SHREE H. N. SHUKLA INSTITUTE OF PHARMACEUTICAL EDUCATION AND RESEARCH

B.PHRAM

(SEMESTER –VI)

SUBJECT NAME: HERBAL DRUG TECHNOLOGY

Chapter 1. Herb as a raw materials

SUBJECT CODE: BP603TP

UNIT-I 11 Hours

Content

Herbs as raw materials

Definition of herb, Herbal medicine, Herbal medicinal product, Herbal drug preparation, Source of Herbs Selection, identification and authentication of herbal materials processing of herbal raw material.

Biodynamic Agriculture

Good agricultural practices in cultivation of medicinal plants including Organic farming.

Pest and Pest management in medicinal plants: Bio pesticides/ Bio insecticides.

Indian Systems of Medicine

a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy

b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.

Introduction:

The interest of people in herbal medicines has increased significantly in both developing and developed countries. There is a great demand for these herbs, hence there is a need to adopt systemic scientific methods for selection, cultivation, collection, processing and ensure the quality, purity, safety, potency and develop modern methods for their quality control so maximum benefit is obtained from these herbal medicines.

Herbs:

It consists of entire plant or any part of the plant.

Herbal Drug:

These consist of plants or any part of the plants, usually in unprocessed or crude forms (crude drugs) which have medicinal value.

• They include different parts of plants like entire aerial part, flowers, fruits, seeds, bark, leaves, roots, rhizomes etc.

• The constituents and their therapeutic activity may be known or unknown.

Herbal drug preparation:

• They are processed form of herbs. They are derived from herbal drug by various techniques like extraction, fractionalization, purification, conc. fermentation and may be in the form of powders, extracts, tinctures, fixed oils, volatile oils, resins, gums, etc.

• They contain a mixture of various constituents. However pure isolated compounds do not come under this category

• Herbal Medicinal Products (Finished Herbal Products):

These are the medicinal products which contain exclusive herbal drugs or herbal drug preparation which are made from one or more herbs.

•They may contain excipients in addition to active ingredients

HERB:

It consists of any part of the plant like leaves, flowers, fruits, roots and rhizomes, bark, tubes, stems and branches

HERBAL MEDICINAL PRODUCTS:

It includes various herbal formulation like tablets, syrups, capsules, semisolid dosage forms etc.

FIXED COMBINATION

It includes herbal medicinal products which contain more than one herbal drug preparations.

Source of herbs:

Herbs or medicinal plants can be obtained from two sources:

A. Wild source
B. Cultivated source

A. Wild Source:

• The plants are obtained from the wild sources such as forest, plains, river banks etc.

• Obtaining herbs from wild source is my economical, less time consuming, decreased cost of labour

• However it also offer various disadvantages such as quality of the plants cannot be predicted due to various environmental changes. The plants will not be uniform in their growth and yielding characteristics.

• Modern scientific techniques cannot be applied to increase the yield as well as quality

• If the plants are obtained continuously from wild source for prolonged periods a may lead to depletion of raw materials from the wild

B. Cultivated source

In recent times, medicinal plants have been systematically cultivated by applying modern scientific techniques.

Advantages:

• Quality and purity is ensured

• Better yield and more profit

• Ensures regular supply of raw materials

Application of modern scientific techniques is possible

Crop Planning: Means ensuring regular supply of raw material to the industry

Application of Scientific Techniques: It includes tissue culture genetic engineering, hybridization and germplasm

STEPS INVOLVED IN THE SELECTION IDENTIFICATION AND PROCESSING OF HERBAL RAW MATERIALS:

Steps Involved in processing of Herbal Drugs

A. Selection of Herbs
B. Identification & Authentication
C. Cultivation of Herbs
D. Collection of Herbs
E. Processing of Herbal Raw Material

A. Selection of herbs:

• The species or botanical variety selected for cultivation should be the same as specified in the official Pharmacopoeia or national documents

• In case of newly introduced medicinal plants, the variety selected for cultivation should be identified and documented

B. Identification & authentication of herbal materials:

• **Botanical identity:** The species, subspecies, genus, variety etc. of the plant for cultivation should be verified from a qualified botanist/institute and recorded

• **Specimens:** In case of a new plant with medicinal properties whose identity is not known, a specimen of the plant should be submitted to a national herbarium for identification & documentation.

• **Seeds and other propagation materials:** The suppliers of seeds and other propagation materials should specify all the necessary information relating to the identity, quality as well as their breeding history. The seeds and propagation materials should be free from contamination and diseases in order to promote healthy plant growth.

C. Cultivation of medicinal plants:

• Cultivation of medicinal plants requires intensive care and management as various factors such as environment, soil, irrigation, pests, etc. play a vital role. These factors vary from one plant to another.

• Scientific documented methods should be followed, if nom data available, traditional methods should be adopted and a systemic method should be developed through research.

• Good Agricultural Practices in Cultivation (GACP) and Conservation Agriculture (CA) which aims to improve, conserve & make more efficient use of natural resources.

D. Collection of herbs:

• For the collection of medicinal plants, a proper time should be selected. Herbs are selected for collection at a stage when they yield maximum amount of chemical constituents skilled labour should be employed as they are trained to identify and select the herbs at a proper stage.

• The age of the plant also plays a vital factor for their selection. Diseased plants should be rejected, season of collection should be given due consideration while selecting the plant for collection.

E. Processing of herbal raw materials:

• Processing of herbal raw materials involves various stages from which the crude drugs undergo after harvesting. It can be classified into primary and secondary processing.

• Cultivation of medicinal plants is also drawn as propagation, which can be done by sexual and asexual methods.

• **Collection:** If mean harvesting of the plant material.

PROCESSING OF HERBAL RAW MATERIALS

PRIMARY PROCESSING	SECONDARY PROCESSING
Garbling	Cutting/sectioning
Washing	Aging/sweating
Parboiling	Baking/Roasting
Leaching	Boiling/Streaming
Drying	Stir frying
	Fumigation
	Extraction

PRIMARY PROCESSING: (It is the basic or initial processing)

It includes simple procedure by which the herbs are prepared like sorting of different parts, garbling, cleaning, drying etc.

