

As Per New Syllabus ER 20
Diploma in Pharmacy 1st Year
Pharmacognosy
Notes



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Chapters	Page No
Chapter 1 : Introduction to Pharmacognosy	4
Chapter 2 : Classification of Drugs	8
Chapter 3 : Quality Control of Crude Drug	14
Chapter 4 : Secondary Metabolites	18
Chapter 5 : Study of Crude Drugs	27
Chapter 6 : Plants Used as Surgical Dressings	71
Chapter 7 : Traditional System of Medicine & Ayurvedic Preparations	82
Chapter 8 : Medicinal & Aromatic Plants	94
Chapter 9 : Herbs as Health Food	100
Chapter 10 : Herbal Cosmetics	111
Chapter 11 : Phytochemical Investigation of Drugs	121

Chapter 1

Introduction

of

pharmacognosy

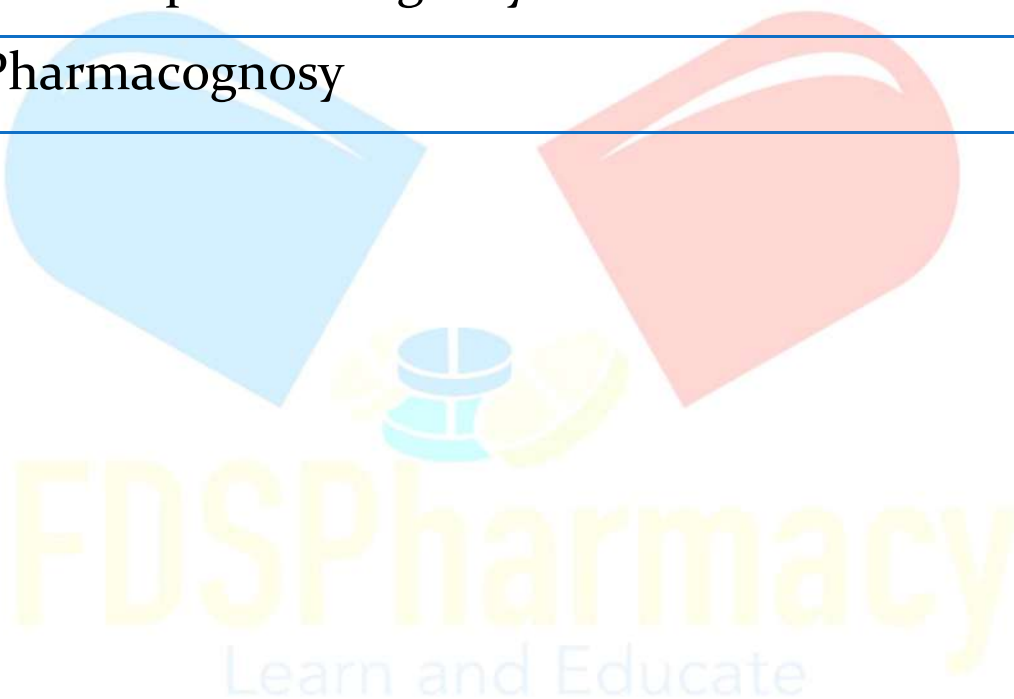
Topics

Pharmacognosy

History of pharmacognosy

Present status of pharmacognosy

Scope of Pharmacognosy



Introduction of pharmacognosy

Pharmacognosy

Is a branch of bioscience dealing with medical and related products of crude and obtain from plants, animals, and mineral origin it can also defined as the study of drug obtain from natural origin

Pharmacognosy is taken from greek word
pharmkon- a drug
gignosio – to aquire the knowledge

The modern pharmacognosy is divided in eight fields

1. **Modical ethnobotany** : This branch studies the traditional use of plants for medicinal Use.
2. **Ethnopharmacology** : This branch studied the pharmacological properties of traditional medicinal substance.
3. **Phytotherapy** : This branch studies the medicinal use of plant extracts.
4. **Phytochemistry** : This branch studies the chemicals obtained from plants. This branch also include the identification of new drugs of plant origin.
5. **Zoopharmacognosy** : This branch studies the process by which animals self-medicate, i.e. They treat and prevent disease by using plants ,soil , and insects.
6. **Pharmacognosy-biotechnology** : This branch studied the synthesis of natural bioactive molecules using biotechnology.
7. **Herbal interaction** : This branch studies the interaction between herbs and other drugs and body.
8. **Marine pharmacognosy** : This branch studies the chemicals obtained from marine organisms.

History of pharmacognosy

- The greek Physician Hippocrates (460 BC – 360BC) Known as ‘ Father of Medicine’.
- Aristotle the renowned philosopher (384 BC – 322 BC)Is well Know for his study on animal kingdom.
- Theophrastus (370 BC – 287 BC) for the plant kingdom .
- Greek pharmacist Galen (131 BC – 200 AD) describe various method of preparation containing active constituents of crude drugs.
- The branch of dealing with the extraction of plants and animals drogs is known as Galenical Pharmacy.

Present status of pharmacognosy

- At the present time, the people have realized that the use of naturally occurring drugs are not only economical but even safer too.
- Active Constituents from naturally occurring drugs have led to rapid development in pharmacognosy and phytochemistry.
- In present scenario, moderate state of all facilities like structure determination and pharmacological screening are available.
- Rapid development in the field of chemistry, biochemistry and pharmacology have further supported advancements in pharmacognosy.

Scope of Pharmacognosy

- 20th Century important drugs discovered from the animal kingdom during the century microorganisms have become essential source of drugs.
- 21st Century Chemistry & genetics were applied in plants to produce new plant & herb varieties.
- Scope of Pharmacognosy for isolation, extraction and development of new chemicals from medicinal plants was increased by the introduction of new branches.
- Pharmacognosy as an applied science has played an important role in developing different disciplines of science.

Scope of pharmacognosy discussed below

- **Synthesis drugs and antibiotics** : The demand of pharmaceutical production of plant origin has increased due to the world wide use of synthesis drugs and antibiotics.
- **Indigenous system of medicine** : Plants synthesis biologically active secondary metabolism due to which they are called a Chemical laboratory.
Based on the availability of medicinal plants as raw material, the WHO has emphasized to utilization of indigenous system of medicine.
- **Herbal medicine** : Since herbal medicine do not have any toxic or side effects they have gained popularity in the recent year.
- **Medicinal plant** : Medicinal Plants are found distributed in almost all part of India, there it is richest so use of medicinal plant.
- **Plant Drugs and remedies** : Complex diseases like cancer AIDS are treated by plant drugs and remedies, which are safer than the Synthetic medicines.

Chapter 2

Classification of Drugs



Topics

Classification of Drugs

- ✚ Alphabetical classification
- ✚ Morphological classification
- ✚ Taxonomical classification
- ✚ Chemical classification
- ✚ Pharmacological classification
- ✚ Chemotaxonomical classification



Classification of Drugs

- Drugs are chemical constituents which are obtained by the natural herbal source or synthetic source Technically and legally the term drug are defined in India under Drugs and cosmetics Act of 1940
- All medicines for internal or external use of human beings or animals all substance intended to be used for in diagnosis , treatment, migration or prevention of diseases in human or animals
- Classification is required for each drug because they are not similar in many except like chemicals , mode of action , morphological etc
- If we are not classified them then we face many problems that is drug identification, drug Adverse effect, and drug action

A method of drug classification should fulfil the following requirements :

- Simplicity
- Easy applicability
- No confusion

The arrangements of classification have their specific merits and demerits Classification is necessary which could be achieved in the following ways

- Alphabetical classification
- Morphological classification
- Taxonomical classification
- Chemical classification
- Pharmacological classification
- Chemotaxonomical classification

➤ **Alphabetical Classification :** The alphabetical classification system is the arrangement of crude drugs is done alphabetically by their latin and English name.

The Pharmacopoeias and reference books categorizing the crude drugs as per this system are :

- ♦ Indian Pharmacopoeia
- ♦ British Pharmacopoeia
- ♦ British Herbal Pharmacopoeia
- ♦ European Pharmacopoeia etc

Example : Acacia, Benzoin, Cinchona, Senna , Yellow bees wax, Zedoary

Merits

- The system is easily and quick use.
- These avoid confusion .
- Location, tracking and adding drugs entries can be done easily.

Demerits

- Alphabetical Classification system of drugs lacks relationship with the previous and successive drugs entries.

➤ Morphological Classification

- The morphological classification system the arrangement of crude drugs is done according to the plants parts like leaf , barks , flower , fruit, seed etc.
- Drug based on this classification system are classified into
 - Organised drugs
 - Unorganised drugs

Organised drugs : The drugs are obtained directly from the plants parts and contain cellular tissue, Rhizomes, barks,leaves etc.

Example

Plants parts	Drugs
Rhizomes	Valerian, Ginger
Flower	Rose, Clove, Saffron
Seed	Almond, Mustard
Hair & Fiber	Cotton, Jute silk
Fruit	Papaya

Unorganised Drugs : These Drugs are prepared from plants through Intermediate physical process like incision , drying or Solvent extraction.

These drugs cannot contain cellular plant tissue.

Example

Category	Drugs
waxes	Beeswax
Dried latex	Opium
Dried juice	Aloe
Dried extract	Agar, Geletin

Merits

- ❖ Identification and detection of adulteration using this drug system is not difficult
- ❖ Pratical study by this classification is more

Demerits

1. The chemical constituents have no correlation with the therapeutics action
2. Repetition of drugs or plants may appear.

➤ Taxonomical / Biological Classification

- ◆ In taxonomical or biological classification system the crude drugs are classified by their Kingdom, subkingdom, Division, Class, Order, Family, Genus and species
- ◆ Examples:

Class	Order	Family	Drugs
Monocotyledonae	Poales	Graminae	Maize, Wheat etc
Dicotyledonae	Rutales	Rutaceae	Lemon, peel etc

Merits

- Evolutionary development are understood under taxonomical classification

Demerits

- It fails to recognize organized & unorganized form of crude drugs
- Chemical nature & therapeutic significance of crude drugs is also not included

➤ Chemical Classification

- In this classification Crude Drugs are put together which contain the similar chemical constituents
- It is very important except in the classification system because chemicals are responsible for the pharmacological action
- Example :

Hormones & Vitamins	Yeast, Oxytonic
Protein & Enzymes	Gelatin, Trypsin
Lipids	Caster oil, Beewax

Merits

- Phytochemical studies are well performed through this system

Demerits

- Confusion occurs when a drug contains many compounds belonging to different groups

➤ Pharmacological Classification

- In this classification drugs are placed together which show the similar Pharmacological / Therapeutical effect
- Example :

Categories	Drugs
Central nervous system	Opium , Tea , Nux-vomica
Cardiovascular system	Rauwolfia

Merits

- The classification system aids in recommending substituents of an unavailable drugs

Demerits

- Drugs with different action on the body get classified into many groups thus create confusion.

➤ Chemotaxonomical Classification

- Chemotaxonomy relates the positin of plants and uses chemical knowledge to biological evolution and relationships
- Plants can also classified using their chemical charecteristics
- Applying chemistry to taxonomy is known as chemotaxonomy
- At the present time chemotaxonmy is also described as chemical plant taxonomy, chemosystematics , and plant chemistry
- This classification can be done on the basis of the distribution of chemical like carbohydrates, lipids, and primary and secondary metabolism eg : Alkaloids , Glycosides

Merits

- This classification system is recent and provide better understanding of the relation ship between chemical constituents , their biosynthesis , and action

Demerits

- It is complex to recognize the chemical in plants Hence it is also a time consuming process

Chapter 3

Quality Control

of

Crude Drugs

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Topics

Adulteration of Drugs

- Morphological or Organoleptic evaluation
- Microscopic evaluation
- Physical evaluation
- Chemical evaluation
- **Biological evaluation**



Quality Control of Crude Drugs

Adulteration of Drugs :

The term Adulteration is defined as substituting original crude drugs partially
or

wholly with other similar-looking substance

Types of Adulteration : Adulteration may be of two types

Unintentional Adulteration : It occurs without any bad intention of manufacturer or suppliers

Unintentional Adulteration may be due to various reasons

- Confusion in vernacular names
- Lack of Knowledge about authentic source
- Similarity in morphology
- Lack of authentic plant
- Similarity in colour
- Careless collection
- Unknown reasons

Intentional Adulteration : Intentional adulteration may be due to the following reasons:

- ♣ Adulteration using manufactured substance
- ♣ Substitution using inferior commercial varieties
- ♣ Substitution using exhausted drugs
- ♣ Adulteration using the vegetative part of the same plant
- ♣ Addition of toxic materials
- ♣ Adulteration of powders
- ♣ Addition of synthetic principles

Evaluation of drugs Adulteration :

Evaluation of drug means confirmation of its identity and determination of its quality and purity and detection of nature of adulteration. The evaluation of a crude drug is necessary because of the following reasons :

Role in identification of botanical source

- ❖ Variation in botanicals
- ❖ Quality control of crude material
- ❖ Identification of common Adulterants
- ❖ Safety Assessment documentation for toxicological activity
- ❖ Standardization of crude drugs

The method for evaluation of crude drugs are :

- Morphological or Organoleptic evaluation
- Microscopic evaluation
- Physical evaluation
- Chemical evaluation
- Biological evaluation

1. Physical Evaluation :-

→ Physical standards are to be determined for drugs wherever possible.

They may help in evaluation, specifically with reference to specific gravity, density, optical rotation refractive index, melting point, viscosity and solubility in different solvents.

2. Chemical Evaluation :-

→ Chemical comprises of different chemical tests and chemical assays.

The isolation, purification and identification of active constituents are chemical methods of evaluation. Quantitative chemical tests such as Acid value, Saponification value etc.

It also help in proper identification of various of the crude drugs.

3. Biological Evaluation:-

→ The estimation of potency of crude drugs is done by means of the its effect on the living organism like bacterial, fungal growth or animal tissue or entities animal, it is called as bioassay

Bioassay is the measure of sample being tested capable of producing the biological effects as that of the standard preparation.

4. Morphological Evaluation (Organoleptic):-

→ It is refers to evaluation of drugs by colour, odor, teste, size, shape and special features like touch, texture and sound etc.

The study of form of crude drugs is morphology while description of the form is morphography. The adulteration of seeds of strychnosnux-vomica with the seed of strychnosnux-blanda or Strychnospotatorium, caraway with Indian dill, Alexandrian Senna with dog Senna is identified by morphological techniques.

5. Microscopic Evaluation:-

→ The microscopic evaluation also covers study of constituents by application of chemical tests to small quantities of drugs in powdered form or to histological sections of the drug (micro-chemistry)

This method allows more detailed examination of a drug and its can be used to identify organised drugs by their know histological characters.

Histological studies are made from very thin sections of the drugs.

Microscope by virtue of its property to magnify permits the minute structure under study to be enlarged and can be used to confirm the structural details of the drugs from plants origin.

Chapter 4

Secondary

Metabolites

Topics

Alkaloids

Terpenoids

Glycosides

Volatile Oils

Tannins

Resins



Secondary Metabolites

Alkaloids

- Alkaloids are heterocyclic nitrogenous compounds. Generally, they are basic in nature due to the presence of amino nitrogen. They can be defined as basic nitrogenous compounds of plant origin which are physiologically active. Chemically, at least one nitrogen atom is present in its cyclic structure.
- Ladenburg stated alkaloids as, 'compounds originated from plants with a basic nature, having one or more nitrogen atom in its ring structure'. The basic nature of alkaloids is due to the presence of N-atom in the 5- or 6-membered ring structure.
- Hence, based on the above findings, alkaloids can now be defined as, 'physiologically active basic compounds of plant origin in which at least one nitrogen atom forms part of a cyclic system.'

Occurance and Distribution

- McKee in 1962 reported that about 1000 investigated alkaloids belong to almost 100 families, 500 genera, and 1200 species.
- Alkaloids are found in any part of the plant. In a species, Only one or two specific parts (and not all) form alkaloids.

For example

- In opium poppy (*Papaver somniferum*), alkaloids are present in fresh latex of the fruit, while the poppy seeds bear no alkaloids.
- In cinchona the bark of the tree has quinine alkaloids.

Isolation

In general, alkaloids may be extracted by any of the following three well-defined and widely accepted processes:

- 1) **Stas-Otto Process:** Alkaloids extracted are according to their basicity and solubility. Extraction is basically carried out by Stas-Otto process in which the moistened drug is treated with alkali to set free the base existing in salt form and then the free base is separated with an organic solvent
- 2) **Kippenberger's Process:** In this Process the powdered and sieved plant substance is first digested with solution of tannin in glycerol at a constant temperature of 40°C for 48 hours. The resultant mixture is further heated to 50°C to complete coagulation of proteinous substance at temperature, and finally filtered.

- 3) **Steam Distillation:** This method is specially employed for volatile liquid alkaloids like coniine, nicotine, and serpentine. This process is not suitable for alkaloids with high molecular weight.

Purification of Crude Extract of Alkaloids

Different alkaloidal crude extracts are purified by different ways:

- ✚ Direct Crystallisation from Solvent
- ✚ Steam Distillation
- ✚ Chromatographic Technique
- ✚ Gradient pH Technique

Identification Tests

- ♣ In case of qualitative estimation the chemical tests are performed for different class of compounds. Following are some of the important chemical tests for alkaloids :
- ♣ **Mayer's Reagent (Potassium Mercuric Iodide Solution):** It gives white or pale yellow coloured precipitate except with alkaloids of purine groups.
- ♣ **Dragendorff's Reagent (Potassium Iodide + Bismuth Nitrate):** It gives orange red coloured precipitate. This reagent is also used as a spray reagent for thin layer chromatography of alkaloids.
- ♣ **Wagner's Reagent (Iodine Solution):** It gives a brown or reddish brown coloured precipitate.
- ♣ **Hager's Reagent (Saturated Solution of Picric Acid):** It gives a characteristic crystalline precipitate.
- ♣ **Freshly Prepared Aqueous Solution of Tannic Acid (5% w/v):** It gives a buff coloured precipitate which is soluble in dilute acid or ammonia solution.

Therapeutic Activity

Alkaloids are pre-infectional compounds which prevent bacterial or fungal infection. Thus, alkaloids in medicine are used as follows:

- 1) They are used as analgesics or pain relievers, e.g., morphine and codeine.
- 2) Atropine and its synthetic derivatives are used in eye examinations for eye dilation.
- 3) Tropicamide is used for diagnosing Alzheimer's disease.
- 4) Quinine (isolated from *Cinchona officinalis*) is an antimalarial drug.

Pharmaceutical Applications

- ❖ Presence of a wide-spectrum and complete diversity of complex structures in alkaloids allow them to show broad-range of pharmacological activities on cardiovascular and central nervous system.
- ❖ Alkaloids have their specific and definite pharmacological action.

Terpenoids

- Terpenoids are the volatile and aromatic substances present in plants and giving them their characteristic fragrance or odour.
- Generally, most of the terpenoids are a group of compounds present naturally in plants with some exceptions of i.e., obtained from other sources) including civet, musk, etc
- In plants, terpenoids are present in leaves and fruits of higher plants, conifers, citrus plants, and other plants.

Occurrence and Distribution

- I. Terpenoids are volatile substances which give plants and flowers their fragrance. They occur widely in the leaves and fruits of higher plants, conifers, citrus and eucalyptus.
- II. Terpenoids comprise tens of thousands of small molecule natural products that are widely distributed across all domains of life. Plants produce by far the largest array of terpenoids with various roles in development and chemical ecology.

Isolation

- Fractional Distillation
- Chromatographic Method
- Chemical Method

Identification Tests

- ✚ **Noller's Test:** The sample to be analysed is mixed with tin and thionyl chloride and subjected to warmth. Pink colouration appears, if tri-terpenoids are present.
- ✚ **Test for Terpenoids:** In a test tube, the plant extract (0.5gm) is taken along with chloroform (2ml). Conc. H_2SO_4 (5ml) is added carefully in the tube in such a manner that it forms a separate layer.
- ✚ Appearance of reddish brown colouration at the junction of two layers confirms the presence of terpenoids.

Pharmaceutical Application

- ♠ Some plants produce volatile terpenes for attracting insects for pollination or to repel certain animals feeding on that plant
- ♠ This bitter taste protects the plants from getting devoured by animals and are also used as antifeedants.
- ♠ They also possess medicinal properties like perilla alcohol acts as antineoplastic agent, artemisinin has antimalarial property, glycyrrhizin has antiulcer, hepatocidal, antimicrobial and diuretic properties, and taxol (diterpenoid) has anticancer property

Glycosides

- ♣ In a glycoside molecules , sugar group is bonded through its anomeric carbon to another group via glycosidic bond A glycosidic bond is a covalent bond that binds the sugar molecule to another molecule (that may or may not be sugar molecules.) Thus a substance containing a glycosidic bond is called a glycoside
- ♣ Glycoside may be defined as “the organic compounds of plants or animals origin which on enzymatic or acid hydrolysis give one or more sugar moieties along with non-sugar moiety”
- ♣ The sugar group is known as the glycone and the non-sugar group as aglycone or genin part of the glycoside

Occurrence and Distribution

- ♦ Glycosides widely occurs in root, bark, fruits, and to a small extent in leaves

Isolation

- Sta-Otto method

Identification Tests

- ❖ Borntrager's Test : 1 gm of drug is boiled with 5-10 ml dilute HCL for 10 Min on a water bath. After boiling the solution is filtered and the filtrate is extracted with CCl_4 / benzene.
- ❖ The obtained extracted solution is shaken with an equal quantity of ammonia solution . A pink or red colour Appears in the ammoniacal layer Which confirms the presence of anthraquinone moiety.

Therapeutics Activity

- Cardiac glycosides are compounds derived from the foxglove plant (*Digitalis purpurea*). Initially, digitalis was used to treat dropsy (i.e., oedema). Later studies revealed that digitalis may treat oedema caused by a weakened heart (i.e., heart failure)

Volatile Oils

- ♣ Volatile oils are obtained from various plant parts. They are basically the mixture of hydrocarbon sesquiterpenes, and polyterpenes and their oxygenated derivatives.
- ♣ Volatile oils carry the plant's active constituents and hence are also called essential oils. Mostly the volatile oils are already present in special secretory tissues in the Plant, e.g., the oil ducts in umbelliferous fruits
- ♣ Volatile or ethereal oils are defined principles of plant as, "odorous volatile principle of plants and animal origin which evaporate when exposed to air at ordinary temperature"

Occurrence and Distribution

- Aromatic plants contain essential oils
- Volatile oils can be formed by two methods, i.e., by hydrolysis of some glycosides, and directly by the Protoplasm

Isolation

- The amount of volatile oils present in plants reaches its maximum at some particular time, e.g., jasmine has the greatest concentration of volatile oil at sunset, and thus the plant parts containing volatile oils should be collected at this particular time.
- Extraction by Steam Distillation:
- Extraction by Scarification:

Identification Tests

- 1) A thin section of drug is treated with an alcoholic solution of Sudan III. A red colour appears that confirms the presence of volatile oils.
- 2) A thin section of drug is treated with a tincture of alkane. A red colour appears that confirms the presence of volatile oils.

Therapeutic Activity

volatile oil molecules enter the body, they correlate with physiological functions through the following three modes of action:

- A. **Biochemical (Pharmacological):** They chemically interact in the bloodstream with hormones and enzymes (like farnesene).
- B. **Physiological:** They interact by participating in specific physiological function; For example, the volatile oil present in fennel contains oestrogen-like compounds which prevent female problems (like lactation and menstruation).
- C. **Psychological:** On inhaling the volatile oil molecules, the olfactory area of the brain (limbic system) gets triggered and releases chemical and neurotransmitter messengers

Pharmaceutical Applications

- Volatile oils are employed as flavouring agent, perfuming agent in pharmaceutical products, foods, beverages, and in cosmetics

Tannins

- The term tannin was first used by Seguin in 1976 to denote substances present in plant extracts which are able to combine with proteins of animal hides, prevent their putrefaction, and convert them into leather.
- On this basis tannin is a substance which is detected qualitatively by a tanning test (the Goldbeater's skin test) and is determined quantitatively by its absorption on standard hide powder.
- Tannins are defined as, "complex substances that usually Occur as mixtures of polyphenols that are very difficult to separate since they do not crystallise".
- Tannins are present in the aerial parts, e.g., leaves, fruits, barks, or stem, generally occurs in immature fruits, but disappears during the ripening process.

