

AITBS
PHARMACY BOOKS

PHARMACOGNOSY

FOR DIPLOMA IN PHARMACY

Exclusively Prepared for D.Pharm 1st Year Students
(PCI ER 2020)



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AITBS PUBLISHERS, INDIA

Preface

This book **"Pharmacognosy"** has written for Diploma in Pharmacy (D. Pharm) first year students strictly followed by the new syllabus provided by the Pharmacy Council of India (PCI) on 23rd September, 2021.

This book is designed to impart knowledge on the medicinal uses of various drugs of natural origin. Also, the course emphasizes the fundamental concepts in the evaluation of crude drugs, alternative systems of medicine, nutraceuticals and herbal cosmetics.

This book will be easy to study, easy to understand and easy to remember as simple English language has been used, which will attract the students to study.

Our target is success for students and we committed to make that happen, as this book has everything in a concise manner as per the syllabus.

The authors grateful to the publishers, AITBS Publishers, India, especially Shri Virender Kumar Arya who has taken keen interest to bring out this book on time.

Authors

SYLLABUS

PHARMACOGNOSY (D. Pharm)

Course Code: ER20-13T **75 Hours (3 Hours/weeks)**

Scope: This course is designed to impart knowledge on the medicinal uses of various drugs of natural origin. Also, the course emphasizes the fundamental concepts in the evaluation of crude drugs, alternative systems of medicine, nutraceuticals, and herbal cosmetics.

Objectives: This course will discuss the following aspects of drug substances derived from natural resources:

1. Occurrence, distribution, isolation, identification tests of common phytoconstituents.
2. Therapeutic activity and pharmaceutical applications of various natural drug substances and phytoconstituents.
3. Biological source, chemical constituents of selected crude drugs and their therapeutic efficacy in common diseases and ailments.
4. Basic concepts in quality control of crude drugs and various system of medicines.
5. Applications of herbs in health foods and cosmetics.

Course Outcomes: Upon successful completion of this course, the students will be able to:

1. Identify the important/common crude drugs of natural origin.
2. Describe the uses of herbs in nutraceuticals and cosmeceuticals.
3. Discuss the principles of alternative system of medicines.
4. Describe the importance of quality control of drugs of natural origin.

Chapter 1. Definition, history, present status and scope of Pharmacognosy

Chapter 2. Classification of drugs:

- Alphabetical
- Taxonomical
- Morphological
- Pharmacological
- Chemical
- Chemo-taxonomical

Chapter 3. Quality control of crude drugs:

- Different methods of adulteration of crude drugs
- Evaluation of crude drugs

Chapter 4. Brief outline of occurrence, distribution, isolation, identification tests, therapeutic activity and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.

Chapter 5. Biological source, chemical constituents and therapeutic efficacy of the following categories of crude drugs.

Laxatives	Aloe, Castor oil, Ispaghula, Senna
Cardiotonic	Digitalis, Arjuna
Carminatives and G.I. regulators	Coriander, Fennel, Cardamom, Ginger, Clove, Black Pepper, Asafoetida, Nutmeg, Cinnamon
Astringents	Myrobalan, Black Catechu, Pale Catechu
Drugs acting on nervous system	Hyoscyamus, Belladonna, Ephedra, Opium, Tea leaves, Coffee seeds, Coca
Anti-hypertensive	Rauwolfia
Anti-tussive	Vasaka, Tolu Balsam
Anti-rheumatics	Colchicum seed
Anti-tumour	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, Gelatine
Miscellaneous	Squill, Galls, Ashwagandha, Tulsi, Guggul

Chapter 6. Plant fibres used as surgical dressings: Cotton, silk, wool and regenerated fibres

Sutures – Surgical Catgut and Ligatures

Chapter 7. Basic principles involved in the traditional systems of medicine like: Ayurveda, Siddha, Unani and Homeopathy

Method of preparation of Ayurvedic formulations like: Arista, Asava, Gutika, Taila, Churna, Lehya and Bhasma

Chapter 8. Role of medicinal and aromatic plants in national economy and their export potential

Chapter 9. Herbs as health food: Brief introduction and therapeutic applications of: Nutraceuticals, Antioxidants, Pro-biotics, Pre-biotics, Dietary fibres, Omega-3-fatty acids, Spirulina, Carotenoids, Soya and Garlic

Chapter 10. Introduction to herbal formulations

Chapter 11. Herbal cosmetics: Sources, chemical constituents, commercial preparations, therapeutic and cosmetic uses of: Aloe vera gel, Almond oil, Lavender oil, Olive oil, Rosemary oil, Sandal Wood oil

Chapter 12. Phytochemical investigation of drugs

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1

History, Definition and Scope of Pharmacognosy

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HISTORY OF PHARMACOGNOSY

Ancient times, the substances from plants and animal sources were used as foods. Later on, these substances were differentiated as food stuffs and therapeutic agents, as man tried to utilize these natural products for treating various diseases. Hence, the substances utilized to remove the disorders are termed as Drug. Then researchers published various documents worldwide mentioning the natural products and their utility for treatment of various diseases.

Papyrus Ebers (1500 B.C.), an old document where mentioned the medicinal uses of various plants and animals by the Egyptians and about anatomy of human beings also. Hippocrates (460-360 B.C.), known as the 'Father of Medicine' due to his study on anatomy and physiology of human beings.

De Materia Medica (78 A.D.) written by a Greek physician Dioscorides (040-080 A.D.), explained about a number of medicinal plants. Pliny and Eider compiled a number of volumes for natural products.

A Greek Pharmacist Galen explained several methods of preparation of phytoconstituents from the crude drugs, and thus,

the branch leading the extraction of natural plants and animal drugs is been said as Galenical Pharmacy.

Ayurveda has also explained various plants having pharmacological activities in the Charak Samhita and Susrutha Samhita written by Charak and Susrutha respectively.

Finally all the natural plant and animal products studied by several physicians were compiled together and form the 'Materia Medica' with their detailed information.

DEFINITION OF PHARMACOGNOSY

Seydler, a German scientist who first coined the term Pharmacognosy in the year of 1815 in his work "Analecta Pharmacognostica" from two Greek word, i.e., Pharmacon (a drug) and gignosco (to acquire the knowledge of).

Thus, Pharmacognosy can be defined as *"the scientific and systematic study of crude drugs from the natural sources (plant, animal, mineral sources) that includes their structural, physical, chemical as well as biological characteristics and also their history, cultivation, collection and preparation"*.

PRESENT STATUS OF PHARMACOGNOSY

Collections as-well-as business of Medicinal and Aromatic Plants have been a source of earnings. Hence, they become very much valued cultivation product that are expressively providing employment prospects, attractive money and contributing dreadfully to upgrade the food security condition throughout the world.

Medicinal plants are extensively utilized by all parts of the people and it has been predicted that more than 17000 species of

plants are used by numerous folkloric group of people worldwide, a few of them are mentioned as follows:

Country	Medicinal and aromatic plant species
China	4941
India	3000
Indonesia	1000
Malaysia	1200
Nepal	700
Pakistan	300
Philippines	850
Sri Lanka	550
Thailand	1800
USA	2564

SCOPE OF PHARMACOGNOSY

- It is an important link between the pharmacology and medicinal chemistry.
- It is the infrastructure on which depends evaluation of novel drugs.
- It is an important bridge between the pharmaceutical and basic science.
- It is a vital link between Ayurveda and Modern system of medicines.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write a short note on Galenical Pharmacy.
2. Define Pharmacognosy. Write its scopes.

LONG ANSWER TYPE QUESTION

1. Write in detail on the development of Pharmacognosy.

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. 'De Materia Medica' was written by:

(a) Galen
(b) Dioscorides
(c) Charak
(d) Sydler

Ans.: (b)

2. Galenical Pharmacy referred the branch of:

(a) Marketing of drugs
(b) Preparation of drugs
(c) Extraction of drugs
(d) None of the above

Ans.: (c)

3. Who is known as the Father of Medicine?

(a) Hippocrates
(b) Sydler
(c) Galen
(d) Dioscorides

Ans.: (a)

4. In Ayurvedia, medicinal plants are described in-

(a) Charak Samhita
(b) Susrutha Samhita

c) Both a & b

d) None of the above

Ans: c)

3. The term Pharmacognosy was coined by

a) Tschirch

b) Hanburies

c) Seibert

d) Snyder

Ans: d)

4. Crude drugs are obtained from

a) Plant sources

b) Animal sources

c) Mineral sources

d) All of the above

Ans: d)

2

Classification of Drugs

INTRODUCTION

The crude drugs obtained from natural sources are utilized in the treatment of various diseases. Hence, it is necessary to arrange them in scientific and systematic manner for their adequate study.

For pharmacognostic study, the natural drugs can be arranged in one of the following classes:

1. Alphabetical Classification
2. Taxonomical Classification
3. Morphological Classification
4. Pharmacological Classification
5. Chemical Classification
6. Chemotaxonomical Classification

1. ALPHABETICAL CLASSIFICATION

This classification is adopted by the following books either in the Latin names or English names of natural drugs.

- British Pharmacopoeia (English).

- British Pharmaceutical Codex (English).
- United States Pharmacopoeia (English).
- Pharmacopoeia Internationalis (Latin).
- Indian Pharmacopoeia (English).
- British Herbal Pharmacopoeia (English).

2. TAXONOMICAL CLASSIFICATION

It indicates the phylum, class, sub-class, order, family, genus and species of the crude drugs. It is characterized for its failure to recognize the organized or unorganized nature of crude drugs. This system of classification can be elaborated further as follows:

Class	Subclass	Order	Family	Drugs
Gymno-spermae	Monocoty-lendonae	—	Ephedraceae	Ephedra
Angio-spermae	Dicotyl-endonae	—	Graminae	Rice, Wheat, Maize
		Rutales	Rutaceae	Lemon peel, Orange peel
		Rosales	Rosaceae	Almond oil, Rose oil
		Umbelliflorae	Umbelliferae	Caraway, Fennel
		Contortae	Apocynaceae	Rauwolfia, Vinca, Kurchi
		Tubiflorae	Solanaceae	Belladonna, Datura

3. MORPHOLOGICAL CLASSIFICATION

In this type of classification, the crude drugs are categorized into plant parts like leaves, fruits, flowers, woods, barks, extracts, gums, etc., as follows:

Parts of Plant	Drugs
Woods	Quassia, sandalwood, guaiacum.
Barks	Arjuna, cinchona, kurchi, cascara, cinnamon.
Flowers	Clove, rose, saffron, santonica, pyrethrum.
Leaves	Coca, digitalis, senna, vasaka, eucalyptus.
Fruits	Bael, colocynth, lemon, orange, fennel, coriander.
Seeds	Linseed, nutmeg, colchicum, nux-vomica.
Subterranean parts	Ginger, turmeric, aconite, rauwolfia, podophyllum, squill, rhubarb.
Entire organisms	Ephedra, ergot, cannabis, lobelia, belladonna, cochineal, cantharides.
Gums	Acacia, tragacanth, sterculia, guar, ghatti.
Latices	Opium, papaya, gutta purcha, rubber.
Dried juices	Aloe, kino, red gum.
Extracts	Catechu, agar, gelatin.

4. PHARMACOLOGICAL CLASSIFICATION

In this system of classification, the drugs are classified according to pharmacological actions of their chief constituents. The drugs similar in their action are put together as follows:

Pharmacological action	Drugs
Carminatives	Coriander, caraway, cinnamon, clove.
Purgatives	Aloe, senna, rhubarb.

Pharmacological action	Drugs
Cardiotonics	Digitalis, squill, strophanthus, thevetia, arjuna.
Anthelmintics	Artemisia, male-fern, quassia.
Anti-cancers	Podophyllum, vinca, taxus.
Anti-spasmodics	Hyoscyamus, datura, stramonium.
Anti-amoebics	Kurchi, ipecacuanha.
Bitters	Gentian, cinchona, nux-vomica.

5. CHEMICAL CLASSIFICATION

In this system of classification, drugs are based on the chemical nature of their active constituents. It is useful for phytochemical studies of crude drugs.

Type of Chemical	Drugs
Alkaloids	Aconite, cinchona, nux-vomica, vinca, ipecac, opium, tea.
Glycosides	Digitalis, senna, squill, aloe, dioscorea, liquorice, wild cherry.
Lipids	Castor oil, peanut oil, mustard, wool fat, cod-liver oil.
Volatile oils	Peppermint, clove, eucalyptus, valerian.
Tannins	Myrobalan, kino, catechu, galls.
Vitamins	Amla, shark-liver oil, cod-liver oil, yeast.
Resins	Benzoin, balsam tolu, myrrh, asafoetida, colophony, guggul, shellac.
Carbohydrates	Agar, honey, starch, tragacanth, guar gum, acacia, sterculia.

6. CHEMOTAXONOMICAL CLASSIFICATION

This is a recent approach to the study of classification of crude drugs where equal importance is given to their taxonomy and biogenesis.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write the taxonomical classification of drugs.
2. Write the morphological classification of drugs.
3. Write the pharmacological classification of drugs.
4. Write the chemical classification of drugs.

LONG ANSWER TYPE QUESTIONS

1. Write the taxonomical and morphological classification of drugs.
2. Write the pharmacological and chemical classification of drugs.



3

Introduction to Plant Parts

INTRODUCTION

Either single or various parts of the same plant can be used as source of drug and hence, it becomes necessary to know various parts of a plant scientifically. Crude drugs are defined as the products from plant and animal origin found in a raw form. They may constitute either cellular or acellular organ of plant or animal. The cellular drugs are broadly known as organized crude drugs whereas acellular drugs as unorganized crude drugs. The organized and unorganized crude drugs can be differentiated as follows:

Organized Crude Drugs	Unorganized Crude Drugs
These are the parts of plants or animals that are made up of cells and have a definite structure, e.g., flowers, seeds, fruits, insects, etc.	These are obtained from parts of plant or animal by the process of extraction and followed by purification, e.g., juices, extracts, resins, etc.
These are found in solid state.	These are found as solid, semisolid or liquid state.
Botanical or zoological terminology can be used to describe these drugs.	Such terminology is inadequate to describe these drugs.

Organized Crude Drugs	Unorganized Crude Drugs
Identification of these drugs can be done by Microscopic evaluation. **Examples:** Digitalis, cinchona, clove, fennel, ephedra, jalap, cochineal, etc.	Chemical tests and physical evaluation methods are used for identification of these drugs. **Examples:** Aloe, agar, colophony, opium, castor oil, bees-wax, pepsin, etc.

ORGANIZED CRUDE DRUGS

Leaves

Leaves are flat, thin, green appendages to the stem, containing, supporting and conducting stands in their structure. In Pharmacognosy, the word leaf includes leaf, compound leaf and leaflets.

Leaves are collected during the flowering season of plants, when the plants reach maturity and they are photo synthetically most active. Then they are dried, graded and packed in air-tight containers protected from light and moisture.

Diagnostic Characters of Leaves

Other than shape, size and colour, leaves are also characterized by various microscopic structures which help in their proper identification.