Garbling (Sorting):

• This process helps in ensuring the purity and cleanliness of the harvest materials

• Dirt like soil, dust, impurities like insects, dead tissues and residual non medicinal plants are separated from the raw material

• The process depends on the part of the plant to be prepared. The process may involve procedures such as removing dirt, foreign substances, discarding damaged parts, peeling of barks, sieving, trimming, removal of hair from roots, removal of seeds from fruits, stripping of leaves from stems.

• This may be done by mechanical means but in some cases it is usually performed manually by hands

Washing:

• After garbing the herbal raw materials should be cleaned well to remove the traces of remaining soil, dirt and other impurities from the surface.

• The roots, rhizomes and tubers are washes with clean water. During the washing process, scrapping and brushing may be necessary.

Parboiling (Blanching):

• After washing, certain herbal raw materials need to undergo parboiling process in which they are put in boiling water for short period.

• This may help in improving the storage life of the raw materials and preventing insert/mould contamination.

• It may also facilitate in further processing such as removal of stubborn impurities as well as outer coats/covering of raw materials.

Leaching:

• Some impurities can be removed by subjecting the plant material under running water known as leaching. However the duration of leaching should be controlled to prevent the loss of chemical constituents present in the drug.

Drying:

• In some cases, the plant material should be thoroughly dried after washing in order to prevent the deterioration and degradation of active constituents. They must be dried as soon as possible to remove moisture and reduce damage due to microbial or mould infestation.

• Drying also prevents the activation of certain enzymes which may otherwise degrade the active ingredients and also facilitate grinding and milling of the raw material.

• Depending on the drug and nature of ingredients, different drying methods can be used.

1. Natural drying:

a) Sun drying:

• Most herbal raw material can be dried in open air under direct sunshine provided the climate is suitable. The duration of drying process depends on the physical structure of the plant material and weather conditions.

• The plant materials should be spread out in thin layers, care should be taken to prevent contamination by dirt impurities

• While drying the plant material should also be protected from inserts, birds, rodents, pests and other domestics

b) Shade drying:

• Some medicinal plants cannot be directly exposed to sunlight, hence need to be dried under shade

• This drying process is slow but helps in minimizing loss of color, volatile oils and aromatic compartments from being evaporated

2. Artificial drying:

• Drying by artificial heat is more rapid than open air drying and is necessary in rainy seasons and regions where there is high humidity.

• The temperature and equipment used for drying depends on the physical and chemical nature of the drug and its constituents. Various equipment such as tray dryers, spray dryers, vacuum dryers are used

• Overheating may lead to excessive loss of volatile components as well as decomposition of chemical constituents. The temperature should be kept maintained below 60°c wherever possible.

a) Tray dryers (Oven)

• The drugs which do not contain volatile oils and are quite stable to heat or which need deactivation of enzymes are dried in tray dryers In the process, hot air of the desired temperature is circulated through the dryers and this facilitates the removal of water content of the drug (belladonna roots, cinchona bark, tea and raspberry leaves and gums are dried by this method).

b) Vacuum dryers:

• The drugs which are sensitive to higher temperature are dried by this process.

E.g. Tannic acid and digitalis leaves

c) Spray dryers:

• Few drugs which are highly sensitive to atmospheric conditions and also to temperature of vacuum-drying are dried by spray-drying method. The technique is followed for quick drying of economically important plant or animal constituents, rather than the crude drugs.

E.g. Papaya latex, pectin, tannins etc.

SECONDARY PROCESSING: (It includes advanced techniques or done post primary Processing)

The secondary processing differs from one herbs to another depending upon the nature of active ingredients as well as therapeutic properties Secondary processing includes techniques such as removal of foreign substances, prevention of microbial/infestation, enhancing the efficacy of drugs, reducing the toxicity, extraction using suitable solvents, conc. & drying of extracts. These are further standardized by different methods.

Cutting, Sectioning and communition:

• After thoroughly drying, the herbal materials are processed by cutting and sectioning into smaller sizes which are convenient for storage as well as extraction.

• Various sizes can be obtained depending on the part of herb and extraction methods used. It may be small particles, coarse powder or fine powder.

Aging/Sweating:

• Aging refers to storing the raw material for a specified time after harvesting

• It is generally done under sun or in shade for up to a year

• During the process of aging excessive water is evaporated & enzymatic reactions may occur to alter the chemical composition of herbal materials.

• **E.g.** Cascara bark should be aged for at least one year prior to use in medicinal preparations to reduce its irritant effects Sweating is done by subjecting the herbal materials at a temperature between 45 to65°C with high humidity for a period ranging from one week to few months. The herbal materials are stacked between woolen blankets or other kind of cloth.

• The sweating process is considered a hydrolytic and oxidative process in which some of the chemical ingredients of the herbs are hydrolyzed or oxidized.

Baking/Roasting:

• It is a process of drug heating where the herbal materials is heated in ovens. The temperature of heating and duration of baking /roasting vary from one herbal material to another until the drug develops a specific color

• **E.g.** Nutmeg is roasted till they turn to yellowish brown color.

Boiling/Streaming:

• In the boiling process the drug is cooked in water or any other liquid solvent such as vinegar, wine, milk or animal urine.

• **E.g.** Acorus calamus rhizome is boiled in cow's urine with stream using a streamer resulting in development of moist texture

Stir frying:

• In the process in which the herbal material are put in spot of frying pan and continuously stirring or tossed for a specific period under heat until the external color changes, charred or even carbonized. To facilitate uniform heating, the drug material can be admixed with sand, talc or clay.

• **E.g.** Liquorice roots and rhizomes are stir fried with honey

Fumigation:

• Sometimes the harvesting raw materials are subjected to fumes. Fumigation with Sulphur-dioxide is commonly employed for some medicinal herbs for the purpose of preserving, color, improved appearance, bleaching and preventing the growth of inserts and moulds.

EXTRACTION OF HERBAL MATERIALS:

Extraction is a process of separation in which the chemical constituents present in plant and tissues are removed by using selective solvents which is called menstrum.

Herbal extracts includes infusion, decoctions, fluid extracts, tinctures and powder extract.

The herbal preparation so obtained may be ready for use as medicinal agent or it may be further processed to finished products such as tablets, capsules and pills.

I. Infusion

It is a liquid preparation obtained by extracting herbal materials with either cold or hot water without boiling. Other solvent may also be used.