Occurrence and Distribution

- ♣ Rhubarb, red rose petals, bearberry leaves, Chinese galls, Turkish gall, hamamelis, chestnut, and maple are rich in gallitannins. Pomegranate rind, pomegranate myrobolans, eucalyptus leaves, some Australian kinds and Oak bark are rich in ellagitannins
- ♣ parts of plants are rich in condensed tannins
 - 1) Barks: Cinnamon, wild cherry, cinchona, willow, acacia, oak, and hamamelis.
 - 2) Roots and Rhizomes: Krameria and male fern.
 - 3) Flowers: Lime and hawthorn.
 - 4) Seeds: Cocoa, guarana, kola, and areca.
 - 5) Leaves: Hamamelis, howathron, and tea.
 - 6) Extracts and Dried Juice: Catechu, acacia, mangrove cutches, East Indian Kino, butea gum, eucalyptus, and kino.

Isolation

The steps involved in extracting tannins are :

- 1) 100gm of the powdered sample is refluxed for 15 minutes in a 500ml Erlenmeyer flask. During the reflux process, the entire sample should be covered with 70% acetone. The flask is removed from the hot plate and filtered in another flask.
- 2) The residue on the filter paper is washed off using a sufficient amount of 70% acetone.
- 3) The washed solution is combined with the filtrate and the resultant mixture is subjected to extraction using diethyl ether.
- 4) This process is repeated five times till the diethyl ether and tannin separate out completely as distinct upper and lower layer, respectively.
- 5) The tannin layer is separated via separatory funnel. The tannin so collected is evaporated till a residue, known as the extracted tannin, is obtained which is the final product.
- 6) The tannin percentage is calculated with the following formula: $\% \text{ tannin} = \frac{\text{Wt. of dried tannin}}{\text{Wt. of the powdered sample}} \times 100\%$
- 7) After extracting the tannin, the aqueous and ethereal layers are concentrated, dried, further iso-lated, and purified using various chromatography techniques.

Identification tests:

- **Gelatin Test:** To a solution of tannin (0.5-1%), aqueous solutions of gelatin (1%) and sodium chloride (10%) are added. A white buff-coloured precipitate is formed.

Therapeutic Activity

The medicinal uses of tannins are:

- I. Anti-Diarrhoeal
- II. Anti-Tumour
- III. Antidote

Resins

- Resins can be defined as, "the hydrocarbon secretion of various plants (especially the coniferous trees)".
- Apart from this, resins are also used as a raw material for synthesising organic compounds.

Occurrence and Distribution

- ✚ Below are the examples of different plants whose different structures or secretion zone contain resins:
- ✚ Ginger (*Zingiber officinale* Roscoe) belonging to family Zingiberaceae has resin cells
- ✚ Cannabis (*Cannabis sativa* Linn.) belonging to family- Moraceae contain resins in their glandular hair.

Identification Tests

- i. Colophony resins are The tests recommended for colophony resins are
- ii. 100mg of resin powder is dissolved in 10ml acetic anhydride. To this solution, few drops of sulphuric acid is added which results in purple violet colouration of the solution.
- iii. **Guaiacum Resin:** A solution of resin is prepared in ethanol and to this solution ferric chloride is added. This results in deep blue colouration of the solution.

Therapeutic Activity

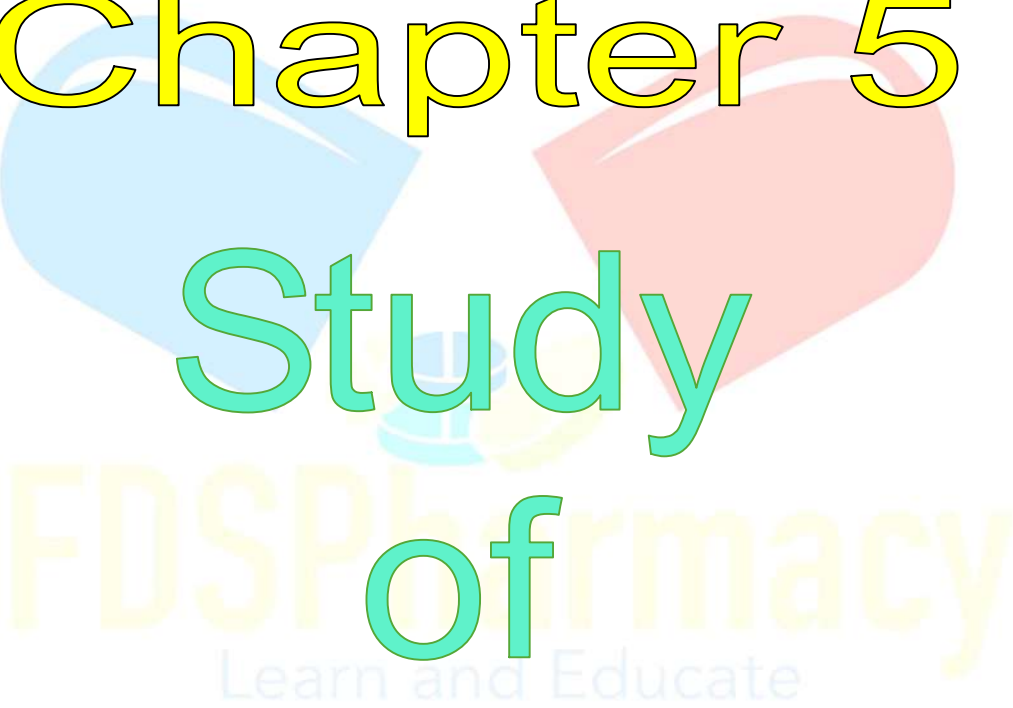
- Resins possess mild antiseptic property, hence are used topically in the form of plaster, ointments, and cerates.
- They are also used for preparing emulsions.

Pharmaceutical applications

Resins are being used since ages in various cultures and are used as herbal medicine for several diseases in the Eastern countries.

Chapter 5

Study of Crude Drugs



Topics

LAXATIVES

- Aloe
- Castor Oil
- Ispaghula
- Senna

CARDIOTONIC

- ◆ Digitalis
- ◆ Arjuna

CARMINATIVES AND G.I. REGULATORS

- Coriander
- Fennel
- Cardamom
- Ginger
- Black Pepper
- Asafoetida
- Nutmeg
- Cinnamon
- Clove

ASTRINGENTS

- Myrobalan
- Black Catechu

DRUGS NERVOUS SYSTEM ON ACTING

- Hyoscyamus
- Belladonna
- Ephedra
- Opium
- Tea Leaves
- Coffee Seeds
- Coca

Anti-Hypertensive

- ✚ Rauwolfia

Anti-tussive

- Vasaka
- Tolu Balsam

Anti-rheumatics

- ❖ Colchicum Seed

ANTITUMOUR

- Vinca
- Podophyllum

ANTIDIABETICS

- Pterocarpus

- Gymnema

DIURETICS

- Gokhru
- Punarnava

ANTI DYSENTERIC

- Ipecacuanha

ANTISEPTICS AND DISINFECTANTS

- Benzoin
- Myrrh
- Neem
- Turmeric

ANTIMALARIALS

- Cinchona
- Artemisia

OXYTOCIC

- Ergot

VITAMINS

- Cod Liver Oil
- Shark Liver Oil

ENZYMES

- Papaya
- Diastase
- Pancreatin
- Yeast

PHARMACEUTICAL AIDS

- ✦ Kaolin,
- ✦ Lanolin,
- ✦ Beeswax,
- ✦ Acacia,
- ✦ Tragacanth,
- ✦ Sodium alginate,
- ✦ Agar,
- ✦ Guar gum, and
- ✦ Gelatin

Miscellaneous

- ♠ Squill
- ♠ Galls
- ♠ Pale Catechu
- ♠ Ashwagandha
- ♠ Vasaka
- ♠ Tulsi
- ♠ Guggul

Study of Crude Drugs

LAXATIVES

- Laxatives are used for curing acute and chronic constipation, (haemorrhoids), treating anorectal and preparing the bowel for colonoscopy.
- Although constipation affects all age group individuals, it especially affects the pregnant women and elderly individuals.
- Constipation is mostly treated by modifying diet.
- Laxatives are the well-known, highly advertised, and commonly used OTC drugs, which exert a therapeutic effect on the GIT.
- Conventionally, these drugs were classified as stimulant/irritant, saline and osmotic cathartics, bulk-forming agents, stool softeners, and Tubricants.

Examples of Laxatives

- Aloe
- Castor Oil
- Ispaghula
- Senna

Aloe

- ♣ Aloe vera is a plant species of the Aloe genus.
- ♣ It grows wild in tropical climates and is also cultivated due to its agricultural and medicinal values.

Synonyms

Mussabar, Kumari, and Aloes.

Biological Source

- ✚ Aloe vera is the dried juice obtained from the leaves of various species of aloe like Aloe pernyi Baker (Scotorine aloe), Aloe vera Linn, (Curacao aloe), and Aloe africana (Cape aloe).
- ✚ It is one of the most familiar of all the medicinal herbs.
- ✚ Out of the more than three hundred species of aloe, only four are believed to have medicinal properties.
- ✚ The most potent medicinal effects are believed to come from aloe vera (also called Aloe barbadensis), which is frequently produced in gel form.

Family

Liliaceae

Chemical Constituents

- Aloe is made up of 30% of aloin which is a mixture of barbaloin, p-barbaloin, and isobarbaloin isomers

Therapeutic Efficacy

Aloe vera has the following therapeutic properties:

- 1) Its gel is stabilised and added with a preservative to be used in the form of pure gel or applied as a Motion.
- 2) Its gel is effectively used in stomach and mouth ulcers.
- 3) Its gel is also helpful in treating burns and aiding wound healing..
- 4) Ointment of aloe gel is used in the treatment of skin Irritations, burns caused by sun, heat or radiation.
- 5) Enzymes obtained by extracting its gel possess analgesic properties, and have shown to inhibit thermal damage and vascular permeability in mice.

Castor Oil

Castor oil is a vegetable oil having anti-inflammatory and antibacterial properties

Synonyms

Castor bean oil, castor oil seed, ricinus oil, oil of palma, and olrum ricini.

Biological Source

- Castor oil is obtained by cold expression from the seeds of *Ficina communi* Linn.

Family

Euphorbiaceae

Chemical Constituents

- ♣ Castor oil contains about 80% of triglyceride of ricinoleic acid. The fatty acids present in the drug are isoricinoleic, noneic stearic and isostearic acids

Therapeutic Efficacy

- 1) It acts as a cathartic due to the irritant action of ricinoleic acid
- 2) Commercially it is used for lubrication.
- 3) Sometimes it is consumed orally as an aromatic castor oil or in the form of capsules
- 4) It is an ingredient of abortifacient paste, and ricinoleic acid is an ingredient in contraceptive creams and jellies.
- 5) Atropine and cocaine used for ophthalmic purposes are suspended in it.

Ispaghula

- ♣ Ispaghula is also known as plantago seeds and psyllium husk
- ♣ The term plantago is a Latin term which means sole of the foot (it refers to the leaf shape).
- ♣ Isabgol is hygroscopic, and swells and expands to become mucilaginous

Synonyms

Isabgul, Ispagol, Ishahgula, spongeal seeds, Indian psyllium, and Flea seed.

Biological Source

- 🌱 Ispaghula is the dried ripe seeds of *Plantago pryllium* L. *Plantago arenaria*, *P. ramosa* (Spanish or French psyllium seed). *Plantago ovata* (blood or Indian plantago seed), on *Plantago amplexicaulis*.)

Family

Plantaginaceae

Chemical Constituents

- ♣ Ispaghula seeds, contain 10% mucilage in their endodermis

Therapeutic Efficacy

Ispaghula has the following therapeutic properties:

- 1) The seeds and husk are used as demulcent, laxative, and emollient.
- 2) It is used for treating chronic constipation, amoebic and bacillary dysentery.
- 3) Its mucilage is used in tablet preparation.
- 4) The crushed seeds are used in the form of poultice for relieving rheumatic pain.
- 5) It effectively works as a soothing agent, thus, is used in duodenal ulcers and piles.

Senna

- Senna is a herb used as a laxative.
- It is also known as Wild senna, *Cassia marilandica*, or locust plant.
- In the at times, the Arabian physicians used senna as cathartics

Synonyms

Folia senna, and Tinnevelles senna

Biological Source

- ♦ Senna is the dried leaflets of *Cassia angustifolia*

Family

Leguminosae

Chemical Constituents

- Senna contains mainly two anthraquinone glycosides called as sennoside A and sennoside B (not less than 2.5%) which account for its purgative property

Therapeutic Efficacy

Senna has the following therapeutic properties:

- 1) It is mainly used as a purgative
- 2) It is used as a stimulant cathartic
- 3) Its inherent action is associated with griping; thus it is dispensed with the carminatives to counteract the undesired effect.

CARDIOTONIC

- Cardiotonics have a positive inotropic action, as a result of which the heart beats stronger and slower.
- Cardiac glycosides (sugar-containing substances made from plants), phosphodiesterase inhibitors, and dobutamine (sometimes used in end-stage heart failure to increase myocardial contractility in dose dependent manner) are some examples of cardiotonics, Digoxin (a preparation of digitalis) is the major cardiac glycoside.

Digitalis

- The genus Digitalis has around twenty species of herbaceous, perennial, or biennial shrubs.
- The digitalis plant is also known as foxgloves.

Synonyms

Digitalis leaves and Foxglove leaves.

Biological Source

- Digitalis is dried leaves of Digitalis purpurea, dried at a temperature below 60°C, immediately after collecting the leaves. The leaves should not contain more than 5% of moisture.

Family

Scrophulariaceae

Chemical Constituents

- Digitalis contains 0.2-0.45% mixtures of both primary and secondary cardiac glycosides (cardenolides).

Therapeutic Efficacy

Digitalis has the following therapeutic properties:

- 1) It enhances the contraction force of heart muscles

Arjuna

- Arjuna is a tree bark used in Ayurveda medicinal system for maintaining cardiovascular health pertaining to the heart itself.

Synonyms

Arjun bark and Arjun

Biological Source

- Arjuna is the dried stem bark of Terminalia arjuna Rob

Family

Combretaceae

Chemical Constituents

- Arjuna bark contains hydrolysable tannins (about 15%). triterpenoid saponin, arjunolic acid, arjunic acid, and arjunogenin

Therapeutic Efficacy

Arjuna has the following therapeutic properties:

- 1) The juice of its leaf has been used in traditional Ayurvedic medicine system for treating dysentery and ear ache.
- 2) It helps in maintaining normal cholesterol levels, as it possesses antioxidant properties.
- 3) It strengthens the heart muscles and maintains the normal functioning of heart.
- 4) It improves the functioning of cardiac muscles.

CARMINATIVES AND G.I. REGULATORS

- Carminatives are soothing drugs which act by relieving stomach and intestinal pain, and expelling gas from GIT by peristalsis.
- Fennel, ginger, coriander, cinnamon, nutmeg, asafoetida, clove, etc. are some examples of carminatives. G.I. regulators like stomachics, stimulants, appetizers, aromatics, antiemetic, sialogogues, and chologogues are used for regulating the activity of GIT.

Coriander

- Coriander is a herb grown once in a year.
- It is also well known by the names of cilantro or Chinese parsley.
- All its parts are edible but fresh leaves and dried seeds are mostly used for cooking purpose.

Synonyms

Coriander fruits, Chinese parsley, and Indian parsley.

Biological Source

→ Coriander is the fully dried ripe fruits of *Coriandrum Sativum*

Family

Umbelliferae.

Chemical Constituents

- Coriander is chemically constituted with volatile oil (0.3-1%), fixed oil (135%) and proteins (20%)

Therapeutic Efficacy

Coriander has the following therapeutic properties:

- 1) Lowers Blood Sugar Level
- 2) Ease Digestive Discomfort
- 3) Fight Food Poisoning
- 4) Help Urinary Tract Infections

Fennel

- Fennel yields both a herb as well as a spice.
- All the plant parts of fennel (roots, stalks and leaves, with the spice obtained from dried seeds) are eatable.
- Fennel has its origin in the Mediterranean.
- It is an ancient and common plant known to the ancient Greeks and spread throughout Europe by Imperial Rome

Synonyms

Large fennel, Sweet fennel, Fennel fruit, Saunt (hindi), Fructos, and Foeniculi,

Biological Source

- Fennel is the dried, ripe fruits of *Foeniculum vulgare* Mill

Family

Umbelliferae

Chemical Constituents

- Fennel contains 2-6.5% volatile oil and 12% fixed oil. The volatile oil contains 50-60% phenolic ether and 18-20% fenchone as its major constituents which impart a distinct odour and taste to the fruits.

Therapeutic Efficacy

Fennel has the following therapeutic properties:

- 1) It is a common Ingredient of cough and stomach mixtures.
- 2) It is used in diseases related to chest, spleen, and kidney
- 3) Anethole is added in mouth and dental preparations.

Cardamom

→ Cardamom is a spice made from the seeds of several plants belonging to the family Zingiberaceae

Synonyms

Cardamom fruit, Elaichi, Hail, and Cardamom seeds.)

Biological Source

Cardamom is the dried ripe fruits of *Elettaria cardamomum*

Family : Zingiberaceae

Chemical Constituents

- The chemical constituents of cardamom fruits are volatile oil (2.5-6.2%), starch (50%), fixed oil (1-10%), and calcium oxalate.)

Therapeutic Efficacy

Cardamom following therapeutic properties:

- ✓ It stimulant and carminative,
- ✓ In India green cardamom (*A. subulatum*) is used for treating teeth and gum infections.
- ✓ It is used preventing treating throat troubles, congestion of lungs, and pulmonary tuberculosis.
- ✓ It is used inflammation of eyelids.

Ginger

- ♦ The generic name ginger *Zingiber*, which has been derived from the Greek word *Zingiberis* which turn has been derived from *Singabera* (Sanskrit name ginger).
- ♦ It is use since ancient times India well in China, and the 1st century traders had transported ginger the Mediterranean region.

Synonyms

Zingiber and *Zingiberis*,

Biological Source

- Ginger the rhizomes of *Zingiber officinale* Roscoe, scrapped to remove the outer skin and dried the sun. It known as Jamulen ginger the market.

Family

Zingiberaceae

Chemical Constituents

- ♠ Ginger contains volatile oil (1-4%), starch (40-60%), fat (10%), fibre (596), inorganic material (6%), residual moisture (10%), and acrid resinous matter (5-8%), Ginger oil is made up of monoterpene hydrocarbons.

Therapeutic Efficacy

Ginger has the following therapeutic properties:

- 1) It is used as a stomachic, aromatic, carminative, stimulant, and flavouring agent.
- 2) Its powder is effective in motion sickness.

Black Pepper

- Black pepper is the fruit of black pepper plant belonging to Piperaceae family.
- It is used as a spice as well as a medicine.
- Its major chemical constituent, piperine, is responsible for its spiciness.

Synonyms

Pepper, Piper nigrum, and Maricha.

Biological Source

- ★ Black pepper is the dried unripe fruit of perennial climbing vine, Piper nigrum Linn. It contains not less than 2.5% of dried piperine

Family

Piperaceae

Chemical Constituents

- Black pepper contains piperine (5-9%), volatile oil (1) 25%), a pungent resin (6.0%), piperidine, and starch (20%). The yellow coloured volatile oil contains phellandrene and caryophyllene.

Therapeutic Efficacy

Black pepper has the following therapeutic properties:

- 1) Its fruits are aromatic, stimulant, stomachic, and carminative.
- 2) It also stimulates the taste buds, thus increases the production of gastric juice.
- 3) Its pungent tasting oil is used as a spice.
- 4) It also enhances the bioavailability of some drugs.

Asafoetida

- The name Asafoetida has been derived from the Latin word fortid which means smelly, Asafoetida is a genus of perennial herbs.
- It has a very distinct, pungent odour.
- It is a spice used as a digestive aid, in food as a condiment, and making pickles.

Synonyms

Gum Asafoetida and Devil's dung

Biological Source

Asafoetida is the oleo-gum resin obtained by incision from the rhizomes and roots of Ferula foetida.

Family

Umbelliferae

Chemical Constituents

- ✓ Asafoetida contains resin (40-65%), gum (20-25%), and with ferulic acid, volatile oil (4-20%).
The chief resin of asafoetida is asaresinotannol present either in free form or is combined

Therapeutic Efficacy

Asafoetide has the following therapeutic properties.

- 1) Its 2% (w/v) suspension is used as a repellent against dogs, cats, deer, rabbits, etc.
- 2) It is used in veterinary to apply over the bandages of dogs so they do not chew them.
- 3) Sometimes it is used as carminative, expectorant, and laxative.
- 4) It is also a powerful nervine stimulant, used in nervous disorders related to hysteria.
- 5) It is also used as intestinal flatulence

Nutmeg

- Nutmeg is a spice with several health benefits.
- It relieves pain, soothes indigestion, strengthens cognitive function, detoxifies the body, boosts skin health, alleviates oral conditions, reduces insomnia, increases immune system function, prevents leukaemia, and improves blood circulation.

Synonyms

Semen myristicle, Myristics, and Jayfat.

Biological Source

- Nutmeg is the kernel of the dried ripe seeds of *Myristica fragrans* Houtten, deprived of its arillus and seed coat and with or without a thin coating of lime.

Family

Myristicaceae

Chemical Constituents

- ♠ Nutmeg contains volatile oil (5-15%) as its active constituent. The oil is secreted in large bubble-like cells in the inner perisperm.

Therapeutic Efficacy

Nutmeg has the following therapeutic properties:

- 1) It is an aromatic, carminative, and flavouring agent.
- 2) It shows a narcotic and anaesthetic action on the central nervous system.
- 3) Peripherally it shows irritant action and irritates the intestine and uterus, thus is an abortifacient.
- 4) Recently it has been used to control diarrhoea related to certain carcinomas.

Cinnamon

- ★ Cinnamon obtained from the inner bark of the trees of genus *cinnamomum* is majorly used in sweet and savoury foods.

Synonyms

Cinnamon bark, Kalmi-Dalchini, and Ceylon cinnamon.

Biological Source

- Cinnamon is the dried inner bark of the shoots of coppiced trees of *Cinnamomum zeylanicum* Nees., (syn. *Cinnamomum vertum*).
- It should contain 1.0% or more of volatile oil

Family

Lauraceae

Chemical Constituents

- ♦ Cinnamon contains many essential constituents such as volatile oil (0.5-1.0%) and phlobatannins (1.2%)

Therapeutic Efficacy

Cinnamon has the following therapeutic applications supporting the development of modern medicine:

- 1) It is highly enriched in carminative, stomachic, and mild astringent properties.
- 2) It may be employed as a flavouring agent, stimulant, an aromatic, and an antiseptic
- 3) Cinnamaldehyde (chemical constituent of Cassia cinnamon) is able to defend against several fungal and bacterial infections

Clove

- ◆ The unopened pink coloured buds of cloves are found in evergreen clove trees.
- ◆ Same as the other spices, they are available throughout the year.
- ◆ Cloves are known to provide a warm, sweet, and aromatic taste.

Synonyms

Caryophyllum, Clove flower, and Clove buds.)

Biological Source

- ◆ Clove is the dried flower buds of *Eugenia caryophyllus*. It should contain 15% (v/w) or more of clove oil.