Followings are few diagnostic characters of common occurrence:

A. **Stomata:** A stoma is a minute epidermal opening present on aerial parts of plants with following characteristics:

- A central pore.

- Two guard cells which is covered by several number of subsidiary or epidermal cells.

Stomata are responsible for two functions in the plant. The main function of stomata is gaseous exchange and the secondary function is transpiration.

Based on the type of guard cells as-well-as arrangement of epidermal cells they are divided into four types:

1. Moss type
2. Gymnospermous type
3. Gramineous type
4. Dicotyledonous type

Out of these, the fourth type of stomata is of diagnostic significance, which are further classified as follows:

1. **Paracytic Stomata:** It consists two guard cells which are surrounded by two epidermal cells, e.g., coca and senna leaves.
2. **Diacytic Stomata:** Here the guard cells are surrounded by two epidermal cells but at the right angle to that of stoma, e.g., peppermint, spearmint and vasaka leaves.
3. **Anisocytic Stomata:** Guard cells are surrouned by three subsidiary cells, e.g., belladonna, datura and stramonium.
4. **Anomocytic Stomata:** The stoma is covered by various epidermal cells, resembling other subsidiary cells, e.g., buchu, digitalis and lobelia.
5. **Actinocytic Stomata:** Guard cells are surrounded by a circle of radiating subsidiary cells.

B. **Leaf Constants:** Leaves of the plants can be identified by determining the followings:

- Vein-islet number.

- Vein-termination number.
- Palisade ratio.
- Stomatal number.
- Stomatal index.

C. **Trichomes:** These are the tubular elongated or glandular outgrowth of the subsidiary cell. These are known as plant hairs also. It comprises of two parts such as the root (in the epidermis) and the body (outside the epidermis). Depending upon the structure and the number of cells present in trichomes, they can be classified as follows:

1. Covering trichomes/non-glandular/clothing trichomes.
   (a) Unicellular (senna, nux-vomica, tea)
   (b) Multicellular
      - Branched (Artemisia, pyrethrum, hamamelis)
      - Unbranched
        — Uniseriate (digitalis, datura).
        — Biseriate (Calendula officinalis).
        — Multiseriate (Cannabis sativa).
2. Glandular trichomes
   (a) Unicellular (vasaka, Piper betel).
   (b) Multicellular (digitalis, mentha, tobacco).
3. Hydanthodes/special type of trichomes (Piper betel, London pride).

Barks

The secondary external tissues lying outside the cambium in stem or root of dicotyledonous plants are called as the bark. It is also

known as periderm. It consists of three layers *viz.*, cork, cork-cambium and secondary cortex. They are found in flat, curved, recurved, channeled and or quill shaped.

Stems

It is an ascending axis of the plant. It comprises of nodes, internodes and buds that give rise to branches, leaves and flowers. They can be aerial, sub-aerial and underground. Based on the presence of mechanical tissues they may be weak stems and herbaceous or woody stems.

Woods

The tissues developed by the cambium on inner side are called as woods. They consist mainly of xylem and a few other tissues. Commercially, two types of wood are available *viz.*, heart wood (the innermost region) and sap wood or laburnum (the outer region).

Flowers

The flower is a modified shoot of plants meant for the production of seeds. Flowers consist of four whorls arranged in a definite manner, calyx, corolla, androecium and gynoecium. After collection of flowers they should be shade dried, so as to retain its colour and volatile oil content (if any) and stored in a cool place.

Fruits

Fruits are the development of ovary wall after the fertilization of ovules of flowers to form the protective covering over the seeds. They are categorized as simple fruits, aggregate fruits and compound fruits.

Seeds

It is a fertilized ovule. They are characterized by the presence of embryo, endosperm and seed-coat. They can be classified as endospermic seeds (e.g., linseed, nux-vomica, colchicum, isapgol, strophanthus, etc.), non-endospermic seeds (e.g., sunflower, cotton, soyabean, etc.) and perispermic seeds (e.g., peppermint, cardamom, nutmeg, etc.).

Underground Drugs

This part of plant may be either root or it may be an underground or sub-aerial modification of stem. The functions performed by modified stem or root are different, but taking into consideration they can be put together for sake of convenience and study.

1. Roots
2. Rhizomes
3. Tubers
4. Bulb
5. Stolon
6. Offsets
7. Sucker

UNORGANIZED CRUDE DRUGS

Gums and Mucilages

Gums are translucent and amorphous substances produced by plants, when plants grow under unfavourable conditions or the plant is injured. Thus, they are the abnormal products of plant growth. They are produced outside outside the cells of plant by the process called Gummosis, e.g., gum acacia, tragacanth, gum karaya, gum ghatti and guar gum.

Mucilages are also the plant products similar to gums and are referred as the normal products of plant growth. They are produced inside the cells of the plant. They form slimy masses with water and do not dissolve in it, e.g., isabgol, linseed, senna, agar, squill, etc.

Resins

These are difficult to define due to their non-uniform physical and chemical nature. They are obtained from plant (e.g., podophyllum, jalap, colophony, guaiacum, etc.) as well as from animal sources (e.g., Shellac). They may be of different types, natural resin, oleo-resin, balsams, and oleo-gum resins.

Dried Juices

These are from fleshy leaves (Aloe) or from stems (Kino) of the plants. Here, the incisions are made to respective part of the plant and juices that come out is collected and dried.

Latices

These are white aqueous suspension obtained by secretion of special tissues of certain plants. These milky suspensions may contain proteins, sugars, minerals and alkaloids chemically.

Extracts

The extracts of plant (agar, sodium alginate, catechu, etc.) and animal sources (Gelatin) are prepared using water as a solvent followed by concentration. While pharmaceutical extracts are prepared using alcoholic or hydro-alcoholic solutions as solvent.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Differentiate organized and unorganized crude drugs.
2. Write a short note on trichomes.
3. Write short note on leaf constants.
4. Write a short note on underground drugs.

LONG ANSWER TYPE QUESTIONS

1. What do you mean by crude drugs? Classify and differentiate them.
2. Write a short note on stomata.
3. Discuss briefly about unorganized crude drugs.
4. Write short note on the barks, stems, woods, flowers and fruits.
5. Discuss the diagnostic characteristics of leaves.

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. **All are organized crude drugs, except:**
   (a) Seeds
   (b) Resins
   (c) Flowers
   (d) Fruits

Ans.: (b)

2. **Unorganized crude drugs cannot be identified by:**
   (a) Chemical tests
   (b) Physical standards

(c) Microscopic evaluation
(d) None of the above

Ans.: (c)

3. Leaves should be collected, when:

(a) Flowers are developed
(b) Fruits are developed
(c) Both (a) and (b)
(d) None of the above

Ans.: (a)

4. Function of stomata:

(a) Gaseous exchange
(b) Transpiration
(c) Both (a) and (b)
(d) None of the above

Ans.: (c)

5. Guard cells are covered by three subsidiary cells, it is:

(a) Paracytic stomata
(b) Anisocytic stomata
(c) Diacytic stomata
(d) Anomocytic stomata

Ans.: (b)

6. Vasaka leaves contain:

(a) Paracytic stomata
(b) Diacytic stomata
(c) Anisocytic stomata
(d) Anomocytic stomata

Ans.: (b)

7. Nux-vomica contains:

(a) Covering trichomes
(b) Glandular trichomes
(c) Hydanthodes
(d) All of the above

Ans.: (a)

8. All are underground drugs, except:

(a) Tubers
(b) Rhizomes
(c) Stolon
(d) Bark

Ans.: (d)

9. Example of anomocytic stomata:

(a) Buchu
(b) Digitalis
(c) Lobelia
(d) All of the above

Ans.: (d)

10. Example of paracytic stomata:

(a) Coca
(b) Senna
(c) Both (a) and (b)
(d) None of the above

Ans.: (c)

4

Scheme of Pharmacognostic Studies

INTRODUCTION

The pharmacognostic study of crude drugs involves the use of various technical terms. The sequence of these terms for illustration shall be as follows:

1. **Official titles:** It is the English name of the drugs which mentioned in the Indian Pharmacopoeia, any other pharmacopoeia or standard books. It should be written at the top for study of any of the crude drugs.
2. **Synonyms:** These are the frequently used alternative names of the official of crude drugs. These represent the names of the drugs in various languages.
3. **Biological source:** This is the most important point of crude drugs to be studied. Students must give attention to the followings while study biological sources for crude drugs.
   - **Nature of the drug:** Whether it consists of dry or fresh or both form of the drug.
   - **Part of plant used:** Particular part of the plant, i.e., flower, bark, seed, fruit, wood, root, etc.

- **Scientific name:** This may be botanical or zoological depending upon the source of the drug, including its family also.

4. **Geographical distribution and history:** It represents the area wherefrom the drug is obtained commercially. Also it may provide the history of transplantation and the original source of drug and its introduction to mankind.
5. **Cultivation and collection:** It represents the various parameters needed to maintain for regeneration of medicinal plants to provide better yield of the drug. It provides the methods of collection further processes including its storage for the market as-well-as for pharmaceutical uses.
6. **Macroscopic characters or Morphology:** It represents the first step of standardization, i.e., identification of crude drugs by organoleptic characters. It is the study of the general appearance of the drug, i.e., colour, odour, taste, size and shape.
7. **Microscopic characters (Histology):** It represents the identification of organized crude drugs by their histological characters, which are observed under microscope. It includes the observation of the arrangement of tissues either from longitudinal section or transverse section of the drug by suitable microscopic study.
8. **Chemical constituents:** These represent various components present in the drug, which is responsible for its pharmacological activities. They may be active or inactive constituents. For example, cinnamon contains volatile oil as active constituents whereas tannin and mucilage are inactive constituents.
9. **Chemical tests:** It represents the confirmation of identity of drugs. As unorganized drugs do not have microscopic characters, so they are confirmed by chemical tests. The chemical tests are also useful in the identification of powdered organized drugs.

10. **Uses:** Basically, drugs are used for two different purposes, preventive (Prophylactic) and curative (Therapeutic). The therapeutic activity represents the action of drugs on human or animal body with specific intention to cure the diseases. For example, fennel is carminative, senna is a purgative, opium is used as a hypnotic, etc.
11. **Commercial varieties, substitutes and adulterants:** It represents the other varieties of the same plant available commercially like *Digitalis purpurea, Digitalis lanata, Digitalis thapsi,* etc. When the drug is not available commercially, a substitute may serve the purpose, although it is less effective than that of original drug. Sometimes, a drug may not be sufficiently available to fulfillment of the demand, an adulterant, similar to the genuine drug in respect of morphological appearance, is mixed with the genuine drug to make sufficiently available.
12. **Storage and preservation:** It represents the packing of crude drugs using suitable container, depending on the state of the constituents present in the crude drugs. It provides the quality as well as purity of drugs for longer time.

QUESTIONS

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. **The most important point for pharmacognostic study is:**
   (a) Synonyms
   (b) Biological source
   (c) Morphology
   (d) Microscopy

Ans.: (b)

2. **The morphological charters include:**
   (a) Colour

(b) Odour
(c) Taste
(d) All of the above

Ans.: (d)

3. Biological source includes:

(a) Nature of the drug
(b) Part of the product
(c) Scientific name
(d) All of the above

Ans.: (d)

4. Histological characters of drugs are studied under the point:

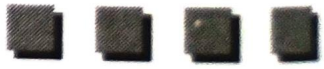
(a) Macroscopy
(b) Microscopy
(c) Both (a) and (b)
(d) None of the above

Ans.: (b)

5. All are included for pharcognostic studies of drugs, except:

(a) Cultivation
(b) Chemical tests
(c) Uses
(d) Melting point

Ans.: (d)



5

Collection and Preparation of Natural Drugs for Market

INTRODUCTION

After the cultivation of medicinal plants, the drugs are needed to be collected and further processed to prepare marketing. The drugs are to be prepared so as to stabilize them in transport and storage as well as to ensure the absence of the foreign particles. The preparation for natural drugs involves several methods to meet the standard pharmacopoeial requirements.

- Collection
- Harvesting
- Drying
- Garbling (Dressing)
- Packing

COLLECTION

Collection is the most important step which comes after the cultivation of medicinal plants. Drugs are collected from the wild as well as cultivated plants. Crude drugs should be collected when they contain maximum amount constituents. The season at which drugs are collected is important as the amount of active constituents change through the year. For example, rhubarb collected only in summer season because anthraquinone derivatives level is more in summer season and less in winter

season. Leaves are generally collected just before the flowers are developed, e.g., vasaka and digitalis leaves contain maximum constituents before the plant bears flowers. Flowers should be collected just before they expand fully (Clove and Saffron).

HARVESTING

Plants must be harvested in a period of time for the production of the best possible quality of plant products. Harvesting can be efficiently done in every respect by the skilled workers, although the cutting devices, harvesters and other machines should be kept clean and adjusted to reduce damage and contamination from soil and other materials. Decomposed plant materials must be identified and removed during harvest as well as post-harvest inspections and processing to avoid of any microbial contaminations and loss of the quality.

DRYING

Before marketing a crude drug, it is necessary to process properly so as to preserve it for longer time. The drying is one of the processes of prime importance. By drying the natural drugs, the moisture content is kept as less as possible in order to decrease the damage from mould and other microbial infestation. Crude drugs can be dried by:

1. **Natural drying:**
   - Sun drying (gum acacia, seeds and fruits).
   - Shade drying (digitalis, clove, senna, peppermint).
2. **Artificial drying:**
   - Tray driers (cinchona, tea, belladonna).
   - Vacuum dryers (digitalis leaves, tannic acid).
   - Spray dryers (papaya, pectin, tannins).

GARBLING (DRESSING)

This process involves the removal of sand, dirt and foreign particles of medicinal plants. For example, excessive stems in case of lobelia and stramonium are needed to be removed and in case of clove the stalks are to be deleted.

PACKING

This is the final step for the preparation of the crude drugs for market. Crude drugs are packed based on their morphological and chemical nature, its therapeutic use and the effects of environmental conditions while transport and storage. Special care should be taken while packing of crude drugs, so as to ensure its storage for longer time and to protect from chemical deterioration. For example, aloe is generally packed in the skin of goat, colophony and balsam of tolu should be packed in kerosene tins, cod-liver oil is packed in sun-protective containers, etc.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write a short note on collection of plant materials.
2. Write a short note on drying of natural drugs.
3. Write short note on garbling and packing of the drugs.

LONG ANSWER TYPE QUESTION

1. Discuss briefly about the collection and preparation of crude drugs.

6

Quality Control of Crude Drugs

ADULTERATION

It is the process of substituting original crude drug with other similar looking substances, partially or wholly, but the similar looking substances are free from or very less in chemical and pharmacological activities. Simply, adulteration is the debasement of an article.

Adulteration can be done by any of the following ways:

1. **Substitution with substandard commercial varieties:** It is the most utilized process of adulteration. The adulterants used here, may resemble original crude drug by morphological, chemical or therapeutic properties, but are substandard in nature. Hence, cheaper in cost, e.g., *S. nux-blanda* or *S. potatorum* are usedin place of *Strychnous nux-vomica*.
2. **Substitution with superficially similar inferior drugs:** Adulterants used here, may not have chemical or therapeutic properties, but give the same morphological appearance to the authentic drug, e.g., belladonna leaves are adulterated with ailanthus leaves.