II. Decoction

It is a liquid preparation obtained by boiling the herbal material with water.

III. Fluid extract

It is a liquid preparation obtained by maceration or percolation of herbal materials in alcohol. The ratio will be one part of liquid contain one part of herbs (1:1).

IV. Tinctures

It is dilute alcoholic extract of herbal materials typically made up of 1 part of herbal material with 5 to 10 parts of the solvent.

V. Powdered extract

It is a form of herbal preparation which is processed into dried, granulated or powdered materials.

BIODYNAMIC AGRICULTURE

Introduction:

• Biodynamic agriculture is a form of organic farming which includes various concepts introduced by Rudolf steiver in 1924.

• Bio dynamics is a system of organic agriculture which recognizes the biological and chemical values of soil and treats soil fertility, plant growth and livestock care as ecologically interrelated tasks.

• Bio dynamic farming is an alternative where the chemical fertilizers are totally replaced by microbial (biological) nutrients derived from bacteria, algae, fungi and it emphasizes the use of manures and composts.

• Bio dynamic farming treats animal, crops and soil as single system and fertilizers the use of traditional systems and development of new local breed and varieties.

• It uses various herbal and mineral additives in the manufacture of composts and field sprays. Bio dynamic farming also emphasizes on the use of astronomical sowing and moon planting calendar. Bio dynamic farming promotes composting, green manuring, crop rotations, inter cropping, mixed cropping, etc. as well as employing predators, parasites, which are natural enemies of pests.

PRINCIPLES AND GUIDELINES FOR GOOD AGRICULTURE PRACTICE (GAP) OF MEDICINAL PLANTS:

• The guidelines described for GAP are intended to streamline the cultivation of medicinal plants as per the well regulated methods and follow a systematic way in cultivation process as it is important for the production of good quality plant material.

• The various stages of processing which are included in good agricultural practice (GAP) are described as follows.

1. Seeds and cm utilization material:

• The seeding materials are to be identified botanically, indicating plant variety, cultivar, chemo type and its origin.

• **Biodynamic agriculture**: it is also known as organic farming technique.

• The material used should be 100% traceable.

• The above same rule applies to vegetative materials as well.

• The parent material of vegetative part used in organic productions should be certified and authentically organic**.**

2. Cultivation:

• Depending on the method of cultivation (conventional or organic) growers should be allowed to follow different standards operating procedures (SOP) for cultivation.

• Care should be taken to avoid environmental disturbances.

• The principles of good crop husbandry must be followed including appropriate rotation of crops.

3. Soil and fertilization:

• Medicinal and aromatic plants should not be grown in soils that are contaminated by sludge.

• The soil should also not be contaminated by heavy metals, pesticidal residues and other unnatural chemicals.

• The use of fertilizers and other chemical products should be as minimum as possible and in accordance with the demands of the plant.

4. Irrigation:

• Irrigation should be minimized as much as possible and only applied as per the needs of the plant.

• Irrigation water should be free from contaminants such as faeces, heavy metals,pesticides, herbicides and other hazardous substances.

5. Crop maintenance:

• Tillage (Preparation of land for growing crops) should be adapted to enable good plant growth and must be carried out whenever required.

• Pesticides and herbicides should be avoided as far as possible.

• The use of pesticides and herbicides has to be documented.

6. Harvesting:

• Harvesting should be done when the plants are in their best quality and quantity.

• Harvesting should be done in optimum conditions as wet soil, dew, rain, high humidity can produce unfavorable effects.

7. Primary processing:

• It includes steps such as washing, drying, freezing etc,

• Processing equipment must be cleaned and regularly serviced.Buildings used for processing should be clean, aerated & provide protected for the harvested crop from birds, insects, rodents and animals.

• All the processed material should be inspected and substandard products must be discarded.

8. Packaging:

• The product should be packed in clean, dry preferably new sacs, bags or cases.

• The label must be clear, permanently fixed and made from non -toxic material.

• Re-usable packaging materials should be well cleaned and dried before use, care should be taken that they do not cause contamination.

9. Storage and transport:

• Packaged dried materials and essential oils should be stored in a dry, well aerated building in which temp. Fluctuations are controlled and good aeration is provided.

• Fresh products should be stored between 1 to 5 ‘C, while frozen products should be stored below -18’C or below -20’C for long term storage.

• Essential oils should be stored as per the chemical storage standards.

• During transportation, sufficiently aerated vehicles should be used.

• National regulations on transport have to be followed.

10. Staff requirements:

• Personnel involved in the good agricultural practice (GAP) should receive adequate training and education related to the nature of the work being carried out.

• The staffs who work with the plant material must have a high degree of personal hygiene.

• Staff with infectious diseases should not be allowed into the rooms in which they can come into contact with plant material.

11. Documentation:

• All the propagation material and steps in the production process must be documented.

• All the starting materials,

• Processing steps including location of cultivation have to be documented.

• All agreements between producer and buyer should be fixed in a written form.

12. Quality assurance:

• In order to ensure a good quality of the produced crude drug, it is extremely advisable to educate all personnel dealing with the crop at various stages.

• Consultation and feedback should be taken from buyers of medicinal and aromatic plants regarding the quality & other properties of plant material and an agreement have to be made.

PEST AND PEST MANAGEMENT IN MEDICINAL PLANTS:

• Pest is an undesired animal or plant which cause: loss of cultivated plants, the different types of pests infecting medicinal plants are as follows.

Types of pests:

• Fungi/Viruses

• Insects

• Weeds

• Non Insect Pest.

1. Fungi and Virus:

Examples: Ascochyta atropae causes necrosis of leaf. *Cercospora atropae* produces leaf spot disease.

2. Insects:

Insects such as flea beetle, flies, moth, cutworms, grass hoppers, spiders, termites etc , also produces significant loss of cultivated plants.

3. Weeds:

A weed is an undesired plant, it can produce losses more than any other pests or diseases. They cause depletion and shortage of nutrients, waters, light, space to the cultivated plants. They also increase the cost of labour and equipment and reduce the quality of cultivated plant. Example of weeds are Parthenium, Ragweed, Medican tea, Varnish tree, etc.

4. Non insect pests:

They are further sub classified as follows

Vertebrates: Animals like Monkeys, Rats, Rabbits, Squirrels, Birds, Pigs, etc.

