases.

10. **Indian Sarsaparilla** (Anantmal) - (Asclepiadaceae)

Tax. note : A twining shrub with very long roots. Plants with opposite glaucous, shining leaves, with milky latex.

Uses : Roots are sweet, demulcent, diuretic, diaphoretic. Used as blood purifier, given in dyspepsia, fever, skin diseases, syphilis, leucorrhoea, genito- urinary diseases and chronic cough.

11. **Indian Jalap** (Nisoth) - *Operculina turpethum* - (Convolvulaceae)

Tax. note : A stout twinning herb, with angled stem, hastate leaves and violet flowers. It is found throughout India.

Uses : Roots are cathartic. They are very useful in dropsy, leprosy, rheumatism, paralysis and melancholia. Used as purgative in chronic constipation. They are hydragogue hence used during enlargement of the spleen.

12. **Chitraka** - *Plumbago zeylanica* (Plumbaginaceae)

Tax. note : A perennial herb grown in plains of India.

Uses : Roots yield 'plumbagin' called 'chitraka', a crystalline substance, which is a powerful irritant to the mouth muscles and uterus. It cause abortion when given internally.

13. **Serpentine** (Sarpagandha) - *Rauvolfia serpentina* (Apocynaceae)

Tax. note : A perennial herb of 2-4 feet height, flowers crimson red , fruits berries. It requires warm climate with porous, sandy soil.

Uses : Roots contain many alkaloids such as ajmaline, ajmalicine, serpentine and reserpine. Of these reserpine is the main constituent and acts as hypotensive agent.

Roots are used in indigenous medicines in the treatment of insomnia, high blood pressure, hypochondria, mental disorders and certain forms of insanity. It has been recently used in numerous other diseases like skin disorders, such as psoriasis, excessive sweating and itching, gynecological ailments (menopausal syndrome) and irregular heart action. As high blood pressure now is one of the commonest diseases, the reserpine drug is considered a great boon.

14. **Asafoetida** (Heeng) *Ferula assafoetida* (Apiaceae)

Tax. note : A perennial herb with unpleasant smell. Grown in Kashmir, and Panjab.

Uses : Oleoresin gum is obtained from the exudates of rootstock. It is carminative, antispasmodic, stimulant, digestive, sedative, expectorant, diuretic, anthelmintic and emmenagogue. It is prescribed in flatulent colic, asthma, hysteria, convulsions, cholera, chronic constipation, chronic bronchitis, whooping cough, spasmodic disorders of bowels and angina pectoris. The fried gum is given either as a solution or emulsion or pills.

15. **Ashwagandha** - *Withania somnifera* (Solanaceae)

Tax. note : Erect branching wild herb. The cultivated plants are morphologically distinct from wild forms. Supplies of roots for medicinal purposes, is being done mostly from cultivated plants. Entire plant is uprooted for collection of roots.

Uses : Main active constituents are 'somniferum', 'withananine'. This is used as a tonic in geriatrics, being efficacious in relieving hand and limb tremors of elderly persons. It is considered as an aphrodisiac and rejuvenator and given for all kinds of weaknesses and is supposed to promote strength and vigour. Several preparations related to nervous systems contain the drug of this plant. Roots yield important drugs useful in all types of skin lesions, paralytic conditions, ulcers, in reducing pus formation and in rheumatic pain inflammation of joints.

16. **Onion** (Pyaz) - *Allium cepa* - (Liliaceae)

Tax. note : A bulbous herb with peculiar smell, widely cultivated in India.

Uses : It is used in jaundice, piles, fever, bronchitis and colic. The crushed bulbs are used in skin diseases. It's warm juice is dropped into ear to relieve earache. It is used in the treatment of cough, spleen enlargement and dyspepsia. As a diuretic it is eaten as raw and taken with salt seems to be a good remedy for colic and scurvy. Bulbs are given during flatulence.

17. **Podophyllum** (Bankakri) *Podophyllum hexandrum* (Podophyllaceae)

Tax. note : It is a herbaceous plant with perennial roots and rhizomes. Commonly grown in Punjab, Himachal Pradesh and Kashmir.

Uses : The medicinal property of the plant is due to the presence of a resin. It is used as an evacuant or purgative in cases of chronic constipation.

18. **Tumeric** (Haldi) *Curcuma domestica* (Zingiberaceae)

Tax. note : Perennial herb with stout stem and tufted leaves, flowers are pale yellow in dense spikes topped by pinkish bracts. Main rhizome (bulb) is thickened bearing a number of cylindrical primary, secondary or even tertiary rhizomes called 'fingers'.

Uses : Rhizome is aromatic, stimulant, antiperiodic, tonic, carminative. It is given in diarrhoea, intermittent fevers, dropsy, jaundice, liver disorders and urinary troubles. Fresh juice of rhizome is used as an antihelmintic. It is also used for cleaning foul ulcers. Along with lime it makes a good dressing for sprains, bruises, wounds etc. Its decoction is an effective eye wash in ophthalmia.

19. **Mango ginger** (Ama-haldi) – *Curcuma amada* (Zingiberaceae)

Tax. note : It is wild perennial herb, with underground perennation rhizome grown in Bengal, Andhra Pradesh, Tamil nadu.

Uses : The rhizome is carminative, stomachic. It has a cooling properties. It is applied over contusions and sprains.

20. **Yam** – Species of *Dioscorea* (Dioscoreaceae)

Tax. note : Yams are mainly climbing or twining herbs, usually found wild as well as in cultivation. They thrive well in sandy loams. They are resistant to drought. Propagation is done by tuberous roots or bulbils. (axillary buds) Species of *Dioscorea* found in India are : *D. bulbifera*, *D. pentaphylla*, *D. opposifolia*, *D. composita*, *D. floribunda* and *D. porazeri*

Uses : Diosgenin is an important alkaloid present in tubers of non-edible species, It is used as a raw material for industrial production of cortico-steroid drug, including cortisone, which is used in oral contraceptives.

DRUGS OBTAINED FROM BARK

1. **Kachnar - Bauhinia variegata** (Caesalpiniaceae)

Tax. note : It is handsome tree with flowers of white coloured.

Uses : The decoction of bark is used internally, in syphilis, leprosy, ulcers and certain skin diseases. It is also given in diarrhoea and liver complaints.

2. **Indian Oak (Hijala) - Barringtonia acutangula** (Barringtoniaceae).

Tax. note : A small tree with beautiful flowers.

Uses : Bark of the old tree is used in diarrhoea. As a febrifuge it is given in malaria. A paste made from bark and seeds with the fresh juice of ginger is applied to the chest of children having acute bronchial catarrh.

3. **Cinnamon (Dalchini) – Cinnamomum zeylanicum** (Lauraceae)

Tax. note : It is an evergreen tree up to 8-12 meters height. Leaves are highly aromatic, 12-17 cm long, dark glossy green above and dull grey-green beneath. Flowers yellow, numerous, inconspicuous berries, blackish, one seeded.