3. **Substitution with artificially manufactured substances:** This practice of adulteration is followed for the drugs of high cost, e.g., chicony in place of coffee.
4. **Substitution with exhausted drugs:** Here, the plant material is mixed with the same which is having no active components, as they have been already extracted out. It is the most common practice in case of volatile oils, e.g., clove, fennel, etc.
5. **Harmful adulterants:** Sometimes, waste materials from market are collected and are admixed with the authentic drugs. This is noticed for adulteration of unorganized crude drugs, e.g., amber coloured glass pieces in colophony.
6. **Adulteration of powders:** The adulterants are mixed with the authentic powdered drugs, based on its morphological appearance, e.g., dextrin in ipecacuanha.

DRUG EVALUATION

Evaluation of drugs means the confirmation of their identity as well as determination of quality and purity and detection of state of adulteration of drugs. It is necessary to be carried out because of the following three reasons:

(a) Biochemical variation in the drug.

(b) Deterioration due to various processes and storage.

(c) Substitution and adulteration.

Evaluation Methods

1. **Organoleptic (Morphological) evaluation:** It refers the identification of drugs by their general appearance, such

as colour, odour, taste, size, shape and special features like touch, texture, sound, etc., e.g., liquorice is of sweet taste, aromatic odour of fruits of umbelliferous plants, etc.

2. **Microscopic evaluation:** It is a qualitative evaluation method used for identification of the organized crude drugs and powdered form, by their predetermined histological characteristics. This involves the observation of type of stomata, trichomes as-well-as various leaf constants like vein-islet number, vein termination number, stomatal number, stomatal index, etc. It also involves the observation other cell components of the drug, e.g., umbelliferous drugs contain vitta.
3. **Chemical evaluation:** It refers the identification of natural drugs by different chemical tests and assays. Chemical evaluation involves the isolation, purification and identification of active constituents. The phytoconstituent investigation is a part of chemical evaluation. It includes detection of alkaloids, carbohydrates, glycosides, fixed oils, proteins, tannins, phytosterols, etc.
4. **Physical evaluation:** This method of evaluation refers the determination of several physical standards of the natural drugs. It involves the determination of moisture content, viscosity, melting point, optical rotation, ash content, extractive values, volatile oil content, foreign organic matter, etc., to ensure the quality and purity of the drugs.
5. **Biological evaluation:** It refers the determination of potency of natural drugs or its preparations by the activity on living organisms like bacteria, fungal growth or animal tissue or entire animal. Bioassay of drugs is preferred when the evaluation is not exactly done by chemical or physical methods of evaluation. It includes the evaluation of hepatoprotective activity, hypoglycemic activity,

anti-inflammatory activity, etc. by means of suitable animal model for testing and control.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write a short note on chemical evaluation of crude drugs.
2. Write a short note on physical evaluation of crude drugs.

LONG ANSWER TYPE QUESTIONS

1. Write a note on adulteration.
2. Discuss various methods for drugs evaluation.

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. Adulteration means:

(a) Debasement of an article
(b) Quality control of drugs
(c) Both (a) and (b)
(d) None of the above

Ans.: (a)

2. Standardization of drugs are done because of:

(a) Biochemical variation in the drug
(b) Deterioration
(c) Adulteration
(d) All of the above

Ans.: (d)

3. Evaluation of drugs refers the:

(a) Determination of quality

(b) Determination of purity
(c) Detection of nature of adulteration
(d) All of the above

Ans.: (d)

4. Microscopic evaluation used for identification of:

(a) Organized drugs
(b) Unorganized drugs
(c) Both (a) and (b)
(d) None of the above

Ans.: (a)

5. Powder adulteration is done in:

(a) Colophony
(b) Ipecacuanha
(c) Senna
(d) Digitalis

Ans.: (b)



7

Chemical Nature of Natural Drugs

1. ALKALOIDS

Alkaloids are heterocyclic organic compound obtained from natural origin, which contain one or more Nitrogen (N) atom that possess specific physiological actions when used in small concentrations.

Properties of Alkaloids

- Colourless, crystalline solid.
- Solubilized in organic non-polar solvent like ether, chloroform and insoluble in water.
- Basic in nature.
- They exist either in free form or as amine.

Types of Alkaloids

I. **True alkaloids:** The 'N' atom is present in the ring system, e.g., quinine, atropine.

II. **Proto alkaloids:** The 'N' atom is outside the ring system, e.g., ephedrine.

III. **Pseudo alkaloids:** Passes the chemical tests for alkaloids, e.g., caffeine.

Chemical Tests for Alkaloids

I. **Mayer's test:** Drug with Mayer's reagent (potassium mercuric iodide solution) gives cream or pale yellow precipitate.

II. **Dragendorff's test:** Drug with Dragendorff's reagent (potassium bismuth iodide solution) gives brown or reddish-brown colour or precipitate.

III. **Wagner's test:** Drug with Wagner's reagent (iodine and potassium iodide solution) gives yellow precipitate.

IV. **Hager's (Picric acid) test:** Drug with Hager's reagent (saturated solution of picric acid) gives yellow precipitate.

Classification of Alkaloids

Generally, alkaloids are classified based on the basic chemical structure from which they are derivedas follows:

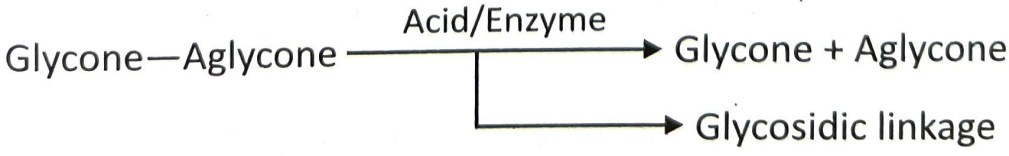
Sl. No.	Type of alkaloid	Examples
1.	Tropane alkaloids	Atropine, cocaine, hyoscine, hyoscyamine
2.	Quinoline alkaloids	Quinine, quinidine, cinchonine, cinchonidine
3.	Isoquinoline alkaloids	Papaverine, emetine, berberine
4.	Indole alkaloids	Strychnine, brucine, serpentine, reserpine
5.	Phenanthrene alkaloids	Morphine, codeine, thebaine

Sl. No.	Type of alkaloid	Examples
6.	Purine alkaloids	Caffeine, theobromine
7.	Pyrrole & pyrrolidine alkaloids	Nicotine, hygrine, trigonelline
8.	Pyridine & piperidine alkaloids	Lobeline, ricinine, coniine
9.	Imidazole alkaloids	Pilocarpine
10.	Steroidal alkaloids	Solanine, solanidine, veratramine, veratridine
11.	Diterpene alkaloids	Aconitine, aconine
12.	Alkaloidal amines	Ephedrine, pseudoephedrine, colchicin

2. GLYCOSIDES

Glycosides can be defined as the organic compounds obtained from the plant or animal sources, which on enzyme or acid hydrolysis give one or more sugar (Glycone) moieties along with non-sugar (Aglycone or Genin) moiety.

Sugars involved in glycosides are of different types, but most commonly it is β-D-glucose, others found are galactose, mannose, rhamnose, digitoxose, cymarose, etc. The linkage between glycone and aglycone is called as glycosidic linkage.



Classification of Glycosides

A. **Based on the chemical nature of aglycone moiety:**

I. Anthraquinone glycosides (aloe, senna).

II. Cardiac glycosides (digitalis, squill).

III. Saponin glycosides (dioscorea, shatavari).

IV. Cyanogenetic glycosides (bitter almond, wild cherry bark).

V. Isothiocynate glycosides (mustard).

VI. Flavonoids flavonol glycosides (citrus fruit, buck wheat).

VII. Coumarin and furanocoumarin glycosides (visnaga, ammi).

VIII. Aldehyde glycosides (vanilla, antmul).

IX. Phenol glycosides (bearberry).

X. Steroidal glycosides (solanum).

XI. Glycosidal bitters or miscellaneous glycosides (gentian, henna).

B. **Based on the linkage between glycone and aglycone part:**

I. **C-glycosides:** When the sugar is linked to carbon atom, e.g., aloe.

II. **O-glycosides:** When the sugar is linked to oxygen atom, e.g., senna, rhubarb.

III. **S-glycosides:** When the sugar is linked to sulphur atom, e.g., mustard.

IV. **N- glycosides:** When the sugar is linked to nitrogen atom, e.g., nucleosides.

3. TERPENOIDS

Terpenes are the hydrocarbons consisting two or more isoprene units (C_5H_8). When the terpenes are modified by oxidation or rearrangement of carbon skeleton, the resulting compounds are known as terpenoids.

Properties of Terpenoids

- Colourless, solid or liquid in nature.
- Insoluble in water and soluble in alcohol, organic solvent and fixed oil.
- Readily volatilized in steam.
- Most of them are optically active.
- They get oxidized by oxidizing agent.

Classification of Terpenoids

Terpenoids are classified based on the number of isoprene unit present in the compound as follows:

Class	No. of isoprene unit	Formula	Examples
Monoterpenes or terpenes	2	$C_{10}H_{16}$	Eucalyptus oil
Sesquiterpenes	3	$C_{15}H_{24}$	Artemisia
Diterpenes	4	$C_{20}H_{32}$	Taxus
Triterpenes	6	$C_{30}H_{48}$	Ambergris
Tetraterpenes or carotenoids	8	$C_{40}H_{64}$	Annato
Pentaterpenes	10	$C_{50}H_{80}$	Citral
Polyterpenes or rubber	N	$(C_5H_8)_n$	Limonene

4. TANNINS

Tannins can be broadly defined as the derivatives of polyhydroxy benzoic acid, which are capable of combing with proteis.

Properties of Tannins

- They form colloidal solution with water.
- They are non-crystalline in nature.
- Soluble in alcohol, glycerine, dilute alkalis, but insoluble in organic solvent except acetone.
- Solution of tannins precipitates alkaloids, heavy metals, gelatin and glycosides.

Classification of Tannins

Tannins can be broadly classified as:

I. **Hydrolysable tannins:** They get easily hydrolyzed by acid or enzyme, e.g., arjuna, amla.

II. **Condensed tannins:** They get decomposed by acid or enzyme, e.g., ashoka bark, catechu, amra.

III. **Pseudo-tannins:** Nux-vomica, ipecacuanha.

Chemical Tests for Tennins

- Solution of drug with ferric chloride ($FeCl_3$) produce blackish colour (hydrolysable tannin) or brownish-green colour (condensed tannin).
- **Gold-beater's skin test:** Membrane from intestine of ox is mixed with dilute hydrochloric acid. Treated with tannin solution for five minutes. The resulting solution then placed in ferrous sulphate solution. The development of brown or black colour on the skin represents the presence of tannins.

5. RESINS AND RESIN COMBINATIONS

Resins are amorphous mixers of essential oil. These are oxygenated products of terpenes and carboxylic acids found as exudations from the trunk of various trees.

Properties of Resins

- These are amorphous in nature.
- Non-crystallysable, transperant or translucent solids, semi-solid or liquid substances.
- Solubilized in alcohol, volatile oils, fixed oils, chloral hydrate and non-polar organic solvents like benzene or ether, butinsoluble in water.
- Hard, non-conductive and combustible masses.

Classification of Resins

Depending upon the type of the constituents of the resin, they are classifies as follows:

I. **Acid resins:** Colophony, sandarac, copaiba, myrrh and shellac.

II. **Ester resins:** Benzoin and storax.

III. **Resin alcohols:** Balsam of peru, gurjan balasam and guaiacum.

6. CARBOHYDRATES

Carbohydrates are defined as polyhydroxy aldehydes or polyhydroxy ketones or compounds. They are much abundant in plants rather than in animals. Carbohydrates of low molecular weight are crystalline in nature, solubilize in water as well as sweet

in taste (glucose, fructose, sucrose). But the high molecular weight carbohydrates are amorphous in nature, tasteless and are insoluble in water (starch, cellulose, gums, pectin, inulin etc.).

Classification of Carbohydrates

- Simple sugars or saccharides.
  - I. Monosaccharides (glyceraldehyde, erythrose, arabinose, starch, manoheptose).
  - II. Disaccharides (sugarcane, malt sugar, cow's milk).
  - III. Trisaccharides (beet, manna, gentian, squill).
- Polysaccharides (alginic acid, pectin, gums, mucilages).

Chemical Tests for Carbohydrates

- **Molisch's test:** It involves testing the drugs with alpha napthol and concentrated sulphuric acid that produce purple colour.
- **Fehling's test:** Drugs with equal amount of Fehling's solution-A and Fehling's solution-B are added and heated; a brick red precipitate is produced.

7. VOLATILE OILS

Odour developing volatile principles from the natural sources are called as volatile oils. They can be also termed as ethereal oil, as they evaporate in exposer of air at normal temperatures. The volatile principles from plants represent the essence or active components, so they are also known as essential oils. These are generally derived from terpenes and their oxidative products. Hence, they composed of isoprene units (monoterpenes, sesquiterpenes and diterpenes). Volatile oils can be extracted and

isolated by various methods like hydro distillation method, enfleurage method and ecuelle method as-well-as liquid carbon di oxide is also utilized for extraction of volatile oils. Peppermint, cardamom, rose, black pepper, sandalwood, eucalyptus, cinnamon, lemon peel, orange peel, almond, fennel, nutmeg, lavender, mustard, spearmint, camphor, etc., are a few examples of volatile oils from natural sources.

Properties of Volatile Oils

- Made up of isoprene unite (C_5H_8).
- Solubilized in alcohol, ether and insoluble in water.
- Produce characteristic odours.
- Generally lighter than water.
- Most of them are optically active.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write the chemical tests for alkaloids.
2. Mention the properties of alkaloids.
3. Write a short note on glycosides.
4. Write the classification of terpenoids.
5. Write short note on tannins.
6. Write a short note on carbohydrates.

LONG ANSWER TYPE QUESTIONS

1. Define and classify alkaloids along with their examples.
2. Discuss the classification of glycosides with examples.

3. Discuss briefly about the terpenoids.
4. Write a brief note on resins and resin combinations.
5. Write down various tests involved in alkaloids, terpenoids and carbohydrates.