Invertebrates: Animals like crabs snails, mites, nematodes, etc.

Fungi and Viruses: They also include various other microorganism which infect the growing medicinal plant and cause loss of quality as well as quantity.

Methods of pest control:

Different techniques are followed to achieve pest control effectively. These methods are discussed as follows:

• Mechanical

• Agricultural

• Biological

• Chemical

1. **Mechanical method:**

• It include simple techniques like hand picking, pruming, burning, using of pest traps,collection and destruction of eggs, larvae and insects. Construction of concrete ware houses to protect from rodents and animals. Rats and mouse traps are also used.

2. **Agricultural method:**

• It includes various methods such as crop rotation, inter cropping, integrated weed management methods, solarisation, etc. Production of pest and insect resistant plants through genetic engineering technique is another approach.

3. **Biological method:**

• This method involves combating of pests with other living organisms such as employment of cats to combat rats and squirrels, employment of birds to combat insects. Some chemical substances produced by female insets such as sex attractants, which can be used to lure male insects and prevent reproduction.

4. **Chemical method:**

• Pests are controlled using chemical pesticides which include insecticides, fungicides, herbicides, rodenticides. However these chemical substances are highly toxic to human beings. Improper use of these chemical pesticides may lead to toxic effects on human and animals

Examples:

- **Rodenticides:** Arsenic trioxide.
- **Insecticides:** Malathion, Parathion, Methoxychlor.

- **Miticides:** Tetradifon, Chlorobenzolate.
- **Fungicides:** Chlorophenols, Quaternary ammonium compounds, etc.
- **Herbicides:** 2, 4 Dichloro phenoxy acetic acid, calcium arsenate

BIO-PESTICIDES/BIO-INSECTICIDES FOR PEST MANAGEMENT:

These are pesticides obtained from natural sources like microorganisms, plants, animals, insects & certain minerals.

Advantages of bio pesticide over chemical pesticides:

• They are non-toxic to plants as well as humans.

• They are biodegradable & do not leave any toxic residues.

• They are less expensive and can be grown along with the cultivated medicinal plants.

• They are ecofriendly and do not affect soil fertility.

• They are safe to handle and use.

Types of bio-pesticide:

• Microbial

• Biochemical

• Plant pesticides

1. **Microbial pesticides:**

• They consist of microorganisms, microbial pesticides can control different kinds of pests and are relatively specific for its target pests. It is reported that some fungi are used to control weeds and insects.

2. **Biochemical pesticides:**

• These are naturally occurring chemical substances which are obtained from insects and animals which have the ability to control the pests by non-toxic mechanism. These include substances like insect sex hormones.

3. **Plant pesticides:**

• Various plant are reported to poses pesticidal and insecticidal properties. They can be grown along with cultivated plants to combat insects and can be used in powdered form or the constituents can be extracted from them and used to spray on the crops.

Examples: Neem, Tobacco, Pyrethrum, Derris, Ryania.

Bio-pesticides/Bio-insecticides: They include all the plants or substances which are derived from such plants that have the ability to kill or resist the various pests and protect the cultivating medicinal plant.

Introduction:

• Bio-pesticides are typically microbial biological pest control that are applied in a manner similar to chemical pesticides.

• Available in different formulations.

• Also used to control soil borne and seed borne fungal pathogens.

• Disadvantages of them are, high specificity slow speed of action and their requirement of suitable condition for their survival.

• Even though, biopesticides are best for controlling the pests of agriculture then the chemicals.

• Therefore, there should be more works on production on biopesticides and encourage people to use biopesticides to control the pests.

• Bio-pesticide is a formulation made from naturally occurring substances that controls pests by non-toxic mechanisms and in ecofriendly manner.

• Bio-pesticides may be derived from animals (e.g. nematodes), Plants (Chrysanthemum, Azadirachta) and micro-organisms (e.g. Bacillus thuringiensis, Trichoderma, nucleopolyhedrosis virus), and include living organisms (natural enemies) etc.

• However, bio-pesticides are generally less toxic to the user and are non-target organisms, making them desirable and sustainable tools for disease management.

Advantages of Bio-Pesticides:

Inherently less harmful and less environmental load,

• Designed to affect only one specific pest or, in some cases, a few target organisms,

• Often effective in very small quantities and often decompose quickly thereby resulting in lower exposures and largely avoiding the pollution problems

• When used as a component of Integrated Pest Management (IPM) programs, biopesticides can contribute greatly.

Types of Bio-pesticides:

- Microbial Pesticides
- Plant- incorporated-protectants (PIPs)
- Biochemical pesticides
- Biotic agents (Parasitoids and Predators)

Some of the Important Microbial Pesticides

Bacillus thuringiensis:

• Discovered in Japan in early 20th century and first become a commercial product in France in 1938.

• Control lepidopterous pets like American bollworm in cotton and stem borers in rice.

• When ingested by pest larvae, but releases toxins which damage the mid gut of the pest, eventually killing it.

• Main sources for the production of but preparations are the strains of the subspecies kurstaki, galeriae and dendrolimus.

Agrobacterium Radiobacter (Agrocin):

• Agrobacterium radiobacter is used to treat roots during transplanting that checks crown gall.

• Crown gall is a disease in peaches, grapevine, roses and various plants caused by soil borne pathogen Agrobacterium tumefaciensm.

• The effective strains of A. radiobacter posses two important features

• They bare able to colonize host roots to a higher population density.

• They produce an antibiotic, agrocin, that is toxic to A. tumefaciens

Pseudomous fluorescens (Phenazine):

• This bacteria is used to control damping of caused by Pythium sp., Rhizoctonia solani, Gaeumannomyces graminis.

• It has ability to grow quickly in the rhizosphere.

Trichoderma:

• Trichoderma is a fungicide effective against soil born diseases such as root rot.

• This is also used against Necteia galligena, that causes silver leaf disease of fruit trees by entering through pruning wounds

Metarizium anisopliae:

• It infects spittlegbugs, rhinoceros beetles.

Beauveria bassiana:

• Controls Colorado potato beetle.

Verticillum lecanii:

• Controls aphids and whiteflies

Nomuraea riley:

• Controls soybeans caterpillars

Baculoviruses (Bvs):

• Controls lepidopterous and hymenopterous pests.

• Rod shaped, circular double stranded super coiled DNA.