Family

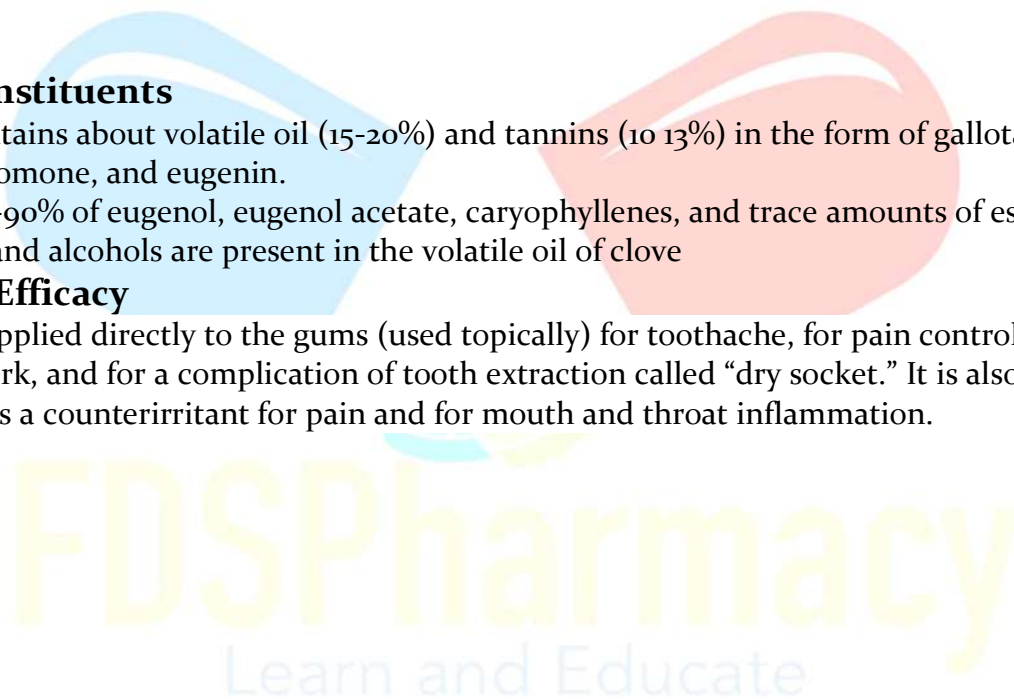
Myrtaceae

Chemical Constituents

- ➔ Clove contains about volatile oil (15-20%) and tannins (10-13%) in the form of gallotannic acid, resin, chromone, and eugenin.
- ➔ About 70-90% of eugenol, eugenol acetate, caryophyllenes, and trace amounts of esters, ketones, and alcohols are present in the volatile oil of clove

Therapeutic Efficacy

- ✓ Clove is applied directly to the gums (used topically) for toothache, for pain control during dental work, and for a complication of tooth extraction called "dry socket." It is also applied to the skin as a counterirritant for pain and for mouth and throat inflammation.



ASTRINGENTS

- Astringents are a group of substances which causes contraction or shrinkage of body tissues, and also dries the body secretions.
- The term astringent has been derived from a Latin term adstringere which means to bind fast.)

Myrobalan

- This plant is mainly known for its fruit which is edible and has the same name.
- In India, myrobalan is considered a sacred tree.
- Its fruit is very nourishing but it has a sour taste.
- The fruits possess health benefits in both dried and fresh forms.

Synonyms

Emblic, Emblic Myrobalan,, Indian Gooseberry, Malacca Tree, or Amla

Biological Source

- Myrobalan consists of dried and fresh fruits of *Emblica officinalis* Gaertn (*Phyllanthus emblica* Linn.)

Family

Euphorbiaceae.

Chemical Constituents

- The fruits of myrobalan are a rich natural source of vitamin C, fat (about 0.5%), phyllembelin, and tannin (5%).

Therapeutic Efficacy

Myrobalan has the following therapeutic uses:

- 1) It is very helpful in skin diseases.
- 2) It is required for glowing skin and it delays wrinkles and skin loosening.
- 3) It facilitates hair growth by stimulating the hair follicles and it also improves hair texture.
- 4) It lowers cholesterol and blood sugar level.
- 5) It also proves beneficial in chronic cough, childhood and allergic asthma, and tuberculosis.

Black Catechu

- ♠ Black catechu occurs in black, shining pieces or cakes, and is sold under the name of Catechu.
- ♠ It grows in deciduous trees reaching up to a height of 9-12m.
- ♠ This plant has short hooked spines and bipinnately compounds green leaves with 50 pairs of feather-like leaflets.

Synonyms

Catechu, Catechu Nigrum, Cutch Khadir (Sanskrit), Katha (Hindi), Katha (Gujarati), Cashoo, Peru catechu, and Cachou.

Biological Source

- Black catechu is the dried aqueous extract obtained from the heart wood of *Acacia catechu*.

Family

Leguminosae

Chemical Constituents

- Black catechu contains tannic acid (7.5-35%), catechin (10-15%), acacatechin (2-12%), philobatannin (25-35%), gum (20-30%), and quercitrin. Minor constituents of black catechu are quercitin, catechu red, and moisture.

DRUGS NERVOUS SYSTEM ON ACTING

- ◆ Central Nervous System (CNS) and the Peripheral Nervous System (PNS) together make up the nervous system.
- ◆ The PNS further divides into the Somatic Nervous System (SNS, regulating sensation and motor control of skeletal muscle) and the Autonomic Nervous System (ANS, regulating involuntary functions such as heart rate and gut motility).
- ◆ The ANS further divides into the sympathetic nervous system (works when the body is active, this increases heart and [respiration rates) and the parasympathetic nervous system (works when the body is at rest, thus it decreases heart rate and increases gastrointestinal motility)
- ◆ Central nervous system agents are medicines affecting the CNS made up of nerves in the brain and spinal cord. The CNS processes and controls most of the functions of body.
- ◆ CNS is affected by various drugs like anaesthetics, anticonvulsants, antiemetic drugs, antiparkinson agents, CNS stimulants, muscle relaxants, narcotic analgesics (pain relievers), non-narcotic analgesics paracetamol and NSAIDs), and sedatives.

Hyoscyamus

- Hyoscyamus is an annual or biennial plant of Solanaceae family, and also of the nightshade family.

Synonyms

Henbane, Hyoscyamus herb, and Hyoscyamus leaves)

Biological Source

- Hyoscyamus is the dried leaves and flowering tops of Hyoscyamus niger. It contains not less than 0.05% of hyoscyamus alkaloid, namely 1-hyoscyamine

Family

Solanaceae

Chemical Constituents

- ★ Hyoscyamus contains hyoscyamine (an alkaloid) as its chief constituent Atropine and hyoscyne (for scopolamines) are also present in smaller quantities.

Therapeutic Efficacy

Hyoscyamus has the following therapeutic properties:

- 1) It is used to counter the gripping action of purgatives.
- 2) It is used for relieving the spasms of urinary tract.
- 3) It is a sedative, hypnotic, expectorant, antispasmodic anti-asthmatic, and a mild diuretic.
- 4) It is used to check salivary secretion.

Belladonna

- Belladonna is a perennial herbaceous plant which is also known as deadly nightshade.
- The foliage or berries contain tropane alkaloids, and are very poisonous.

Synonyms

Poison black cherry, Belladonna leaf, Belladonna folium, and Deadly night shade leaf.

Biological Source

Belladonna is the dried leaves and flowering tops of Atropa belladonna. It should contain 0.30% or more of total alkaloids calculated as hyoscyamine.

Family

Solanaceae

Chemical Constituents

- Around 0.3-0.60% alkaloids are extracted from *Atropa belladonna* in which hyoscyamine is the main component

Therapeutic Efficacy

The therapeutic uses of belladonna herb are as follows:

- 1) It has anticholinergic and parasympathetic properties.
- 2) In case of poisoning of opium and chloral hydrate, belladonna is used as an antidote.
- 3) It is also used to decrease the secretion of sweat, gastric juice, and saliva.
- 4) It is used in breathing abnormalities in infants.
- 5) It is used for reducing sweat and other secretions.

Ephedra

→ Ephedra is a native plant of Mongolia and Central Asia. It is an evergreen shrub having ephedrine as the chief active ingredient. The principal medicinal property of ephedrine is its powerful stimulatory action on heart and nervous system.

Synonym

Ma Huang

Biological Source

- Ephedra is the dried young stems of *Ephedra nebrodensis* Tinco, *Ephedra gerardiana* Wall, *Ephedra sinica* Stapf, *Ephedra equisetina* Bunge, and other species of ephedra.

Family

Ephedraceae

Chemical Constituents

- ♠ The primary amino alkaloids found in ephedra are ephedrine, n-methyl ephedrine, nor-ephedrine, pseudo ephedrine, etc. he, etc.

Therapeutic Efficacy

Ephedra possesses the following therapeutic properties:

- 1) Ephedrine is used for providing relief from asthma and hay fever.
- 2) It helps in diminishing hyperaemia and increasing blood pressure for long term.
- 3) It also causes mydriasis in eyes.
- 4) In China, the root has been used clinically for its anti sudorific (antiperspirant) activity: however, the herb possesses sudorific action.
- 5) It is also used in the treatment of allergic bronchial disorders.

Opium

- Opium is the dried latex extracted from the seedpods of the plant opium poppy (*Papaver somniferum*).
- The unripened pods are slit open for the sap to seep out, which is then dried on the outer surface of the pod.
- The resulting latex is scraped off the pod which is yellow brown in colour and bitter in taste.
- Different types of alkaloids, e.g., morphine, codeine, thebaine, and papaverine are present in this latex.

Synonyms

Raw Opium, Gum Opium, and Afeem

Biological Source

- ✓ Opium is the dried latex extracted from the unripe capsules of the plant opium poppy or *Papaver somniferum* Linn.

Family

Papaveraceae

Chemical Constituents

- The alkaloids present in the latex are derived from aminoacids, phenylalanine, and tyrosine.

Therapeutic Efficacy

Opium possesses the following therapeutic properties:

- 1) Hypnotic, Sedative, and Analgesic Properties
- 2) Stimulation of Chemoreceptor Zone
- 3) Antitussive Properties
- 4) Muscle Relaxant Properties

Tea Leaves

- ☞ Tea is an evergreen shrub having several alternate branches.
- ☞ The leaves are pointed, lanceolate, or elliptically-oblong having short petiole.
- ☞ The leaves have smooth surface on both sides with a shiny green appearance, a prominent midrib, and pinnately veined on one side

Synonym

Folia thea.

Biological Source

- Tea is the leaf buds and leaves of the plant *Thea Sinensis*.

Family

Theaceae.

Chemical Constituents

- The principal constituents are caffeine (trimethyl xanthine) and tannin (10-24%), Adenine, theophylline, theobromine (dimethyl-xanthine) and its isomer, xanthine, and volatile oil are present in trace amounts.

Therapeutic Efficacy

- By inhibiting iron absorption by tannates and other ligands, caffeine helps in treating genetic haemochromatosis.
- It also helps in treating diabetes-induced blindness, which is an angiogenic related condition.
- It also plays a vital role in lowering the risk of ischemic heart disease in geriatrics.

Coffee Seeds

- The source of coffee is a coffee bean, which is a seed of the *Coffea* plant.
- It's the pit found within the red or purple fruit known as a cherry.
- The coffee fruit, like ordinary cherries, is classified as a stone fruit.
- Brazil and India are the major suppliers of coffee nowadays.
- The large plantation of coffee is seen in Karnataka, Kerala and Tamil Nadu. At present it is cultivated in Maharashtra also

Synonyms

Coffee ored, coffee beum,

Biological Source

- It is the dried ripe seed extracted from *Coffea arabica* or *C. Liberica* Hiern, and lack of seed coat.

Family

Rubiaceae

Chemical Constituents

- Caffeine, tannin, fixed oil and proteins are the main constituents of coffee bean. It constitutes 2-3% caffeine, 3.5% tannins, 13% proteins, 10-15% fixed oil, chlorogenic or caffeotannic acid and sugars in the form of dextrin, glucose, etc.

Therapeutic Efficacy

- 1) It is used as a source of caffeine. Caffeine causes stimulant and diuretic effects that are main effects of coffee.
- 2) It is used to counteract the toxic effects because of CNS depressant drugs.

Coca

- Coca is a plant, Cocaine is derived from the leaves of coca plant which is an illegal drug, and is inhaled, injected or smoked for mind-altering effects.
- Cocaine is also an FDA approved Schedule II drug.
- It means that cocaine can be prescribed by a healthcare practitioner, but the process is strictly regulated.

Synonyms

Coca, Humaca coca, Truxillo coca, Java coca, Folia cocae

Biological Source

- ♦ Coca or coca leaves are dried leaves of *Erythroxylum coca* (Huanaco Coca) or of *Erythroxylum trailliae* Rusby (Truxillo Coca).

Family

Erythroxylaceae

Chemical Constituents

- The drug constitutes 0.7 to 1.5% of total alkaloids, Tropane esters are the majority of alkaloids.

Therapeutic Efficacy

- 1) It acts as a local anaesthetic. It is the first known local anaesthetic through which various other synthetic substitutes with similar activities have been prepared.
- 2) In general, coca leaves are used as stimulant, restorative and also in convulsions. The sedative and respiratory depressant effects of morphine and associated drugs are reduced by cocaine because of CNS depressant properties.

ANTIHYPERTENSIVE

- The pressure exerted by blood against the walls of blood vessels is termed as blood pressure.
- When the blood pressure persistently remains high, the condition is termed as hypertension.
- As a result of this persistently high blood pressure, the heart, blood vessels, and other organs are excessively stressed.
- Hypertensive patients are at a high risk of an abnormal increase in blood pressure. These patients are also exposed to secondary complications resulting in diseases affecting other vital organs.
- This is a single factor that may produce numerous other cardiovascular diseases, resulting in morbidity and premature deaths.
- It has found to affect 25% of the adult population.
- It is in 25% a significant risk factor for death resulting from CHF, stroke, MI, and renal failure.
- In untreated cases, it results in complications such as other heart problems, kidney diseases, and stroke.
- Factors that may be responsible for contributing to the incidence of hypertension include the urban lifestyle, culture, diet and stress.

Rauwolfia

- Rauwolfia or sarpagandha is an evergreen plant named after its discoverer, a German doctor and traveller, Leonhard Rauwolf (1582).
- Due to its immense therapeutic properties it is used in Ayurvedic, Unani, and Homeopathy.

Synonyms

Rauwolfia root, Serpentina root, Chhotachand, Sarpogandhiur and Indian snake root

Biological Source

- ♠ Rauwolfia is the dried roots of Rauwolfia serpentina Benth.)

Family

Apocynaceae

Chemical Constituents.

→ Rauwolfia contains about 0.7-2.4% of total alkaloidal tenses from which more than 80 alkaloids have been isolated

Therapeutic Efficacy

Rauwolfia has the following therapeutic uses:

- 1) It is a hypotensive drug having a strong sedative and hypotensive activity,
- 2) It is a mild tranquiliser used for removing low level of anxiety.
- 3) It is a rich source of indole alkaloids of medicinal value such as reserpine, ajmaline, ajmalicine, and serpentine which are used in the treatment of circulatory disorders.
- 4) Its roots are used for managing and lowering the blood pressure, due to the presence of reserpine which dilates the blood vessels, depresses CNS activity, and acts as a hypnotic.
- 5) Deserpidine and rescinnamine are also used as hypotensive and tranquilliser.)

ANTITUSSIVES

- Antitussives subdue coughing by reducing the activity of cough centre in brain.
- Cough is a protective reflex.
- It aids in expelling the respiratory secretions or foreign particles from the lungs and upper airway passages.
- Antitussives are used for relieving dry cough.

Vasaka

- Vasaka is an important medicinal herb. Almost all the plant parts (roots, leaves, etc.) are used for treating various diseases. Vasaka leaves are of great importance.

Synonyms

Adhatoda, Adulsa, and Malabar nut.

Biological Source

- ♠ Vasaka is the dried and fresh leaves of *Adhatoda visica* Nees, Syn.

Family

Acanthaceae

Therapeutic Efficacy

- 1) It is used as an expectorant and bronchodilator.
- 2) In large doses, it is irritant and causes vomiting and diarrhoea
- 3) It also shows abortifacient effect due to the same reason

Tolu Balsam

- Tolu balsam is used as a fragrance and flavouring agent in pharmaceutical products.
- It also has a mild antiseptic and expectorant property.
- However no clinical data regarding Tolu balsam to treat any condition has been put forward by the researchers,

Synonym

Tolu Bakam

Biological Source

- The solid or semi-solid balsam is obtained by incision from the trunk of *Myroxylon Balsamum* (Linn.).

Family

Leguminosa

Chemical Constituents

- ♦ Tolu balsam contains cinnamic acid (10-15%) and Benzoic acid (6-88%)

Therapeutic Efficacy

Tolu balsam has the following therapeutic properties:

- 1) It is widely used as a flavouring agent in medicinal syrups, confectionery, chewing gums, and perfumeries.
- 2) Cinnamic and benzoic acid are antiseptics and used as a pharmaceutical aid.
- 3) It is also used for.
Coughs and lung congestion, Skin rashes and wounds, Skin parasites and ringworm,

ANTI RHEUMATIC

- ♦ Antirheumatics are drugs used in the therapy of inflammatory arthritis, predominantly rheumatoid arthritis, but also Idiopathic juvenile arthritis, psoriatic arthritis, ankylosing spondylitis and others.

Colchicum Seed

- Colchicum autumnale, an autumn-blooming flower is also known as meadow saffron, autumn crocus or naked lady.

Synonyms

- Autumn Crocus, Wild Saffron, Meadow Saffron, European Colchicum seed, Meadow Crocus, and Colchicum root.

Biological Source

- ★ Colchicum is the dried ripe seeds and corm of Colchicum autumnale Linn. The Indian species is obtained from C luteum Baker.

Family

Liliaceae

Therapeutic Efficiency

- It is the drug of choice for the treatment rheumatism and gout
- It has also been reported to poses anti-tumour activity

ANTITUMOUR

- Antitumour (or anticancer or antineoplastic drug) is effective in treating malignant or cancers disease.
- Alkylating agents, antimetabolites, natural products, and hormones are major class of anticancer drugs

Vinca

- ✚ Vinca (or sadabahar or periwinkle) is commonly grown in India. It has its origin in Madagascar. Two varieties of vinca, namely pink and the white coloured flower varieties are grown for their medicinal value.)

Synonyms

Catharanthus, Periwinkle, and Sadabahar

Biological Source

- Vinca is the dry whole plant of Catharanthus roseus or vinca rosea

Family

Apocynaceae

Chemical Constituents

- ◆ Vinca contains a large number of indole alkaloids, of which around 20 dimeric indole dihydroindole alkaloids exhibit oncolytic activity, vincristine and vinblastine आँकलोलि being the most significant ones

Therapeutic Efficacy

Vinca has the following therapeutic properties

1. Its leaves and stems are a source of alkaloids, which have anticancer properties
- 2 Its leaves are used to control diabetes and high blood pressure
- 3 Its alkaloids are sedative and tranquilizer
- 4 it relieves muscle pain and depression

Podophyllum

- Podophyllum is the dried rhizome and rootlet of the mayapple that is used as a caustic or as a source of the more effective podophyllin

Synonyms

Indian Podophyllum, Podophyllum Radix, Himalayan Mayapple.

Biological Source

- ★ Podophyllum consists of dried rhizomes and roots of Podophyllum hexandrum Royle or Podophyllum emodi Willd. American podophyllum consists of dried rhizome and roots of P.peltatum

Family

Berberidaceae

Chemical Constituents

- Indian Podophyllum contains from 7% to 15% of known as podophyllin

Therapeutic Efficacy

- 1) Because of cytotoxic action, podophyllum is used in the treatment of venereal and other warts
- 2) It is also purgative, cholagogue and bitter tonic

ANTIDIABETICS

- Antidiabetics are drugs used for controlling and stabilising the glucose level in the blood of individuals suffering from diabetes.
- These drugs are mainly used to control diabetes.

Pterocarpus

- Pterocarpus is a genus of pastropical trees.
- It is having around 35 species of which P. marsupium is one of the most famous members of this genus.

Synonyms

Bijasal, Indian kino tree, and Malabar kino.

Biological Source

- Pterocarpus is the dried juice of Pterocarpus marsupium Line. The juice is obtained from the stem and bark by making vertical incisions on them. The exuding juice is collected and dried

Family

Leguminosae

Chemical Constituents

- Kino is having around 70-80% of kinotannic acid. kino red, k-pycatechin (catechol), resin, and gallic acid.

Therapeutic Efficacy

- Pterocarpus has the following therapeutic properties :
- It acts as a powerful astringent,
- It is used for treating diarrhoea, dysentery, and passive haemorrhage toothache.

Gymnera

- ♠ The terms gymnema and sylvestre are derived from Latin origin with their meanings as naked and from the forest.

Synonyms

Gymnema, Gurmarbooti, gurmar, gurmari, gudma, and Madhunashini.

Biological Source

- Gymnema is the leaves of a perennial woody climber plant, Gymnema sylvestre R. Br. It should contain not less than 1.0% of gymnemic gymnemagenin on dried basis. acids calculated on gymnemagenin on dried basis

Family

Asclepiadacea

Chemical Constituents

- The leaves consist of pentriacontane, hentriacontane, phytin, a and B chlorophylls, resin, tartaric acid, formic acid, butyric acid, mucilage inositol. d-quercitol, gymnemic acids (anti-sweet compounds), mixture of triterpene saponines and anthraquinone derivatives.

Therapeutic Efficacy

- 1) prevents dental plaque and caries
- 2) It also has the property of reducing weight

DIURETICS

- Drugs promoting urine output are known as diuretic drugs which refer only to those agents that act directly on the kidneys.
- These drugs primarily increase the excretion of water and ions like sodium (Na), chloride (Cl), or bicarbonates (HCO_3) from the body. Glomerular filtration, tubular reabsorption, and tubular secretion in kidneys determine the excretion of substances.
- Tubular reabsorption is a process which involves active transport of electrolytes and other solutes from tubular urine to tubular cells, and then to extracellular fluid. As a result, the glomerular filtration increased. The mechanism of action of diuretic drugs also involves a decrease in tubular reabsorption.
- However, these drugs have no effect on glomerular filtration rate or on the action of Anti-Diuretic Hormone (ADH) on the distal portion of nephron. Diuretics effectively treat cardiac oedema (accumulation of fluid in extravascular tissues), especially the one associated with congestive heart failure.
- They are also employed in the treatment of various disorders like nephrotic syndrome, diabetes insipidus, hypertension, nutritional oedema, oedema of pregnancy, and cirrhosis of liver. They also decrease the intracellular and cerebrospinal fluid pressure.

Gokhru

- ♦ Its name has been obtained from the sharp thorns that grow from the seeds. The Latin word tribulus is converted as caltrop which means a peaked weapon.

Synonyms

Gokshur, puncture vine, and land caltrops.

Biological Source

✚ Gokhru is the dried ripe fruits of *Tribulus terrestris* Linn.

Family

Zygophyllaceae

Chemical Constituents

- ★ The major constituents of the dried fruits of *T. terrestris* are steroidal saponins, including terestrosins (A, B, C, D. and E). desgalactotigonin, F-gitonin desglucolantigonin, and gitonin.

Therapeutic Efficacy

Gokhru has the following therapeutic properties:

- 1) It is used in the treatment of diarrhoea and dysentery.
- 2) It promotes lactation.
- 3) It is used in the treatment of psoriasis and eczema
- 4) It has the property of diuretic because of high amount of nitrates and essential oils found in seeds

Punarnava

- Punarnava is used medicinally since ancient times. It is mainly employed by the practitioners of Ayurveda medicine. It offers a wide range of health benefits. It is beneficial for liver and prevents it from infections.