Uses : Volatile oil obtained from the bark is used in medicine as a carminative, antiseptic, astringent and also used in bowel complaints. Powdered cinnamon is a reputed remedy for diarrhea, dysentery and vomiting. The bark is given in nausea, gastric irritation, flatulence, spasmodic affections of the bowels, toothache and tongue paralysis. A paste of the bark is applied on forehead to get relief from neuralgic pain or severe headaches. Bark oil is used as antiseptic.

4. Quinine (Kunain) Cinchona spp. (Rubiaceae) (C. Succirubra, C. Ledgeriana, C. Calisaya and C. officinalis)

Tax. note : A slender tree is about 10 m height, leaves 10-12 cm long and elliptic. Plant is a native of South America. In India it is grown in Nilgiris, Sikkim, West Bengal and Khasia hills.

Uses : The bark removed from both roots and stem is dried artificially at the temperature below 75°C and is then packed in gunny bags and stored. The dry bark is chemically treated for extraction of different alkaloid of which the most important is quinine.

Quinine is a white granular, very bitter substance possesses bactericidal action and chiefly used in the treatment of malaria. It is also used as antiseptic. It is also used in treatment of other fevers.

Dutch have the monopoly in quinine production; about 90% of the world supply of quinine is done by them. India is one of the three countries, which are the major suppliers of quinine.

5. Kurchi – Holarrhena antidysenterica (Apocynaceae)

Tax. note : A shrub or small tree found throughout India. Leaves opposite, subsessile flowers white in corymbose cymes. Follicle cylindrical white spotted.

Uses : Bark has anthelmintic, febrifugal and tonic properties. It also cures amoebic dysentery and diarrhoea. It is useful in spleen disorders and skin diseases.

6. Aloe – Gwarpatha – Aloe barbedensis (Liliaceae)

Tax. note : Plant is 2-3 feet high, with fleshy, pulpy leaves. It contains lot of mucilage.

Uses : Leaves juice (mucilaginous) is given as a remedy for intestinal worms, in childrens. Pulp of one leaf is given daily to subside abdominal tumours. Leaves are also used in treatment of piles, dropsy, sciatica and rheumatism.

7. Indian Barberry (Rasaut) Berberis aristata (Berberidaceae)

Tax. note – It is a spiny shrub, found growing in North-West Himalayas.

Uses : The extract of plant is used a purgative for children, blood purifier, tonic and febrifuge. The chief constituent of the plant, is 'Berberine' a bitter alkaloid. It is used as astringent, deobstruent and diaphoretic.

8. Arjun - Terminalia arjuna (Combretaceae)

Tax. note : An evergreen tree with spreading crown and drooping branches.

Uses : The bark is acrid, and has a cooling effect. It also acts as a cardiac stimulant, commonly prescribed in heart diseases. During morning time, drinking of decoction with milk in empty stomach gives relief from complaints of hypertension.

9. Ashoka Tree – *Saraca asoca* (Caesalpiniaceae)

Tax. note : It is a spreading evergreen tree with orange coloured flowers.

Uses : Bark is medicinal. Its decoction is given in uterine disorders (monorrhagia, leucorrhoea). It is also efficacious remedy for piles and dysentery. Flowers are also medicinally taken for diabetes.

DRUGS OBTAINED FROM STEMS/WOOD

1. Catechu (Katha) *Acacia catechu* (Mimosaceae)

Tax. note : It is a small thorny tree. Leaves are bipinnate.

Uses : Katha obtained from wood of the plant is very useful and valuable astringent in the treatment of bleeding gums, tonsils, ulcers of mouth. Powdered katha is used to fill a cavity of teeth, to relieve pain. The tincture of catechu is useful for bed sore.

2. Ephedrine - *Ephedra foliata* (Ephedraceae)

Tax. note : It is a busy perennial evergreen shrub. Leaves are needle like. Flowers are white small, unisexual.

Uses : Plant is found in drier regions of India. 'Ephedrine' is the main alkaloid. The decoction of stem, is used as a remedy for rheumatism and syphilis.

3. Sandal wood - (Safed Chandan) - *Santalum album* (Santalaceae)

A very useful tree species. Wood powder of the plant is given in gonorrhoea, urethral haemorrhage, chronic bronchitis. Sandal oil is used in the treatment of scabies and other skin diseases.

DRUGS OBTAINED FROM LEAVES

1. Belladonna - *Atropa belladonna* (Solanaceae)

Uses : The leaves contains two alkaloids which are used externally to relieve pain and internally to check the action of secretory glands. Atropine is used to dilate pupil of the eye during eyesight testings. Leaves are also used in asthma, colic and bladder spasms.

2. Senna – *Cassia angustifolia* (Caesalpiniaceae)

Tax. note : It is a small herb with copper coloured, cylindrical pods.

Uses : Senna is useful laxative and is recommended for habitual constipation. It is often used with carminatives.

3. Vasak – Rusa – *Adhatoda vasica* (Acanthaceae)

Tax. note : It is found wild throughout India. Plant is a gregarious, evergreen, shrubby herb with dense terminal spikes.

Uses : Leaves contain alkaloid vasicine which is powerful expectorant and antispasmodic. It is commonly used in chest diseases. The leaves are given in malarial fever. A poultice of leaves is used for scabies and other skin diseases. Juice of leaves is given in diarrhoea and dysentery. Vasicine also acts as insecticidal and antiseptic properties of the plant.

4. Bryophyllum (Patharchata) – *Bryophyllum pinnatum* (Crassulaceae)

Tax. note : A succulent perennial herb.

Uses : The leaves are used as an astringent and antiseptic. Slightly warm leaves are applied on wound, boils, cuts, ulcers, bite of venomous insects, to subside the swelling.

5. Tylophora – *Tylophora india* (Asclepiadaceae)

Tax. note : It is a trailing creeper with thick, deep green, opposite sessile leaves.

Uses : It is useful in the treatment of bronchial asthma. Leaves are taken directly or chewed or swallowed.

6. Physic nut – (Safed arand or Ratanjot) – *Jatropha curcas* (Euphorbiaceae)

Tax. note : A wild shrub found in waste places or neglected regions All plant parts contain latex, and have glandular trichomes.

Uses : Fresh latex is applied locally on piles, scabies, eczema, ring worm, itch and decayed teeth. A warm poultice of leaves is applied to the breasts of nursing mothers.

7. Pennywort – (Brahmi) *Centella asiatica* (Apiaceae)

Tax. note : A trailing herb, rooting at the nodes, commonly found growing in black cotton soil.

Uses : Leaves are remedy for skin diseases (eczema, ulcers etc.). To infant children, leaves are given during dysentery. Leaves powder with milk is given to remove weakness and to improve memory.

8. Swallow wart – (Aak) - *Calotropis procera* (Asclepiadaceae)

Tax. note : A perennial undershrub, with waxy covering on all parts of the plant, Leaves opposite, flowers in corymbose cyme. Latex present in all parts of the plant.

Uses : Smoke after burning of leaves is inhaled for the cure of asthma and cough. Skin diseases are cured by leaves. Leaves are used in dropsy and enlargement of the abdominal viscera. The latex of leaves is used as an abortifacient.