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. Alkaloids are:

(a) Crystalline solid
(b) Basic in nature
(c) Insoluble in water
(d) All of the above

Ans.: (d)

2. Example of true alkaloids:

(a) Quinine
(b) Atropine
(c) Both (a) and (b)
(d) None of the above

Ans.: (c)

3. Example of pseudo alkaloid:

(a) Caffeine
(b) Ephedrine
(c) Quinine
(d) Atropine

Ans.: (a)

4. Mayer's reagent is:

(a) Potassium mercuric iodide solution
(b) Potassium bismuth iodide solution
(c) Iodine and potassium iodide solution
(d) Picric acid

Ans.: (a)

5. Wagner's reagent is:

(a) Potassium mercuric iodide solution
(b) Potassium bismuth iodide solution
(c) Iodine and potassium iodide solution
(d) Picric acid

Ans.: (c)

6. Dragendorff's reagent is:

(a) Potassium mercuric iodide solution
(b) Potassium bismuth iodide solution
(c) Iodine and potassium iodide solution
(d) Picric acid

Ans.: (b)

7. Glycosides are hydrolyzed by:

(a) Acids
(b) Enzymes
(c) Both (a) and (b)
(d) None of the above

Ans.: (c)

8. The most common sugar for glycoside is:

(a) β-D-glucose
(b) Mannose
(c) Galactose
(d) Cymarose

Ans.: (a)

9. Example of C-glycoside is:

(a) Aloe
(b) Senna
(c) Rhubarb
(d) Mustard

Ans.: (a)

10. Example of O-glycoside is:

(a) Senna
(b) Mustard
(c) Aloe

(d) None of the above

Ans.: (a)

11. Example of cardiac glycoside:

(a) Digitalis
(b) Dioscorea
(c) Lobelia
(d) Shatavari

Ans.: (a)

12. The isoprene unit having the molecular formula of:

(a) C_5H_8
(b) C_5H_{10}
(c) C_6H_8
(d) C_6H_{10}

Ans.: (a)

13. Tetraterpenes are also known as:

(a) Rubber
(b) Carotenoids
(c) Both (a) and (b)
(d) None of the above

Ans.: (b)

14. Example of pseudo-tannin:

(a) Amla
(b) Ashoka
(c) Nux-vomica
(d) Arjuna

Ans.: (c)

15. Gold-beater's skin test involves the intestine of:

(a) Ox
(b) Goat
(c) Cow
(d) None of the above

Ans.: (a)

8

Pharmacological Grouping of Natural Drugs

A. LAXATIVES

Laxatives are the drugs which loose the bowels or produce increasing and hastening intestinal evacuation or promote defecation.

The mechanism of action of laxatives may be bulk forming, irritant or emollient based on the chemical nature of active constituent.

Depending upon the intensities of drug effects, they are categorized as follows:

(i) **Laxatives** suggest the elimination of soft formed stools, e.g., senna, isapgol, karaya gum, liquid-paraffin etc.

(ii) **Purgatives** suggest more fluid evacuation, e.g., castor oil, aloe, rhubarb etc.

(iii) **Drastics** act by irritating the mucus membrane of the intestine, e.g., jalap, podophyllum, colocynth etc.

(iv) **Hydrogogues** produce fluid motion, e.g., croton oil, colocynth etc.

ALOE



Aloe

Synonyms

Aloe

Biological Source

It is the dried juice of the leaves of *Aloe vera, Aloe ferox, Aloe barbadensis, Aloe perryi,* belonging to the Family Liliaceae.

Morphology

- **Colour:** Dark brown, brownish-black and black in colour.
- **Odour:** Charastrastics.
- **Taste:** Intensly bitter.
- **Size:** Found in the form of masses of various sizes.

Chemical Constituents

Barbaloin, Aloe-emodin, Resin, Isobarbaloin.

Uses

1. It is used as irritant purgative.
2. It is used in cosmetic as a protective.
3. It is also used in skin blemishes.
4. It is used in the treatment of burns.
5. It is also applied for painful inflammations.

RHUBARB



Rhubarb

Synonyms

Rheum, Rhizome-rhei and Rhubarb-Rhizome.

Biological Source

It is the dried rhizome of *Rheum palmatum, Rheum rhaponticum* belonging to the family Polygonaceae.

Morphology

- **Colour:** Brown or yellow
- **Odour:** Fragrant
- **Taste:** Bitter and astringent
- **Size:** 2-20 cm × 1.5-2 cm
- **Shape:** Sub cylindrical, barrel-shaped

Chemical Constituents

Physicon, Aloe-emodin, Chrysophenol, Rhein.

Uses

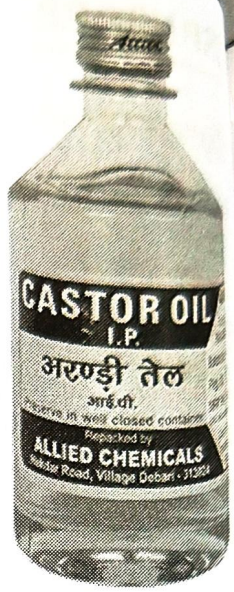
It is used as:

1. Laxative
2. Mild purgative
3. Stomachic

CASTOR OIL

Synonyms

Oleum Ricini.



Castor Oil

Biological Source

It is obtained by cold expression of the kernels of seeds of *Ricinus communis*, belonging to the family Euphorbiaceae.

Morphology

- **Colour:** Pale yellow or colourless.
- **Odour:** Nauseating.
- **Taste:** Bland, acrid, nauseating.

Chemical Constituents

Ricinoleic acid, fatty acids like isoricinoleic, linoleic, stearic and isostearic acids.

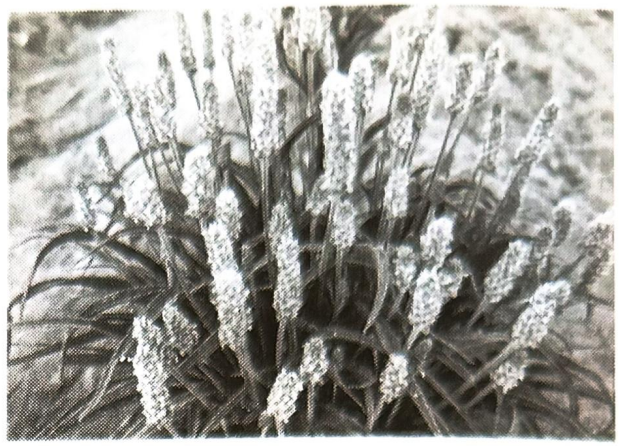
Uses

1. It is used as a cathartic.
2. It is also used for lubrication.
3. It used in the preparation of paints, vernishes, polishes, etc.
4. It is also used as an emollient.

ISPAGHULA

Synonyms

Isapgol, Isabgol.



Ispaghula

Biological Source

It is the dried seeds of *Plantago ovata*, belonging to the family Plantaginaceae.

Morphology:

- **Colour:** Pinkish grey or brown.
- **Odour:** None.
- **Taste:** Mucilaginous, bland.
- **Size:** 10-35 mm × 1-1.75 mm.
- **Shape:** Ovate cymbiform.

Chemical Constituents

Pentosan, aldobionic acid, fixed oil, proteins.

Uses

1. It is used as demulcent, laxative, emollient.
2. It is used in the treatment of chronic constipation, amoebic and bacillary dysentery.
3. It is used as stabilizer in the ice-cream industry.

Adulterants

Plantago lanceolata, Plantago asiatica.

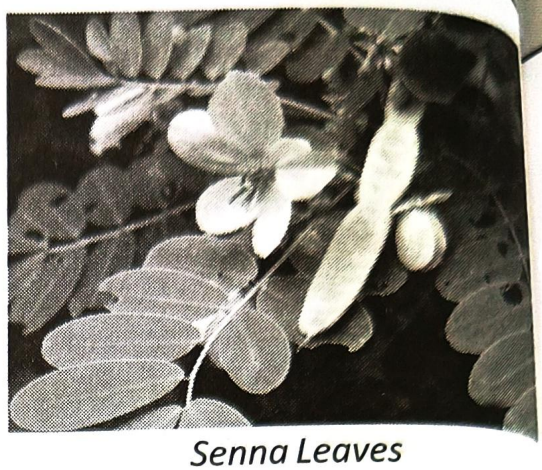
SENNA LEAVES

Synonyms

Indian Senna, Tinnevelly Senna.

Biological Source

It is the dried leaflets of *Cassia angustifolia*, belonging to the family Leguminosae.



Senna Leaves

Morphology

- **Colour:** Yellowish-green.
- **Odour:** Slight.
- **Taste:** Bitter and characteristic.
- **Size:** 25-60 mm × 7-8 mm.
- **Shape:** Lanceolate.

Chemical Constituents

Sennoside A, sennoside B, sennoside C, sennoside D, rhein, aloe-emodin, isorhamnetin, kaempferol.

Uses

1. It is used as laxative.
2. It is an irritant purgative.
3. It is used in the treatment of constipation.

Substitutes and Adulterants

1. Dog senna or Italian senna (*Cassia ovata*).
2. Palthe senna (*Cassia auriculata*).
3. Arabian senna (*Cassia angustifolia*).
4. *Ailanthus glandulosa.*

B. CARDIOTONICS

Cardiotonics are the drugs which are used to promote strength or energy to the activity of the heart by increasing the force of contraction of cardiac muscles and or by stimulating the overall activity of the heart. Example of natural cardiotonic drugs are digitalis, arjuna, strophanthus, squill and thevetia.

DIGITALIS

Synonyms

Digitalis leaves, Foxglove leaves.



Digitalis

Biological Source

It is the dried leaves of *Digitalis purpurea*, belonging to the family Scrophulariaceae.

Morphology

- **Colour:** Dark greyish-green.
- **Odour:** Slight.
- **Taste:** Bitter.
- **Size:** 10-40 cm × 4-20 cm.
- **Shape:** Ovate-lanceolate to broadly ovate.

Extra Features

Leaves are broken and crumpled.

Chemical Constituents

Purpurea glycoside A, Purpurea glycoside B, digitoxin, gitoxin, gitaloxin, verodoxin, digitoxose, glucoverodoxin.

Uses

1. It is used in the treatment of Congestive Heart Failure (CHF).
2. It is used to slow down the ventricular rate in atrial filtration.

Allied Drugs

1. *Digitalis lanata.*
2. *Digitalis lutea.*
3. *Digitalis thapsi.*

ARJUNA

Synonyms

Arjuna bark.

Biological Source

It is the dried stem bark of *Terminalia arjuna,* belonging to the family Combretaceae.



Arjuna

Morphology

- **Colour:** Greyish-brown (outer side) and Reddish-brown (inner side).

- **Odour:** None
- **Taste:** Astringent
- **Size:** 15 cm × 10 cm × 1 cm
- **Shape:** Flat
- **Fracture:** Short

Chemical Constituents

Tannins, saponins, arjunolic acid, arjunic acid, arjungenin, â-sitosterol, ellagic acid.

Uses

1. It is used as a cardiotonic.
2. It is used as an anti-dysenteric agent.
3. It possesses diuretic property.
4. It is also used in tanneries and as timber.

C. CARMINATIVES & GASTROINTESTINAL REGULATORS

The carminative drugs are the soothing agents which act by relieving pain in the stomach and intestine and expel flatulence and gas from the gastrointestinal tract by increasing peristalsis, e.g., fennel, coriander, cardamom, clove, cinnamon etc. They are given in case of indigestion, gastric discomfort and loss of appetite.

The gastrointestinal regulators, regularize the activity of gastrointestinal tract. These include bitter stomachic, stimulants, aromatics, anti-emetics, appetizers etc.

CARDAMOM

Synonyms

Cardamom fruits, cardamom seeds.



Cardamom

Biological source

It is the dried ripe fruits of *Elettaria cardamomum*, belonging to the family Zingiberaceae.

Morphology

- **Colour:** Green or pale buff.
- **Odour:** Aromatic, agreeable and pleasant.
- **Taste:** Strongly aromatic.
- **Size:** Capsules are 2 cm in length.
- **Shape:** Ovoid or oblong.

Chemical Constituents

Cineol (Eucalyptol), terpinyl acetate, borneol, terpinene, fixed oil, starch, proteins.

Uses

1. It is used as carminative, aromatic and stimulant.
2. It is also used as a good flavouring agent.

Substitutes and Adulterants

1. Long wild native cardamom.
2. Korarima cardamom.
3. Cardamom husk.

BLACK PEPPER

Synonyms

Golmirch, Maricha, Marichamu.

Biological Source

It is the dried unripe fruits of *Piper nigrum*, belonging to the family Piperaceae.



Black Pepper

Morphology

- **Colour:** Blackish-brown or greyish black.
- **Odour:** Aromatic.
- **Taste:** Pungent.
- **Size:** 3.5-6 cm in diameter.
- **Shape:** Globular.

Chemical Constituents

Piperine, piperidine, starch, resin, volatile oils like l-phellandrene and caryophyllene.

Uses

1. It is used as a carminative.
2. It is also used as aromatic, stomachic and stimulant.
3. It is also used as spice.

Substitutes

1. *Piper attenuatum*
2. *Piper brachysuachytm*
3. *Piper longum*

CORIANDER

Synonyms

Coriander fruits.



Coriander

Biological Source

It is the dried ripe fruits of *Coriandrum sativum,* belonging to the family Umbelliferae.

Morphology

- **Colour:** Yellowish-brown to brown.
- **Odour:** Aromatic.
- **Taste:** Spicy and characteristic.

- **Size:** 4-8 mm × 2-4 mm.
- **Shape:** Sub-globular.

Chemical Constituents

D-linalool (Coriandrol), L-borneol, geraniol, pinene.

Uses

1. It used as an aromatic, carminative and stimulant.
2. It is also used as a flavouring agent.
3. It is used as a purgative.

Substitutes

Bombay coriander fruits.

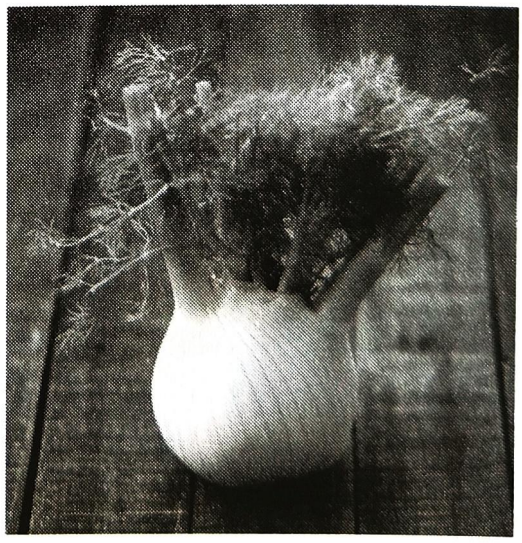
FENNEL

Synonyms

Fennel fruits, Fructus Foeniculum, Saunf.

Biological Source

It is the dried ripe fruits of *Foeniculum vulgare*, belonging to the family Umbelliferae.



Fennel

Morphology

- **Colour:** Green to yellowish-brown.
- **Odour:** Sweet aromatic.
- **Taste:** Strongly aromatic and mucilaginous.
- **Size:** 5-10 mm × 2-4 mm.
- **Shape:** Straight or slightly curved.

Chemical Constituents

Fenchone, anethole, phellandrene, limonene, methyl chavicol, anisic aldehyde.

Uses

1. It is used as a carminative, aromatic and stimulant.
2. It is also used as a flavouring agent.
3. It is also used as an expectorant.

GINGER

Synonyms

Zingiber, Zingiberis, Sonth.

Biological Source

It is the rhizomes of *Zingiber officinale*, belonging to the family Zingiberaceae.