Synonyms

Hogwood, Vishkhapara, Sattha, Gahadpurma, Komme Saaranathi, and Khatam

Biological Source

- ♠ Parmava is the dried herb of the whole plant *Boerhaavia diffusa*

Family

Nyctaginaceae

Chemical Constituents

- ♠ Parava consists of an alkaloid, punarnavine (0.04 RIS) and an antifibrinolytic agent, permavoside. It consists potassium nitrate (6%) an oily substance, and ursolic acid

Therapeutic Efficacy

- Antioxidant Activity
- Analgesic and Anti-Inflammatory Activity
- Anti-Viral Activity
- Hepatoprotective Activity
- Antibacterial Activity

ANTI DYSENTERIC

- Antidysenterics are drugs used for treating dysentery (an inflammatory disorder of the lower intestinal tract). Dysentery is the result of bacterial or parasitic infection causing pain, fever, or diarrhoea

Ipecacuanha

- ♦ Roots of Ipecac are a powerful emetic agent used to induce vomiting in cases of poisoning. It is a flowering plant which is native to Brazil.

Synonyms

Ipecacuanha root and Radix ipecacuanha.

Biological Source

- Ipecacuanha is the dried rhizomes and roots of *Cephaelis ipecacuanha* (Brotero) A. It should contain 2% or more of the ether-soluble alkaloids.

Family

Rubiaceae

Chemical Constituents

- Ipecacuanha has about 2-2.5% of alkaloids. The main alkaloids of ipecac present in the bark are:
 - 1) Phenolic alkaloids
 - 2) Cephaline.
 - 3) Dimethyl psychotrine

Therapeutic Efficacy

The therapeutic uses of ipecacuanha are:

- 1) Ipecac syrup is used as an expectorant. Since it is well tolerated by children, it is used in whooping cough.
- 2) Emetine hydrochloride is used parentally for the treatment of amoebic dysentery.
- 3) Ipecac syrup is the most effective and dependable emetic for treating systemic poisoning.
- 4) Ipecac and opium powder (e.g., Dover's powder) are together used as a diaphoretic.

ANTISEPTICS AND DISINFECTANTS

- The term antiseptics are used for those chemical agents [that are used on animate or living bodies (e.g.. human body tissue, plant tissue, etc.).
- The chemical agents used in case of lifeless or inanimate objects (e.g.. working area, dishes, bench, etc.) are termed as disinfectants. Generally, disinfectants are bactericidal, though they may sometimes be bacteriostatic.

Benzoin

- The benzoin has four varieties and their names are Sumatra, Palembang, Penang, and Siam benzoin.
- They are easily identified by their specific look.
- Sumatra, Penang and Siam benzoin are the three derivatives which are derived from three different plants.

Synonyms

Sumatra Benzoin and Loban.

Biological Source

- Benzoin occurs in two forms Sumatra and Slam.
- The balsamic resin is derived from *Styrax benzoin* Dryand or *Styrax paralleloneurus* Perkins and another species of *Styrax* marketed under the name of Sumatra Benzoin.
- It may also have the balsamic resin obtained from *Styrax tonkinesis* and other species known as Siam Benzoin on a commercial scale.

Family

Styracaceae

Chemical Constituents

- The major constituents of benzoin resin are coniferyl benzoate, benzoic acid, cinnamic acid and p-carmaryl cinnamate, as well as triterpenoids as minor compounds

Therapeutic Efficacy

Benzoin has the following therapeutic properties

- 1) It acts as an irritating expectorant, a carminative, and diuretic.
- 2) It is used externally as an antiseptic
- 3) It is used in the form of compound tincture of benzoin, and as an inhalation for treating upper respiratory tract infection.
- 4) It is used to delay the rancidity of fats and oil in the preparation of benzoate lard.

Myrrh

- ♦ Myrrh is a sap-like resin which is obtained by making Incisions in the bark of trees that belongs to the members of the Commiphora species.

Synonyms

Gum, Bol, and Myrrha.

Biological Source

- Myrrh is an oleo-gum-resin obtained from *Commiphora molmol* Engler and also from other *Commiphora* species.

Family

Burseraceae

Chemical Constituents

- ♣ Myrrh contains yellowish thick volatile oil (10%), gum (60%), resin (25-40%), and bitter principle (3-4%).

Therapeutic Efficacy

Myrrh has the following therapeutic properties:

- 1) It is used as a stimulant and an antiseptic.
- 2) It acts as a protective agent.
- 3) It is astringent to the mucous membrane; therefore, its tincture is used in mouthwashes and gargles.

Neem

- ➔ Neem is a very famous medicinal herb in the field of Ayurvedic medicine system. Around 5000 years ago, it was used as a traditional medicine.

Synonyms

Margosa, arishth, nim tree, and nimba.

Biological Source

- ♣ Neem consists of all the aerial parts of *Azadirachta indica*.

Family

Meliaceae

Chemical Constituents

- ♣ Nimbidin is the bitter constituent of neem. The seeds contain 45% of oil. In 1968, complex limonoid compound, azadirachtin was isolated from the neem seeds and its structure was established in 1975.

Therapeutic Efficacy

The therapeutic uses of neem are:

- 1) Its bark is used as a good bitter tonic, astringent, and an antiperiodic.
- 2) It is used in the treatment of malarial fever.
- 3) Its bark is also used for skin diseases.
- 4) Its leaves are used in the form of poultice over sores, and in the form of decoction in ulcers and eczema.
- 5) Its fresh tender twigs are used for cleaning teeth and in pyorrhoea.

Turmeric

- ♣ Turmeric is a spice which provides yellow colour to the curry. In India, it is in use for thousands of years as a spice as well as a medicinal herb.

Synonyms

Indian saffron and turmeric,

Biological Source

- Turmeric is the dried and fresh rhizomes of *Curcuma longa* Linn. (*Calomestica*). It should contain not less than 4% of volatile oil. *C. amada*, *C. angustifolia*, *C. aromatica*, *C. caesia*, *C. zedoaria*, and *C. longa* are some other varieties of curcuma.

Family

Zingiberaceae

Chemical Constituents

- Turmeric consists of volatile oil (1-6.5%), resin. zingiberaceous starch grains, and curcuminoids (yellow coloured substances)

Therapeutic Efficacy

Turmeric has the following therapeutic uses

- 1) It is used as a colouring agent for ointments and creams.
- 2) It is used for the detection of boric acid,
- 3) It is used as an anti-inflammatory,
- 4) In China, *C. wenyuin* (*C. aromatica*) is used for (cervical cancer.
- 5) It is used as an antiarthritic agent. which has been isolated from *C. aromatic* species.



ANTIMALARIALS

- Antimalarials are drugs used effectively in the treatment of malaria.
- They prevent or relieve the malarial symptoms.
- Most antimalarial drugs target the erythrocytic stage of malaria infection, which is the phase of infection that causes symptomatic illness.

Cinchona

- ✚ Cinchona is a tall, evergreen tree which on maturing attains a height of 50-100 feet.
- ✚ The medicinally important part of cinchona tree is the bark from which quinine alkaloid is extracted and used in the treatment of malarial infection.

Synonyms

Jesuit's bark, Peruvian bark, and Calisaya bark.

Biological Source

- ♣ Cinchona is the dried bark of the stem or root of *Cinchona succinubra*, *C. ledgeriana*, and *C. calisaya*.

Family

Rubiaceae.

Chemical Constituents

- Most important alkaloids are stereoisomers quinine and quinidine and their respective 6' demethoxy derivatives, cinchonidine and cinchonine. Quinine is the most important alkaloid and the other less: significant alkaloids are quinicine and cinchonine.

Therapeutic Efficacy

Cinchona and its constituents have the following therapeutic user

- 1) Its bark is used as an antimalarial, antipyretic, and analgesic
- 2) Its bark is also used as an antiseptic in the treatment of abscesses, cavities, ulcers, as a mouthwash and gargle in sore-throat.
- 3) Cinchona is used in the treatment of small pox, antiseptic fevers, pneumonia, blood poisoning etc.
- 4) It is also used in the treatment of whooping cough, hay-fever, spleen enlargement, bemieranias, and other neuralgic infections
- 5) The barks and all cinchona preparations are valuable in intermittent fever.

Artemisia

- ♣ Artemisia, also known as mugwort, wormwood, and sagebrush is a plant of the daisy family of Asteraceae.
- ♣ It belongs to a diverse variety of plants having around 200-400 species.

Synonyms

Santonica and Worm seeds.

Biological Source

- Artemisia is an unexpanded flower-head obtained from the plant *Artemisia cina* Berg, *Artemisia brevifolia* Wall, *Artemisia maritima* Linn., and other species of Artemisia.

Family

Asteraceae

Chemical Constituents

Santonica possesses oil and two crystalline substances, santonin and artemisin

Therapeutic Efficacy

- ♦ Santonica is a strong anthelmintic acting against roundworm infections.
- ♦ It shows no effect on hook worms and tape worms.
- ♦ Today, the crude drug is rarely used for therapeutic purpose, and has been totally replaced by santonin.



OXYTOMIC

- Oxytocics are drugs which stimulate the contraction of smooth muscles of uterus.
- The administration of an oxytocic can initiate and enhance rhythmic uterine contraction at any time, but relatively high doses are required for such responses in early pregnancy.
- Oxytocic agents commonly used include oxytocin, certain prostaglandins, and the ergot alkaloids.
- These drugs are used for induction and augmentation of labor at term, control postpartum haemorrhage, correct postpartum uterine atony, produce uterine contractions after cesarean section or other uterine surgery, and induce therapeutic abortion.
- These drugs are used with extreme caution in parturients with severe hypotension and hypertension, partial placenta previa, cephalopelvic disproportion, or grand multiparity.
- The risk of using these agents is much higher in mothers who have undergone recent uterine surgery or who have suffered recent sepsis or trauma.
- The most serious adverse reaction is sustained tetanic contraction of the uterus, resulting in foetal hypoxia or rupture of the uterus.

Ergot

- ♦ Ergot of Rye is a fungal disease of wheat and rye caused by a fungus *Claviceps purpurea*.
- ♦ Grain of rye and wheat are replaced by a dark, purplish sclerotium.

Synonyms

Ergot of Rye and Ergota

Biological Source

- Ergot is the dried sclerotium of a fungus, *Claviceps purpurea* Tulasne, found in the ovary of the rye or Secale cereal

Family

Clavicipitaceae

Chemical Constituents

- ➔ Chemically, ergot alkaloids are indole alkaloids that are peptide derivatives of lysergic acid. Therefore, these alkaloids are also known as peptide alkaloids, and its concentration is around 0.1-0.25%

Therapeutic Efficacy

Ergot and alkaloids extracted from it have the following therapeutic uses:

- Ergotamine tartrate is used as an analgesic for treating migraine.
- Ergotoxine methanesulphonates (mesylates) are used in geriatric patients for migraine.
- Ergot and ergometrine maleate are used as oxytocic to enhance labour pain during delivery and also to prevent post-partum haemorrhage.
- Lysergic Acid Diethylamide has a psychotomimetic action, therefore, is used in the treatment of psychiatric patients.
- It is used for treatment and prophylaxis of post-abortion

VITAMINS

- Vitamins are natural substances found in plants and animals and known as essential nutrients for man beings.
- The name vitamin is obtained from vital amines as it was originally thought that these substances were all amines, although not all vitamins are amines Human body uses these substances to stay healthy and support its many functions

According to the ability to be absorbed in for or water, vitamins are classified as:

- 1) Fat-Soluble Vitamins: Vitamin A, D, and K are fat soluble vitamin
- 2) Water Soluble Vitamins: Vitamin B complex and Vitamin C are water soluble

Different vitamins perform different functions depending on their role in biological processes.

- ♦ Their functions can be understood well by studying the diseases related to their deficient condition.
- ♦ The vitamins and their deficiency diseases are given below

Shark Liver Oil

- Shark liver oil as the name suggests is obtained from the livers of sharks.
- It has been used as a folk medicine for promoting wound healing and curing respiratory and digestive system problems since ancient times

Synonym

Oleum Selachoids

Biological Source

- ✚ Shark liver oil is the fixed oil obtained from the fresh and carefully preserved livers of various species of shark, mainly *Hypoprion brevirostris* and *Galeorhinus*

Family

Carcharhinidae

Chemical Constituents

- ♣ Vitamin A is present in shark liver oil at concentration ranging from 15,000-30,000 International unit per gm. The glycerides of saturated and unsaturated fatty acids are also present

Therapeutic Efficacy

Shark liver oil has the following therapeutic uses:

- 1) It is used in cases of vitamin A deficiency. It is also known as anti-xerophthalmic factor.
- 2) This oil lacks vitamin D, thus, is required to be fortified.
- 3) The absence of vitamin D does not make this oil suitable as a substitute of cod liver oil.
- 4) It is nutritive oil.
- 5) It is used for preparing dilute shark liver oil, shark liver oil emulsion (Indian NF), and shark liver oil with vitamin D.

Cod Liver Oil

- Cod liver oil is a nutritional supplement made from cod fish liver.
- It contains the omega-3 fatty acids (eicosapentaenoic acid and docosahexaenoic acid) like other fish oils

Synonym

Oleum morrhi

Biological Source

- It is obtained from the fresh liver of cod fish, *Gadus morrhua*, and other *Gadus* species.

Family

Gadidae

Chemical Constituents

- Vitamin A and vitamins of D group are responsible for the oil's therapeutic efficacy. A gramme of oil includes at least 255mcg of vitamin A and 2.125mcg of vitamin D.

Therapeutic Efficacy

Cod liver oil has the following therapeutic uses

- 1) It is used as a dietary supplement
- 2) It is particularly beneficial in the treatment of rickets and TB.
- 3) It is used to relieve arthritis pain and stiffness
- 4) It is a viable therapy option for multiple sclerosis.
- 5) Because of its high vitamin content, it is effective in the treatment of domestic burns.

ENZYMES

- Enzymes are proteins that catalyse or increase the rate of chemical reactions.
- The enzymes are highly specific and effective protein molecules (except RNAs) that catalyse almost all biochemical reactions.
- Sometimes non-protein coenzymes or cofactor are also required for the catalytic functions of enzymes

Some properties of enzymes are briefed below:

- 1) All enzymes are proteins, except group of catalytic RNAs.
- 2) The molecular weight of enzyme ranges from 12,000 to 1 million or more like other protein molecules.
- 3) The catalytic activity of enzymes is mainly due to their own primary, secondary, tertiary, and quaternary structures of protein and their specific conformation. The catalytic activity of enzyme gets destroyed in case of denaturation or dissociation into sub-units

Papaya

- ♦ Papain is an enzyme found in and extracted from papaya. It is a powerful digestive enzyme thus, is important in digestive processes involving the breakdown of tough protein fibres

Synonyms

Papayotin, Vegetable pepsin, Arbuz, Nematolyt, Caroid, Summetrin, Tromasin, Velardon, and Vermizym.

Biological Source

- Papain is the dried and purified latex of the green fruits and leaves of *Carica papaya* L. Papain can also be obtained from the juice of stems, leaves, and petioles (the activity is nearly the same as that obtained from the fruit latex)

Family

Caricaceae

Chemical Constituents

- ➡ Papain contains proteolytic enzymes (peptidase I) which convert the proteins into dipeptides and polypeptides.

Therapeutic Efficacy

Papain has the following therapeutic purposes:

- 1) It is used in preventing adhesions, in sloughing and infected wounds, in relieving the symptoms of episiotomy (incision of vulva), internally as a protein digestant, anthelmintic (nematode), and an anti inflammatory agent.

- 2) It is used in treating dyspepsia, intestinal and gastric disorders, and diphtheria by dissolving the diphtheria membrane.
- 3) It is used in surgery for reducing blood clots (in cases when thromboplasma is undesirable), and for local treatment of buccal, pharyngeal, and laryngeal disorders

Diastase

- Diastase is an enzyme found in malt and produced when the seeds germinate.
- The enzyme converts starch into me and then into glucose.
- Diastase occurs as a yellowish white; amorphous powder, with a faint characteristic odour

Synonyms

Maltin Diastase of malt Amylase, and malt extract

Biological Source

- ✚ Malt extract is obtained from the dried barley grains of one of more varieties of *Hordeum vulgare* Linne

Family

Poaceae

Chemical Constituents

Diastase contains dextrin, maltose, traces of glucose, and amylolytic enzyme diastase (8%),

Therapeutic Efficacy

Diastase has the following therapeutic properties

- 1) Malt extract and purified diastase are used as amylolytic enzymes.
- 2) They serve as an aid in digestion of starch.
- 3) They are used as bulk producing laxatives.

Pancreatin

- ★ Pancreatin is a compound made up of various digestive enzymes produced by the exocrine cells of pancreas.
- ★ Amylase, lipase, and protease make up this enzyme
- ★ The mixture is used to treat surgical pancreatectomy, pancreatitis and cystic fibrosis that cause a lack of pancreatic secretions.

Synonyms

Diastase vera, Zynpar, Pancreatic acid, Pendriotanone

Biological Source

- Pancreatin can be obtained from either animal or plant sources. Amylase, lipase, and protease are the primary enzymes that contain pancreatin. Pancreatin is often generated from cattle or pigs, although it can also be obtained from plants.

Family

Sudae and Bovidae

Chemical Constituents

- ♦ Amylase, lipase, and protease are all found in the pancreatin. Pancrelipase is a similar blend of enzymes that has more active lipase enzyme than pancreatin.

Therapeutic Efficacy

Pancreatin has the following therapeutic uses:

- 1) Pancreatic enzymes help in the breakdown of various nutrients, like proteins, fats, and carbohydrates (which converts it into body energy).
- 2) It promotes healthy weight gain and maintains healthy weight.
- 3) It promotes absorption of essential vitamins and minerals.

Yeast

- ♠ Yeast is a fungus which has a vegetative body of simple individual cell under normal growth conditions.
- ♠ It is a unicellular fungus which spreads by forming mycelia containing small and definite nuclei and reproducing by budding and ascospore foramen.
- ♠ Around 350 species of yeast are known so far.
- ♠ Yeasts are classified based on their uses and morphological characters.

Synonyms

Brewer's yeast and Baker's yeasts.

Biological Source

- ♦ Yeast is the unicellular fungal microorganism *Saccharomyces cerevisiae*

Family

Saccharomycetaceae

Chemical Constituents

- ♦ Yeast contains moisture (65-85% nitrogenous compounds (proteins), glycogen, fat, vitamins (thiamine, riboflavin, nicotinic acid, pantothenic acid, folic acid, biotin, etc.), ash, and enzymes (invertase, diastase, zymase and maltase)

Therapeutic Efficacy

Yeast has the following therapeutic properties

It is used for manufacturing alcohol, beer, and various wines

It is used in the bread industry to raise dough

PHARMACEUTICAL AIDS

- ◆ Pharmaceutical aids, also known as pharmaceutical necessities are substances having a little or zero therapeutic value, but are used for manufacturing or compounding various pharmaceuticals. These substances are obtained from various animals, vegetables, minerals, and also from synthetic sources.
- ◆ Study of Pharmaceutical Aids Following are the few pharmaceutical aids which are studied in detail in this section:
 - 1) Kaolin,
 - 2) Lanolin,
 - 3) Beeswax,
 - 4) Acacia,
 - 5) Tragacanth,
 - 6) Sodium alginate,
 - 7) Agar,
 - 8) Guar gum, and
 - 9) Gelatin

Kaolin

- ◆ Kaolin or China clay is almost white in colour. It is different from other industrial clays in terms of its fine particle size and pure colouring. Since it can be dispersed in water, it is considered an ideal pigment.

Synonyms

China clay, paper clay, and white clay

Biological Source

- ◆ Kaolin is a group of hydrous aluminium silicates, among which kaolinite is the major mineral

Chemical Constituents

- Contains mainly the **clay mineral kaolinite** ($\text{Al}_2\text{O}_3(\text{SiO}_2)_2(\text{H}_2\text{O})_2$), a hydrous aluminosilicate.

Therapeutic Efficacy

Kaolin has the following therapeutic uses

- ➡ It is used in mild to moderate diarrhea severe diarrhoea (dysentery), and cholera

- It is used in combination with other products to treat darrhoea and to relieve soreness and swelling within the mouth occurred due to radiotherapy
- These combination products are also used in the treatment of ulcers and chronic ulcerative colitis (inflammation in large intestine)
- Its directly applied on the skin in the form of a wet dressing (poultice) or a dusting powder.
- It is used for drying or softening the skin.

Lanolin

- The sebaceous glands of animals bearing wool secrete lanolin which is a wax.
- The form of lanolin used by humans is obtained from domestic sheep breeds raised to obtain their wool

Synonyms

Wool fat, wool wax, wool grease, hydrous wool fat, Adeps Lanae, etc.

Biological Source

- Lanolin is a fat-like stance obtained from the secretion of sebaceous glands of the sheep *Ovis aries* Linn. These glands are deposited onto the wool fibres

Family

Bovidae

Chemical Constituents

- The enters and polyesters of 33 alcohols (of high molecular weight) and 36 fatty adds together make up a complex mixture of Lanolin

Therapeutic Efficacy

Lanolin has the following therapeutic uses:

- 1) It is applied topically for treating or preventing dry skin, itching, or other skin irritation caused by diaper rash, radiation therapy skin burns, etc.
- 2) It is also used for treating sore and cracked nipples caused by breast-feeding

Beeswax

- ★ Bees wax is a natural wax obtained from the honey bees of the *Apis* genus. The worker bees produce was in scales in their abdominal segments by the eight wax producing glands.

Synonym

Cara flava, cera alba, mom, madhujan, white bees wax, and yelow bees wax.

Biological Source

- Bees wax is the purified wax obtained from the honey comb of the bees *Apis melifera* and other species of *Apis*.

Family

Apidae

Chemical Constituents

- ♠ Bees wax is esters of monohydric alcohols having 1 straight chain acids About 80% of myricin, Le.. myricyl palmitate is present in bees wax, which is its major constituent Free cerotic acid (about 15%), melissic acid (in small quantities), and cerolein (aromatic substance) are other constituents

Therapeutic Efficacy

Beeswax has the following therapeutic uses:

- 1) It is used in plasters and polishes,
- 2) It is used in ointment for hardening purposes.
- 3) It is an ingredient of paraffin ointment I.P

Acacia

- Acacia is a genus of plant including different types of trees and shrubs,
- Some plants of genus acacia contain toxic chemicals that can potentially cause hair loss, affect GIT's ability to intake nutrients, and cause stunt growth.

Synonyms

Gum acacia, gum Arabic, and acacia gummi.

Biological Source

- Acacia is the dried gummy exudation obtained from the stems and branches of *Acacia senegal* (L.) Willd or other African species of *Acacia*. It is also found in the stems and branches of *Acacia arabica*, Willd.

Family

Leguminosae

Chemical Constituents

- Arabin, a complex mixture of calcium, magnesium, and potassium salts of Arabic acid, is the chief constituent of acacia.
- Arabic acid hydrolyses into L-arabinose, L rhamnose. D-galactose, and D-glucuronic acid.

Therapeutic Efficacy

Acacia has the following therapeutic uses

- 1) Its mucilage is a demulcent
- 2) It is an essential pharmaceutical aid for emulsification and to be used as a thickening agents
- 3) It is used as a binding agent in tablet formulations.
- 4) It is used in the granulation process of tablet manufacturing due to its compatibility with other plant hydrocolloids, starches, carbohydrates, and proteins.
- 5) It is combined with gelatin to form coacervates for drug microencapsulation.

Tragacanth

- Tragacanth is the dried, gummy exudation of *Astragalus* species.
- It is a small, low, bushy perennial shrub with large tap root along with the branches.
- The root is tapped to obtain gum.

Synonyms

Gum tragacanth, gum dragon, goat's thorn, and hog gum.

Biological Source

- Tragacanth is the air dried gummy exudate, either flowing naturally or obtained by incision from the stems and branches of *Astragalus gummifer* Labill and other species of *Astragalus*.