9. Basil – Tulsi - *Ocimum sanctum* (Lamiaceae)

Tax. note : Strongly aromatic herb. Aroma is due to presence of volatile oil in leaves.

Uses : Although, all parts of plant are useful, however, leaves are much used medicinally. The leaf juice is given in chronic fever, haemorrhage and to check vomiting. Decoction of leaves is given in malaria, gastric diseases of children and liver disorders.

10. Betel Pepper – (Pan) - *Piper betle* (Piperaceae)

Tax. note : A climbing shrub. Leaves are shining cordate with long petiole, and acute apex.

Uses : Oil coated, slightly warm leaves are useful for blistering surface and ulcers. Leaf juice is used as eyes drops in ophthalmia. It is also given during indigestion, diarrhoea and laryngitis. Fresh juice with honey is given to children during teething period.

11. Dhatura – *Datura stramonium* (Solanaceae)

Uses : The leaves yield stramonium which has narcotic and antispasmodic properties used as a substitute of belladonna.

DRUGS OBTAINED FROM FLOWERS

1. Saffron – (Keshar) – *Crocus sativus* (Iridaceae)

Tax. note : A very small perennial herb with underground corm, 6 or more narrow, linear radical leaves. Flowers are single violet funnel shaped, tripartite, orange red stigmas are used in the spice trade. Flowering period ranges from October to November.

Uses : Saffron contains the bitter principle picrocrocin. It is mild stimulant, stomachic, carminative, antispasmodic, nerve sedative, mild narcotic, diuretic and emmenagogue. It promotes menstruation.

2. Iron wood – (Nag Keshar) – *Mesua ferra* (Clusiaceae)

Tax. note : It is tree of Himalayan region.

Uses : The flowers of this plant are very useful, act as astringent and stomachic. They are given during excessive perspiration and bleeding during piles. They check vomiting, cough, dysentery, thirst and irritability of stomach.

DRUGS OBTAINED FROM FRUITS

1. Bel – *Aegle marmelos* – (Rutaceae)

Tax. note : A tall plant with trifoliate leaves, root suckers are used in propagation of plants.

Uses : Fruits are of great medicinal value. The unripe or half ripe fruit is astringent, stomachic, antiscorbutic and digestive. It is best given in sub-acute or chronic cases of diarrhoea, dysentery and in irritation of the elementary canal; it is a useful adjunct in after treatment of bacillary dysentery. The ripe fruit is prescribed in intestinal disorders and certain forms of dyspepsia, characterized by alternate constipation and diarrhoea. It has a cooling and laxative effects.

2. Fish Berry - *Anamirta cocculus* – (Menispermaceae)

This is a large smooth, woody climber. The bark on old stem is spongy and deeply cracked. The fruits are drupes usually in pairs, round or reniform. It is found in Eastern Bengal, Orissa and South India.

Uses : The dried ripe fruit is a powerful narcotic. The juice of the fresh berries is applied to scabies and ulcers. An ointment made of the seeds, after removing the seed coat is a powerful germicide. It is locally used for ringworm and other parasitic skin diseases. It is also used for killing head lice.

3. Purging Cassia (Amaltas) – *Cassia fistula* (Caesalpiniaceae)

This is an ornamental tree with yellow flowers. Found throughout India.

Uses - The pulp from the pods is of great therapeutic value; it is a mild pleasant and safe purgative. Its confection is given in diabetes. The leaves are emollient; their juice makes a useful dressing for ringworm. The root is used as a tonic, febrifuge and a strong purgative.

4. Emblic (Aonla) – *Emblica officinalis* (Euphorbiaceae)

Tax. note : A small tree found throughout in India.

Uses - The fruit is of great medicinal value. It is one of the richest sources of vitamin C. The fresh fruit is astringent, refrigerant, tonic, antiscorbutic, diuretic, laxative and blood purifier. It is used in fevers,

vomiting, indigestion, habitual constipation and other digestion troubles. It is given in diarrhoea, dysentery and haemorrhage. The infusion of seeds is a useful eye-wash in ophthalmic diseases.

5. Opium (Afim) - *Papaver somniferum* (Papaveraceae)

Tax. note : A herb native of W. Asia, now grown in Uttar Pradesh, in East Punjab, Rajasthan and Madhya Pradesh.

Uses : An juice obtained by making a cut on the unripe capsules of *Papaver somniferum* and allowing the milky sap, which exudes to dry spontaneously.

Opium is stimulant (in its primary effects medicinally), narcotic, anodyne, and antispasmodic (in its secondary action). It affects chiefly the cerebrospinal system, and the nerves arising therefrom. It tends to diminish every secretion excepting that of the skin, which increases under its use. In overdoses it is a powerful, poison. In painful spasmodic affections, opium in large and repeated doses often affords immediate relief. In various morbid states of the abdominal viscera, e.g., simple or cancerous ulceration of the stomach, chronic gastritis, gastrodynia, nervous and sympathetic vomiting, diarrhoea, dysentery, colic pictonum, strangulated hernia, visceral destruction, it is quite effective. In diseases of the genito-urinary system (e.g., cystitis, cistirrhoa, spasmodic stricture of the urethra, also in menorrhagia, dysmenorrhoea, irritable states of the uterus, metritis), it is a remedy of the highest value. In cancerous and gangrenous ulceration, opium has favourable influence on the local symptoms. External application of opium proves valuable in various rheumatic, neuralgic, ophthalmic and other painful affections.

6. Long Pepper (Piplamul / Lendipeepal) – *Piper longum* (Piperaceae)

Tax. note : This is a slender creeping undershrub. It is a native of India and cultivated in the Western Ghats, Karnataka and Tamil Nadu for the fruits.

Uses : The sun-dried unripe fruit (berries) or the spike of the small flowers is known as long pepper. It is a cardiac stimulant, carminative, alternative, tonic, laxative, digestive, emollient, stomachic and antiseptic. To prevent fever after childbirth, it is an efficacious remedy.

7. Belleric Myrobalan (Bahera) - *Terminalia bellirica* (Combretaceae)

Tax. note : A common tree grown as an avenue plant.

Uses : The ripe dry fruit is bitter and given in piles, dropsy, diarrhoea, leprosy, biliousness, dyspepsia and headache. Half ripe fruit is given as purgative and fully ripe as an astringent.

8. Chebulic Myrobalan (Harrad) – *Terminalia chebula* – (Combretaceae)

Tax. note : A tree, commonly found in India.

Uses - The fruit is the chebulic myrobalan of commerce. It is an efficacious, laxative, astringent, stomachic, tonic and alternative. The fruit pulp is given in chronic diarrhoea, dysentery, flatulence, asthma, urinary disorders, vomiting, enlarged spleen and liver etc. It is used externally as a local application to chronic ulcers and wounds and as a gargle in stomatitis. Fine powder of fruit is used as a dentifrice and considered useful in bleeding and ulceration of the gums. Powder of this fruit, along with bahera, aonla is called 'Trifala' most commonly used as a medicinal powder.