Ginger

Morphology

- **Colour:** Buff.
- **Odour:** Aromatic.
- **Taste:** Pungent.
- **Size:** 5-15 cm × 1.5-6.5 cm.
- **Shape:** Ovate.

Chemical Constituents

Zingiberene, gingerol, shogaol, starch.

Uses

1. It used as a stomachic, carminative and aromatic.
2. It is also used as a flavouring agent.
3. It is also used in mouth washes, ginger-beverages and liquors.

ASAFOETIDA

Synonyms

Gum asafetida, Devil's dung, Hing.

Biological Source

It is the living roots and rhizomes of *Ferula foetida, Ferula rubricaulis,* belonging to the family Umbelliferae.



Asafoetida

Morphology

- **Colour:** Yellowish-white to reddish-brown.
- **Odour:** Intense and alliaceous.
- **Taste:** Bitter and acrid.
- **Size:** 0.5-3 cm in diameter.
- **Shape:** Rounded or flattened.

Chemical Constituents

Asaresinotannol, ferulic acid, pinene, gum.

Uses

1. It is used as a carminative, nervine tonic and flavouring agent.
2. It is also used as intestinal antiseptic.
3. It is also used for culinary purposes.

CINNAMON

Synonyms

Cinnamon bark, Kalmi-Dalchini, Ceylon cinnamon.



Cin

Biological Source

It is the dried inner bark of shoots of *Cinnamomum zeylanicum*, belonging to the family Lauraceae.

Morphology

- **Colour:** Yellowish-brown (outer surface), dark yellowish-brown (inner surface).
- **Odour:** Aromatic, sweet followed by warm sensation.
- **Taste:** Pungent.
- **Size:** 1 m × 1 cm × 0.5 mm.
- **Fracture:** Splintery.

Chemical Constituents

Cinnamaldehyde, eugenol, benzaldehyde, cuminaldehyde, phellandrene, pinene, cymene, caryophyllene.

Uses

1. It is used as a carminative, stomachic and mild astringent.
2. It is also used as a flavouring agent.
3. It is also used as an aromatic, stimulant and antiseptic.

Substitutes and Adulterants

1. Jungle cinnamon.
2. Cinnamon chips.
3. Saigon cinnamon.
4. Java cinnamon.

NUTMEG

Synonyms

Myristica, Jaiphal.



Nutmeg

Biological Source

It is the dried kernels of seeds of *Myristica fragrans*, belonging to the family Myristicaceae.

Morphology

- **Colour:** Greenish-brown or brown.
- **Odour:** Strongly aromatic.
- **Taste:** Pungent and aromatic.
- **Size:** 20-30 mm in length and 20 mm broad.
- **Shape:** Ellipsoidal.

Chemical Constituents

Myristicin, elemicin, saffrole, myristic acid, palmitic acid, oleic acid, lauric acid, protein, starch.

Uses

1. It is used as an aromatic, stimulant and carminative.
2. It is also used as a flavouring agent.
3. It is also used in the treatment of rheumatism.

CLOVE

Synonyms

Caryophyllum, Clove flower, Clove bud, Laung.



Clove

Biological Source

It is the dried flower buds of *Eugenia caryophyllus*, belonging to the family Myrtaceae.

Morphology

- **Colour:** Crimson to dark bown.
- **Odour:** Slightly aromatic.
- **Taste:** Pungent and aromatic.
- **Size:** 17.5 mm × 4 mm × 2 mm.
- **Shape:** Dome shaped.

Chemical Constituents

Eugenol, eugenol acetate, methylamylketone, caryophyllene, gallotannic acid, resin, eugenin.

Uses

1. It is used as a dental analgesic.
2. It is used as a carminative, stomachic, stimulant and aromatic agent.
3. It is also used as a flavouring agent.
4. It is also used as an antiseptic agent.

Adulterants

1. Mother cloves.
2. Blown cloves.
3. Clove stalks.
4. Exhausted cloves.

D. ASTRINGENTS

Astringents are the drugs that cause contraction of organic tissues and muscular living fibres by precipitating proteins. For example, black catechu, myrobalan, behra etc.

BLACK CATECHU

Synonyms

Cutch, Kattha, Khadir, Khair.

Biological Source

It is the dried aqueous extract of the heartwood of *Acacia catechu*, belonging to the family Leguminosae.



Black Catechu

Morphology

- **Colour:** Light brown to black.
- **Odour:** None.
- **Taste:** Very astringent.
- **Size:** 2.5-5 cm.
- **Shape:** Cube or brick shaped pieces.

Chemical Constituents

Acacatechin, catechu red, quercetin and gum.

Uses

1. It is used as an astringent.
2. It is used for cooling and digestive purposes.
3. It is used in case of cough and diarrhea.
4. It is also used for dying and tanning purposes.

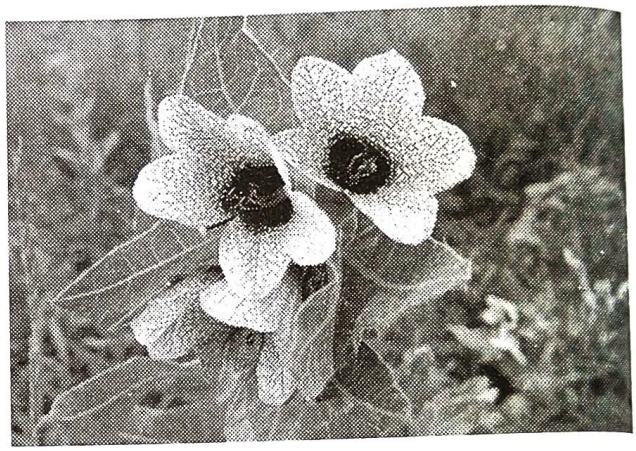
E. DRUGS ACTING ON NERVOUS SYSTEM

The nervous system of human being is anatomically divided into two broad categories *viz.*, the central nervous system and peripheral or autonomic nervous system. The various natural drugs give their therapeutic activities either by stimulating or depressing any of the nervous system. Examples of natural drugs acting on nervous systems are hyoscyamus, belladonna, datura, aconite, ashwagandha, ephedra, opium, cannabis, nux-vomica etc.

HYOSCYAMUS

Synonyms

Hyoscyamus herb, Hyoscymus leaves, Henbane.



Hyoscyamus

Biological Source

It is the dried leaves and flowering tops of *Hyoscymus niger*, belonging to the family Solanaceae.

Morphology

- **Colour:** Greyish-green or pale green.
- **Odour:** None.
- **Taste:** Intensely bitter.
- **Size:** 20-30 cm × 4-10 cm.

Chemical Constituents

l-hyoscyamine, hyscine and atropine.

Uses

1. It is used to relieve the spasms of urinary tract.
2. It possesses sedative property.
3. It is also used as an expectorant and anti-asthmatic drug.

Substitutes

Hyoscyamus muticus.

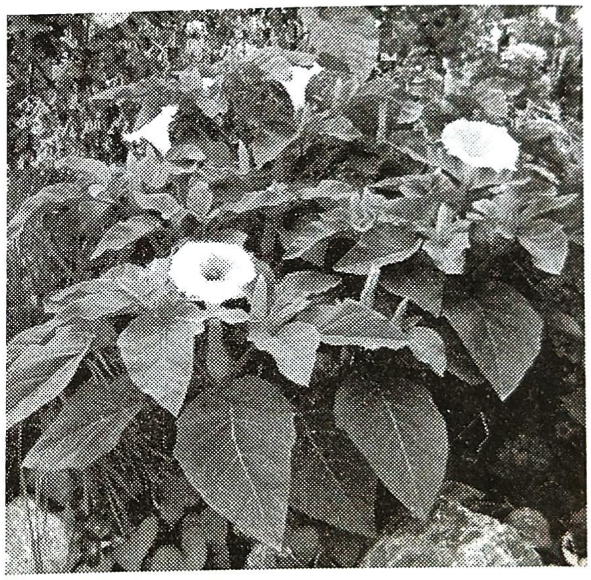
DATURA

Synonym

Datura herb.

Biological Source

It is the dried leaves and flowering tops of *Datura metel*, belonging to the family Solanaceae.



Datura

Morphology:

- **Colour:** Pale green.
- **Odour:** Characteristic.
- **Taste:** Bitter.

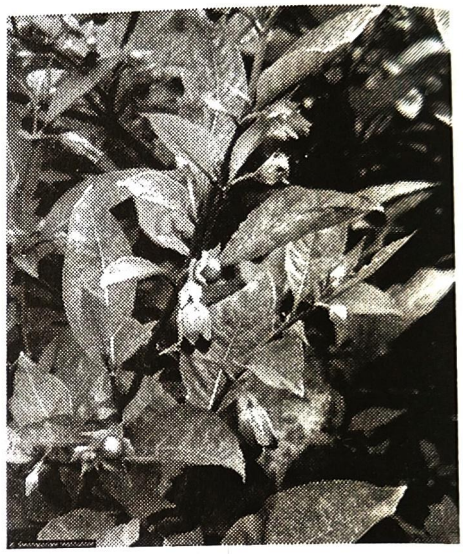
Chemical Constituents

Hyoscine, l-hyoscyamine and atropine.

Uses

1. It is used in the treatment of asthama and cough.
2. It is also used as an antispasmodic and CNS depressant agent.
3. It is also used in the treatment of gastric or duodenal ulcers.

BELLADONNA



Belladonna

Synonyms

Belladonna leaf, Deadly night shade leaves.

Biological Source

It is the dried leaves and other aerial parts of *Atropa belladonna, Atropa acuminata,* belonging to the family Solanaceae.

Morphology

- **Colour:**
  - Green to brownish-green (leaves).
  - Purple to yellowish-brown (flowers).
  - Green to brown (fruits).
- **Odour:** Slight and characteristic.
- **Taste:** Bitter and acrid.
- **Size:**
  - **Leaves:** 5-25 cm × 2.5-12 cm.

- **Flowers:** 2.5 cm × 1.5 cm
- Fruits about 10 cm.

➢ **Shape:** Ovate (leaves), campanulate (flowers), sub-globula (fruits).

Chemical Constituents

l-hyoscyamine, scopoletin, belladonnine, N-methylpyrroline and pyridine.

Uses

1. It is used to reduce secretions of sweat, salivary and gastric glands.
2. It acts as a powerful spasmolytic in intestinal colic.
3. It is used as an antidote for poisoning due to opium, chloral hydrate and muscarine.

ACONITE

Synonyms

Aconite root, Monk hood.



Aconite

Biological Source

It is the dried tuberous roots of *Aconitum napellus*, belonging to the family Ranunculaceae.

Morphology

➢ **Colour:** Dark brown

- **Odour:** Slight
- **Taste:** Slight
- **Size:** 4-10 cm × 1-3.5 cm
- **Shape:** Conical and tapering
- **Fracture:** Short and horny

Chemical Constituents

Aconitine, aconine, mesaconitine, hypoconitine, neopelline, napelline, neoline, starch, aconitic acid and succinic acid.

Uses

1. It is used externally in the treatment of neuralgia, sciatica, rheumatism and inflammation.
2. It is also used as an analgesic and cardiac depressant.

ASHWAGANDHA

Synonyms

Withania roots, Ashwagandha, Asgand, Indian Ginseng.



Ashwagandha

Biological Source

It is the dried roots and stem bases of *Withania somnifera*, belonging to the family Solanaceae.

Morphology

- **Colour:** Buff to grey-yellow (roots), green (stem bases).

- **Odour:** Strong.
- **Taste:** Mucilaginous, bitter and acrid.
- **Size:** 10-17.5 cm × 6-12 mm.
- **Shape:** Conical

Chemical Constituents

Withaferin, cuscohygrine, tropine, pseudotropine, anaferine, withasomnine, vasamine, starch, resins.

Uses

1. It is used as hypotensive and depressant agent.
2. It is also used as antispasmodic and anthelmintic agent.
3. It is used in the treatment of asthama.
4. It is used as a tonic and antitumour drug.

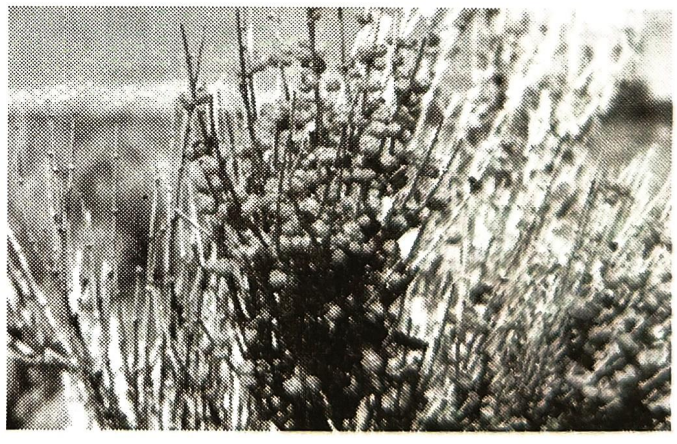
Substitutes

Withania coagulance.

EPHEDRA

Synonyms

Ma-Haung.



Ephedra

Biological Source

It is the dried young stem of *Ephedra gerardiana* and *Ephedra nebrodensis*, belonging to the family Gnetaceae or Ephedraceae.

Morphology

- **Colour:** Greenish-yellow.
- **Odour:** Aromatic and pine-like.
- **Taste:** Astringent.
- **Size:** 30-35 cm × 5 mm.
- **Shape:** Cyllindrical.
- **Fracture:** Fibrous in the cortex.

Chemical Constituents

Ephedrine, L-methyl ephedrine, D-methyl iso-ephedrine, D-pseudoephedrine, norephedrine and dimethyl ephedrine.

Uses

1. It is used in the treatment of asthama, hay-fever and whooping cough.
2. It is used for the extraction of ephedrine.
3. It acts as a sympathomimetic drug.

OPIUM

Synonyms

Raw Opium.

Biological Source

It is the dried latex from the unripe capsules of *Papaver somniferum*, belonging to the family Papaveraceae.



Opium

Morphology

- **Colour:** Dark brown.
- **Odour:** Strong characteristic.
- **Taste:** Bitter.
- **Shape:** Conical or rounded.

Chemical Constituents

Morphine, codeine, narcotine, thebaine, papaverine, narceine, codamine, lanthopine, starch, tannin.

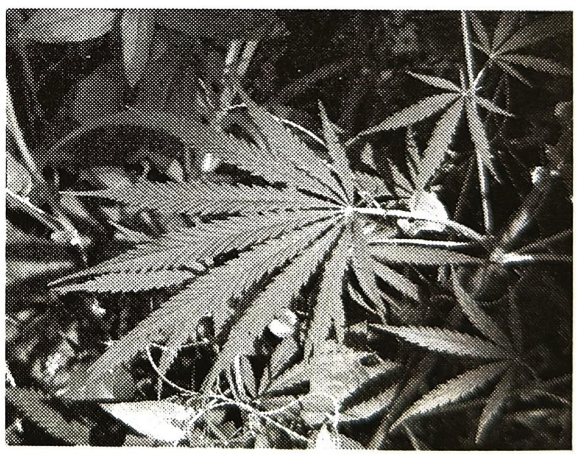
Uses

1. It is used as an analgesic and narcotic drug.
2. It is also used as an expectorant.
3. It is used in the treatment of diarrhea, cough and bronchitis.