Family

Leguminosae

Chemical Constituents

- ★ Tragacanth is made up of two major fractions, i.e., tragacanthin (water-soluble) and bassorin (water insoluble)

Therapeutic Efficacy

Tragacanth has the following therapeutic uses:

- 1) It is used as a demulcent in cough and cold preparations.
- 2) It is used treat diarrhoea.
- 3) It is used as an emollient in cosmetics.
- 4) It is used as a thickening, suspending, and an emulsifying agent for oils and waxes.

Sodium Alginate

- ◆ Sodium alginate is the sodium salt form of alginic acid and gum extracted from the cell walls of brown algae. having chelating activity.

Synonyms

Sodium alginate and Sodium polymannuronate

Biological Source

- ◆ Sodium alginate is the sodium salt of alginic acid, which a polyuronic acid containing reduced mannuronic, and glucuronic acids is obtained from the algal growth.

Chemical Constituents

- ⇒ Sodium alginate is the sodium salt of alginic acid, which is a linear polymer of L-guluronic acid and D-mannuronic acid

Therapeutic Efficacy

Sodium alginate has the following therapeutic uses:

- 1) Its high and medium viscosity grades are used for preparing pastes, creams, and for thickening and stabilising emulsions.
- 2) It is a good suspending and thickening agent.
- 3) It is used as a binding and disintegrating agent in tablets and lozenges.
- 4) It is used for preparing jellies, ice cream, etc. in food industries.
- 5) It is also used in textile industries.

Agar

- Agar is a jelly-like substance, obtained from algae, and derived from agarose (polysaccharide), which forms the supporting structure in the cell wall of certain algae species, and which is released on boiling.
- These algae are known as agarophytes belonging to the Rhodophyta (red algae) phylum.

Synonyms

Agar-agar, Chinese-isinglass, vegetable gelatin, gelose, and Japan-agar.

Biological Source

- Agar is the dried hydrophilic colloidal polysaccharide complex extracted from the agarocytes of algae belonging to the class Rhodophyceae

Chemical Constituents

→ Agar consists of agarose and agaropectin (polysaccharides).

Therapeutic Efficacy

Agar has the following therapeutic uses:

- 1) It is used as an emulsifying agent, bulk laxative, and a suspending agent.
- 2) It is used for preparing bacteriological culture medium.
- 3) It is used in the production of ointments and medicinal encapsulations.)
- 4) It is also used as a dental impression mold base

Guar Gum

- Guar gum powder is obtained from the Guar seed undergoing multiple industrial processes.
- Guar gum attains uniformity and very high viscosity at low concentrations by getting rapidly hydrated in cold water.
- Being colloidal in nature, it provides excellent thickening to the solution.

Synonyms

Guar flour, decorpa, jaguar, jaguar gum, guaran, gum cyamopsis, and cyamopsis gum.

Biological Source

⇒ Guar gum is the powder of the endosperm of the seeds of *Cyamopsis tetragonolobus* Linn.

Family

Leguminosae

Chemical Constituents

- Galactomannan (guaran) is the major constituent of guar gum. This substance hydrolyses to yield galactose and mannose.

Therapeutic Efficacy

Guar gum has the following therapeutic uses:

- 1) It is used as a bulk laxative,
- 2) It is used as a protective colloid.
- 3) Since its thickening power is 5-8 times more than starch, it is used as a thickener,
- 4) It is used in treating peptic ulcer.
- 5) It is used as a binding and disintegrating agent tablet manufacturing.

Gelatin

- Gelatin is derived from collagen obtained from various animal body parts.
- It is commonly used as a gelling agent in food, pharmaceutical drugs, vitamin capsules, photography, and cosmetic manufacturing

Synonyms

Gel foam, puragel, and gelatinum.

Biological Source

- ◆ Gelatin is a product obtained by partial hydrolysis of collagen, derived from the skin, white connective tissue, tendons, ligaments, and bones of ox (*Bos taurus* Linn.), sheep (*Ovis aries* Linn), etc.

Family

Bovidae

Chemical Constituents

- ◆ Gelatin consists of gluten protein which hydrolyses into a mixture of amino acids.

Therapeutic Efficacy

Gelatin has the following therapeutic uses:

- 1) It is used in the preparation of pastilles, pastes, suppositories, capsules. pill-coatings, and gelatin sponge
- 2) It is used as a suspending agent, tablet binder. coating agent, stabiliser, thickener, and texturiser in food.
- 3) It inhibits crystallisation in bacteriology for preparing cultures.

MISCELLANEOUS

Squill

- ◆ Squill is a plant that can be found in Africa, India, and the Mediterranean region.
- ◆ Despite grave safety issues, the plant's bulbs are occasionally utilised to create medicine. Squill is used as a rat poison for pest management.

Synonyms

Jangali pyaj, Sea onion, Urginea.

Biological Source

- Squill is made up of sliced and dried scale leaves from *Urginea maritime*'s bulb.

Family

Liliaceae,

Chemical Constituents

- ☞ The cardiac glycosides of bufadienolides types (scillaren A and scillaren B) as well as scillatenase enzyme, are found in Indian squill.

Therapeutic Efficacy

Squill has the following therapeutic uses:

- 1) It is similar to digitalis as it increases vigour while decreasing the frequency of cardiac action.
- 2) It is also a strong expectorant, and is commonly used to treat chronic bronchitis and coughs in general.
- 3) It causes emesis in excessive dosages.

Galls

- Plant galls, like benign tumours or warts in animals, are aberrant outgrowths of plant tissues. Viruses, fungus, and bacteria, as well as other plants, insects, and mites, can all cause them.

Synonyms

Blue Galls, Nutgalls, Turkey galls, Aleppo galls, Galla

Biological Source

- ★ Galls are vegetative outgrowths caused by the gall wasp.

- ★ *Adleria gallartinctorar* Olivier depositing eggs on the twigs of dyer's oak, *Quercus infectoria*

Family

Wasp *Adleria gallariinctorne* Olivier - Cynipidae *Quercus infectoria* - Fagaceae

Chemical Constituents

- Gallotannic acid, gallic acid, ellagic acid, sitosterol, methyl betulate, methyl oleanolate, starch, calcium axalate, nyctanthic acid, roburic acid, and syringic acid are among the tannins found in galls.

Therapeutic Efficacy

Galls have the following therapeutic uses:

- 1) Astringents are made from galls.
- 2) Tanning and dyeing processes involves galls.
- 3) It is also utilised in the production of tannic acid and ink.

Pale Catechu

- Pale catechu is an extract occurring as dark or pale-brown coloured cubes having a dull, powdery fracture. It may also occur in the form of lozenges.

Synonyms

Gambier, Pale Catechu, Terra Japonica, and Catechu.

Biological Source

- Pale catechu is an extract prepared from the leaves and young shoots of *Uncaria gambler* Roxburg.

Family

Rubiaceae

Chemical Constituents

- Pale catechu contains about 7.33% (+) catechin and 22.50% catechutannic acid.

Therapeutic Efficacy

Pale catechu has the following therapeutic uses:

- 1) All parts of the plant have astringent properties.
- 2) In India, it was used as skin lotions since remote times.
- 3) The Malays (ancient Malaysia) also use it as a lotion. and apply it to treat burns.
- 4) In paste form, it is used to treat scurf.
- 5) It has commonly been used by the Indians and Malays to treat diarrhoea and dysentery, and as a gargle for sore throat.

Ashwagandha

- The name Ashwagandha has been derived from the Sanskrit language and is a combination of the word ashva meaning horse and gandha meaning smell.
- Thus, the roots have a strong horse-like odour.

Synonyms

Withania root and Winter cherry.

Biological Source

- Ashwagandha is the dried roots and rhizomes of *Withania somnifera*.

Family

Solanaceae

Chemical Constituents

Ashwagandha comprises of the following constituents:

- 1) Alkaloids: Ashwagandhine, Withanine, Isopelletierine, and Anaferine.
- 2) Steroidal Lactones: Withanolides and Withaferins
- 3) Phytosterols: Sitoindosides and B-sitosterol

Therapeutic Efficacy

Ashwagandha has the following therapeutic uses:

- 1) It is a sedative and hypnotic.
- 2) It is hypotensive, and shows respiratory stimulant actions along with bradycardia.
- 3) It is an immunomodulatory agent.
- 4) Conventionally, it has been used in rheumatism, gout, hypertension, nerve, and skin diseases.

Tulsi

- Tulsi is an herbaceous, branched annual plant. It can be easily grown and is regarded as the holy plant of Hindus. It also holds an important place in the ancient Ayurveda system of medicine.

Synonyms

Bisva Tulsi, Varavara, Manjariki (Sanskrit), Babui, Tulsi, Sabran, Kala-Tulsi, Baranda, Shyama Tulsi, Rama Tulsi (Hindi), and Holy Basil (English))

Biological Source

- ♠ Tulsi is the dried leaves of *Ocimum sanctum*)

Family

Labiatae

Chemical Constituents

- ♠ The leaves and flowering tops of tulsi contain 0.1-0.9% of bright, yellow coloured, and pleasant smelling volatile oil

Therapeutic Efficacy

Tulsi has the following therapeutic uses:

- 1) It is a diaphoretic, carminative, stimulant, demulcent, aphrodisiac, diuretic, fragrant, aromatic, anthelmintic, and febrifuge.
- 2) It is also used as an antidote to snake-poison.
- 3) It exhibits antimicrobial properties.
- 4) It also possesses anti-inflammatory properties due to the presence of eugenol oil in leaves.
- 5) It is used in respiratory tract infections.

Guggul

- ◆ Guggul is obtained from the sap (gum resin) which exudes from *Commiphora wightii*.
- ◆ In Ayurvedic medicine system, it is in use since 600 BC.
- ◆ In ancient literatures, it is mentioned to be useful in the treatment of atherosclerosis.

Synonyms

Palankasha and Devadhupa.

Biological Source

- ➔ Guggul is an oleogum-resin (oleoresin) that exudes spontaneously as a result of injury from the bark of *Commiphora wightii*.

Family

Burseraceae

Chemical Constituents

- ★ Guggul contains steroids, diterpenoids, aliphatic esters, amino acids, etc.

Therapeutic Efficacy

Guggul has the following therapeutic uses:

- 1) Oleogum resin obtained from guggul is used in obesity, arthritis, and rheumatism..
- 2) It is also used as an anti-inflammatory and hypocholesterolemic drug.
- 3) Its semi-purified form, patented with the name of 'Gugulip' and is marketed by Cipla, shows antihyperlipidemic activity.

Chapter 6

Plant Fibres used as surgical dressings

Topics

Plant Fibres used as surgical dressings

Study of Fibres

- Cotton
- Silk
- Wool
- Regenerated fibre (rayon)

Sutures and Ligatures



Plant Fibres used as surgical dressings

- Fibres are elongated cells having thick walls and pointed ends.
- The cell walls consist of cellulose but the presence of lignin is not confirmed, i.e., it may or may not be present.
- They can be obtained from different parts of plants like leaf which is fibrous, pliable, strong, and green.
- Fibrous, pliable, and green leaves are the source of fibres.
- A leaf which can be curled around a finger without breaking is a potential source of fibres.
- The natural fibre-reinforced polymer composite materials are rapidly being used in industries as well as in fundamental researches.
- Fibres are also chemically synthesised from various materials.

Classification

Fibres are classified based on their source

Source	Fibres
Plant Fibres	Jute, Flax, banana, Cotton, and Hemp
Animal Fibres	Silk and Wool
Regenerated and Synthesis fibres	Nylon, terylene, and orlon
Mineral Fibres	Glass, and Asbestos

Uses

- They are used for making ligatures, oiled silk, surgical dressings
- They are used for making lint and gauze.
- They are used in textile industries for weaving clothes
- They are used as filtering medium and straining medium
- They are used for insulation purpose.

Study of Fibres

→ Few examples of fibres which are used in pharmacy for different purposes :

- Cotton
- Silk
- Wool
- Regenerated fibre (rayon)

Cotton

- Cotton fibres are soft, fluffy, and staple.
- Cotton grows in a ball, or protective case, around the seeds of cotton plants.
- It is one of the world's leading agricultural crops which are produced economically in huge quantities.
- Large scale production of cotton is also making cotton products inexpensive.

Synonyms

- Raw cotton,
- Cotton wool,
- Purified cotton,
- Absorbent cotton, and
- Surgical cotton.

Source

- Cotton is the epidermal trichomes or hair of the seeds of cultivated species of *Gossypium* (*Gossypium herbaceum*, and *Gossypium barbadense*).

Family

- Malvaceae

Cultivation and Collection Cotton

- ✚ Cotton plant is found as a perennial in tree-like plants. These plants grow well in tropical climates

Preparation

- ❖ After the cotton plant has reached its flowering stage, it bears fruits known as capsules or balls. The fruits contain 3-5 cells. The ripe fruits containing a number of seeds in each loculus open up widely. The seeds are brown coloured and are encircled with a thick mass of white hairs (cotton fibres). The long-lint hairs are staple or floss, while the short-fuzz hairs are linters. The cotton fibres and their seeds are collected by hand.
- ❖ The collected raw cotton is mechanically processed by ginning in which the hairy substance is separated from the undesired substances (dirt, leaf-fragments, and other foreign materials).
- ❖ Cotton is also subjected to delinting process in which the short hairs which pass along with the cotton fibres obtained from the ginning process are removed.
- ❖ From the raw long-sized cotton hairs obtained by separation, colouring matters and traces of wax and oil coating the hairs (making them non-absorbent) are removed.
- ❖ The so treated absorbent cotton is passed through the carding machine which arranges the fibres in parallel direction and also frees them from immature fibres completely.
- ❖ Short fibres are again removed mechanically by the process of combing.
- ❖ In the final step, the processed cotton fibres are defatted with alkali, washed, bleached with chlorinated soda, washed again with diluted mineral acid, dried, and sterilised.

Organoleptic Evaluation

- **Colour** : White due to bleaching; off-white when sterilised.
- **Odour** : Odourless
- **Taste** : Tasteless
- **Size** : Cotton fibres are 2.5-4.5 cm in length and 25 – 35 micron in diameter

Chemical Constituents

- Raw cotton contains cellulose (about 90%), moisture (7- 8%), and natural impurities (4-6%) such as wax, fat, and protoplasm remnants.

Uses

- ✓ They are used as a filtering medium.
- ✓ They are also used as an insulating material.
- ✓ Absorbent cotton is used in surgical dressings to absorb blood, mucus, pus and prevent the wounds from infections.

Silk

→ Silk is a natural protein fibre which can be woven into textiles. The protein present in silk is fibroin and is produced by certain insect larvae to form cocoons.

Synonyms

- Mantua,
- Pongee,
- Samite, and
- Sendal.

Source

- Silk is the fibre obtained from the cocoons of *Bombyx mori* (Mulberry silkworm) and other species of *Bombyx* and also from *Antheraea* species.

Family

- Bombycidae

Preparation

Cultivation of Silkworms

Hatching

Moulting

Spinning the cocoon

Sorting cocoon

Softening the Sericin

Reeling the filament

Steps	Description
Cultivation of Silkworms	Silkworm is the caterpillar of small half moths belonging to "bombyx" which lives only on leaves of mulberry tree. The silkworm spent their entire life in eating these leaves,
Hatching	Eggs of silkworm are warmed up for hatching in winter by spreading them over the trays in the hatching shed and chopped leaves of mulberry trees are spread on the perforated paper. For eating the leaves, the worm climbs through the holes.
Moulting	After 35 days of hatching, worm is 10,000 times heavier as it was born. Worm becomes greenish white caterpillar, and starts spinning; and the silkworm built its cocoon to settle down in it.
Spinning the Cocoon	The liquid silk comes from two glands called spinneret in the silkworm head. As the liquid comes out, it is hardened into very fine filaments which are coated by a gummy substance called sericin which comes from other two glands nearby.
Sorting Cocoons	The cocoons are sorted according to colour, size, shape, and texture, as all these affect the final quality of the silk.
Softening the Sericin	The cocoons are put through a series of hot and cold immersions, as the sericin must be softened to permit unwinding of the filament as a continuous filament.
Reeling the Filament	The process of unwinding of the filament from cocoon is called reeling.

Organoleptic Evaluation

- **Form** : Very fine, solid, and smooth.
- **Colour** : Yellow.
- **Length** : About 1200m long.
- **Diameter** : 5-25µ.
- **Solubility** : Soluble in cuoxam solution sulphuric acid, and concentrated hydrochloric acid.

Chemical Constituents

- Natural silk consists of fibroin protein which hydrolyses into glycine (44%), alanine (27%), serine (11%), tyrosine (5%), and other amino acids.

Uses

- ✓ Silk fibres are used for preparing special types of sutures, sieves, and ligatures.

Wool

- Wool is a specific type of hairs of some mammals.
- It is mainly obtained from sheep and goats and sometimes also comes from other animals like qiviut from musk oxen, angora from rabbits and other types of wool from camelids.

Synonym

- Sheep wool

Source

- Wool is obtained from the fleece of sheep *Ovis aries*

Family

- Bovidae, (Order Ungulata)

Preparation

- ❖ Wool is removed from the body of sheep.,
- ❖ The dust and dirt is removed by beating the wool over the netting.
- ❖ The dirt passes through netting and the burrs and pieces of straws, etc. are picked up.
- ❖ The wool is washed in tanks with warm soapy water.
- ❖ It is then squeezed between rollers.
- ❖ After washing the wool is dried and the fibres are mechanically loosened.
- ❖ These are then carded and spun into yarn.

Organoleptic Evaluation

- **Appearance:** Wool hairs are smooth, elastic, lustrous, curly, hygroscopic, and slippery; they have the tendency to cling together.
- **Solubility:** Insoluble in 66% sulphuric acid, acid, concentrated hydrochloric acid, and cuoxam solution.
- **Size:** Wool hairs are 2-50cm long, 5-100µm wide, and 13-40µm in diameter

Chemical Constituents

- Wool fibres are made up of keratin protein. They show elasticity, in contrast to the cellulose and silk fibres.

Uses

- ✓ It is used in manufacturing dressings like domette and crepe bandages and flannel.
- ✓ It is used as a filtering and straining medium.

Regenerated fibre (Rayon)

- Regenerated fibre is made by dissolving the cellulose fraction of plant fibre in chemicals and then again making it a fibre by viscose method. It is also termed as regenerated cellulose fibre as it consists of cellulose like cotton and hemp.

Synonyms

- Regenerated cellulose and viscose rayon.

Source

- Rayon is an artificial fibre, composed of regenerated cellulose

Preparation

- ❖ The pulp form of cellulose of coniferous wood is processed into viscose rayon. The pulp contains about 80-90% of cellulose and hemicellulose.
- ❖ Cellulose is treated with sodium hydroxide to yield Sodium cellulosate, and further treated with carbon disulphide and sodium hydroxide to yield a viscous solution of sodium cellulose xanthate.
- ❖ These filaments are drawn together to form yam, which is de-sulphurised, bleached, washed, twisted, and then dried.

Features

- It has a smooth texture, unique gloss, moisture absorption and desorption properties, and superior staining property.
- It is commonly used because it does not get soft and melt with heat.

Uses

- ✓ It is used for making fabrics, surgical dressings, and viscose rayon absorbent wool.

Sutures and Ligatures

- Sutures, commonly called stitches, are sterile surgical threads that are used to repair cuts (lacerations).
- They also are used to close incisions from surgery.
- Some wounds (from trauma or from surgery) are closed with metal staples instead of sutures.
- A ligature is a thread or string without a needle which is used to tie blood vessels and other tissues together.

Classification of Sutures and Ligatures

→ Types of Absorbable Sutures

- Gut
- Polydioxanone (PDS)
- Poliglecaprone (MONOCRYL)
- Polyglactin (Vicryl)

→ **Types of Non-absorbable sutures/Ligatures**

- These types of sutures can all be used generally for soft tissue repair, including for both cardiovascular and neurological procedures. Nonabsorbable sutures are not affected by the body fluid and remained unchanged for a long period. They are removed after healing of the wounds. Silk, cotton, nylon, and metallic sutures are classified as nonabsorbable sutures.

- Silk Sutures
- Cotton Sutures
- Nylon Sutures
- Linen Sutures
- Metallic sutures

Essential Properties of Sutures and Ligatures

- ✚ They must be sterile.
- ✚ Their strengths must be adequate for the purpose for which they are used.
- ✚ They must not cause any irritation as far as practicable.
- ✚ Their gauge should be as fine as possible.
- ✚ If absorbable, approximate time of absorption should be known.

Suture Selection and Techniques

- **Continuous Suture** : A continuous Suture is a surgical technique which involves several stitches wherein the doctor uses a single strand of the suture thread material
- **Interrupted Sutures** : The interrupted suture is a technique that uses many strands of the suture material in order to close a wound
- **Deep Sutures** : Yet another type of surgical suture technique is the deep suture technique. Here, the doctor places the suture under the tissue layers. which are deep below the skin.
- **Buried Sutures** : The buried suture technique is applied by doctors such that the suture knot is found inside, i.e. within or under the area that has to be closed off
- **Purse String Sutures** : A type of continuous suture the purse-string suture is placed around the infected area
- **Subcuticular Suture** : The suture that is usually placed in the patient's dermis, i.e. the layer of tissue which lies below the skin's upper layer, is known as the subcutaneous suture In this type of suture, the doctor places short stitches in a line, parallel to the wound. The doctor also anchors the stitches on either end of the wound.

Surgical Catgut

- Catgut is best used for wounds in areas where the tissue regenerates rapidly.
- A disadvantage to Using this suture material is that a higher level of tissue reaction is incited in the surrounding tissue due to the foreign protein nature of the catgut suture.

Synonyms

- Kit gut,
- Violin gut,
- Surgical gut,
- collagen fibre

Source

- Catgut suture is made by twisting together strands of purified collagen taken from the serosal or submucosal layer of the small intestine of healthy ruminants (cattle, sheep, and goats) or from beef tendon.

Properties

- ❖ It allows for smooth passage through tissue.
- ❖ It is packed in IPA to retain memory & increase pliability.
- ❖ Its uniform chrome content provides required wound support and absorption.
- ❖ It is available from U.S.P Sizes 5-0 to 2

Types

- **Boilable Catguts:** If tubing is anhydrous then it is boilable
- **Non-Boilable Catguts:** If tubing contains alcohol and small water which avoids heat sterilization is non-boilable

Preparation

- ❖ **Raw Material:** When sheep are slaughtered the intestine are roughly washed and placed in cold brine for transport
- ❖ **Selection and Washing:** The intestines are washed thoroughly with water. Poor samples are rejected.
- ❖ **Splitting:** The intestinal tube is fitted over the end of a flat curved peg and then splitted longitudinally with knife into "smooth" ribbons.
- ❖ **Removal of Unwanted Layers:** The gut consists of 4 layers-mesentric, muscular, submucous and mucous layers. All submucous layer are scraped away mechanically by blunt knife
- ❖ **Orientation of Fibres:** During above scrapping process the constituent fibres of gut become arranged in more parallel way.
- ❖ **Hardening:** At this stage the ribbon may be tanned or hardened by soaking in the solution of chromic salts.
- ❖ **Spinning:** The ribbons are next tied at the ends in group of two, three or more, depending on the gauge of thread to be prepared, pulled to an even tension and spun, Chromicising can be done.

- ❖ **Drying:** This is done in an atmospheric condition with regard to temperature and humidity.
- ❖ **Finishing:** The dried strings are rubbed against an abrasive surface to produce a smooth, uniform string of circular section.

Sterilisation

- **Heat Process**
 - i) Tubing
 - ii) Drying
- **Chemical Process:** Guts are sterilised by immersing them in iodine solution.
- **Ionising Radiation Process:** Guts are packed in aluminium foils containing 90% isopropyl alcohol and Passed through gamma irradiation.