9. Kateli - *Solanum viarum* – (Solanaceae)

Tax. note : It is a wild perennial herb. It grows well in the hilly areas particularly of Khasia and Jaintia hills in North-East and Nilgiri hills of South India. Nearly whole body of the plant is covered with yellow hairs (hirsute). The stem bears prickles. Leaf is 7" to 5" long and is deeply lobed, hirsute and bears only

straight prickles. Flowers are white in colour, and are produced in large number. The berry is about 2-5 cms. in diameter.

Uses : The berries contain the alkaloid 'Solasodine' which is used by pharmaceutical companies for the preparation of many important drugs. It is a nitrogen analogue of diosgenin and is a good source of sapogenin.

Cortisone, a steroidal hormone prepared from solasodine, is found to be effective in the treatment of acute stages of rheumatoid arthritis, chronic cases of asthma, leukemia, obesity and skin diseases.

DRUGS OBTAINED FROM SEEDS

1. Croton (Jamalgota) – *Croton tiglium* (Euphorbiaceae)

Tax. note : This is a shrub or small tree, native of South East Asia but now cultivated in Assam, Bengal and South India.

Uses : The seeds are the source of croton oil, which is used as a strong purgative. Externally the oil is a stimulant and a powerful irritant and rubefacient. It is used as a liniment and a good stimulant in bronchitis, asthma, paralysis, gout, chronic rheumatism, laryngitis, neuralgia, sciatica and diseases of joints.

2. Psyllium (Isabgol) – *Plantago ovata* – (Plantaginaceae)

Tax. note : This is an annual herb. It is cultivated in parts of Rajasthan and Maharashtra.

Uses : The seeds are mildly laxative, demulcent, mucilaginous, cooling, emollient, astringent and diuretic. They are used in the treatment of dysentery, constipation and disorders of the digestive system. The mucilaginous matter is found in the seed coat, and therefore, the seed coat or husk is used.

DRUGS OBTAINED FROM ALL PARTS OF PLANTS

1. Blood Wort (Gandana) - *Achillea millefolium* (Asteraceae)

Tax. note : It is erect pubescent herb about two feet high. It is usually distributed in Western Himalayas at 6,000 to 9,000 feet elevation.

Uses : The herb contains bitter aromatic tonic which is astringent, stimulant and diaphoretic. It is recommended for colds, obstructed perspiration, fevers, hysteria, flatulence, heart burn, colic, epilepsy, piles, amenorrhoea, kidney disorders, profuse mucous discharges and nervous diseases. Its decoction is a useful mouth-wash, hair-wash and an astringent for sore nipples. A strong decoction is used as an injection for bleeding piles, vaginal haemorrhages and nasal bleeding.

2. Kalmegh (Chirayta) – *Andrographis paniculata* - (Acanthaceae)

Tax. note : This is an erect herb up to 3 feet; branches 4-angled or almost winged ; leaves 2-3 inches long lanceolate, tapering to the base ; flowers small, pink, solitary arranged in lax spreading axillary and terminal racemes or panicles, the whole forming a large paniculate inflorescence 3-4 inches long, tapering at each end; seeds many, subquadrate, rugose, glabrous; flowering time September to December. The plant is found growing throughout India.

Uses : The whole plant is used for bronchitis, dyspepsia, dysentery and influenza etc. The decoction of plant and the powder of seeds is also used in fevers.

3. Absinthe (Vilayti Ajwain) - *Artemisia absinthum* (Asteraceae)

Tax. note : This is an aromatic herbaceous, hairy perennial herb. It is found in Kashmir from 5,000 to 7,000 feet elevation.

Uses : The leaves are used as a tonic, stomachic and anthelmintic. Small doses of its infusion are given for dispersing the yellow bile of jaundice from the skin. It is also given in the diseases of the digestive system, anaemia and wasting diseases etc. The poultice of its leaves is applied for treatment of gout or rheumatic joints. It is a useful antiseptic and detergent in skin diseases. An infusion of the leaves is given as an enema for killing worms in the rectum. Fruits are useful dressing for the scalp to check dandruff and falling of the hair. The seeds are astringent, antispasmodic, narcotic, intoxicating, aphrodisiac and carminative. The paste of seeds is used for decaying teeth, piles, fistula, tumours and parasitic skin diseases.

4. Achyranthes (Apamarg Chirchita) - *Achyranthes aspera* (Amarantaceae)

Tax. note : This is a roadside weed with spike inflorescence.

Uses : The plants are used medicinally for several diseases such as piles, colic, boils etc. It is pungent, purgative, diuretic and astringent. Roots are used for pyrrhoea also used in cough and fevers. Leaf paste is applied on forehead for relieve of headache. Food desire is suppressed for longer duration i.e. up to 15 days, if the seeds extract is taken by a person.

5. Pedalium (Bara Gokhru) - *Pedalium murex* (Pedaliaceae)

Tax. note : This is a low, thick stemmed, succulent annual herb; found in Gujarat, Konkan and Andhra Pradesh.

Uses : Fresh plants infused in water or milk become mucilaginous. This infusion is diuretic and demulcent; it is given in disorders of urinary system, gonorrhoea, spermatorrhoea, impotence, nocturnal seminal emissions, calculous affections and dropsy.

6. Black Nightshade (Makoy) - *Solanum nigrum* – (Solanaceae)

Tax. note : It is a small herb up to 1-2 feet height with simple leaves and white flowers found distributed throughout India.

Uses : The herb is a cardiac tonic, alternative, diuretic, sedative, diaphoretic, cathartic, anodyne, expectorant and hydragogue. It is used as a decoction in dropsy, enlargement of the liver and jaundice. The syrup of herb is given as an expectorant. In fevers it is given as a cooling drink. The leaf juice is given in inflammation of the kidneys, bladder, in gonorrhoea, piles and enlargement of spleen. Hot leaves are applied over the swollen and painful testicles. The berries are alternative and tonic. They are given in fever, diarrhoea and heart diseases.

7. Indian Solanum (Kateli) - *Solanum xanthocarpum* (Solanaceae)

Tax. note : A common prickly herb found throughout India.

Uses : The herb is expectorant, bitter, stomachic, astringent, diuretic, alterative and anthelmintic. Its decoction is given in fever, cough, asthma, dropsy, flatulence, gonorrhoea, pain in the chest and heart disease.

8. Chiretta– *Swertia chirata* – (Gentianaceae)

Tax. note : A common climbing shrub (liana) found throughout tropical India and the Andamans.

Uses : The fresh plant is antiperiodic, alterative, tonic, hepatic stimulant and diuretic; its watery extract is very effective in fevers. The plant is commonly used in rheumatism, urinary diseases, dyspepsia; general debility, syphilis, skin diseases, piles, bronchitis, impotence, gonorrhoea and jaundice. The fecula prepared from the roots and stem, known as '**sat giloe**' is a valued drug for intermittent fevers, chronic diarrhoea, chronic dysentery, jaundice and rheumatism.

9. Periwinkle (Sadabahar) - *Catharanthus roseus* (Apocynaceae)

Tax. note : An erect annual or perennial herb ; native of Madagascar but now commonly grown in India as an ornamental plant. Leaves opposite oval, obovate or oblong, glossy; flowers usually 2-3, in cymose axillary clusters ; fruit a cylindrical follicle, many-seeded. Flowers white or pink.