CANNABIS

Synonyms

Indian Hemp, Ganja, Marijuana.



Cannabis

Biological Source

It is the dried flowering tops of *Cannabis sativa*, belonging to the family Cannabinaceae or Moraceae.

Morphology

- **Colour:** Dull-green.

- **Odour:** Strong, characteristic and narcotic.
- **Taste:** Acrid and pungent.
- **Shape:** Flattened or cylindrical.

Chemical Constituents

1-3-4 trans tetrahedrocannabinol, volatile oil, trigonelline, choline, cannabinol, cannabidiol, cannabidiolic acid, cannabigerol, cannabichromene.

Uses

1. It is used as a narcotic, sedative and analgesic agent.
2. It is having psychotropic properties.
3. It causes intoxication, euphoria and mental disturbances.

NUX-VOMICA

Synonyms

Crow-fig, Semen strychni, Nux-vomica seed.



Nux-Vomica

Biological Source

It is the dried ripe seeds of *Strychnos nux-vomica*, belonging to the family Loganiaceae.

Morphology

- **Colour:** Greenish-brown.
- **Odour:** None.

- **Taste:** Intensely bitter.
- **Size:** 10-30 mm × 4-6 mm.
- **Shape:** Disc shaped.

Chemical Constituents

Strychnine, brucine, α-colubrine, pseudo strychnine.

Uses

1. It is used as a bitter stomachic and tonic.
2. It is used as a CNS stimulant.
3. It is used for denaturing alcohol and inedible fats.
4. It is used as standards for bitterness and dog poison.

Adulterants

1. *Strychnos nuxblanda.*
2. *Strychnos potatorum.*

Allied Drugs

1. *Strychnos wallichiana.*
2. *Strychnos ignatii.*

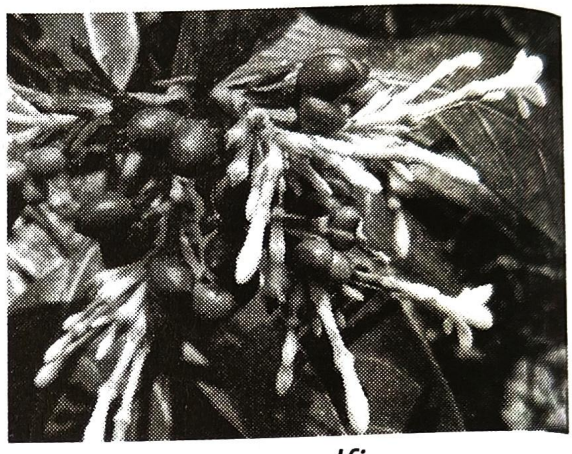
F. ANTIHYPERTENSIVES

The substances which are used in the treatment of high blood pressure are known as antihypertensive drugs. The systolic pressure in the range of 160-280 mm of mercury is regarded as high blood pressure which may cause cardiac arrest. A suitable natural antihypertensive drug is rauwolfia roots.

RAUWOLFIA

Synonyms

Rauwolfia root, Chhotachand, Sarpaganda, Snake-root.



Rauwolfia

Biological Source

It is the dried roots of *Rauwolfia serpentina,* belonging to the family Apocynaceae.

Morphology

- **Colour:** Greyish-yellowish to brown.
- **Odour:** Odourless.
- **Taste:** Bitter.
- **Size:** 10 to 15 cm × 1 to 3 cm.
- **Shape:** Sub-cylindrical.

Chemical Constituents

Reserpine, Yohimbine, Serpentine, Serpentinine, Ajamalicine, Ajamaline, Rauwolfinine, rescinnamine and reserpinine.

Uses

1. It is used in the treatment of hypertension.
2. It produces tranquilizing effect.
3. It is also used in the treatment of anxiety, cardiac arrhythmia, asthma and gastric ulcers.
4. It is also used as CNS depressant.

Substitutes and Allied Drugs

1. *Rauwolfia densiflora.*
2. *Rauwolfia perakensis.*
3. *Rauwolfia tetraphylla.*
4. *Rauwolfia vomitoria.*

G. ANTI-TUSSIVES

These are the drugs which act upon the pulmonary membranes that hasten or alter expectoration. They stimulate and expel the bronchial mucous or bronchial secretions and thus help in their removal. The examples of anti-tussives are ephedra, vasaka, tulsi etc.

VASAKA LEAVES

Synonyms

Adhatoda.



Vasaka Leaves

Biological Source

It is the fresh and dried leaves of *Adhatoda vasica,* belonging to the family Acanthaceae.

Morphology

- **Colour:** Dark green.
- **Odour:** Characteristic.
- **Taste:** Bitter.
- **Size:** 12-20 cm × 2.5-5 cm.
- **Shape:** Lanceolate.

Chemical Constituents

Vasicine, vasicinone, vasakin, adhatodine.

Uses

1. It is used as an expectorant.

2. It possesses oxytocic action.
3. It is also used as a bronchodilator.

TULSI

Synonyms

Holy basil, Sacred basil



Tulsi

Biological Source

It is the fresh and dried leaves of *Ocimum sanctum*, belonging to the Family Labiatae.

Morphology

- **Colour:** Green.
- **Odour:** Aromatic.
- **Taste:** Slightly pungent.
- **Size:** 30-75 cm in height.
- **Shape:** Oblong.

Chemical Constituents

Eugenol, carvacrol, Eugenol-methyl-ether, caryophyllin.

Uses

1. It is used in the treatment of cough.
2. It is used as a stimulant.
3. It is also used as an antibacterial and insecticidal agent.

H. ANTIRHEUMATICS

Rheumatism is characterized by soreness of the skin, stiffness of muscles and pains in the joints and other associated structures including arthritis. The drugs used in the treatment of rheumatism are known as antirheumatics. The natural antirheumatics that are effectively used in rheumatism are guggul, salai, jatamansi, colchicum etc.

GUGGUL

Synonyms

Gum guggul, Indian bdellium, Scented bdellium.



Guggul

Biological Source

It is the oleo-gum-resin obtained from barks of *Commiphora weightii* and *Commiphora mukul*, belonging to the family Burseraceae.

Morphology

- **Colour:** Brown to pale yellow or dull green.
- **Odour:** Aromatic and balsamic.

- **Taste:** Bitter.
- **Size:** 0.5-2.5 cm in diameter.
- **Shape:** Rounded.

Chemical Constituents

Myrcene, dimyrcene, polymyrcene, caryophyllene, guggulosterol I, guggulosterol II, guggulosterol III.

Uses

1. It is used as an anti-inflammatory agent.
2. It is used as an anti-rheumatic drug.
3. It is also used as hypolipidemic and hypo cholesteremic drug.

Substitutes

1. *Commiphora berryi.*
2. *Commiphora caudata.*
3. *Commiphora roxburghii.*

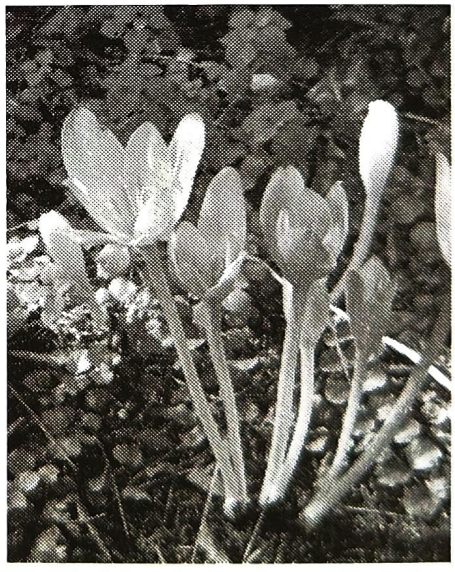
INDIAN COLCHICUM

Synonyms

Colchicum seeds.

Biological Source

It is the dried seeds of *Colchicum luteum,* belonging to the family Liliaceae.



Indian Colchicum

Morphology

- **Colour:** Dark reddish-brown.
- **Odour:** None.
- **Taste:** Bitter and acrid.
- **Size:** 2-3 mm in diameter.
- **Shape:** Globular.

Chemical Constituents

Colchicine, demecolcine, colchicoresin, starch and fixed oil.

Uses

1. It is used in the treatment of gout and rheumatism.
2. It is used to cause polyploidy.
3. It is used in the cultivation of medicinal plants.

I. ANTITUMOUR DRUGS

The cancer or the carcinogenic growth is an abnormal mass of new tissue growing in or on part of the body. It is regarded to be an incurable disease. The drugs which are used in the treatment of cancer are called as antitumour drugs. Example of natural drugs are vinca, podophyllum, colchicum, benafsha, anacardium etc.

VINCA

Synonyms

Catharanthus, Vinca rosea, Periwinkle.

Biological Source

It consists of dried whole plant of *Catharanthus roseus*, belonging to the family Apocynaceae.



Vinca

Morphology

- **Colour:** Green (leaves), pale grey (root), violet, pink-white/ carmine red (flower).
- **Odour:** Characteristic.
- **Taste:** Bitter.

- **Size:**
  - **Leaves:** 2.5-4 cm × 1.5-2 cm
  - **Roots:** 3-5 cm × 0.5-1 cm
- **Shape:** Leaves are ovate or oblong, roots are cylindrical.

Chemical Constituents

Vinblastine, vincristine, vindoline, vindolinine, catharanthine, ajmalicine, serpentine, lochnerine, tetrahydroalstonine.

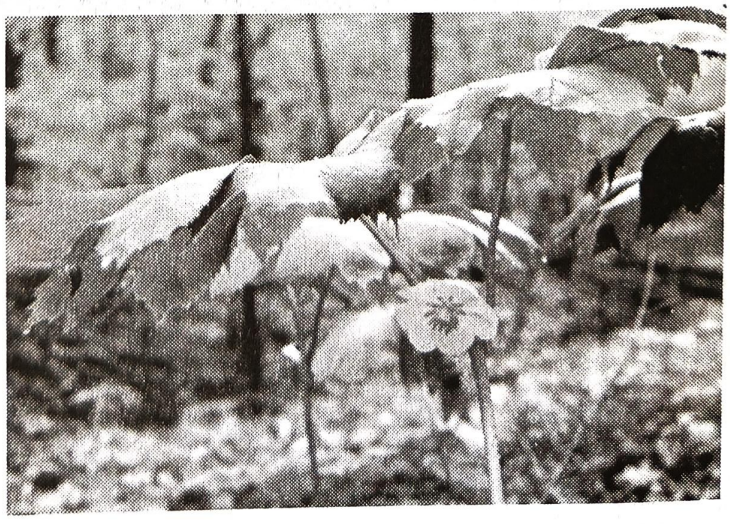
Uses

1. It is used in the treatment of leukaemia.
2. It is used in the treatment of Hodgkin's disease.
3. It is also having hypotensive and anti-diabetic activities.

PODOPHYLLUM

Synonyms

Indian podophyllum resin, Podophyllin.



Podophyllum

Biological Source

It is a mixture of resin obtained from dried roots and rhizomes of plants *Podophyllum hexandrum* or *P. emody,* belonging to the family Berberidaceae.

Morphology

- **Colour:** Light brown to greenish-yellow or brownish green.
- **Odour:** Characteristic.
- **Taste:** Bitter and acrid.
- **Solubility:** Insoluble in water and soluble in 90% alcohol.

Chemical Constituents

Podophyllotoxin, picropodophyllin, quercetin, astragalin and resinous substances.

Uses

1. It is used in the treatment of tumour.
2. It is used as a paint in the veneral and other warts.
3. It is also used as a drastic purgative and hydrogauge cathartic.

J. ANTIDIABETICS

When the glucose level is increased in the circulatory system or blood, the condition is called as diabetes. Thus, diabetes is the inability of the body to utilize glucose due to failure of pancreas to secret insulin in the sufficient quantity. Drugs which are used to treat diabetes are known as antidiabetics. Natural antidiabetics are gymnema, bitter gourd, jambhul, stevia and Indian kino.

GYMNEMA

Synonyms

Gudmar, Madhu nashini.



Gymnema

Biological Source

It is the leaves of *Gymnema sylvestre*, belonging to the family Asclepiadaceae.

Morphology

- **Colour:** Green.
- **Odour:** Pleasant and aromatic.
- **Taste:** Tasteless.
- **Size:** 3-5 cm × 1-2 cm.
- **Shape:** Elliptic or ovate.

Chemical Constituents

Hentriacontane, pentriacontane, phytin, α and β-chlorophylls, resin, tartaric acid, formic acid, butyric acid, mucilage inositol, d-quircitol, gymnemic acid.

Uses

1. It is used as an antidiabetic agent.
2. It is also used as a stomachic, stimulant and laxative.
3. It is also used in the treatment of hypoglycemia.
4. It is also used as a diuretic agent.

Substitute

Gymnema hirsutum.

PTEROCARPUS

Synonyms

Bijasal, Indian kino tree, Malabar kino, Asana, Rakta-chandan.



Pterocarpus

Biological Source

It is the dried juice of *Pterocarpus marsupium*, belonging to the family Leguminosae.

Morphology

- **Colour:** Ruby-red.
- **Odour:** Odourless.
- **Taste:** Astringent.
- **Size:** 3.5-10 mm granules.
- **Shape:** Angular grains.

Chemical Constituents

Kinotannic acid, kino-red, kinoin, pyrocatechin, resin and gallic acid.

Uses

1. It is used as an antidiabetic agent.
2. It is used as powerful astringent.
3. It is also used in the treatment of diarrhea, passive haemorrhage and toothache.
4. It is used in dying, tanning and printing.

K. DIURETICS

Diuretics are the drugs that increase the flow of urine. Several natural drugs like gokhru, punarnava, tea, coffee, digitalis etc. are known for their diuretic properties. They act by increasing the renal blood flow and glomerular filtration or by activating the tubular absorption and tubular reabsorption of urine formation.

GOKHRU

Synonym

Puncture vine.



Gokhru

Biological Source

It is the dried fully ripen fruits of *Tribulus terrestris*, belonging to the family Zygophyllaceae.

Morphology

- **Colour:** Greenish to grey.
- **Odour:** Odourless.
- **Taste:** Bitter.
- **Size:** 1-1.5 cm.
- **Shape:** Globose.

Chemical Constituents

Harmine, harman, gitogenin, chlorogenin, ruscogenin, kaemferol, tribuloside flavonoids, resins.

Uses

1. It is used as a diuretic and tonic.
2. It is also used in the treatment of calculus affection and painful micrition.
3. It is also used in the treatment of gout.
4. It is used in case of dysuria and gonorrhea.

PUNARNAVA

Synonyms

Rakta Punarnava, Hog weed.

Biological Source

It is the fresh as well as dried herb known as *Boerhaavia difussa*, belonging to the family Nyctaginaceae.



Punarnava

Morphology

- **Colour:** Whitish-green (leaves), greenish-purple (stems), pink (flowers).