Advantages

- ✓ It is less likely to form sinuses if the wound turns septic.
- ✓ It is used for suturing the mucosa of gastrointestinal tract where a non-absorbable suture might cause chronic ulceration or haemorrhage.
- ✓ In certain situations it might be used as a skin suture,



Chapter 7

Traditional System of Medicine & Ayurvedic Preparations

Topics

Traditional System of Medicine & Ayurvedic Preparations

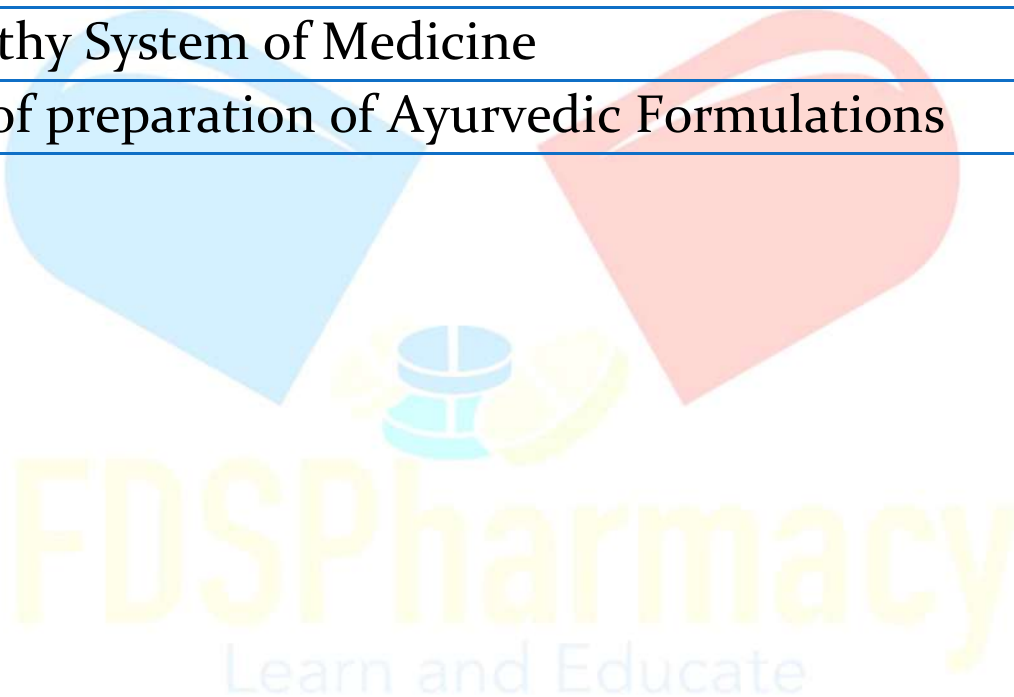
Ayurveda System of Medicine

Unani System of Medicine

Siddha System of Medicine

Homeopathy System of Medicine

Methods of preparation of Ayurvedic Formulations



Traditional System of Medicine & Ayurvedic Preparations

- These alternative systems of medicines are referred to as traditional systems of medicines, which are still in use by about 80% of the world population.
- The traditional Chinese medicine system, Unani system, Ayurvedic system, Amachi, and Homoeopathy are the traditional systems of medicine which in ancient times were practiced only in China, Greece, India, Tibet, and Germany, respectively; but at the present time worldwide population rely on them.
- The major systems of medicines that are used alternatively are as follows:
 1. Ayurveda system,
 2. Unani system,
 3. Siddha system, and
 4. Homeopathy system

Ayurveda System of Medicine

- Ayurvedic medicine system was established by the Hindus in India several thousand years ago.
- The Vedic period started with the Aryans.
- The four holy books (written in Sanskrit) invented with divine inspiration were included in the Vedas, which means wisdom.
- These Vedas were initially conveyed to the students by their teachers in a verbal manner.
- But during the period of 2500-1500 BC ' the Vedas were available in written forms on birch bark.
- Later, they were even available written on papers.
- Rig Veda (the oldest Veda) has drugs and diseases mentioned in it. Atharva Veda (the fourth Veda) has ideologies for maintaining health and the medicinal effects of health mentioned in it.

History of Ayurveda

- ✚ Ayurveda is attributed to **Dhanvantari**, the physician to the gods in Hindu mythology, who received it from **Brahma**.
- ✚ Its earliest concepts were set out in the portion of the Vedas known as the **Atharvaveda** (c. 2nd millennium BCE).
- ✚ The period of Vedic medicine lasted until about 800 BCE.
- ✚ The Vedas are rich in magical practices for the treatment of diseases and in charms for the expulsion of the demons traditionally supposed to cause diseases.
- ✚ The chief conditions mentioned are fever (*takman*), cough, consumption, diarrhea, dropsy (generalized edema), abscesses, seizures, tumours, and skin diseases (including leprosy).
- ✚ The herbs recommended for treatment are numerous.
- ✚ The golden age of Indian medicine, from 800 BCE until about 1000 CE, was marked especially by the production of the medical treatises known as the Caraka-samhita and Susruta-samhita, attributed respectively to Caraka, a physician, and Susruta, a surgeon.

- ✚ Estimates place the Caraka-samhita in its present form as dating from the 1st century CE, although there were earlier versions.
- ✚ The Susruta-samhita probably originated in the last centuries BCE and had become fixed in its present form by the 7th century CE. of somewhat lesser importance are the treatises attributed to Vagbhata.
- ✚ All later writings on Indian medicine were based on these works, which analyze the human body in terms of earth, water, fire, air, and ether as well as the three bodily humours (vata, pitta, and kapha).

Basic Principles Involved

- The development of Ayurvedic medicine system is based on the following 5 pharmacological principles of drug, i.e., Panchsheel
1. **Rasa** : It denotes the drug's taste (i.e., Dravya), action, and properties.
 2. **Guna** : It denotes the drug's physical properties
 3. **Virya** : It denotes the drug's potency and shows two intrinsic properties
 4. **Vipaka** : It denotes the end product of digestion
 5. **Prabhava** : It denotes the drug's power

Five Elements

- Akasha (space),
 - Vayu (air),
 - Agni (fire),
 - Jala (water), and
 - Prithvi (earth).
- **Akasha** : It denotes the spaces within the body. i.e., mouth. nostrils. abdomen, etc.
- **Vayu** : It denotes the muscular movement.
- **Tejas or Agni** : It denotes the functions of enzymes, i.e., intelligence, digestion, and metabolism.
- **Apa or Jala** : It denotes the body fluids, i.e., plasma, saliva, and digestive juices.
- **Prithvi** : It denotes the body structure, i.e., bones, teeth. flesh. and hair)

Doshas

- It is believed that all the processes occurring within a body are governed by a balance of the 3 types of doshas. The dosha which dominates a person's behaviour and body is called his constitution type.
1. **Vata** : It is composed of air and space. All the movements in the mind and body are controlled by it, thus should be maintained in a good balance.
 2. **Pitta** : It is composed of fire and water. All heat, metabolism, and transformation within the mind and body are controlled by pitta
 3. **Kapha** : It is composed of earth and water. It cements the elements in the body, providing the material for physical structure. It maintains resistance of the body. It causes joint lubrication, provides moisture to the skin, helps in wound healing, fills the spaces in body, provides biological strength, vigour and stability, supports memory retention. provides energy to heart and lungs, and maintains immunity

Unani System of Medicine

- Unani (or Yunani or Unani-tibb) is a traditional medicine system practiced in India and Indian subcontinent.
- It refers to practice of Graeco-Arabic medicine, which relies on the teachings of Hippocrates and Galen (physicians of Greece and Rome, respectively).
- The Unani medicine was developed into an elaborate medical system by Rhazes (Arab and Persian physicians)
- The base of Unani medicine system is formed by the concepts of four humours, Phlegm (Balgham), Blood (dam), Yellow bile (safra), and Black bile (sauda)

Basic principle involved

- The principles of Hippocrates formed the base of unani medicine system.
- Hippocrates laid the facts that disease is a nature process, symptoms are the reaction that body produces towards the diseases and physicians role is to help the natural forces of the body.
- He introduced the method of checking patients medical history He also brought the Humoral theory Which is his most essential contribution towards the medical kingdom
- The components whose loss in human body can cause a disease or even death are as follows:
 1. Al-Arkan (Element),
 2. Al-Mizaj (body fluids),
 3. Al-Akhalt (Body Fluid),
 4. Al-A'za' (Organ),
 5. Al-Arwah (pneuma)
 6. Al-Quwa (Power),
 7. Al-At'al (Function)

Siddha System of Medicine

- Siddha medicine system was founded by the Dravidian culture of the pre-Vedic period.
- It is the oldest medicine system, which utilises drugs obtained from vegetables.
- Siddha medicine system deals with the human body as well as with the inner soul.
- This medication system should not be used for earning money as it is a divine art based on truth.

Basic Principles Involved

- The universe is made up of matter and energy (two essential entities). The Siddhas call them Siva (male) and Shakti (female, creation). Matter cannot exist without energy in-built in it and vice versa. Matter and energy co-exist and cannot be separated. There are 5 primitive elements (bhutas), i.e., munn (solid), neer (fluid), thee (radiance), vayu (gas), andaakasam (ether). These elements should not be confused with modern chemistry. Different proportions of them are present in every substance. Earth, water, fire, air, and ether are the manifestations of these elements.

- The human body is made up of different combinations of these elements. There are 3 substances (dravyas), i.e., vatham, pitham, and karpam which facilitate the body's physiological functions.
- Tridoshas According to Siddha Medicine All the body functions (physical, mental, and emotional) are controlled by the tridoshas:

1) Vatham

- It is dry, light, cold, and motile.
- It is formed by aakasam and vayu.
- It controls the nervous actions (movement, activity, sensation, etc.).
- It predominates in the bone.
- It dominates in first one-third phase of life when activities like growth, sharpness of function of sense are greater.

2) Pitham

- It indicates heat.
- It is formed by thee.
- It controls the metabolic activity of the body, digestion, assimilation, warmth, luster, intellect, etc.
- It predominates in the tissue blood.
- It dominates in the second one-third phase of life.

3) Karpam

- It is smooth, firm, viscid, and heavy.
- It is formed by munn and neer.
- It controls the stability of body such as strength, potency, and smooth working of joints.
- It predominates in other tissues.
- It dominates in the last one-third phase of life.

Given below are the 7 dhatus:

1. Rasa (lymph),
2. Kurudhi (blood),
3. Tasai (muscle),
4. Kozhuppu (adipose tissue),
5. Elumbu (bone),
6. Majjai (marrow), and
7. Sukkilam and artavam (male and female hormones).

Homeopathy System of Medicine

- Homeopathic medication are prepared by successive dilutions with forcefully shaking and striking (succession).
- It was believed by the Homeopaths that after each dilution the effect of medication is enhanced : and this preparation process was named potentisation.
- Dilution is carried on till the original substance completely fades away.
- Before recommending any medicine, the Homeopaths ask the patients about their symptoms, physical and psychological state

Basic Principles Involved

- Every science guides the whole system by their some specific basic principles. Similarly, Homoeopathy being a science of medical treatment has its own philosophy, and its therapeutics relies on certain principles which are much different from those of other school of medical science.
- **Hahnemann discussed these fundamental principles in different sections of his medicine and philosophy as follows :**
 1. **Law of Similia :** Homoeopathy medicine system relies on the therapeutic law, Simillia Similibus Curentur, which means 'let likes be cured by likes'. In this healing system, the patient is given such a medicine which will produce the same symptoms (as found in the patient) if given to a healthy person also. Thus, the symptoms of the patient are matched with the pathogenesis of the medicine; and the medicines which show greater degree of similarity, viz. Simillimum are selected and administered to cure the patient.
 2. **Law of Simplex :** As per this law, simple and single drugs should be prescribed at a particular time. Thus, medicines act on healthy human beings individually and in simple form without the addition of any other substance.
 3. **Law of Minimum :** As per this law, drugs are administered in minimum quantity because of hypersensitivity in disease. The drug action is always directed towards normal as a result of altered receptivity

Methods of preparation of Ayurvedic Formulations

- Indian medicine comes from Ayurveda which is said to be the science of life and was originated by Brahma.
- Ayurveda contains knowledge of medicines and the healing art.
- Ayurvedic medicine system from the ancient era utilises many pharmaceutical dosage forms which are even practiced at the present time.
- These dosage forms are derived from vegetable drugs
- Nowadays Allopathic and modern system of medicine is in general practice· however the pharmacists should be aware of the prevailing Ayurvedic dosages forms and their process of manufacturing.

➤ The preparation and standardisation of the following Ayurvedic formulations are discussed below.

1. Arishta,
2. Asava,
3. Gutika,
4. Taila,
5. Chuma,
6. Lehya, and
7. Bhasma.

Arishta

- Arishtas are prepared by the process of fermentation for a specific time period after boiling the main decoction substance and adding other ingredients.
- Arishta is an ancient medicinal preparation mentioned in the Vedas, having Ayurvedic medicines.

Method of Preparation

- The drug is coarsely powdered (javkut) to prepare kasaya, which is strained and transferred to the fermentation vessel.
- Required amount of sugar, jaggery, or honey are dissolved, boiled, and then added to the mixture obtained after straining the kasaya.
- For the fermentation process, the temperature has to be kept constant; this can be achieved by placing the container in a special room, in an underground cellar, or in a heap of paddy.
- The jar is uncovered (lid is removed) after a prescribed time and the contents are inspected to determine whether or not complete fermentation has occurred.
- The fluid in the jar is decanted followed by straining after 2-3 days only when the fine suspended particles has settled at the bottom.
- The liquid obtained after straining is the product which is filtered and the filtrate is stored in a bottle.
- This filtered Arishta has a characteristic aromatic and alcoholic odour.

Asavas

- Asavas are a famous ancient medicinal preparation mentioned in the Vedas.
- Asavas are prepared by the process of fermentation for a prescribed time after mixing all the specified ingredients with required quantity of unboiled water.

Method of Preparation

- The drug is soaked in the form of a decoction in a solution of either sugar or jaggery for a prolonged duration.
- There after the mouth of the vessel is covered with a lid and edges are sealed with clay.

- During this time period, fermentation of Asava takes place; and as a result alcohol is produced which acts as a preservative.
- The product is filtered and the filtrate is stored in a bottle.
- The filtered Asava should be clear and free of froth at the top.
- It should have a characteristic, aromatic, and alcoholic odour. It should not be sour. Asavas can be stored for a long duration in well stoppered bottles or jars

Examples Kumaryasava, Madhukasava, Vasakasava, Arvindasava, Punarnavasava, etc.

Difference between Arishtas and Asavas

- The preparation method of Arishtas is decoction and that of Asavas is infusion.
- The fermentation time duration of Arishtas is much smaller than that of Asavas.

Gutika

- Gutikas are available as medicated pills, prepared by combining the vegetables, mineral or animal drugs together.
- Gutikas should be consumed within two years.
- The pill forms of Gutikas having mineral ingredients can be used for life long.

Method of Preparation

- Drugs obtained from plants are separately dried and finely powdered.
- The minerals are made into bhasmas or sindura.
- When parada (mercury) and gandhaka (sulphur) are stated, kajjali is made first and added with other drugs one at a time as given in the formula.
- This mixture is grounded properly in khalva to yield a soft paste containing the prescribed fluids.
- The mass after reaching a condition that it can be casted as pills is again grounded with added sugandha dravyas (flavouring agents) like kasturi and karpura.
- The mass obtained should not stick upon rolling between the fingers. The mass is shaped into many pills, which are dried in shade or in sun.
- If sugar or jaggery is added, paka is vigorously mixed.
- In warm state, vatakas should be rolled and shade dried.
- Pills of plant origin are stored in air-tight containers and should be consumed within two years.
- Pills of mineral origin can be used indefinitely.
- Gutikas should retain their original colour, odour, and taste after formulation.
- Gutikas containing salt or sugar should be prevented from moisture

Examples Lasunadi gutika, Marma gutika, Pranda gutika, Bilvadi gutika, Marma gutika, Mritsanjivni gutika, etc.

Taila

- Tailas are called sneha kalpa/paka and prepared by cooking oil with the juice or the decoction and paste of drugs.
- Paste of the drug should be 1/4th part of the oil and the liquid (drava) should be four times of oil.
- If no liquid is specified in the recipe, water should be used.

Method of Preparation

- There are three essential components for preparation of tailas:
 - Dravya (Liquid).
 - Kalika (thin paste of drug).
 - Snehadravya (Ghee or tail).
- Kalika is taken one part by weight, Snehadravya should be four parts, and Dravya should be sixteen parts.
- Kalika and Dravya are mixed together, Snehadravya is added and boiled and stirred well continuously so that Kalika does not adhere to the vessel.
- When all Dravyas have been evaporated, the moisture in Kalika will also start evaporating.
- At this stage, it should be stirred more often and carefully to ensure that kalika does not stick to the bottom of the vessel.
- The kalika tested from time to time to know the condition and stage of preparation.
- In Snehadravya, sarkara (sugar, if present) is added to the final product when cooled.
- Wherever lavans (salt) and ksharas (alkali) are used in this preparation, they are added to Sneha and then strained.
- Tailas will have the colour, odour and taste of the drugs used and has consistency of oil.
- When considerable quantity of milk is used in preparation the oil becomes thick due to Ghrita, and in cold season may condense further.
- Tailas can be used internally and topically. They retain potency for about sixteen months.
- They are taken internally with warm water or warm milk.

Example : Asanabilvadi Talia, Aswagandhabalalakshadi Taila, Bhringgamalaka Taila, Bramhi Taila, etc

Churna

- Churnas are finely powdered drug(s).
- Drugs stated in patha are first cleaned, dried, pulverised, and then sieved.
- Churnas are stored in air-tight containers to maintain their potency and free flowing nature for a year.

Method of Preparation

- The drug prescribed in the yoga is cleaned, dried, finely powdered, and sieved.
- In case of many drugs, each drug is separately powdered, sieved, and weighed, followed by mixing together all the resultant powder.
- For large scale production, all the drugs are cleaned, dried, powdered together in disintegrators, and then screened through mechanical sifters.
- The powder should be made fine enough to pass through 80 mesh sieve.
- The powder particles should not adhere or become moist.
- The therapeutic efficacy of fine powder is comparatively better.

Example : Ashwandhadi Churna, Eladi Churna, Haritaki Churna, etc

Lehya

- Lehyas (also known as aveleha or leha) is a Semisolid drug product prepared by adding sugar, Jaggery (gur), or sugar candy to the drug and further boiling with drug juice or decoction.

Method of Preparation

- Lehyas are prepared by dissolving jaggery or sugar candy in liquid, followed by moderate boiling and straining the obtained mixture to remove impurities.
- Boiling is stopped when the paka (phanita) becomes thready on pressing between two fingers or if it sinks in water without getting dissolved.
- Small quantities of the fine powdered drugs are added and stirred in a constant and vigorous manner to yield a homogeneous mass.
- The hot preparation is added and properly mixed with ghee or oil (if required); while if honey is to be added the preparation should be first cooled.
- Lehyas have the following components:
 - Kasaya or other liquids,
 - Jaggery, sugar, or sugar candy,
 - Powders or pulps of certain drugs,
 - Ghee or oil, and
 - Honey.

Examples : Kutajavaleha, Draksavaleha, VasavaJeha, Sumavaleha, etc.

Bhasma

- Bhasmas are grey, Whitish, yellowish, or black coloured powdered from of substance.
- These can be obtained from metals, minerals, or animals sources by a process named calcinations carried out in closed crucibles or in pits covered with cow drug cakes (puta).
- They are typically stored in glass container.
- Bhasmas are stable and retain their potency for a long time.

Method of Preparation

- Bhasmas are prepared in two steps, namely sodhana and marana.
- These are time-consuming processes and require attention:
- **First Stage (Sodhana):**
 - Bhasmas, as already known are obtained from minerals, metals, marine, and animal products. Sodhana is a purification process which is of the following two types:
 1. Samanya Sodhana: In this method, thin metal sheets are heated and immersed in taila, takra, gomutra, etc. This method can be used for large number of metals or minerals.
 2. Visesa Sodhana: This method can be used for some drugs and preparations.
- **Second Stage (Marana):**
 - This second stage of bhasma preparation occurs in the following steps:
 - ✚ The purified drug is grounded for a specified time with juices of particular plants or kasayas of drugs (stated for a specific mineral or metal) in a stone mortar and pestle (khalva).
 - ✚ Small cakes (cakrikas) are prepared from the obtained mixture.
 - ✚ These cakes are sun dried and arranged in a shallow earthen plate (sarava) as a single layer.
 - ✚ Thereafter, the plate is closed with another plate, edges are sealed by winding clay smeared cloth in seven consecutive layers, and then it is dried.
 - ✚ A pit is formed in an open space, and filled with cow dung cakes up to the half level.
 - ✚ The sealed earthen container (iv) is kept in the pit and more cow dung cakes are added to fill up the remaining space.
 - ✚ All the four sides and the middle of the pit are put on fire.
 - ✚ After complete burning, the pit is cooled, the earthen container is taken out, opened, and its contents are removed.
 - ✚ The content if required is again grounded with juice in a khalva to yield a fine powder, from which cakes are made, and putas are obtained.
- Bhasmas are yellowish, black, dark, White, grey, red, or reddish black in colour, as per the major drug and the other drugs in the process of marana

Examples : Tamra basma, Godanti bhasma, Pravala bhasma, Mukta bhasma, Lauha bhasma, etc.

Chapter 8

Medicinal and Aromatic Plants

Topics

Role of Medicinal and Aromatic plants in National economy and their export potential



Medicinal and Aromatic Plants

- Role of Medicinal and Aromatic plants in National Economy and their Export Potential
- Plants are the chief and cost-effective source of various drugs and several chemical intermediates (essential in the manufacturing of various drugs).
- About 25% of current medications are obtained from plant components directly or indirectly.
- Morphine, codeine, papaverine, quinine, emetine, quinidine, digoxin, caffeine, hyoscyne, hyoscyamine, xanthotoxin, psoralen, senna glycosides, vincristine, vinblastine, ergot alkaloids, papain, nicotine, strychnine, brucine, colchicine, rutin, pyrethroids, and berberine are some of the plant-based medications being produced at the current time.
- Products of aromatic plants are widely utilised as spices, flavouring agents, perfumes, and medicines.
- They also provide raw ingredients for manufacturing various essential industrial chemicals.
- Ajowain, cedar wood, celery seed, citronella, eucalyptus, lemongrass, mentha, palmarosa, patchouli, turpentine, and vetiver are the essential oils produced in India.
- Some of these compounds are used as raw materials to manufacture industrial chemicals, e.g., B-ionone from lemongrass oil, which is used to make vitamin A.
- India has been dubbed as the World's Botanical Garden, with over 2200 species of medicinal and essential oil-producing plants, because of its diverse climatic conditions and geography.

Export Potential of Medicinal and Aromatic Plants

- Many medicinal plants are exported to other countries:
 1. Seed husk and seed of Isabgol (*Plantago ovate*)
 2. Opium alkaloids (*Papaver somniferum*)
 3. Leaves, pods and total sennoside concentrate of Senna (*Cassia angustifolia*)
 4. Root and root alkaloids of Periwinkle (*Catharanthus roseus*)
 5. Quinine and quinidine alkaloids (*Cinchona officinalis* and allied species)
 6. Ipecac root alkaloids (*Cephaelis ipecacuanha*)
 7. Solasodine (berries of *Solanum viarum*)
 8. Diosgenin/16 DPA (*Dioscorea floribunda* and allied species)
 9. Menthol and mint oil (*Mentha arvensis*)
 10. Celery seed (*Apium graveolens*)
 11. Citral and ionones from oil of lemon grass (*Cymbopogon flexuosus*)
 12. Gudmar herb (*Gymnema sylvestre*)
 13. Kuth root and essential oil (*Saussurea lappa*)
 14. Mehndi leaves (*Lawsonia alba*)
 15. Sindura fruits (*Bixa orellana*)
 16. Papain (*Carica papaya*)
 17. Podophyllum (*Podophyllum peltatum*)
 18. Rauwolfia (*Rauwolfia serpentina*)
 19. Valerian (*Valeriana wallichii*)

20. Cassia tora
21. Guar gum (Cyamopsis tetragonolobus)
22. Gudmar (Gymnema sylvestre)

The essential oils are also exported regularly:

1. Jasmine otto and absolute (Jasminum grandifloru)
2. Agar wood oil (Aquillaria agallocha)
3. Sandal wood oil (Santalum album)

Indian Herbal Trade in World Scenario

- Demand and supply of herbal drugs are rapidly increasing The annual revenue generated by Indian herbal industry is about 2,300 crore as compared to pharmaceutical industry turnover of 14,500 crore with growth rate of 15%.
- India has exported many medicinal and herbal products in last few years. Globally, India is the second largest producer of castor seeds (with 1,25,000 tonnes per annum productive value).
- Isabgol, opium alkaloids, senna derivatives, vinca extract, cinchona alkaloids, ipecac root alkaloids, solasodine, Diosgenine/16DPA, menthol gudmar herb, mehndi leaves, papian, rauwolfia, guar gum, jasmine oil, sandalwood oil, etc.
- Are the major herbal pharmaceuticals which have been exported from India in the recent years.
- Overall revenue of herbal medicines (OTC products, ethical and classical formulations, and home remedies of traditional medicine systems) in India is about U.S. \$ 1 billion and export of herbal crude extract is about U.S. \$ 80 million.