Uses : All parts of the plant, particularly the root bark contain alkaloids; possess hypotensive, sedative and tranquilizing properties. They also cause relaxation of muscles and depression of the central nervous system. The plant has been used as a folk remedy for diabetes in various parts of South Africa and also in India and Sri Lanka.

Drug yielding plants of all the categories are summarized in the following table.

I	Drug yielding plants. Drug obtained from underground parts. 1. Drug obtained from bark 2. Drug obtained from stem 3. Drug obtained from leaves 4. Drug obtained from flowers 5. Drug obtained from fruits and seeds.
II	Plants used as antidotes

1 : Drug Yielding Plants

(I). Drug Obtained from Roots and other underground Parts

NAME	BOT. NAME & FAMILY	USES
Mithazahar	Aconitum napellus (Ranunculaceae)	Alkaloid aconite used in rheumatism, & also to relieve fever pain.
Atis	A. heterophyllum	The roots are used as astringent and in diarrhoea dyspepsia and cough.
Bach	Acorus calamus (Araceae)	Rhizome – as emetic, nauseant, antispasmodic, expectorant and carminative. Also used for asthma and chronic diarrhoea.
Piaz	Allium cepa (Liliaceae)	Bulbs are stimulant, diuretic expectorant, rubefacient aphrodisiac oil used as heart stimulant, reduced blood sugar, relieve earache.
Lahsun	Allium sativum (Liliaceae)	Bulbs are stimulant, carminative, diuretic, stomachic, appetizer and aphrodisiac. It is used in cough, fever, hysteria, nervous affections. Juice is used in skin diseases, earache, dyspepsia, colic etc.
Kira-mar	Aristolochia bracteata (Aristolochiaceae)	Roots purgative, anthelmintic

NAME	BOT. NAME & FAMILY	USES
Satawar	<i>Asparagus adscendens</i> (Liliaceae)	Roots used in diarrhoea & dysentery.
Talmakhana	<i>Asteracantha longifolia</i> (Acanthaceae)	Roots used for dropsy, Jaundice and rheumatism.
Rasaut, Daruhaldi	<i>Berberis aristata</i> (Rhamnaceae)	Extract from root barks, is used in ophthalmia.
Haldi	<i>Curcuma longa</i> (Zingiberaceae) <i>C. domestica</i>	Rhizomes used in diarrhoea, intermittent fever, Jaundice & liver disorder, also used as aromatic, stimulant, tonic, carminative purifier, Rhizomes are externally applied on spleen & wounds.
Kanta alu.	<i>Dioscorea deltoida</i> (Dioscoreaceae)	Root yield a cortisone-a steroid hormone, used in rheumatic diseases and ophthalmic disorders.
Jalab	<i>Exogonium purga</i> (Convolvulaceae)	A resinous drug i.e. 'Jalab', obtained from fleshy roots and used as purgative.
Heeng	<i>Ferula asafoetida</i> (Apiaceae)	The gum resin obtained from the roots is used in colic, dyspepsia hysteria, cholera, & indigestion, epilepsy, scorpion stings, asthma, cough.
Vilayati Gentiana	<i>Gentiana lutea</i> (Gentianaceae)	The root is sweet and used in cough bronchitis, & urinary disorders. Generally used in dried condition. In combination with iron salts, useful as tonic.
Anantmool	<i>Hemidesmus indicus</i> (Asclepiadaceae)	Root is diuretic, diaphoretic, and demulcent.
Mulathi	<i>Glycyrrhiza glabra</i> (Papilionaceae)	The root is used as tonic, laxative, in cough, genito urinary diseases, and in scorpion sting.
Gingseng	<i>Panax quinquefolia</i> (Araliaceae)	The roots are a favorite Chinese medicine against stomachic, stimulant.
Podophyllum	<i>Podophyllum emodi</i> (Berberidaceae)	The roots and rhizomes yield the drug podophyllum, used in the treatment of skin diseases, tumours, cancer tissue diseases etc. Drug is also stimulant and purgative.
Sargandha	<i>Rauwolfia serpentina</i> (Apocynaceae)	Extracts from roots are used in diarrhoea and dysentery. Roots are hypnotic, sedative. Decoction of roots is employed to increase uterine contraction and it is recommended during child birth. Reserpine one of the alkaloids of root has a depressant action on central nervous system & produces sedation & lowers blood pressure.
Kaliziri	<i>Saussurea lappa</i> & <i>S. candianas.</i> (Asteraceae)	The drug contains the essential oil, used to cure cough, asthma, skin diseases. The roots are used as tonic stomachic carminative & stimulant.
Chiretta	<i>Swertia chirayita</i> (Gentianaceae)	The root contains ophelic acid and chiration, which are laxative stomachic & antidiarrhoeic. It is used in indigestion, dyspepsia & bilious affections. It is bitter tonic.
Ramdatoon	<i>Smilax zeylanica</i> (Liliaceae)	Roots used in the treatment of venereal diseases, also applied for rheumatism and in bloodless dysentery.
Kateki	<i>Solanum xanthocarpum</i> (Solanaceae)	Used in cough & asthma.
Jangli pyaz	<i>Urginea indica</i> (= <i>Scilla indica</i>) (Liliaceae)	Bulbs contain several glucosides which are cardiac, stimulants & are used in the form of syrup for bronchial catarrh, & in chronic bronchitis.
Asvagandh	<i>Withania somnifera</i> (Solanaceae)	Roots yield important drugs useful in all types of skin lesions, ulcers and in reducing pus formation & inflammation. It is also used in rheumatic pain inflammation of joints and in paralytic conditions. It is also known to stimulate sex impulses and improve sperms.
Adrakh	<i>Zingiber officinale</i> (Zingiberaceae)	Rhizomes are carminative, stimulant and aromatic. It is used in stomach disorder, dyspepsia, colic vomiting, dysentery and cholera.

(II). Drugs Obtained From Barks

NAME	BOT. NAME & FAMILY	USES
Akola	Alangium salvifolium (Alangiaceae)	Alkaloid obtained from bark, is used to lower blood pressure.
Saptaparni	Alstonia scholaris (Apocynaceae)	The bark of the plant is employed in the treatment of chronic dysentery.
Kachnar	Bauhinia variegata (Caesalpiniaceae)	Bark is used as tonic & astringent and also useful in ulcers, leprosy and in other skin diseases.
Daruhaldi	Berberis lycium (Berberaceae)	Useful in the treatment of ophthalmia, piles & as laxative.
Quinine	Cinchona calisaya C. officinalis C. ledgeriana (Rubiaceae)	The most important constituent of cinchona bark quinine is used in the treatment of malaria, as a tonic and antiseptic.
Tejpat	Cinnamomum tamala (Lauraceae)	The bark is used in gonorrhoea. Leaves are stimulant and carminative used in rheumatism colic, diarrhoea and in scorpion sting.
Dalchini	Cinnamomum zeylanicum (Lauraceae)	The bark is used for checking nausea & vomiting. It is stimulant, carminative, useful in diarrhoea & dysentery.
Bargad	Ficus benghalensis (Moraceae)	The infusion of bark is a tonic and astringent. It is used in dysentery, diarrhoea & diabetes.
Ashoka	Saraca indica (Caesalpiniaceae)	The bark is astringent and is used in uterine affection & in menorrhagia. It is also used in scorpion sting, for piles and dysentery.
Bakoli	Mimusops elengi (Sapotaceae)	Used as tonic, febrifuge in catarrh of bladder & urethra.