- **Odour:** Odourless.
- **Taste:** Bitter.
- **Size:**
  - **Leaf:** 25-30 mm × 12-20 mm
  - **Stem:** 1 m
  - **Flower:** 10-25 mm.
- **Shape:** Leaf- ovate, oblong sub-orbicular, stem- cylindrical.

Chemical Constituents

Punarnavine, potassium nitrate and ursolic acid.

Uses

1. It is used as a diuretic agent.
2. It is also used as a stomachic and expectorant.
3. It is used in the treatment of jaundice.
4. It is also used in case of abdominal pain.

Substitutes

1. *Trianthema portulacastrum.*
2. *Trianthema obcordata.*
3. *Trianthema decandra.*

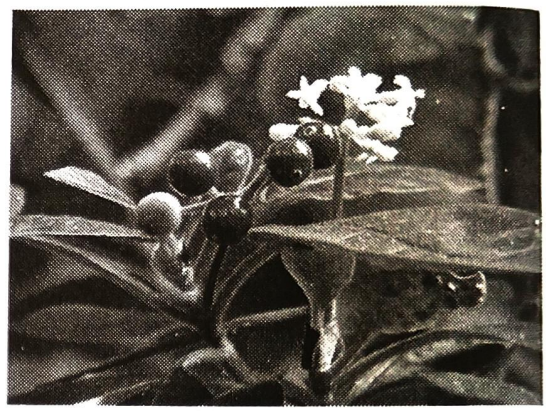
L. ANTIDYSENTERICS

Dysentery comes from two words *viz.*, dys and enteron which means bad intestine. It is caused by certain protozoal animals like amoeba, shigella and certain ciliate protozoans, schistosoma etc. It is characterized by the inflammation of the colonic mucosa which leads to passage of blood and mucus. The drugs which are used to treat dysentery are known as antidysenterics, which act either by preventing the multiplication or by killing the protozoans. Kurchi and ipecacuanha are the examples of natural antidysenterics.

IPECACUANHA

Synonyms

Ipecac.



Ipecacuanha

Biological Source

It is the dried roots and rhizomes of *Cephaelis ipecacuanha* or *Cephaelis acuminata,* belonging to the family Rubiaceae.

Morphology

- **Colour:** Brick red to dark brown.
- **Odour:** Faint.
- **Taste:** Bitter.
- **Size:** 150 mm × 6 mm (roots), 2 mm in diameter (rhizomes).
- **Shape:** Tortuous (roots), cylindrical (rhizomes).

Chemical Constituents

Emetine, cephaeline, psychotrine, dihydrocephaeline, emetamine, ipecacuanhic acid, ipecacuanhin, starch and calcium oxalate.

Uses

1. It is used in the treatment of amoebic dysentery.
2. It is used as an emetic in the form of syrup.
3. It is also used as an expectorant in small doses.

M. ANTISEPTICS AND DISINFECTANTS

Antiseptics can be defined as the chemical sterilizing substances which are used to kill pathogenic microorganisms or for prevention of their growth. They should be sufficiently non-toxic to living tissues.

Whereas, the term disinfect indicates the destruction or to make a surface free from pathogenic organisms. Hence, disinfectants kill bacteria and their spores. Generally they are not applied to the living tissues due to their toxicity, but are used for sterilization of instruments and apparatus.

Neem, turmeric, myrrh, benzoin, turpentine are examples of the natural antiseptics and disinfectants used in medical practice.

TURMERIC

Synonyms

Indian saffron, Haldi, Haridra.



Turmeric

Biological Source

It is the dried as well as fresh rhizomes of *Curcuma longa*, belonging to the family Zingiberaceae.

Morphology

- **Colour:**
  - Externally, yellowish to yellowish-brown.
  - Internally, yellowish-orange to orange.
- **Odour:** Characteristic.

- **Taste:** Slightly bitter.
- **Size:** 2-5 cm × 1-2 cm.
- **Shape:** Ovate or oblong or cylindrical.

Chemical Constituents

Curcumin, turmerone, zingiberene, borneol, caprylic acid.

Uses

1. It is used as an antiseptic agent.
2. It is used as an expectorant.
3. It is also used as a colouring agent in ointments and creams.
4. It is also used for detection of boric acid.

MYRRH

Synonyms

Gum Myrrh, Bol, Myrrha.



Myrrh

Biological Source

It is an oleo-resin obtained from *Commiphora molmol,* belonging to the family Burseraceae.

Morphology

- **Colour:** Reddish-brown (external), brown (internal).
- **Odour:** Aromatic and agreeable.
- **Taste:** Aromatic and agreeable.

- **Size:** 1.5-3 cm in diameter.
- **Shape:** Rounded or irregular tears.

Chemical Constituents

Cuminic aldehyde, eugenol, α, β and γ-commiphoric acids, α and β-herabomyrrholic acids.

Uses

1. It is used as an antiseptic and stimulant.
2. It is also used as protective.
3. It is also known for its astringent effect.

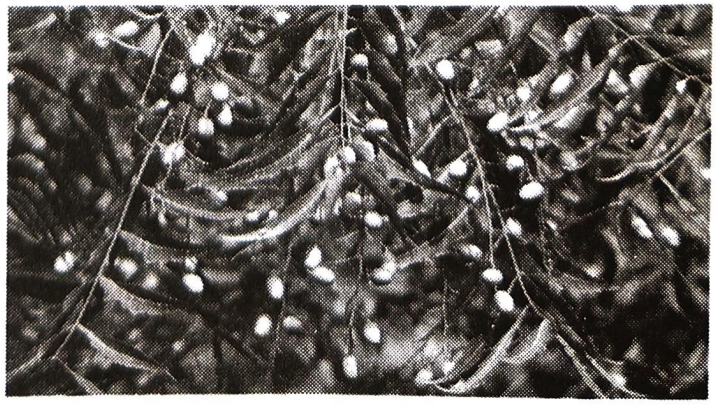
Adulterants

1. Arabian myrrh.
2. Yemen myrrh.

NEEM

Synonyms

Margosa, Nim.



Neem

Biological Source

It is the leaves and other aerial parts of *Azadirachta indica*, belonging to the family Meliaceae.

Morphology

- **Colour:** Dark green to greenish-yellow.
- **Odour:** Characteristics.
- **Taste:** Bitter.
- **Size:** 7 cm × 2.5 cm.
- **Shape:** Lanceolate, serrate.

Chemical Constituents

Azadirachtin, salanin, quercetin, nimbin, nimbinin, nimbidin, nimbosterol, meliantrol, meliacin.

Uses

1. It is used as an antiseptic.
2. It is also used as insecticides.
3. It has antifertility and antiviral properties.

N. ANTIMALARIALS

Anti-malarials are the drugs which are used in the prophylaxis or treatment of malaria. Malaria is an infectious disease caused by four species of a protozoan *viz., Plasmodium malariae, Plasmodium vivax, Plasmodium ovale and Plasmodium falciparum.* Artemisia and cinchona are the examples of natural anti-malarial drugs, which act either by preventing the maturation of sporozoites or by destroying them.

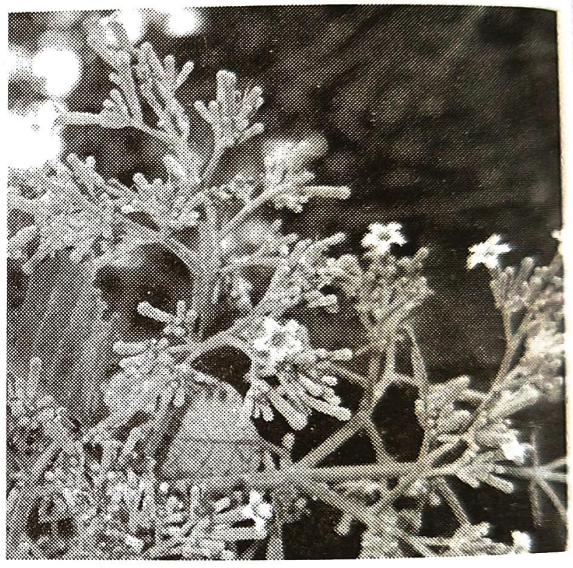
CINCHONA

Synonyms

Jesuit's bark, Peruvian bark.

Biological Source

It is the dried bark of *Cinchona calisaya, Cinchona officinalis, Cinchona ledgeriana, Cinchona succiruba,* belonging to the family Rubiaceae.



Cinchona

Morphology

- **Colour:** Reddish-brown.
- **Odour:** Characteristics.
- **Taste:** Intensely bitter and somewhat astringent.
- **Size:** 12-25 mm × 1.5-5 mm.
- **Shape:** Longitudinal with transverse cracks.

Chemical Constituents

Quinine, quinidine, cinchinine and cinchinidine,

Uses

1. It is used as an anti-malarial drug.
2. It is also used as an anti-pyretic drug.
3. It is used in the treatment of rheumatism and neuralgia.
4. It is also used as a cardiac depressant.

Substitutes

1. Cuprea bark (*Remijia pendunculata*).
2. False cuprea bark (*Remijia purdiena*).

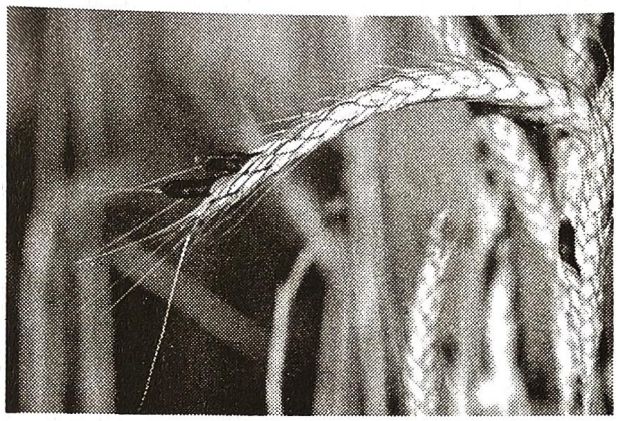
O. OXYTOCICS

Oxytocics are the drugs that have stimulant effect on the motility of uterus, by contracting the uterine muscles which ultimately leads to the easy parturition. Natural drug like ergot is found to be most effective oxytocic drug. Vasaka and cinchona are the other natural drugs having such properties.

ERGOT

Synonyms

Ergot of Rye, Ergota.



Ergot

Biological Source

It consists of the dried sclerotium of a fungus *Claviceps purpurea*, belonging to the family Hypocreaceae.

Morphology

- **Colour:** Dark violet to black (external), whitish or pinkish-white (internal).
- **Odour:** Disagreeable and faint.
- **Taste:** Unpleasant.
- **Size:** 1-3 cm × 1-5 mm.

- **Shape:** Triangular.
- **Fracture:** Brittle with short fracture.

Chemical Constituents

Ergometrine, ergotamine, ergosine, ergocristine, ergocryptine, ergocornine, ergometrinine, ergotaminie, ergosinine.

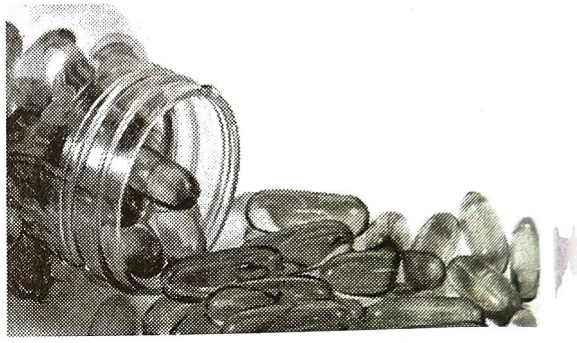
Uses

1. It is used in labour to assist delivery.
2. It is used to reduce post-partum haemorrhage.
3. It is also used in the treatment of migraine.

P. VITAMINS

Vitamins are the substances which are essential for the maintenance of normal metabolic functions of the body. These are not synthesized by human body itselves. Hence, they should be supplied from the outside sources. Various natural vitamins found are cod liver oil, shark liver oil, carrots, amla, yeast etc.

SHARK LIVER OIL



Shark Liver Oil

Synonyms

Oleum Selachoids.

Biological Source

It is the fixed oil obtained from the fresh livers of *Hypoprion brevirostris* and other species.

Morphology

- **Colour:** Pale yellow to brownish-yellow.
- **Odour:** Characteristic fishy.
- **Taste:** Bland or fishy.
- **Solubility:** Soluble in ether, chloroform but insoluble in water.

Chemical Constituents

Vitamin A, fatty acids.

Uses

1. It is used in the deficiency of Vitamin A.

2. It is also nutritive.
3. It is used in burn and sunburn ointments.

AMLA

Synonyms

Emblica, Indian Goose berry, Emblic myrobalan.



Amla

Biological Source

It is the dried as-well-as fresh fruits of *Emblica officinalis*, belonging to the family Euphorbiaceae.

Morphology

- **Colour:** Green to light yellow or brick red.
- **Odour:** None.
- **Taste:** Sore and astringent.
- **Size:** 1.5-2.5 cm in diameter.
- **Shape:** Globose.

Chemical Constituents

Ascorbic acid (Vitamin C), fat, tannin, pectin, phosphorus, iron, calcium.

Uses

1. It is used as a diuretic, refrigerant and laxative.

2. It is used in the treatment of diarrhea and dysentery.
3. It is also used in case of jaundice, dyspepsia and anaemia.
4. It is used in the treatment of asthama and bronchitis.
5. It is also used in the preparation of inks, hair oils and shampoo.

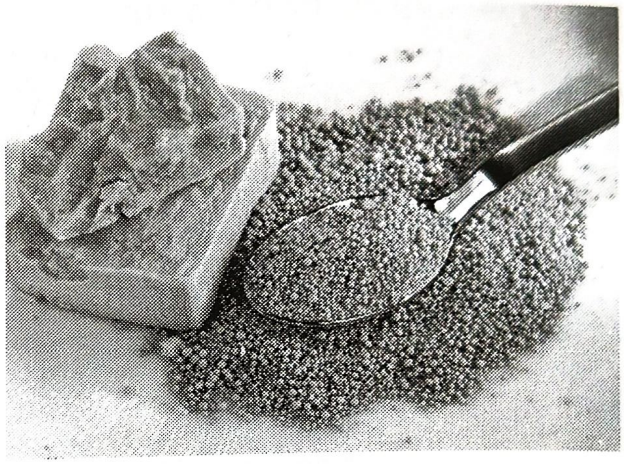
Q. ENZYMES

These are the protein substances that serve a role of catalyzing the biochemical reactions. They are colloidal in nature, heat-liable and highly specific in action. Depending upon the reactions they catalyzed, enzymes are classified as hydrolases, transferases, lyases, oxidases, reductases, isomerases, synthetases etc. The enzymes consisting protein component called as apoenzymes and enzymes consisting non-protein component called as coenzymes. The enzymes naturally found are yeast, diastase, papaya etc.

YEAST

Biological Source

It is the unicellular fungal microorganisms *Saccharomyces cerevisiae,* belonging to the family Saccharomycetaceae.



Yeast

Morphology

- **Colour:** Whitish powder.
- **Odour:** Characteristic.
- **Taste:** Disagreeable.
- **Size:** 1.5 μ.