Medicinal Plant Based Indigenous System of Medicine

- ✚ Approximately, 25,000 licensed pharmacies are under Indian medicine system; of which currently, 1,000 single drugs, and 3,000 compound preparations are registered.
- ✚ Out of 8,000 herbal drug manufacturers, not more than large scale manufacturers are in India.
- ✚ Annual turnover of Indian herbal industry was around U.S. \$300 million in Ayurveda, U.S. \$ 27.7 million in Unani.
- ✚ This value went up to U.S. \$ 31.7 million and the total turnover became U.S. \$ 48.9 million of Ayurveda and herbal products.
- ✚ Export of herbal drugs in India is around U.S. \$ 80 million.

Role in National Economy

- ◆ India is a hub of medicinal and aromatic plants.
- ◆ Ministry of Environment and forest has reported around 9500 plants species having medicinal value. These important plants species should be preserved and also cultivated to meet the demand of domestic industries and to exploit the bright prospect for export.

Medicinal Plants

- India is blessed with an expensive wealth of medicinal plants, which have contributed to the development of ancient Indian materia medica.
- The Charak Samhita (1000 B.C.) is one of the earliest treatises on Indian medicine.
- It records the utilisation of over 340 herbal medicines. Most of these herbals are still collected from wild plants to satisfy the demand of medical profession.
- The therapeutic properties of drugs are due to the presence of complex chemical substances (secondary metabolites) in one or more parts of these plants.
- Based on their composition, these plant metabolites are categorised as alkaloids, glycosides, corticosteroids, essential oils, etc.
- Alkaloids form the largest group, and includes morphine and codein (poppy), strychnine and brucine (nux vomica), quinine (cinchona), ergotamine (ergot), hypocyamine, (belladonna), scopolamine (datura), emetine (ipecac), cocaine (coco), ephedrine (ephedra), reserpine (rauwolfia), caffeine (tea dust), aconitine (aconite), vaccine (vasaca), santonin (artemisia), lobelin (lobelia), etc.
- Glycosides form another important group, and includes digoxin (foxglove), stropanthin (strophanthus), glycyrrhizin (liquorice), barbaloin (aloe), sennosides (senna), etc.
- Corticosteroids have recently gained importance, and include diosgenin (dioscorea), solasodin (solanum sp.) etc.

Aromatic Plants

- Aromatic volatile plants contain odoriferous and substances present in the roots, wood, bark, foliage, flowers and fruits as essential oils. gum exudates, balsam, and oleo-resin.
- The chemical nature of these aromatic substances depends on the complex chemical compounds.
- These aromatic substances are used as germicides and anti-hacterials; however, mainly they are Used in perfumery and the food-flavouring industries.

Volatile or Essential Oils

- ❖ Volatile oil contains the substances which impart odour and taste to the plant (essential oil).
- ❖ Since they evaporate when exposed to air, they can be obtained by distillation, expression, or extraction.
- ❖ Ethereal oils are those volatile oils, which are identical to or closely resemble the natural oils and can be made synthetically.
- ❖ Ajowain oil, cedar wood oil, celery oil, citronella oil, davana oil, eucalyptus oil, geranium oil, lavender oil, lemon grass oil, mentha oil, palmarosa oil, patchaouli rose oil, sandal wood oil, turpentine oil, and vetiver oil are the essential oils obtained from plants in India.
- ❖ Although, production of major oils is well-organised, a few developing countries have volatile oil rich flora which is not being fully utilised or cultivated.
- ❖ The United Nation Industrial Development Organisation has taken steps to set up a rural based small scale essential oil industry.

Indian Scenario

- ✚ Currently, Kerala is at highest position in production of black pepper, cardamom, and ginger; and also produces considerable amount of long pepper, and turmeric.
- ✚ Andhra Pradesh is alone producing more than half of the country's turmeric and chillies.
- ✚ The spices export during April-December 2008 was estimated to be 3,34,150 tonnes valued 3,810.95 crore (U.S. \$ 860.40 million) as against 3,25,320 tonnes valued 3,320.00 crore (U.S. \$ 821.45 million) in the corresponding period of the last financial year.
- ✚ During April-December 2008, export of most of the major spices has increased in terms of quantity and value, compared to the same period of last year.
- ✚ During April- December 2008, the export of pepper from India has been 19,100 tonnes valued at 317.77 crore as against 27,580 tonnes valued 400.20 crore of last year.
- ✚ The average export price of pepper has gone up from 145.11 per kg in 2007 to ₹166.37 per kg in 2008.
- ✚ During the period, India has exported 1,41,000 tonnes of chilli and chilli products valued ₹793.18 crore as against 1,49,755 tonnes valued ₹7807.03 crore of last year.
- ✚ Export of seed spices has increased in terms of quantity and value, compared to last year.
- ✚ Export of coriander seeds during April-December 2008 has been 19,600 tonnes valued at 137.23 crore as against 19,150 tonnes valued at 77.69 crore of last year, showing an increase of 77% in value.
- ✚ The unit value of export has increased to 70.01/kg in 2008 from 40.57/kg in 2007.
- ✚ The export of value-added products (curry powder, spice oils, and oleoresins) has substantially increased in terms of quantity and value, compared to last year.
- ✚ During April-December 2008, a total quantity of 10,500 tonnes of curry powder and spices valued 124.45 crore has been exported as against 8,375 tonnes valued at 81.10 crore of last year.
- ✚ The During April-December 2008, the export of spice oils and oleoresins has been 5,550 tonnes valued at 574.23 crore as against 4,815 tonnes valued at 404.04 crore of last years, showing an increase of 42% in value and 15% in volume. Against the export target of 4,25,000 tonnes valued 4,350.00 crore (U.S. \$ 1,025.00) for the year, the achievement of 3,34,150 tonnes valued ₹3,810.95 crore (U.S. \$ 860.40 million) up to December 2008 is 79% in quantity, 88% in rupee value, and 84% in dollar terms of value.

Chapter 9

Herbs

as

Health Food

Topics

Neutraceuticals

Antioxidants

PROBIOTICS

PREBIOTICS

Dietary Fibres

OMEGA-3-FATTY ACIDS

Spirulina

CAROTENOIDS

SOYABEAN

GARLIC

FDSPharmacy
Learn and Educate

Herbs as Health Food Neutraceuticals

- In 1989, Stephen Defelice discovered the term nutraceuticals from nutrition and pharmaceutical.
- He defined nutraceutical as a substance that is considered as a food or its part, which provides nutritional value and other health benefits, including disease prevention or health promotion.
- Thus, nutraceuticals are foods or food ingredients that provide medical or health benefits.
- They range from isolated nutrients, dietary supplements, and specific diets to genetically engineered designer foods and herbal products.

Classification

- Depending upon various characteristics, nutraceuticals are classified into the following major classes:
 1. Nutraceuticals according to their food source.
 2. Nutraceuticals according to their mechanism of action.
 3. Nutraceuticals according to their chemical nature.
 4. Nutraceuticals according to their higher contents in specific foods items.

Nutraceuticals according to their food source.

- Nutraceuticals can be obtained from plants, animals, and microbes

Source	Examples of Nutraceuticals
Plants	Ascorbic Acid, Ellegic Acid, Cellulose, Pectin
Animals	Choline, Conjugated Lenoleic Acid
Microbes	Yeast, Lactobacilus acidophilus,

Nutraceuticals According to mechanism of Action

- In this system, the nutraceuticals factors can be grouped together without considering the food source, based upon their confirmed physiological properties.
- The classes includes are antioxidant, antibacterial, antihypertensive, antihypercholesterolemic, anti aggregate, anti inflammatory, etc

Nutraceuticals According to their Chemical nature

- In this Class, Nutraceuticals are categorised under molecular or elemental groups. This model includes several large groups, which provide a basis for sub-classification, subgroups, etc
 1. Isoprenoid derivatives
 2. Phenolic substance
 3. Fatty acids and structural lipids
 4. Carbohydrates and derivatives
 5. Amino acid based substance
 6. Microbes
 7. Minerals

Nutraceuticals According to their Higher content in Specific Food Items

Categories :

- Nutraceuticals can also be categorised based on the food available in the market:

✚ Traditional Nutraceuticals :

✚ Non-traditional Nutraceuticals:)

Traditional Nutraceuticals

- Traditional nutraceuticals are natural and bring no changes in the food.
- Numerous natural components are present in the food that provides benefits (apart from basic nutrition), like lycopene in tomatoes, omega-3 fatty acids in salmon, or saponins in soy.

Non-Traditional Nutraceuticals

- Non-traditional nutraceuticals are artificial foods formed through biotechnology. Food samples contain bioactive components formulated to produce products for human well-being.

Therapeutic Applications

- Nutritional therapy is a healing system that uses dietary therapeutics or nutraceuticals as a complementary therapy.
- This therapy relies on the belief that foods can not only be sources of nutrients and energy, but can also provide the following benefits :
 1. Provide medicinal benefits,
 2. Avoid side effects,
 3. Increase the health beneficial effects,

4. Due to their natural dietary supplement, they do not have unpleasant side effects,
 5. Increase the health value, diet and improve medical condition of humans, and
 6. Easily available and economically affordable
- Most of the nutraceuticals possess numerous therapeutic benefits and are claimed to exhibit physiological benefits or provide protection against various diseases.
1. Cardiovascular agents,
 2. Anti-obese agents,
 3. Anti-diabetic agents,
 4. Anti-cancer agents,
 5. Immune boosters,
 6. Substances that manage chronic inflammatory disorders, and
 7. Formulations to cure degenerative diseases.

Antioxidants

- Antioxidants are natural or synthetic substances that either prevent or delay some types of cell damage.
- Vegetables and fruits are good sources of antioxidants; however, research has shown that some antioxidant supplements are not beneficial in preventing diseases.
- Vitamins C and E, selenium, and carotenoids (betacarotene, lycopene, lutein, and zeaxanthin) are some common examples of antioxidants

Classification

- **Enzymatic Antioxidants** : Catalase, Glucose 6 phosphate dehydrogenase, etc
- **Non-Enzymatic Antioxidants** : vitamin C, vitamin E, plant polyphenol, carotenoids, and glutathione.

Sources of Antioxidants

- Antioxidants are abundantly found in plant foods, including fruits, vegetables, nuts, whole grains, and also in some meats, poultry, and fish
1. Allium sulphur compounds are obtained from leeks, onions, and garlic
 2. Beta-carotenes are obtained from pumpkin, mangoes, apricots, carrots, spinach, and parsley.
 3. Flavonoids are obtained from tea, green tea, citrus fruits, red wine, onion, and apples.
 4. Indoles are obtained from broccoli, cabbage, and cauliflower
 5. Lutein is obtained from green leafy vegetables (spinach) and corn
 6. Zinc is obtained from seafood, lean meat, milk, and nuts.
 7. Vitamin A is obtained from liver, sweet potatoes, -carrots, milk, and egg yolks.
 8. Vitamin C is obtained from oranges, blackcurrants, kiwifruit, mangoes, broccoli, spinach, capsicum, and strawberries
 9. Vitamin E is obtained from vegetable oils (wheatgerm oil), avocados, nuts, seeds, and whole grains
 10. Zoochemicals are obtained from red meat, offal, fish, and plants that animals eat.

Therapeutic Applications

- Cardiovascular Diseases
- Cancer
- Brain Injury
- Neurodegenerative Diseases
- Liver Damage

PROBIOTICS

- Probiotics are friendly bacteria that promote healthy digestion and absorption of some nutrients.
- They crowd out pathogens, such as yeasts, bacteria, and viruses that may cause disease and develop a mutually advantageous symbiosis with human GIT.
- Bacteria belonging to Lactobacillus and Bifidobacterium groups are most commonly used in probiotics.
- Saccharomyces boulardii (yeast) may also be used.

Selection Criteria

- Living organisms can be termed as probiotics if they fulfil the given criteria:
 - They should get separated from the same species from the expected host.
 - They should have a clear favourable impact on the host.
 - They should not produce any symptoms of disease.
 - They should have the capacity to survive the GIT conditions and should easily pass through it.
 - They should have the capacity to endure extended lengths of time during storage.

Mechanism of Action

- 1) Adhering and colonising in the gut.
- 2) Suppressing the development or epithelial intrusion by pathogenic organisms and or generation of antimicrobial substances.
- 3) Improving intestinal hindrance work.
- 4) Controlling the exchange of dietary antigens.
- 5) Stimulating the host mucosal and systematic immunity.

Therapeutic Applications

- ✓ Probiotics help balance the friendly bacteria in the digestive system.
- ✓ They include good bacteria, which are live microorganisms that provide health benefits on consumption.
- ✓ Due to their ability to restore the natural balance of gut bacteria, they provide health benefits.
- ✓ They are known for their ability to prevent diarrhoea or reduce its severity.
- ✓ Their supplements have the ability to improve some mental health conditions.

PREBIOTICS

- Prebiotics are indigestible carbohydrates that promote the growth of good bacteria of large intestine, e.g., Bifidobacteria and Lactobacilli.
- Bacterial breakdown (fermentation) of prebiotics form Gases and Short-Chain Fatty Acids (SCFAs), which feed bacteria themselves and colonic lining cells.
- Some SCFAs are absorbed and provide some energy (1-2 kcal/gram prebiotics).
- Wheat, onions, leeks (the bulb), potatoes (cooked and cooled), and jicama are the examples of foods rich in prebiotics.

Mode of Action

- Since prebiotics are non-digestible carbohydrates, they are not digested by the upper GIT and travel in the ileum and colon where they are broken down by the resident microbes.
- They stop intestinal bleeding in intestine.
- They coat the host surface receptors.
- They produce bacteriocins, which inhibit the growth of related toxins.
- They control metabolism and boost immunity

Therapeutic Applications

- ✓ Prebiotics improve immune function in the gut and body.
- ✓ They promote regular bowel movement
- ✓ They reduce the intestinal infection
- ✓ They initiate and regulate Immune function

Dietary Fibres

- Dietary fibres are edible but non-digestible plant carbohydrates, containing at least 3 monosaccharides.
- Lignin (not a carbohydrate) is also a dietary fibre.
- Undigested fibre (cannot be absorbed in the small intestine) reaches the large intestine, where it is or may be not broken down into absorbable substance by the normal intestinal bacteria.

Classification

- **Soluble Fibre** : It includes pectins, gums, and mucilage (found mainly in plant cells). It mainly lowers the LDL (bad cholesterol) levels, and can also help with constipation. Fruits, vegetables, oat bran, barley, seed husks, flaxseed, psyllium, dried beans, lentils, peas, sweet potatoes, soy milk, and soy products are good sources of soluble fibre.
- **Insoluble Fibre** : It includes cellulose, hemicelluloses, and lignin (make up the structural parts of plant cell walls). It mainly increases the bulk of faeces and prevents constipation and related problems (haemorrhoids).

Daily Intake of Fibres

- According to the government guidelines 2015, the recommended intake of fibre is as given below

Age (year)	Recommended Intake of Fibre
2-5	15g per day
5-10	20g per day
11-16	25g per day
17-Above	30g per day

In case of deficiency of fibre , one should

- Take rich fibre breakfast cereals (wholewheat biscuit, muesli without sugar, bran flakes, and porridge) and fresh fruits, seeds and nuts.
- Take wholemeal or seeded wholegrain breads.
- Take whole wheat pasta, bulgur wheat, or brown rice.
- Take potatoes with skins (baked potato, wedges) or boiled potatoes (hot or as salad).
- Try fruit, vegetable sticks, rye crackers, oatcakes, unsalted nuts, or seeds in snacks.

Therapeutic Applications

- ✓ Dietary fibre taken in adequate amount promotes good health and provides various health benefits, like improved bowel function, controlled blood sugar level, improved gut health, and improved immunity.
- ✓ Reduced Risk of Type 2 Diabetes
- ✓ Reduced Risk of Cardiovascular Diseases
- ✓ Reduced Risk of Cancer
- ✓ Reduced Risk of Breast Cancer

OMEGA-3-FATTY ACIDS

- Omega-3 fatty acids are found in fish, flaxseed, and dietary supplements (fish oil).
- ALA (Alpha-Linolenic Acid), EPA (Eicosapentaenoic Acid), and DHA (Docosahexaenoic Acid) are the three major omega-3 fatty acids.
- ALA being an essential fatty acid, cannot be produced by the body, thus, one should get it from foods and beverages. Body can convert some ALA into very small amounts of EPA and then into DHA.
- Consequently, the levels of these omega-3 fatty acids in the body can be increased only by getting EPA and DHA from foods and dietary supplements.
- Omega-3 fatty acids are important components of cell membranes.

- Retina, brain, and sperm cells have high DHA levels.
- Omega-3s also provide calories to provide energy to the body.
- They also have many functions in the heart, blood vessels, lungs, immune system, and endocrine system.

Types of Food Providing Omega 3 Fatty Acids

- Omega-3 fatty acids either occur naturally in some foods or are added to some fortified foods)
- Following are the food items that provide adequate amounts of omega-3s:
 - Fish and other seafood (cold-water fatty fish, such as salmon, mackerel, tuna, herring, and sardines)
 - Nuts and seeds (flaxseed, chia seeds, and walnuts)
 - Plant oils (flaxseed oil, soybean oil, and canola oil)
 - Fortified foods (certain brands of eggs, yogurt, juices, milk, soy beverages, and infant formulas)

Therapeutic Applications

- ✓ Omega-3 fatty acids reduce the risk of cardiovascular diseases.
- ✓ They reduce the risk of death in a person with a cardiovascular disease.
- ✓ They reduce the risk of sudden cardiac death due to an abnormal heart rhythm.
- ✓ They reduce the risk of blood clots by preventing blood platelets to clump together.
- ✓ They keep the lining of arteries smooth and damage free, which might otherwise make the arteries thick and hard. This prevents formation of plaque in the arteries.
- ✓ They slow down the production of substances involved in the body's inflammatory response
- ✓ They increase the levels of High-Density Lipoprotein (HDL/good cholesterol).
- ✓ They lower down the blood pressure.

Spirulina

- Spirulina is a blue green algae, *Spirulina platensis* or *Spirulina. maxima* (and belongs to family Oscillatonaceae).
- Spirulina can be consumed by humans and other animals.
- In spirulina, carbohydrates are mainly found in the form of glycogen and rhamnose which are easily digestible and require less insulin.
- Vitamin content of spirulina mainly includes natural β -carotene with 9-ciscarotenoid isomer having more anti-oxidant capacity.
- Other vitamins present in the spirulina are B₁, B₂, B₃, B₆, B₁₂ and E₃.

Therapeutic Applications

- ✓ Spirulina shows immunostimulant activities as it stimulates the production and activity of bone marrow stem cells, macrophages, and T-cells. It also enhances the functioning of spleen and thymus gland.
- ✓ In vitro studies on spirulina have shown that it increases cell nucleus enzyme activity and DNA repair, and therefore shows anti-cancer properties.
- ✓ Its water extract inhibits HIV-1 replication in human derived T-cell lines and in human peripheral blood mononuclear cells

CAROTENOIDS

- Carotenoids are the pigments that occur naturally in animal and plant kingdoms.
- This group of fat-soluble pigments contains more than 700 compounds imparting red, orange, and yellow colours.
- Carotenoids are mostly hydrocarbons, containing 40 carbon atoms and 2 terminal rings.

Classification

- Photosynthetic organisms (plant algae and cyanobacteria), some non-photosynthetic bacteria, and fungi produce carotenoids.
- Two classes of naturally occurring carotenoids are:
 1. **Carotenes** (β -carotene) consisting of linear hydrocarbons that can be cyclised at end or both the ends of the molecule.
 2. **Oxygenated derivatives of carotenes** (lutein, violaxanthin, , and zeaxanthin)

Therapeutic Applications

- ✓ Vision Benefits
- ✓ Cardiovascular Benefits:
- ✓ Skin Aging Protection
- ✓ Skin Cancer Protection
- ✓ Bone Health
- ✓ Slowing Rate of Mental Decline
- ✓ Boosting Immunity
- ✓ Reduced Risk of Breast Cancer and Prostate Cancer

SOYABEAN

- Soyabean (or golden bean or miracle crop) is a complete source of protein and oil.
- Its generic name is soy (glycine soya).
- It belongs to the legume family and was originated in China.
- It was introduced to India across the Himalayan Mountains many years ago.
- Soyabean is grown for their seeds and is the second largest oil seed after groundnut in India.
- Soyabean is full of nutritional value.
- It contains about 40-50% high quality protein and 20-22% oil.
- Soyabeans also have some essential amino acids (5%), carbohydrates, vitamins (thiamine and riboflavin), and minerals.
- Soyabean is cultivated in states of India, like Madhya Pradesh, Maharashtra, Uttar Pradesh, and Rajasthan.

Therapeutic Applications

- Soyabean oil (extracted from its seed) is widely used in India as vegetable cooking oil.
- Soyabean milk is a nutritious drink as it contains the essential proteins, fibres, fatty acids, vitamins, and minerals. Thus, it maintains an optimum level of health.
- Soyabean flour is good for health and can be used as a supplement of wheat flour.
- Soyabean foods (tofu and soya yogurt) are rich source of proteins and vitamins.
- Soyabean contains low fat and almost no cholesterol.
- It contains omega-3 fatty acids, which keeps the heart healthy.
- It is an excellent source of calcium and vitamin B₁₂

GARLIC

- Garlic is the fresh compound bulb of *Allium sativum* Linn. (and belongs to family Liliaceae).
- It is cultivated in India, Russia, USA, Italy, and Southern Europe.
- Garlic is being used medicinally in Egypt since ancient times.
- Earlier, it was used in the treatment of leprosy, but later it was started to be used in the treatment of scurvy, ear aches, flatulence, etc.
- Plentiful of minerals, vitamins, carbohydrates, amino acids, volatile oils, and other trace elements are bulbs in garlic bulbs

Therapeutic Applications

- ✓ Garlic exhibits various therapeutic properties like analgesic, carminative, gastric stimulant, anticonvulsant, antibacterial, aphrodisiac, and diuretic.
- ✓ It aids in digestion and absorption of food.
- ✓ It is used in the treatment of malignant tumors, hypertension, atherosclerosis, tuberculosis, whooping cough, piles, duodenal ulcer, epilepsy, diabetes, chronic bronchitis, and bronchial asthma.
- ✓ It also prevents blood clotting, lowers cholesterol and blood sugar levels, and boosts immunity.
- ✓ Oil of garlic is used as an insecticide.