(III). Drugs Obtained from Stems & Woods

NAME	BOT. NAME & FAMILY	USES
Arjun	Terminalia arjuna (Combretaceae)	Bark is used in treatment of cardiac disorders
Aak	Calotropis procera (Asclepiadaceae)	The milky latex of stem is used in the treatment of leprosy and rheumatism.
Ephedra	Ephedra gerardiana (Gnetaceae)	The entire plant body yields an alkaloid the ephedrine. It is used in asthma, hay fever & in cold.
Chandan	Santalum album (Santalaceae)	The powder of the wood is given in gonorrhoea & fever. Oil obtained from wood is used as stimulant, expectorant, and in the treatment of bronchitis, gonorrhoea chronic cystitis, and as an urinary antiseptic.

(IV). Drugs Obtained from Leaves

NAME	BOT. NAME & FAMILY	USES
Rusa, Vasak	Adhatoda vasica (Acanthaceae)	Alkaloid vascine from leaves is commonly used in chronic bronchitis & asthma. Juice of leaves is given in dysentery and diarrhoea. Poultice of the leaves is applied over fresh wounds inflammatory swelling & in rheumatic joints.
Aloe (Gwarpantha), Ghritkumari	Aloe barbadensis (Liliaceae)	The leaves are used externally on inflamed parts of the body.
Santonin	Artemisia cina(Asteraceae) (Asteraceae)	An essential oil obtained from the leaves is used as purgative; dried leaves are used medicinally as a stimulant, stomachic, tonic & anthelmintic.
Belladonna	Atropa belladonna (Solanaceae)	Leaves contain many alkaloids out of which hyocyanine and atropine are used as antidote in opium poisoning. They are

NAME	BOT. NAME & FAMILY	USES
		used in asthma, colic. Atropine is used to dilate pupil of the eye, during eyesight testing. Dried leaves are used as narcotic, sedative, diuretic and antispasmodic. Belladonna is also employed externally to relieve pain and internally to check excessive sweat, cough etc.
Neem	Azadirachta indica (Meliaceae)	The leaves are carminative, expectorant, insecticidal, anthelmintic. Juice is given in jaundice & skin diseases. Decoction of leaves is antiseptic and used in ulcers & eczema. Oil from seed is stimulant, antiseptic and used in rheumatism & in skin diseases. Fruits are purgative, emollient & anthelmintic. Bark, leaves and seeds are also used in snake bite and scorpion sting.
Brahmi	Bacopa monnieri (Scrophulariaceae)	The leaves are heart stimulant and are indispensable in the treatment of many heart diseases. The plant is used as nerve tonic. It is also used in asthma, epilepsy and in snake bite.
Ganja (Bhaang)	Cannabis sativa (Cannabinaceae)	Dried leaves are commonly known 'Bhang', leaves are sedative, narcotic, digestive and diuretic used in dysentery, diarrhoea and indigestion. 'Ganja' is the dried flowering tops of female plants and its resinous extract is called 'Charas'.
Senna	Cassia angustifolia (Caesalpiniaceae)	Senna obtained from leaflets is used as laxative & purgative.
Amaltas	Cassia fistula (Caesalpiniaceae)	The bark, root, leaves and pods are frequently used in indigenous medicine. It is used as purgative.
Datura	Datura stramonium (Solanaceae)	The leaves & seeds are antiseptic anodyne, and narcotic. Leaf poultice is a popular remedy for lumbago swelling of joints painful tumor and glandular inflammation. Roasted leaves are applied to enlarged testicles, burns, boils and rheumatic sciatic nerve.
Datura	Datura metel (Solanaceae)	Dried leaves are used in medicine for the same purposes as the leaves of belladonna & stramonium.
Foxglove	Digitalis purpurea (Scrophulariaceae)	The leaves are used as a cardiac stimulant and tonic in central nervous system etc.
Cocaine	Erythroxylum coca (Erythroxylaceae)	The leaves contained alkaloid known as cocaine, which is used in medicine as a local anaesthetic. It also used as a tonic for the digestive and nervous system. Leaves are astringent and also used as stimulant & masticatory.
Nilgiri Safeda	Eucalyptus globulus (Myrtaceae)	Oil from the leaves is used in asthma & bronchitis. It is also used in the treatment of nose & throat disorders, malaria and other fever.
Marorphali (Kurchi)	Holarrhena antidysentrica (Apocynaceae)	The leaves, bark & the seeds are antidysentric, anthelmintic and carminative. It is also used as a tonic & in pulmonary affections.
Tulsi	Ocimum sanctum (Lamiaceae)	Leaves are aromatic, stomachic, expectorant, stimulant and anticatarrhal. They are given in disorders of liver, cold & cough. In malaria they are taken along with pepper & ginger.
Pippermint	Mentha arvensis Mentha piperita (Lamiaceae)	Used as an anthelmintic. Oil obtained from leaves is used as carminative stimulant and for allaying nausea, sickness & vomiting.
Bakain	Melia azadirach (Meliaceae)	Fruits are used as an anthelmintic.
Pan	Piper betle (Piperaceae)	Leaves are used as aromatic, carminative and stimulant.
Nirgundi	Vitex negundo (Verbenaceae)	Leaves after boiling with water is used in black fever.
Akarkara	Spilanthes acmella (Asteraceae)	Leaves used to relieve toothache and as a mosquito larvicide.
Thyme	Thymus vulgaris	Used against hookworms and also as toothpaste.

NAME	BOT. NAME & FAMILY	USES
	(Lamiaceae)	
Antamool	Tylophora indica (Asclepiadaceae)	Leaves are expectorant, emetic & diaphoretic.

(V). Drugs Obtained From Flowers

NAME	BOT. NAME & FAMILY	USES
Wormseed	Artemisia cina (Asteraceae)	Santonin extracted from flower buds is one of the best remedies for intestinal worms. It is also used as purgative.
Kesar, Saffron	Crocus sativus (Iridaceae)	Saffron is used in fevers, melancholia and enlargement of liver. It is used as stimulant, stomachic and in catarrhl affections.
Gathorasankh	Leonotis nepetaefolia (Lamiaceae)	The ashes of flower heads are applied to ringworm and itchy skin diseases.
Dronpushpi	Leucas cephalotes (Lamiaceae)	The flowers are used as a remedy for cough and cold.
Mahua	Madhuca indica (Sapotaceae)	Distilled alcoholic liquid from flower is used for rheumatism.
	Matricaria chamomilla (Asteraceae)	The flowers are used as stimulant, attenuant & carminative. They are also used in hysteria, dyspepsia & intermittent fevers. Oil from dried flowers is externally used in rheumatism.