• Bathyplectes, trichrogramma, encarsia, muscidifurax etc.

Biotic agents / Natural enemies:

Predators:

• They consume several to many prey over the course of their development, they are free living and they are usually as big as or bigger than their prey.

• Lady beetles, rove beetles, many ground beetles, lacewings, true bugs such as Podisus and Orius, syphid fly larvae, mantids, spiders, and mites such as Phytoseiulus an Amblyseius.

INDIAN SYSTEMS OF MEDICINES

A. BASIC PRINCIPLES OF AYURVEDA, SIDDHA, UNANI, HOMEOPATHY

INTRODUCTION:

Traditional system of medicine also known as indigenous/folk medicines/alternate medicine comprises of medicinal aspects of knowledge, skills, and practices based on different cultures and different people which are used to treat the diseases.

It includes various system being practiced throughout the world

"AYUSH"

A – Ayurveda

Y – Yoga

U – Unani

S – Siddha

H – Homeopathy

DEFINITION:

According to WHO,

"The health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral-based medicines, spiritual therapies, manual technologies and exercises, applied singularly or in combination to treat, diagnose and prevent illness or maintain well-being"

AYURVEDA – INDIAN SYSTEM OF MEDICINE

• "Ayur" means life and "Veda" means science of life

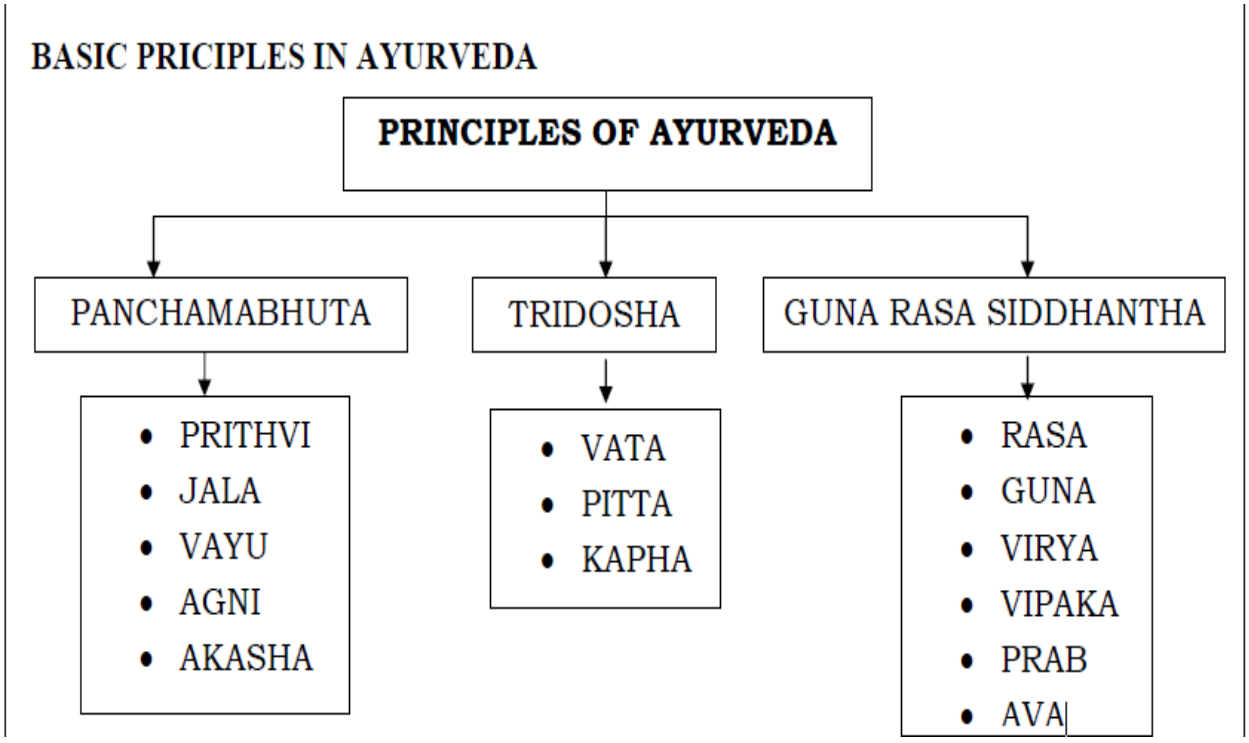
• This system of medicine came into existence in about 900BC

• Ayurveda system of medicine is the oldest written medicine system and in certain cases, it is even assumed to be the most effective than modern medicines

• Charaka and Sushruta made significant contributions to Ayurveda

• The Book "Charak samhita" was written by charaka and he was known as father of Ayurveda

• Ayurveda system of medicine developed an extensive use of medicine from plant Origin



PANCHA BHUTA

According to this theory, universe are made up of five elements (Pancha Bhuta) and they are present in the human body,

• Earth (PRITHVI)

• Water (JALA)

• Fire (AGNI)

• Air (VAYU)

• Space/Ether (AKASHA)

TRIDOSHA

The five elements (Pancha Mahabhuta) exist in human body in three different forms, together known as "Tridosha"

- VATA (Air + Space/Ether)
- PITTA (Fire + Water)
- KAPHA (Water + Earth)

These tridoshas when present in balanced form in the body is considered as healthy condition, any imbalance in tridoshas is considered as diseased condition. Ayurveda tries to maintain the balance in these elements.

DOSHAS	REPRESENTATIVES
Vata	• Factors responsible for movements and sensations (ANS, CNS). • It regulates the psychic and nervous system. • Imbalance of this leads to diseased of ENT, heart, urinary tract, skin etc.
Pitta	Factors responsible for digestion, metabolism, heat production, blood pigmentation, endocrine function, energy • It regulates energy production, digestion, tissue building etc. • Imbalance of this leads to disease like acidity, indigestion, liver and skin diseases
Kappa	• Factors responsible for strengthening stomach, joints, limbs and refreshing sense organs • It regulates heat, formation of fluids, mucous etc. • Imbalance of this results in joints pain, brain disease, drowsiness etc.