Chapter 10

Herbal Cosmetics

Topics

Herbal Cosmetics

Alovera Gel

Almond Oil

Lavender Oil

Olive Oil

Rosemary Oil

Sandal Wood oil



Herbal Cosmetics

- Herbal cosmetics are products formulated using various permissible cosmetic ingredients to form a base in which one or more herbal ingredients are added to provide the defined cosmetic benefits.
- Herbs do not produce instant cures.
- They offer a way to put the body in proper tune with nature.
- A huge number of cosmetic and toiletry formulations have been designed and developed based upon the Indian herbs.

Alovera Gel

- Aloe vera gel is obtained from the leaves of aloe plants.
- It has been used to heal and soften the skin.

Sources

- Aloe is the dried juice obtained by incision from the bases of leaves of various species of Aloe, i.e., Aloe perryi Baker, Aloe vera Linn., or Aloe barbadensis Mil., and Aloe ferox Miller.

Family

- Liliaceae

Chemical Constituents

- The most Important constituents of Aloes are the three isomers of aloins, Barbaloin, β -Barbaloin, and sobarbaloin

Commercial Preparation

- ❖ After transport to the factory, the plants are washed and disinfected. There are two basic methods of processing. First, processing of the entire leaf including the shell containing aloin (whole leaf method); and second, separating the leaf from the gel before processing (separation method).
- ❖ In the separation method, bottom of the leaf is cut off and the leaves are left to bleed. This leads to the aloin (known for its bitter taste and laxative effect) leaking out of the leaves. For a quality product, it is important that the aloin is kept out of the final gel.
- ❖ After removing the gel from plants, it is filtered and finally homogenised, pasteurised and stabilised. The last step is then to concentrate the gel. The process from cutting the leaves and the final aloe extract is completed in maximum of 2 days.
- ❖ Now the concentrated aloe vera gel is sold to the end consumers or to the industries who produce herbal products with aloe vera gel.

Marketed Products

- 🌈 Diabecon, Evicare (Himalaya Drug Company), Kumari Asava Pharma (Baidyanath).

Therapeutic and Cosmetic Uses

- ✓ It also helps in treating dry skin.
- ✓ It helps in activating new hair growth as it increases blood circulation to the scalp
- ✓ It is one of the natural ways to get rid of dandruff as it helps in healing dry skin, fungal infections, and excessively oily skin (causes of dandruff).
- ✓ It helps to condition the hair and soften it.

Almond Oil

- Almond oil contains large amount of nutrients and useful properties, thus making it a powerful cosmetic ingredient.
- There are two types of almond oils, each with their own uses:
- 1) Bitter almond oil has a strong smell and is sometimes used in soaps, aromatherapy, and massage therapy; but has toxic properties when ingested.
- 2) Sweet almond oil is extracted from sweet almonds, and is commonly used as an ingredient in skin and hair products. It is safe to ingest internally.

Source

- Sweet almond oil is best suited for skin as it is obtained from an almond tree (*Prunus amygdalus* var. *Dulcis*) Whose seeds do not contain poisonous Chemicals.
- Bitter almond oil can be toxic and derved from a different kind of almond tree (*Prunus amygdalus* var. *Amara*). It is only used for medicinal purposes.

Chemical Constituents

- Both varities of almond contain fixed oil (40-55%), protein(20%), Mucilage, emulsion. Bitter almond contain the colourless, crystalline, cyanogenelic glycoside, amygdalin(2.5-4.0%)

Commercial Preparations

Sample Preparation

- ✚ The collected seeds are manually dehulled and sorted to remove the mesocarp.
- ✚ Then, the seeds are sun-dried for 2 days, oven-dried for 2 hours at 105°C temperature, and finely grounded into flour using a blending machine.
- ✚ Almond Oil Extraction Method from the Seed Flour A total 100gm of the prepared sample flour is transferred to Soxhlet thimble which was fixed on a 500ml round bottom flask. 300ml hexane is added in the flask and heated on a thermostatically controlled heating mantle up to the boiling point. Refluxing is continued for 4 hours until the oil is fully extracted.

Almond Oil Production

- ❖ Almond oil can be extracted from the bitter almond as well as the sweet almond. Oil is generally obtained through a cold-pressing process; however, sweet almonds can be pressed warmly. First, the almonds are cleaned of impurities and loosed from their shells.
- ❖ The pre-cleaned seeds are lightly warmed to the press temperature and fed into a screw press. The resulting almond oil and almond press cakes undergo immediate further processing.

- ❖ The press cakes are crushed and cooled before sent for more processing or into storage. The oil is turned into pure oil, after undergoing several stages of purification (rough filtration, fine filtration, and safety filtration).
- ❖ Alternatively, after being pressed, the oil is left undisturbed for a few days to allow the mucilaginous components to settle and then removed with the help of filter press. After being cold-pressed, the oil can be used to refined or untreated.

Marketed Products

- ◆ Baidyanath lal tail (Baidyanath Company),
- ◆ Himcolin gel Mentat,
- ◆ Tentex Royal (Himalaya Drug Company), and
- ◆ Sage badam roghan (Sage Herbals).

Therapeutic and Cosmetic Uses

- ✓ Almond oil is used as an anti-inflammatory, immunity booster, anti-hepatotoxicity, and in irritable bowel syndrome.
- ✓ It is helpful in preventing colon cancer.
- ✓ It is helpful in preventing cardiovascular disease by elevating the level of HDL and reducing the level of LDL.
- ✓ Adding almond oil to diet may help in keeping the blood sugar stable.
- ✓ Diets rich in monounsaturated and polyunsaturated fats decrease body fat and promote weight loss.
- ✓ It gets quickly soaked in the skin, which makes it a powerful and effective moisturizer.

Lavender Oil

- Lavender oil is an essential oil obtained by distillation of the flower spikes of certain species of lavender.
- Two forms are distinguished, lavender flower oil, colorless oil, insoluble in water, having a density of 0.885 gm/ml; and lavender spike oil, a distillate from the herb *Lavandula latifolia*, having density 0.905 gm/ml.

Sources

- Lavender oil is obtained by steam distillation of freshly cut flowering tops and stalks of *Lavandula Officinalis*. Lavender plant is native to the Mediterranean countries.

Family

- Lamiaceae

Chemical constituents

- The main constituents of lavender are linalool, linalyl acetate, 1,8-cineole, β -ocimene, terpinen-4-ol, and camphor.

Commercial preapration

Lavender Oil Extraction

- ❖ Lavender essential oil is extracted by steam distillation of the fresh or partly dried leaves. This generates a greater amount of oil compared to other techniques due to the reduction of polar compound loss. Harvest of lavender blooms is typically around June month. Lavender flowers are compacted into a still. A boiler is then used to steam the bottom of the still filled with lavender flower at low pressure. The lavender flower pockets containing oil are broken from this heating procedure and a pipe of cold water is run through the centre of the still.
- ❖ The hot lavender oil vapour condenses on the cold pipe with the cold water and is then collected into a holding tank where it is allowed to settle. Due to the polarity and the densities of the oil and water, these two will divide in the holding tank whereupon the water is piped out, leaving just lavender essential oil.

Lavender Oil Distillation

- ❖ Essential lavender oil is produced using steam distillation. Lavender is harvested for the distillation process in the morning once the dew has evaporated. The harvest of lavender for oil distillation is generally in September when the plant is in full bloom and has begun to wither. Two 100 gallons food-grade, stainless steel pots are used for the distillation of lavender oil. A plant that means stems and flowers are loaded into the pots, sealed and low-pressure steam begins to flow through the tank.
- ❖ Temperature is monitored throughout this procedure to ensure that the highest grade of oil and hydrosol is obtained. During this procedure the steam causes the plants oil glands to erupt, and the oil evaporates into the steam. At this point, the steam is routed through copper tubing on its way to the condenser where cold water running during the coils cools the steam, which condenses it back to a high-grade liquid of oil and hydrosol.
- ❖ Passing steam through copper tubing helps to get sweet, higher quality oils. At this point the lavender water and lavender oil are separated into their respective containers. The essential oil, being lighter than water, rises to the surface of the condensate, and is collected in a beaker attached to the separator.

Therapeutic and Cosmetic Uses

- ✓ Lavender oil can help ease sore or tense muscles, Joint pain, and rheumatism, sprains, backache, and lumbago.
- ✓ It is a natural anti-inflammatory, so helps reduce itching, swelling and redness.
- ✓ It helps lower elevated blood pressure levels and could be used for hypertension.
- ✓ It contains antiseptic components that can heal the skin quicker and prevent possible infections.
- ✓ It enhances collagen production and encourages regeneration of skin tissues.
- ✓ It even conditions the hair and keeps it lustrous and manageable.

Olive Oil

- Olive oil is a multi-purpose ingredient, which is used across lifestyle spectrums for benefits, ranging from nutrition and health to skin and hair.
- Its unique composition and properties make it ideal for skincare.

Sources

- Olive oil is a fixed oil obtained by expressing the ripe fruits of *Olea europaea* Linn. or *O. ferruginea* (Indian olive)

Family

- Oleaceae

Chemical Constituent

- The main chemical composition of olive oil is composed of fatty acid glycerides and non-glycerides.

Commercial Preparation

Collecting and Grading the Olives

- After collecting the ripe olives, they are divided according to their plumpness, state of ripeness, and quality.
- Then, they are taken to the press and stored for a few hours to several days to allow the olives to get warm so that they release their oil easily.)

Washing and Milling the Olives

- Then the olives are rinsed in cold water and passed along a conveyer belt between rollers or continuous hammers. This machinery breaks down the cells and de stones the olives.

Creating an Olive Paste through Malaxation

- The milled olives travel from the mill into vats in which slowly turning blades mash the olives into homogenised paste,

Cold-Pressing the Olive Paste to Extract the Oil

- The oil is extracted by loading the olive paste into a hydraulic press. The paste is evenly spread over hemp pressing bags or disks covered with synthetic fibers. Around 25 to 50 bags or disks are stacked onto a press plate. Plate guides are inserted at intervals of 5-6 bags to maintain balance of the stack and distribute the pressure evenly.

Separating the Oil from the Vegetable Water

- Separation is achieved by pumping the mixture into a centrifuge, comprising of a rotating drum and an auger spinning on the same axis at great speed.

Storing and Packaging the Oil

- The oil is stored in underground vats until it is ready to be shipped. Then, the oil is canned or bottled on an assembly line. Cans or dark-tinted bottles keep the deep-green colour of the olive oil intact.

Marketed Products

- ♦ Figaro oil.

Therapeutic and Cosmetic Uses

- ✓ Olive oil is used in the manufacture of pharmaceutical preparations, soaps, textile lubricants, sulphonated oils, liniments, cosmetics, plasters.
- ✓ It is a good solvent for parenteral preparations.
- ✓ It is internally used as a nutrient, demulcent, emollient, cholagogue, and a mild laxative.
- ✓ It is used as a vehicle for oily suspensions for injection.
- ✓ It reduces the signs of aging.
- ✓ It also keeps scalp healthy by inhibiting the overgrowth of microbes.

Rosemary Oil

- Rosemary receives its name from the Latin term Dew of the Sea, as it is native to the sea cliffs of the Mediterranean region.
- Its essential oil is best known for its stimulating, soothing, and pain relieving properties.

Sources

- Rosemary oil is obtained by distillation of the flowering tops of leafy twigs of *Rosmarinus officinalis*.

Family

- Lamiaceae

Commercial Preparations

Preparation of the Plant Material

- The flowering stems are chosen for distillation, removing the excessively woody parts.
- The size of the branches can be reduced if too long, also to facilitate loading into the boiler.
- It is useful to keep the stems and leaves intact for homogeneous passage of steam and avoid the harmful "cork effect" due to packing the leaves too tightly through distillation.
- Rosemary oil is extracted from the fresh Rosemary flowering tops by steam distillation.

Marketed Products

- ◆ Anti-dandruff hair oil,
- ◆ Anti-dandruff shampoo,
- ◆ Protein shampoo for oily/greasy hair, and
- ◆ Erina Plus (Himalaya Drug Company).

Therapeutics and Cosmetic Uses

- ✓ Rosemary oil has anti-spasmodic and anti-inflammatory properties which help in relieving joint pains and soreness of muscles.
- ✓ It can help boost the immune system and combat diseases associated with chronic health problems
- ✓ It deeply hydrates skin and can be used as a moisturiser.
- ✓ It aids in controlling sebum production
- ✓ It helps reduce the appearance of blemishes and can be used to lighten stretch marks.
- ✓ It stimulates the skin and gives a radiant glow.
- ✓ It revives dull skin and gives it a refreshed feel.,
- ✓ It stimulates hair growth.
- ✓ It fights dandruff-related problems

Sandal Wood oil

- Sandalwood oil, distilled from the heart wood and roots of the sandalwood tree is a valuable essential oil.
- extensively used in beauty, health and in rituals.
- It possesses a distinct mild earthy aroma and plays a vital role in healing various skin conditions.

Sources

- Sandalwood oil is obtained by distillation of sandalwood, *Santalum album* Linn

Family

- Santalaceae

Chemical Constituents

- The main compound of the oil was the oxygenated terpene santalol (52.83%). The other main compounds of the essential oil were α -bergamotol (10.18%), nuciferol (7.07%), γ -elemene (3.64%), cis-lanceol (2.74%) and α -cedrol (2.65%).

Commercial Preparation

- Commercial Preparations For producing commercially valuable sandalwood oil with high levels of fragrance requires minimum 15 years old *Santalum* trees. The sandalwood tree's valuable sandalwood oil is within the tree's heartwood. Older the tree, higher will be the proportion of heartwood. Because the oil is held tightly within the wood, a distillation process is required, in which the wood is first grounded to powder.

Steam Distillation

- ❖ In steam distillation process, steam heated at extremely high temperatures (140- 212 F) is passed through the powdered wood. As a result, the sandalwood essential oil, locked within the cellular structure of the wood, is released.
- ❖ The steam and oil mixture flows through a condenser and cools to yield a layer of oil and a layer of water. The sandalwood essential oil separates from the hydrosol (floral water), rises to the top, and then collected.

Marketed Products

- ◆ Abana,
- ◆ Evecare,
- ◆ Lukol,
- ◆ Antiwrinkle cream (Himalaya Drug Company) and
- ◆ Mahamarichadi tail,
- ◆ Brahma rasayan (Dabur).

Therapeutic and Cosmetic Uses

- ✓ Sandalwood oil is a great antiseptic agent that is safe and effective both externally and internally
- ✓ It functions to lower hypertension even when applied externally
- ✓ Its antioxidant property is used for promoting skin health.
- ✓ It effectively scavenges free radicals from the skin and diminishes oxidative damage.
- ✓ It also flushes out the toxins from the internal layers of skin, promotes overall skin health and treats various skin infections like acne, pimples, rashes, boils etc.

Chapter 11

Phytochemical

Investigation

of

Drugs

Topics

Phytochemical Investigation of Drugs

Extraction of Drugs



Phytochemical Investigation of Drugs

- Phytochemistry involves the study of chemicals (mainly the secondary metabolites) the plants produce as a measure to protect themselves from insects, pests, pathogens, herbivores, UV exposure, and environmental hazards.
- Phytochemistry includes the structural compositions, the biosynthetic pathways, functions, mechanism of actions in the living systems, and the medicinal, industrial, and commercial applications of secondary metabolites.
- Phytochemicals (derived from the Greek word phyto meaning plant) are naturally occurring and biologically active chemical compounds present in plants.
- They provide health benefits for humans in addition to those provided by the macronutrients and micronutrients.

Extraction of Drugs

- The process of separating medicinal By active constituents of plant and animal tissues with the help of selective solvents and standard procedures is termed extraction.
- The extracted products of plant tissues obtained in liquid or semisolid state (after removing the solvent) or in dry powdered form are complex mixtures of metabolites; these products are meant for oral or external use.
- The extracted preparations include decoctions, infusions, fluid extracts, tinctures, pilular (semisolid) extracts, or powdered extracts; these preparations are named as galenicals after Galen (a Greek physician of 2nd century)
- The standardised extraction procedures involve treatment with a selective solvent (menstruum) to yield the therapeutically active constituents of crude drugs, removing the inactive ones.
- The undissolved residue left behind is termed marc.
- The menstruum used for extraction should have the following properties:
 - Chemically and physically inert,
 - Non-toxic,
 - Inexpensive, and
 - Selective, i.e., it should dissolve the desired active constituents with a minimum of the inert material
- Water, ethanol, and their mixtures are most commonly used as they fulfil the above mentioned considerations.
- The drug extraction process is divided into the following four steps:
 - The solvent penetrates the drug,
 - The drug constituents dissolve in the solvent,
 - The solution within the cells diffuses out, and
 - The dissolved portion separates from the exhausted drug.

Modern Methods of Extraction

- Extraction of crude drugs can be carried out by various processes, and the selection of process depends on the chemical properties of the drug's active constituents.
- Various extraction methods employed are:
 1. Maceration,
 2. Digestion,
 3. Percolation,
 4. Continuous hot extraction (Soxhlet extraction),
 5. Supercritical fluid extraction,
 6. Counter current extraction,
 7. Microwave assisted extraction,
 8. Ultrasonic assisted extraction,
 9. Infusion and decoction, and
 10. Pressure cooker extraction.

Maceration

- The word maceration denotes softening. The maceration process (or Process M) is used for producing tinctures, extracts, and concentrated infusions.
- It is the simplest method of crude drug extraction, which was official in I.P., 1966.

Digestion

- Digestion is a modified maceration process.
- It involves extraction at such a high temperature which does not put adverse effects on the active ingredients.
- Higher temperature enhances the solvent action of menstruum and constant mechanical agitation of the system speed up the attainment of equilibrium.
- If at the used temperature the menstruum gets volatilised easily, a reflux condenser should be attached to the vessel in which the digestion process is being performed; this facilitates the condensation of menstruum, so that it can be recovered and returned back to the container.

Percolation

- The term percolation has been derived from the Greek word percolare which means to pass through.
- Percolation (or Process P) is also termed lixivation.
- It involves extracting the constituents of granulated or powdered drug by slowly passing down through it a suitable menstruum.
- The menstruum while travelling down the drug column under the influence of gravity, extracts the drug particles layer-wise, which are further replaced with the layers above as it moves downwards.
- Percolation method achieves complete drug extraction.

Supercritical Fluid Extraction (SFE)

- The process of SFE involves separating one component (i.e., the extractant) from another (i.e., the matrix) using supercritical fluids (i.e., the extracting solvent).
- The extraction is generally from a solid matrix or from liquids.
- Supercritical fluid is a substance at temperature and pressure above its critical point. It can diffuse through solids like a gas and dissolve materials like a liquid.
- It can be suitably used as a substitute for organic solvents in various industries and laboratory processes. The most Commonly used supercritical fluid are carbon dioxide and water which are used for decaffeination and power generation , respectively How ever Modified Co- solvent such as ethanol or methanol can also be used

Advantage

- ✓ SFE determines the rate at which the extraction can be performed.
- ✓ The SFE process completes within 20-60 minute
- ✓ SFE produces less waste solvent

Disadvantages

- ◆ Carbon dioxide (the most commonly used solvent in SFE) cannot be used for extracting polar compounds due to its low polarity.
- ◆ Presence of water in SFE process may cause problems.
- ◆ In SFE, the matrix effect is unpredictable.
- ◆ SFE process requires specialised/expensive equipment.

Counter Current Extraction (CCE)

- In CCE, toothed disc disintegrators are used to pulverise the wet raw material to be extracted.
- Fine slurry is obtained which is moved in one direction within a cylindrical extractor.
- Here the slurry comes in contact with the extraction solvent.
- The farther the slurry moves, the more concentrated the extract becomes.
- When the quantities of solvent and material and their flow rates are optimised, complete extraction is concentrated extract is received at one end of the extractor while the marc (which is free of visible solvent) falls out from the other end.

Microwave Assisted Extraction (MAE)

- Microwaves are non-ionising electromagnetic waves present in the electromagnetic spectrum between X-rays and infrared rays.
- They are made up of the electric and magnetic field (two oscillating perpendicular fields), of which the former is responsible for heating

Infusion and Decoction

- These methods are now rarely used. Infusions were prepared from vegetable drugs with water-soluble and easily extractable constituents; and decoction process was used for extracting vegetable drugs with water-soluble and heat soluble constituents. In the infusion process, the drug was moistened with water, macerated with boiling water, the liquid was strained, and desired volume was made.)

Pressure Cooker Extraction

In this method, the drug is initially macerated with the menstruum and then is held for 5-15 minutes in a pressure cooker at 15lb/sq. inch pressure.

The cooker is then cooled and the extract is removed by straining and pressing the marc.

This method achieves complete drug extraction in comparatively less time.

However, it cannot be used for drugs with thermolabile constituents.

Isolation, Purification, and Identification of Drugs

- The progress in the isolation and analysis techniques has led to the identification of many unknown compounds.
- For isolating a particular compound from its plant material, various processes are involved.
- These isolation processes depend on the nature of the active constituents present in the crude drug.
- After isolation, identification, and purification of a plant constituent, the class of the compounds and the particular substance within that class should also be determined.
- Complete identification depends on measuring other properties (such as melting point, boiling point, optical, rotation, and retention factor) and comparing the data with those in standard literature with techniques of Ultraviolet (Uv), Infrared(IR), Nuclear Magnetic Resonance (NMR). and Mass Spectral (MS) measurements.
- For the final confirmation of a known plant compound that has been identified on the above basis is compared with the standard sample, while the identity of new compounds is confirmed by chemical degradation or by the synthesis of compound in laboratory

Spectroscopy

- Spectroscopy involves the study of interaction of electromagnetic radiation with matter.
- The various spectroscopic methods that are utilised for identification of natural compounds are:
- Ultraviolet (UV) and Visible Spectroscopy

- Ultraviolet (UV) and visible absorption techniques involve the analytical methods which measure the light absorption lying in the wavelength region from 190-900nm by different substances.
- The wavelength region from 190- 380nm is the UV region and that from 380-900nm is the visible region of the electromagnetic spectrum.
- Absorption in the UV-visible region results from the electronic transitions within the molecule.
- The separation step and absorption measurement in UV- Visible region is the most widely used analytical procedure in the field of pharmacy.
- The UV-spectrum along with other analytical data often serves as a tool for identity Confirmation and is also used as a detector in HPLC.
- The absorption spectra of every plant constituent are different in specific range of visible light specimen.
- A very dilute Solution should be used, and the wavelength should be recorded in nanometres with maximum and minimum of the peak.

Chromatography

- Chromatography is the most versatile separation technique and involves separation of two or more substances by distribution between a fixed (or stationary) phase and a moving (or mobile) phase.
- Chromatography is used for separation, isolation, purification, and identification of components in a mixture.
- Plant materials can be separated and purified using various chromatographic complex systems of mixtures.
- Thus, the identification methods for botanical drugs obtain a characteristic fingerprint of a specific plant that shows the presence of a particular Chromatographic technique like High Performance Liquid Chromatography (HPLC), Gas Chromatography (GC), Gas Chromatography-Mass Spectrometry (GC-MS), and Thin Layer Chromatography (TLC) are widely used for such purpose.

Electrophoresis

- The technique of electrophoresis involves migration of a charged particle under the influence of an electric field (electro-charged particle and phoresis-movement).
- For separating mixtures by electrophoresis, a filter paper strip saturated with an electrolyte solution (a buffer solution) is supported in the centre and its two ends are dipped into solutions having immersed electrodes.
- After placing a spot of the material to be fractionated on the paper, the whole apparatus is sealed and a potential difference of 2-10volts/cm is applied along the paper.
- Some mixtures are separated at higher voltages.

- The solutes move towards the anode or cathode based on the nature of charge on the ions of solute mixture.
- Thus, the amino acids can be separated into either groups (acidic, neutral or basic group) or individual amino acids.
- A substance's migration velocity magnitude of ionic charge and the size and shape of the depends on the particular molecule.
- The filter paper used can also be replaced with thin layers of gels, and the process is then termed gel filtration.
- Many alkaloidal mixtures, plant acids, component sugars of cardiac glycosides, and anthraquinone derivatives have been separated by this method.



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