(VI). Drugs Obtained From Fruits & Seeds

NAME	BOT. NAME & FAMILY	USES
Bel.	Aegle marmelos (Rutaceae)	The unripe or halfripe fruits are used as astringent, digestive, stomachic. The fruits pulp is used as aromatic cooling, laxative, tonic, The pulp is also given in diarrhoea, dysentery, intestinal disorders and constipation
Ajwain	Carum copticum (Apiaceae)	Fruits & seeds are carminative, antispasmodic & stimulant. They are also used in colic, diarrhoea, cholera & dyspepsia.
Indrayan	Citrullus colocynthus (Cucurbitaceae)	Fruits and seeds are used as purgative.
Jira	Cuminum cyminum (Apiaceae)	The fruits are used as stomachic, carminative, diuretic, stimulant and astringent. They are also used in diarrhoea and dyspepsia and for promoting the secretion of milk in women and animals.
Jamalgota	Croton tiglium (Euphorbiaceae)	It is one of the most drastic & violent purgative, used in insanity and convulsions with high blood pressure. It is also used in rheumatism, paralysis & painful afflictions of joints and limbs.
Aonla, Amla	Emblia officinalis (Euphorbiaceae)	Fruits are rich in vitamin C. They are acrid, cooling, refrigerant & laxative. Dried fruits are employed in haemorrhage, diarrhoea & dysentery. They are effectively used in digestive troubles.
Opium (Poppy)	Papaver somniferum (Papaveraceae)	The latex obtained from immature fruits is the source of opium. It contains 25 alkaloids, the most important & powerful are morphine & codeine Opium as whole is used as sedative, anodyne, antispasmodic hypnotic & sudorific. Morphine is used to relieve anxiety and sleeplessness due to pain. Codeine is used as a mild analgesic & respiratory sedative.
Kalimirsch (Black pepper)	Piper nigrum (Piperaceae)	Fruits are carminative, aromatic & digestive given in diarrhoea, dyspepsia, piles, cough, gonorrhoea etc. The fruits is externally used as rubefacient and as a local application

NAME	BOT. NAME & FAMILY	USES
		for relaxed sore throat, piles, & skin diseases.
'Isabgol' Psyllium	Plantago ovata Plantago indica (Plantaginaceae)	Seeds of several species of Plantago, contain a mucilaginous substance which acts as a laxative. It is used in inflammatory conditions of the mucous membrane of gastro-intestinal and genito-urinary tracts.
Arandi (Castor)	Ricinus communis (Euphorbiaceae)	Oil extracted from seeds is used a purgative, counter irritant & scorpion sting & fish poison.
Kuchla (Nux-vomica)	Strychnos nux-vomica (Loganiaceae)	'Nux vomica' drug is obtained from seeds, which is used as a tonic, stimulant & in the treatment of paralysis and nervous disorders.
Methi	Trigonella foenum graecum (Papilionaceae)	Seeds contain trigonellin. They are diuretic and are given in dyspepsia, colic and disorders of stomach. Roasted and infused seeds are used for dysentery.

2 : Plants Used as Antidote

NAME	BOT. NAME & FAMILY	USES
Tejpat	Cinnamomum tamala (Lauraceae)	The leaves are used in scorpion sting.
Jira	Cuminum cyminum (Apiaceae)	The seeds are used in snake bite.
Ashok (Sita)	Saraca asoca (Caesalpinaceae)	The bark is astringent and is used in scorpion sting.
Belladonna (Sagangur)	Atropa belladonna (Solanaceae)	Alkaloids hyoscyamine and atropine are used as an antidote in opium poisoning.
Neem	Azadirachta indica (Meliaceae)	The bark gum, leaves and seeds of the plants are used in snake bite and scorpion sting.
Brahmi	Bacopa monnieri (Scrophulariaceae)	Stem & leaves are used in snake bite.
Tulsi	Ocimum sanctum (Lamiaceae)	Leaves are used against snake bite & scorpion sting.
Dudhi	Wrightia tinctoria (Apocynaceae)	Bark & root against snake bite and scorpion sting.
Heeng	Ferula assafoetida (Apiaceae)	Gum, resin obtained from root stock is used against snake bite.
Hathi-surh	Heliotropium indicum (Boraginaceae)	Juice of leaves used against scorpion bites and insects stings.
Choti Harjod	Peristrophe bicalyculata (Acanthaceae)	Plant is remedy for snake bite.
Barleria	Barleria cristata (Acanthaceae)	Seeds are used for snake bite.
Adhajhara	Achyranthes aspera (Amaranthaceae)	Leaves paste is applied on insect bite.
Bel	Aegle marmelos (Rutaceae)	Root paste mixed with black pepper applied daily for seven days in bites by mad dog.
Pyaj	Allium cepa (Liliaceae)	Juice of bulbs are used against insect bites.
Madhu kamini	Murraya paniculata (Rutaceae)	Bark & root paste is applied over bites of venomous animals.
Arandi	Ricinus communis (Euphorbiaceae)	Seeds are used in scorpion sting.
Kalmegh	Andrographis paniculata (Acanthaceae)	Plant used against in scorpion bites.
Chakora	Cassia tora	Root used against in snake bite.

NAME	BOT. NAME & FAMILY	USES
(Puwar)	(Caesalpinaceae)	
Chhua-mue	Mimosa pudica (Mimosaceae)	The root is made into a paste in the water, collected after washing raw rice and given orally for snake bite.
Bichhauti	Tragia involucrata (Euphorbiaceae)	A paste of the root & mustard seeds is given in snake bite.
Zingiber	Zingiber zerumbet (Zingiberaceae)	Rhizome is used in snake bite.
Tal makhana	Alternanthera sessilis (Amaranthaceae)	Leaves are crushed and the paste is applied on scorpion sting.
Banda	Vanda roxburghii (Orchidaceae)	The roots are used for allaying pain caused by the stings of scorpion.
Costus	Costus speciosus (Zingiberaceae/Costaceae)	Root is used for snake bite.

PROBLEMS IN STUDY OF MEDICINAL PLANTS

Problem in identification

In the ancient Indian Ayurvedic texts such as Charak Samhita, Ashtanga Hridaya Samhita and Susruth Samhita a large number of medicinal plants have been described that had been used in preparing drugs and curing a number of ailments. Unfortunately, a number of these plant species are known by their vernacular and classical names. It is difficult to correlate these names with acceptable scientific names and one plant species can have many vernacular or classical names and one name may refer to different plant species. The scientific study of traditional medicines, derivation of drugs through bio-prospecting and systematic conservation of the concerned medicinal plants is very important.

Problems in cultivation :

Amongst number of problems faced in cultivation, following are of prime importance :-

(a) *Non availability of Quality Planting materials :*

The first major problem in the cultivation of medicinal and aromatic plants is the non-availability of good quality planting materials. The high yielding and disease resistant varieties of selected medicinal and aromatic plants introduced by the reputed Research Institutes are not easily available. A fairly large number of growers are not even aware of them and they continue to buy the poor quality planting materials available locally. The yield is lower and the quality of the product is sub-standard that creates problem in marketing. The net return is much less that demoralised the growers.