SAPTA DAHU (Basic structures of body)

Combinations of these five elements (Pancha Mahabhutha) form seven basic tissues of the body which referred as "SAPTA DAHU"

1. Food juices (RASA)

2. Blood (RAKTA)

3. Muscle tissues (MAMSA)

4. Fat tissues (MEDA)

5. Bone marrow (MAJJA)

6. Bone tissues (ASTI)

7. Reproductive organs (SHUKRA)

These sapta dahu undergo wear and tear to form "MALA" (Excretory products)

GUNA-RASA-VIRYA-VIPAKA-PRABHAVA SIDDHANTHA:

SAPTA DAHU (Basic structures of body)

These are considered as five pharmacological principles/properties of "Dravya" (drug substances),

RASA (TASTE – Therapeutically active agents)

GUNA (UNIVERSAL – Certain physical attribution of drug, which effect the tridosha)

VIRYA (TO PRODUCE ACTION – An active principle by which potency is characterised)

VIPAKA (DIGESTION & ASSIMILATION – End product of all digestive transformation of drugs)

KARMA/PRABHAVA (THERAPEUTIC ACTION – Actual therapeutic activity of the drug in individual)

MALAS (By-products of Dhatus)

1. Urine

2. Faeces/Stool

3. Sweat The Doshas, Dhatus and Malas should be in equilibrium state to assure heath and any imbalance leads to disease

DIAGNOSIS:

1. Diagnosis was based on moment-to-movement monitoring of interaction between health and illness

2. Diagnosis includes investigation of

i. Urine
ii. Pulse
iii. Nervous system
iv. Mucous and mucous secretions
v. Stool
vi. Body sounds
vii. Digestion fire

3. Observation of Doshas (Vatta, Pitta, Kapha)

4. Observation of Skin, Eyes, Hair, Nails and Tongue

TREATMENT:

Treatment involved in different methods

• Elimination therapy

• Alleviation therapy

• Psychic therapy

• Surgical therapy

In addition to single drugs, compound formulations are generally used to treat diseases in the form of tablets, pills, powders and syrups

Treatment include use of,

• Herbs (Plant remedies)

• Metals (Gold, silver, copper, lead, tin and iron)

• Minerals

• Animal drugs

SOME AYURVEDIC DRUG AND USES:

DRUG USES

Arjun-aristha -Heart disease

Khadir-aristha -Skin disease

Kumary-asava -Liver disease

Chirayantha arka –Fever

SIDDHA – TAMIL SYSTEM OF MEDICINE

• "Agastya" was believed to be the father of siddha medicine and he wrote a book known as "AGATTIYAR CHARKKU"

• To achieve mastery over nature and longevity, the ancient Tamils introduced two ways in their quest of knowledge

➢ Yoga

➢ Siddha medicine

• Person dedicated to the task of ailing the community were use to be yogis also known as

Siddhars. Siddhars were men born with great talents who lived for thousands years and by their devotion, search of truth, attained perfection in their life.

BASIC PRINCIPLES OF SIDDHA MEDICINE:

"Nature the best physician Food itself is a medicine"

• According to siddha medical science, universe is composed of five elements

➢ Earth

➢ Water

➢ Air

➢ Fire

➢ Ether

Man consumes water and food, breathes the air, maintains heat in body and remains alive because of life force provided by ether

• Earth is the first element which provides fine shape to the body and includes bone, muscle, skin, hair, tissues etc.

• Water represents blood, glandular secretions, vital fluids etc. Fire is responsible for emotion, vigor and vitality and helps in digestion, circulation, respiration and nervous system activity.

• Ether represents man's mental and spiritual faculties

• Harmonization/equilibrium between these makes a person healthy.

TRIGUNA – VATA, PITTA, KAPHA

VATA – People with predominant vata are characterized by stout, black, cold, inactive personalities. Increased vata develops flatulence, acidity, obesity, heart attacks etc.

PITTA – People with predominant pitta are characterized by lean, whitish complexioned hot personalities. Increased pitta shows early greying of hair, reddish eyes, burning chest, mental de-arrangement, anemia etc.

KAPHA - People with predominant kapha are characterized by well buid, good complexioned, well behaved personalities. Increased kapha leads to jaundice, heart attack, high fever, anemia etc.

DIAGNOSIS:

• Diagnosis involved examination of

➢ Urine (MUTHRAM)

➢ Pulse (NADI)

➢ Eye (VIZHI)

➢ Voice (DHWANI)

➢ Body color (NERAM)

➢ Tongue (TWAKA)

➢ Body (DEHAM)

➢ Faeces (MALAM)

• Diagnosis involved the study of person as well as disease. System emphasizes that the treatment must be based not only on disease but also patient characteristics (Age, Gender, Race, habits, Mental frame, Diet, Appetite, Physical condition, habitat etc.)

TREATMENT:

• The system made use of not only plant and animal drugs but also produced great treasure in treating diseases with metals and minerals

KASHAYAM (Decoction)

CHURNA (Powder)

TAILAM (Medicinal Oils)

CEULLIGAI (PILLS & TABLETS)

CHENDURUM (METAL COMPLEXES)

BHASMA (CALCINATED DRUGS)

• Metals were incinerated and used as medicine. Most commonly used metals includes gold, silver, tin, lead and iron in small quantities. They also used drugs that sublime on heating e.g. mercury and sulphur in small quantities.

• Siddhas were aware of various pharmaceutical industrial process e.g. calcination, sublimation, distillation, fusion, separation, fermentation, congelation etc. and served as poly-pharmacists.

• Some secret methods (especially fixing and consolidation of certain volatile substances e.g. mercury, sulphur, arsenic) are still a mystery

• Siddha treats all disease other than emergency conditions

• This system is effective in treating STD, UTI's, Liver and GIT diseases, general debility, post-partum anemia, fever, chronic diseases like arthritis, diarrhea and allergic disorders.

DIET IN SIDDHA:

Siddha system also gives importance to "Pathya" (restriction in diet).

RESTRICTED FOODS: Chicken, mangoes, coconut, fenugreek, mustard, sesame, almonds etc.

NON-RESTRICTED FOODS: wheat, milk, ghee, pulses, tender vegetables, goat meat, sugar etc.