(b) *Lack of proper guidance :* Although books have been published on the agronomy of medicinal and aromatic plants, but none of these provide the proper guidance. The cost analysis given in most of these books is unrealistic. Here are many medicinal plants like Kalmegh (*Andrographis paniculata*), Muskdana (*Andrographis moschatus*) and Kewanch (*Mucuna pruriens*) to name a few that are easy to cultivate, but difficult to sell. Buyers want to buy these herbs at throw away prices.

The dwindling forest cover, over exploitation and growing demand has led to the cultivation of some of the medicinal and aromatic plants. The trend has gained momentum in the last 6-8 years. There is a growing demand for herbs and herb derived products for variety of other applications like food flavourings, cosmetic and personnel hygiene products (in fragrance, creams, lotions), industrial chemicals, food ingredients etc. As a result of such

market trends, it became rather obvious that herbs deserve serious consideration as potential alternative cash crops.

When the mono cropping of medicinal plants is undertaken, they also suffer from diseases like root wilt, rot, blight etc. and pest attack. The incidence of pest attacks and diseases have been reported from several parts of the country where medicinal plants are being cultivated for the last 3-4 years.

CULTIVATION TIPS TO INCREASE GERMINATION PERCENTAGE

To increase the percentage of germination in herbs that have small seeds like Ashwagandha (*Withania somnifera*), Kalmegh (*Andrographis paniculata*) etc., instead of the common broadcasting method, pellets method and preparation of nursery beds would be more preferable.

Seeds are spread on the beds in such a manner that there is no overlapping. A mixture of fine soil and FYM is prepared in the ratio of 1:1. The seeds are covered with a thin layer (1 cm) of this mixture, water is sprinkled and paddy straw is spread over the beds so that seeds should not be washed away in rain or blown away by strong winds. The paddy straw is removed in 3-4 days when the germination begins and plants are transplanted in the main field after 25-30 days.

It is interesting to find that the rough environments are most suitable for growing the strongest medicinal herbs, e.g. root crops need little irrigation and colder temperature often produce higher chemical yield.

- ◆ When selecting a growing site, it's important to avoid areas where chemical residues may be present and where hard to control weeds are established.
- ◆ In case of aromatic plants used for extracting essential oils, the critical issues are : site selection, adaptability, seed bed preparation, seeding, fertilization, harvesting, weed control, storage and processing.
- ◆ Most herbs require large amounts of sunlight because the essential oils and alkaloids develop best when the plants receive at least 6-7 hours of sunshine per day.
- ◆ Growers need to determine how tolerant the various crops are to soil moisture.
- ◆ Growers must be familiar with the hardiness of different herb varieties.
- ◆ If seeds are smaller and lighter then the seeding depth should be shallow.
- ◆ The row spacing for different herbs is different. Some herbs grow well in wide row spacing while other performs well in narrow spacing.

MARKETING

The marketing of medicinal and aromatic plants is comparatively tougher than spices, cereals and other agricultural produces. The ayurvedic and pharmaceutical companies are more concerned with price than quality. Due to unethical trade practices only a small margin of profits from medicinal and aromatic plants trickle down to the thousands collectors and growers. India can emerge as one of the major players in the world herbal trade due to the following advantages:.

- (a) India has centuries old traditions of ayurvedic system of medicines.

- (b) There are over 1000 species of aromatic plants available in our country out of which the chemistry and property of 500 species are known but only 50 species are being commercially utilized as source of essential oils.
- (c) Availability of different climatic zones supporting the rich biodiversity.

REMEDIAL MEASURES

The growers have to focus on two types of medicinal and aromatic plants:

- (a) Import substitute
- (b) Diminishing availability

The focus should be shifted to plants like St. John's Wart, Milk Thistle, *Ginkgo biloba*, Vanilla, Lavender, Ylang ylang, Rosemary, Thyme, Sage etc. These medicinal and aromatic plants have world wide acceptance and the demand is increasing at a healthy rate of 15% per annum.

Contract Farming is another solution to this problem. The ayurvedic and pharmaceutical companies and exporters can enter in 'Contract Farming', with interested farmers for the cultivation of medicinal and aromatic plants that have high value, good export potential, import substitutes or whose availability in wild is rapidly decreasing.

The 'Contract Farming' has the following advantages:

- a) Assured uninterrupted supply.
- b) Insured against fluctuation in prices.
- c) Comparatively, less probability of adulteration.
- d) Consistency in Quality of raw materials.
- e) Cheaper or at par with the market rate
- f) Choice of Organic or conventional crops.

With proper selection of the right variety, combination of soil treatment and growing method a number of medicinal plants can be grown in plain and valley.

CHANGING MARKETING TRENDS

There is growing trend of using culinary herbs that offer health benefits. These include rosemary, turmeric, sage, thyme, mint, dill, parsley, cumin, ginger and others. These culinary herbs have GRAS (generally recognized as safe) status. If an herb is not GRAS then major food companies won't even consider it. Culinary herbs are sold fresh or in dried form. Flax seed has suddenly caught the fancy of consumers. It has become one of the top selling food in the markets of developed countries due to its pleasant nutty taste.

As per the conservative estimates, global trade in medicinal and aromatic plants is over 80 billion US\$ and is likely to double within a decade. Besides health benefits, medicinal plants also provide crucial livelihood options for millions of rural people in India, tribal and women in general. Currently more than 95% nutraceutical ingredients have originated from the herb or plant based entity. This fact signifies that great potential exists for herbs.

Herbs have been an integral part of health and healthcare for centuries and will continue to play a vital role in public health for generations to come. In spite of so many turbulence being faced by the herb industry today, the future is still promising for properly manufactured and researched herbal and ayurvedic preparations.

MAP VERSUS MAC'S

Globally, there is an increasing interest of herbal usages in the lively hood set-ups. The demand for MAC's (Medicinal and aromatic crop) channelling market system in India to meet the domestic and export market is increasing steeply.. Cultivation of MAC's has high potentials over agricultural crops with regard to net profits. It has a wide scope with a special concern of promoting social harmony balance, employment opportunities, self-employment motives and up-surge in national economy. Currently, from the point of fast depleting forest resources, quality concern and national economic drive, "commercial cultivation of MAC's" is a need of the day. Government assisted and promoted national network framed by a combined abilities of planners, economists, policy makers, scientists; industrialists and progressive farming communities can be the unique solution in commercializing MAC's. A network of organizing and mobilizing a common platform of growers, NGO/GO/self help groups, local traders, regional traders, processors and stake holders under the umbrella of equitable bio-partnership is the foremost need in channelising market issues in India. A ready-reckoner of resource data base or a web site discharging the updated production and marketing issues on MAC's can be a potential weapon in creating mass motivation among rural communities by building up their confidence levels. Further, multiple linked chain of community based organization and MAC's based companies in a value based chain of production to consumption (PC) and marketing continuum (MC) is to be formulated in production and supply of quality material to industry and to assure benefits to growers. In nutshell, MAC's can be an integral part of natural resource management contributing for economic growth; environmental, protection and trade provided marketing channel system is perfectly stream lined.

The proposed marketing channels of MAC's are shown in flow chart.