UNANI SYSTEM OF MEDICINE:

Unani system of medicine has its roots in Greece. This system was introduced by "Hippocrates" who freed medicine from realm of superstitions and magic This system was introduced in India by Abu Bakr Bin Ali Usman Kasahani, Sadruddin Damashiqui, Bahwabin Khawas Khan, Ali Geelani, Akabl Arzani and Mohammad Hoshim Alvi Khan

BASIC PRINCIPLES UNANI SYSTEM OF MEDICINE:

HIPPOCRATIC THEORY PYTHOGORIAN THEORY

Blood (DUM) Hot & Moist

Phlegm (BALGHAM) Hot & Dry

Yellow Bile (SAFRA) Cold & Moist

Black Bile (SAUDA) Cold & Dry

• Unani system is based on Greece philosophy that considers the body to be made of four elements (Earth, Water, Air and Fire) which have four different temperaments (Cold, Hot, Wet, Dry)

• Interaction of these elements produces four temperatures;

➢ Hot & Moist (Air)

➢ Hot & Dry (Fire)

➢ Cold & Moist (Water)

➢ Cold & Dry (Earth)

• The body consists of simple and compound organs which got their nourishment through four humors;

➢ Blood

➢ Phlegm

➢ Yellow bile

➢ Black bile

• It is believed that blood is hot and wet, phlegm is cold and hot, yellow bile is hot and dry and black bile is cold and dry

• Mijaz/Temperature/Humors of a person

Mizaj-e-har (Hot)

Mizaj-e-barid (Cold)

Mizaj-e-yabis (Dry)

Mizaj-e-rath (Moist)

Balance form of these 4 humors is called as healthy condition and imbalance form is known as pathological condition

DIAGNOSIS AND TREATMENT:

It is done by recording the parameters such as psychology, age, gender, habits, working condition, history etc.

• Pulse reading

• Examination of sputum, urine, stools

• Patient counseling

Diseases are detected with the help of pulse, urine and stool and treatment involves various Strategies

TREATMENT METHODS	**STRATEGIES**
Ilaj bil tadbeer	Drugless regiments e.g. exercise, massage, hamam (Turkish bath), douches (Cold and hot) etc.
Ilaj bil ghiza	Diet therapy
Ilaj bil dawa	Correction of cause 1. Ilaj bil zid 2. Ilaj bil misl Drugs are given as crude or as compound drugs (mostly plant origin, some minerals and animal drugs)
Ilaj bil yad	Surgical procedures

UNANI MEDICINE:

• The material medica describes drugs obtained from herbs, animals, and mineral source

• Herbal drugs include various parts of plants and their products

• Animal drug includes organs, flesh, hair, bones etc.

• Mineral drug includes metal like gold, silver, lead, arsenic, etc. Precious stones like emerald, sapphire are also used.

HOMEOPATHY SYSTEM OF MEDICINE:

• It is a specialized forms of therapeutics developed by a German physician, chemist and pharmacist "Dr. Samuel Christian Friedrich Hahnemann" in 1810.

• So, the system treats the diseases or sufferings by the drugs that possess power of producing similar sufferings

• In the quest of reducing the damaging side-effects of drugs with medical treatments, Dr. Hahnemann began experimenting on himself and a group of health volunteers.

• He started giving smaller and smaller medicinal doses of drugs and found that as well as reducing toxicity, the medicines actually appears to be more effective at the lower the dose.

• He also observed that symptoms caused by toxics "medicines" such as mercury, were similar to those of the diseases they were being used to treat e.g. syphilis, which lead to the principle he describes as "like cures like".

FUNDAMENTALS IN HOMEOPATHY:

LAWS	**BASIS**
Law of similia	Let likes be cured by likes
Law of simplex	Simple and single drug be prescribed at time
Law of minimum	Drugs are used in minimum quantities i.e. just to arise the reaction in a Body
Drug providing	Drugs of known curative power should be known. Curative power is the ability of drug to produce disease symptoms when employed in healthy individuals
Drug potentisation	Process of dynamization of the drug in such a way that it produce the curative effect
Vital force	Disease is noting but disharmonious flow of vital force that gives rise to abnormal sensation and functions. To achieve health, this force needed to be restored
Acute and chronic diseases	Characterization of disease on the basis of onset, nature of progress and Termination
Individualization	No two individuals are alike in the world, so are the disease and medicine can't be prescribed on the basis of name of the disease

Direction of cure	Cure takes place within outward from above to downward and symptoms disappear in the reverse of their appearance

DIAGNOSIS:

• Collection of detailed case history and medicinal history

• Investigation of symptoms, location, sensation etc.

• Build up a symptoms picture of the patient

TREATMENT:

• Used drug in the form of mother tincture, small pills and powders

• Preparation of doses involved three processes, they are trituration, succession and serial dilution

• Potentiation is a physical process denotes by "C" three scales are used, they are decimal, centesimal and millesimal.

SOURCES OF MEDICINE:

• PLANTS: Various plants, fungi, etc.

• ANIMALS: Secretions, saliva, etc.

• MINERALS AND CHEMICALS: Toxic metals, inorganic salts etc.

• SERUM: Protoplasm of animals, hormones, etc.

• VACCINES: Bacterial and Viral products etc.

DISADVANTAGES OF HOMEOPATHY:

• Selection of correct drug is difficult

• It takes long periods of time to cure in chronic cases.

B. PREPARATION AND STANDARDIZATON OF AYURVEDIC FORMULATIONS VIZ ARITAS AND ASWAS, GHUTIKA, CHURNA,LEHYA AND BHASMA

DEFINITION:

Ayuvedic medicines are all the medicines intended for internal and external use, for or in the diagnosis treatment, or prevention of disease or disorder in human beings or animal and manufactured exclusively in accordance with the formulae described in the authorative. books of ayurvedic systems of medicine specified in the first schedule of the Drug and Cosmetic act 1940.

AYURVEDIC DOSAGE FORMS

SOLID	SEMI SOLID	LIQUID
VATIKA	AVALEHA	ASAVA
GUTIKA	LEPA	ARISHTA
CHURNA	MATRAS	ARKA
BHASMA	KALKA	KWAHA
KSHARAS	SWARASA	TAILA
NASYAS	KAJJALI	DRAVAKA
SATTVA	PRAASH	NETRABINDU

VATIKA:

• Medicaments are in tablet form

•Prepared by compression

PREPARATION:

Plant Drug material dried

↓

Cleaned

↓

Finely powdered separately

↓

Minerals made to Bhasma + Additives

(Mixed uniformly)

↓

Moistened with Syrup, Extracted, binder if required

↓

Make uniform tablets by direct compression

on tablet compression machine

GUTIKA:

• Medicament is in the pills form

PREPARATION:

Plant Drug material dried

↓

Cleaned

↓

Finely powdered separately

↓

Minerals made to Bhasma + Additives (Mixed uniformly)

↓

Moistened with Syrup, Extracts

↓

Make uniform pencil cylinders

↓

Cut into same sizes & rolled in between fingers

↓

Dried in shade or sun

STORAGE:

• Air tight container

• Preparation containing vegetable drugs can be used for 2 years

• Pills and vatis should not lose their original color, smell, taste and form

• Preparations containing minerals or metals can be used for infinite period

• When sugar, salt is an ingredient, the pills should be kept away from moisture

PACKING:

• Bottles

Strip packing

Blister packing

MARKETED FORMULATIONS:

Marikadi Gutika

• Khadiradi Vati

• Sanjivini vati

• Lakshmivilasrasa vati

CHURNA:

It is fine powder of drug or drugs

TYPES:

- Simple,
- Compound,
- Ash containing

PREPARATION:

Plant drug material dried

↓

Cleaned & Dries

↓

Finely powdered separately

↓

Sieved through 80# separately

↓

Pulverised together

↓

Filled in containers

MARKETED FORMULATIONS:

• Ashwagandhadi Churna

• Triphala Churna

• Trikatu Churna

• Sudarshan Churna

• Drakshadi Churna

BHASMA:

These are the preparation containing ash which are obtained through the process of Incineration of crude drug treated with metallic or non-metallic minerals (gold, silver, zinc, copper) reagents or extract or plant juice or animal derived substances like shells & horns in closed crucibles or in pits with cow dung cakes

PREPARATION:

SODHANA

Cleaning, detoxification, purification process

↓

Reduce to fine powder

↓

React with mineral Herbal extract or minerals solution

to form wet mass

↓

Convert into pellets or sludge

↓

INCINERATION

↓

White, gray, black colored ash collected

1.SHODHANA is a process of purification and detoxification by which physical and chemical blemishes and toxic materials are eliminated substances are subjected for further processing Remove harmful substances and impurities present in drugs.

2. MARNA is a process in which metals and minerals are made into paste with various drugs and juices. Objective to make bhasma and this drugs are reduced to finest particles.

3. JARANA is a process of decomposing the particles by subjected to fire treatment in a measured manner for reducing them to ashes. To make it absorbable.

AVALEHA

• It is sugar based semi solid preparation for oral use

PREPARATION:

Decoction (Kwatha) mixed with sugar, jiggery, sugar candy, honey

↓

Boil with continuous stirring

↓

Homogenous mass is prepared

LEPA

• Lepa are semi solid preparation for external application in the form of paste

• Vegetable powders are stable for 1 month but with mineral stable long last

PREPARATION:

Fine powdered drug + mineral mixed

↓

Add cows urine, water, oil ghee

↓

Make soft paste

ARISHTA

These are liquid ayurvedic preparation prepared by process of fermentation (sandana process)

PREPARATION:

Decoction of Drug is prepared and placed in fermentation vessel

↓

Sugar, jiggery or honey is added

↓

Closed with earthen lid sealed edges with clay & cloth

↓

Fermented at constant temperature

↓

Set aside to settle down particle matter

↓

Fluid decanted & filtered

↓

Boil to avoid further fermentation

↓

Filled in bottle & sealed

MARKETED PREPARTIONS

Dashmularishta

Draksharista

Vidangarista

Asokarishta

ASAVA

These are liquid ayurvedic preparation prepared by process of fermentation (sandana process

PREPARATION

Water + sugar, jiggery, honey & Boiled

↓

Cooled

↓

Poured in fermentation of vessels

↓

Fine powder of drug is added to it

↓

Sealed

↓

Keep for fermentation

↓

Set aside to

↓

settle down particulate matter

↓

Fluid decanted & filtered

Boil to avoid further fermentation

PROPERTIES:

• Should be clean

• No foam should be produced

• Should not become sour on standing

• It has characteristic, aromatic & alcoholic odour

• During fermentation, alcohol is produced which facilitates extraction of active constituents contained in the drug

• Alcohol also serve as preservative in the product.

• Earlier, the wooden pots are fumigated with pippali powder and also smeared with ghee before the fermentation liquids are pour into them.

MARKETED PREPARTIONS

- Asavas
- Kumarisava
- Madhukasava
- Punarnavasava
- Chandanasava

STANDARDIZATION OF AYURVEDIC DOSAGE FORMS: PARAMETERS OF EVALUATION

1. Taxonomical Estimation

• Authentication of drug material

2. Organoleptic/sensory Evaluation

• Color

• Odour

• Appearance

• Powder particle size Distribution

• Powder flow

• Clarity

3. Foreign Matter

• Foreign Plant

• Own Plant

• Other Plant

• Mineral

4. Microscopic Evaluation

QUALITATIVE

• Palisade ratio

• Vein Islet

• Vein termination

• Stomatal Intex

• Stomatal Number

QUANTITAIVE

• Lycopodium Spore count method

• Starch Grain

• Calcium Oxalate Crystals

5. Physicochemical Evaluation

• pH

• Disintegration time

• Friability

• Hardness

• Sedimentation Rate

• Solubility

• Viscosity

Ash value

• Total Ash

• Acid insoluble Ash

• Water soluble

• Sulphated Ash

Extractive values

• Water soluble

• Ethanol soluble

• Ether soluble

Oil related values

• Saponification matter

• Acid value

• Ester value

• Swelling Index

• Foaming Index

• Melting Range

• Optical Rotation

6. Chromatographic & other Methods

• TLC & HPTLC

• HPLC

• UV Spectroscopy

• GC-MS

• Fluorimetry

7. Pharmacological Parameters

(Bioassay to estimate potency)

• Bitterness

• Astringent Activity

• Antimicrobial Activity

• Hemolytic Activity

• Antioxidant activity

• Nitric oxide Scavenging Activity

8. Toxicological

(Establishment of Safety)

• Limit Tests

• Pesticide contain

• Heavy metals contain

• Aflotoxin

• Radio-active contamination

• Bio-burdan

• Pathogenic and Non-pathogenic