Chemical Constituents

Invertase, diastase, zymase, maltase, vitamins like thiamine, riboflavin, nicotinic acid, pantothenic acid, folic acid, biotin, etc.

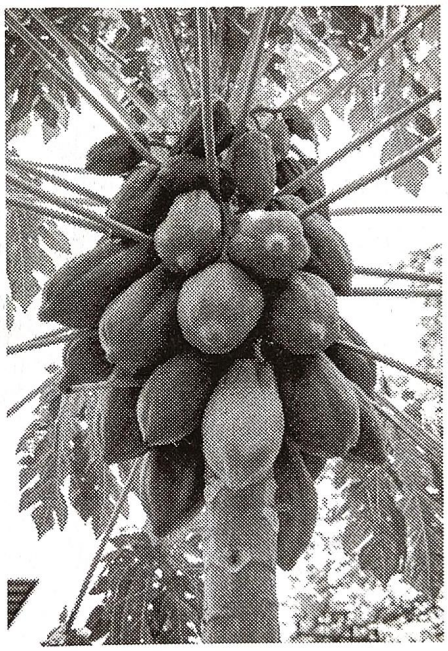
Uses

1. It is used in the manufacture of alcohol, beer and wines.
2. It is used as a source of vitamin B.
3. It is also a good source of protein.

PAPAYA

Synonyms

Papeya, Papai, Pappayam.



Papaya

Biological Source

It is the half-ripe fruits of *Carica papaya*, belonging to the family Caricaceae.

Morphology

- **Colour:** Light brown or white.

- **Odour:** Characteristic.
- **Taste:** Characteristic.
- **Solubility:** Soluble in glycerine, but insoluble in alcohol.

Chemical Constituents

Papain and chymopapain.

Uses

1. It is used as a meat tenderizer.
2. It is used as digestant and anti-inflammatory agent.
3. It is also used for degumming of silk fabrics in textile industry.

R. PHARMACEUTICAL AIDS

These are the substances which having no or minimum therapeutic value, but are important for the manufacture or compounding of various pharmaceutical formulations such as tablets, capsules, syrups, emulsions, suspensions etc.

Based on the use of pharmaceutical aids from different natural sources, they can be classified as follows:

Sl. No.	Class	Examples
1	Colours	Caramel, turmeric, indigo, cochineal, saffron.
2	Diluents	Lactose, glucose, sesame oil, cinnamon water.
3	Disintegrating agents	Starch, cellulose, CMC.
4	Emulsifying and suspending agents	Acacia, agar, bentonite, gelatin, tragacanth, tragacanth, guar gum, methyl cellulose, alginic acid.
5	Flavours	Lemon oil, orange oil, cinnamon, rose, anethol, cocoa.
6	Lubricants	Talc, magnesium stearate, cocoa butter.
7	Ointment bases	Beeswax, lanolin, paraffin, wool fat, polyethylene glycol.
8	Solvents	Alcohol, glycerine.
9	Sweetening agents	Honey, sorbitol, glycerrhiza.

ACACIA

Synonyms

Gum acacia, Gum Arabic.



Acacia

Biological Source

It consists of the dried gummy exudation from stems and branches of *Acacia arabica*, belonging to the family Leguminosae.

Morphology

- **Colour:** Cream-brown to red.
- **Odour:** Odouless.
- **Taste:** Bland and mucilaginous.
- **Solubility:** Soluble in water and insoluble in alcohol.

Chemical Constituents

Arabin, oxidase.

Uses

1. It is used as a demulcent.
2. It is used as an emulsifying and suspending agent.
3. It is also used as a good binding agent.

GUAR GUM

Synonyms

Guar flour, Jaguar gum.



Guar Gum

Biological Source

It consists of the powder of endosperm of seeds of *Cyamopsis tetragonolobus*, belonging to the family Leguminosae.

Morphology

- **Colour:** Colourless or pale yellowish-white.
- **Odour:** Characteristics.
- **Taste:** Gummy and characteristic.
- **Solubility:** Soluble in water and insoluble in alcohol.

Chemical Constituents

Guaran, proteins.

Uses

1. It is used as a binding and disintegrating agent.
2. It is also used as a bulk laxative and appetite depressant.
3. It is also used in the treatment of peptic ulcer.

HONEY

Synonyms

Madhu, Honey purified, Mel.



Honey

Biological Source

It consists of the sugar secretion deposited in honey comb by the bees *Apis mellifica, Apis dorsata,* belonging to the family Apidae.

Morphology

- **Colour:** Pale yellow to yellowish-brown.
- **Odour:** Characteristics, pleasant.
- **Taste:** Sweet and faintly acrid.
- **Solubility:** Soluble in water and insoluble in alcohol.

Chemical Constituents

Glucose, fructose, sucrose, maltose, gum, succinic acid, acetic acid, dextrin, formic acid, diastase, inulase.

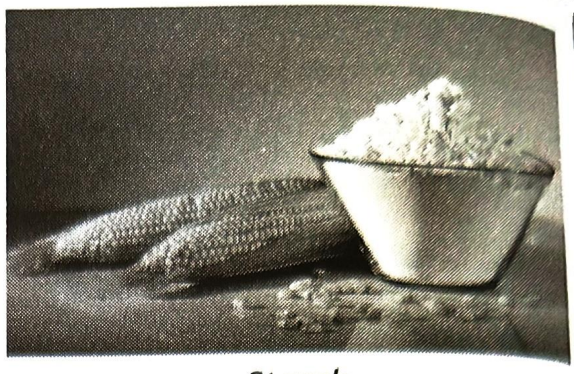
Uses

1. It is used as a demulcent and sweetening agent.
2. It is used as a nutrient to the infant.
3. It is also used as an antiseptic.
4. It is applied to burns and wounds.

STARCH

Synonyms

Amylum



Starch

Biological Source

It is the polysaccharide granules from the grains of maize (*Zea mays*), rice (*Oriza sativa*) or wheat (*Triticum aestivum*), belonging to the family Graminae, and also from the tubers of potato (*Solanum tuberosum*), belonging to the family Solanaceae.

Morphology

- **Colour:** White, cream coloured or yellowish.
- **Odour:** Odourless.
- **Taste:** Mucilaginous.
- **Solubility:** Soluble in boiling water and insoluble in cold water and alcohol.

Chemical Constituents

Amylose and amylopectine in the proportion of 1:2.

Uses

1. It is used as a nutrient, demulcent, protective and as absorbent.
2. It is used in the preparation of dusting talcum powder.
3. It is used as an antidote in iodine poisoning.
4. It is also used as a disintegrating agent in pills and tablets.
5. It is also used as a diluent and emollient.

TRAGACANTH



Tragacanth

Synonyms

Gum Tragacanth, Tragacantha.

Biological Source

It consists of the gummy exudation from stems and branches of *Astragalus gummifer*, belonging to the family Leguminosae.

Morphology

- **Colour:** White or pale yellowish-white.
- **Odour:** Odourless.
- **Taste:** Tasteless.
- **Size:** 25 mm × 12 mm × 2 mm.
- **Shape:** Curved, flattened ribbon like flakes.
- **Solubility:** Soluble in water and insoluble in alcohol.

Chemical Constituents

Tragacanthin, bassorin, starch, tragacanthic acid.

Uses

1. It is used as a demulcent and an emollient.
2. It is also used as a thickening, suspending and emulsifying agent.
3. It is also used as a binding agent and an adhesive.

AGAR

Synonyms

Agar-agar, Japanese-Isinglass.



Agar

Biological Source

It consists of the gelatinous substance from *Gelidium amansi*, belonging to the family Rhodophyceae.

Morphology

- **Colour:** Yellowish-grey or white to nearly colourness.
- **Odour:** Odourless.
- **Taste:** Mucilaginous.
- **Solubility:** Soluble in boiling water and insoluble in cold water and organic solvents.

Chemical Constituents

Agarose and agaropectin.

Uses

1. It is used as an emulsifying agent and bulk laxative.
2. It is used in the preparation of bacteriological culture medium.

ARACHIS OIL

Synonyms

Ground-nut-oil, Peanut oil, Sweet oil.



Arachis Oil

Biological Source

It consists of the fixed oil of seeds kernels of *Arachis hypogea*, belonging to the family Leguminosae.

Morphology

- **Colour:** Pale yellow.
- **Odour:** faint and characteristics.
- **Taste:** Bland and nut-like.
- **Solubility:** Soluble in ether, chloroform and light petrolium and insoluble in water.

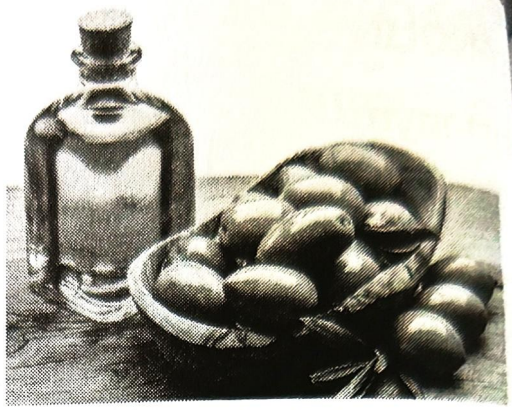
Chemical Constituents

Oleic acid, linoleic acid, stearic acid, arachidic acid, palmitic acid.

Uses

1. It is used as a lubricant.
2. It is used as edible oil.
3. It is also used as a solvent for intramuscular injections.

OLIVE OIL



Olive Oil

Synonyms

Oleum Olivae.

Biological Source

It consists of the fixed oil of the ripe fruits of *Olea europoea*, belonging to the family Oleaceae.

Morphology

- **Colour:** Pale yellow or greenish-yellow.
- **Odour:** Slight and characteristics.
- **Taste:** Bland, faintly acrid.
- **Solubility:** Soluble in chloroform, ether and insoluble in alcohol.

Chemical Constituents

Olein, palmitin and linolein.

Uses

1. It is used as an emollient and soothing agent.
2. It is used to soften the skin and crusts in eczema and psoriasis.
3. It is also used as nutrient, demulcent and mild laxative.

LANOLIN

Synonyms

Adeps Lanae, Hydrous wool fat.



Lanolin

Biological Source

It consists of the purified fat-like substance from the wool of *Ovis aries*, belonging to the family Bovidae.

Morphology

- **Colour:** Whitish-yellow.
- **Odour:** Faint and characteristics.
- **Taste:** Bland.
- **Solubility:** Soluble in chloroform and ether and insoluble in water.

Chemical Constituents

Carnaubic acid, oleic acid, myristic acid, palmitic acid, lanoceric acid and lanopalmitic acid.

Uses

1. It is mainly used as water absorbable ointment base.
2. It is also used as base for water soluble creams and cosmetic preparations.

YELLOW BEESWAX

Synonyms

Beeswax, Cera-flava.



Yellow Beeswax

Biological Source

It consists the purified wax from the honey-comb of the bees *Apis dorsata, Apis mellifica,* belonging to the family Apidae.

Morphology

- **Colour:** Yellow to yellowish-brown.
- **Odour:** Agreeable and honey like.
- **Taste:** Sweet.
- **Solubility:** Soluble in alcohol, chloroform, ether, etc., and insoluble in water.

Chemical Constituents

Myricin, cerotic acid, melissic acid, cerolein.

Uses

1. It is used to prepare ointments, plasters as-well-as polishes.
2. It is also utilized in the ointment for tightening purposes for the manufacture of candles, moulds etc.

GELATIN

Biological Source

It is derived by boiling animal tissues like skin, tendons, ligaments, and bones with water.



Gelatin

Morphology

- **Colour:** Colourless or pale yellow.
- **Odour:** Characteristic.
- **Taste:** Slight and broth-like.
- **Solubility:** Soluble in hot water and insoluble in cold water.

Chemical Constituents

Gelatin, glutin and moisture.

Uses

1. It is used as a valuable dietary supplement.
2. It is used in the preparation of ice-cream.
3. It is used as an antidote for halogen poisoning.
4. It is used in the preparation of nutrient media.

SODIUM ALGINATE

Synonyms

Algin, Sodium polymannuronate.



Sodium Alginate

Biological Source

It consists of the sodium salt of alginic acid obtained from *Macrocystic pyrifera, Laminaria hyperborean, Laminaria digitata* and *Ascophyllum nodosum,* belonging to the family Phaeophyceae.

Morphology

- **Colour:** White to buff coloured powder.
- **Odour:** Odourless.
- **Taste:** Tasteless.
- **Solubility:** Soluble in water and insoluble in alcohol, ether, chloroform.

Uses

1. It is used in the preparation of paste, creams.
2. It is also used for thickening and stabilizing the emulsions.
3. It is used as a binding agent, disintegrating agent and a good suspending agent.

S. MISCELLANEOUS NATURAL DRUGS

LIQUORICE

Synonyms

Liquorice root, Glycyrrhiza, Mulethi.



Liquorice

Biological Source

It is the dried roots and stolons of *Glycyrrhiza glabra*, belonging to the family Leguminosae.

Morphology

- **Colour:** Yellowish-brown to pale yellow.
- **Odour:** Faint and characteristic.
- **Taste:** Sweet.
- **Size:** 20-50 cm × 2 cm.
- **Shape:** Cylindrical.
- **Fracture:** Fibrous in bark and splintery in wood.

Chemical Constituents

Glycyrrhizin, flavone glycoside, liquitrin glucose, sucrose, resin, asparagine and fat.

Uses

1. It is used as demulcent and mild expectorant.
2. It is used as a sweetening agent, antispasmodic, anti-inflammatory and antiulcer drug.

3. It is used as a flavouring agent.
4. It is also used in the treatment of cough and Addison's disease.

PICRORHIZA

Synonyms

Indian gentian, Ktki.



Picrorhiza

Biological Source

It is the dried rhizomes of *Picrorhiza kurroa*, belonging to the family Scrophulariaceae.

Morphology

- **Colour:** Greyish-brown (external), blackish (internal).
- **Odour:** Slight and unpleasant.
- **Taste:** Bitter.
- **Size:** 3-5 cm × 0.5-1 cm.
- **Shape:** Cylindrical.

Chemical Constituents

Kutkin picroside I, kutkin picroside II and kutkoside.

Uses

1. It is used as a bitter tonic, antiperiodic, febrifuge and stomachic.

2. It is also used as a laxative in large doses.
3. It is used in the treatment of jaundice.

LINSEED OIL

Biological Source

It is the fixed oil obtained from the dried fully ripe seeds of *Linum usitatissimum*, belonging to the family Linaceae.



Linseed Oil

Morphology

- **Colour:** Yellow.
- **Odour:** Characteristic.
- **Taste:** Pleasant.
- **Solubility:** Soluble in ether, petroleum ether and chloroform and insoluble in water.

Chemical Constituents

Palmitic acid, stearic acid, oleic acid, linoleic acid, linolenic acid, tocopherol, squalin, linamarin.

Uses

1. It is used in the treatment of scabies and other skin diseases.
2. It is also used as a nutrient and emollient.
3. It is used in the preparation of non-staining iodine.

GARLIC

Synonyms

Allium.



Garlic

Biological Source

It is the bulbs of *Allium sativum*, belonging to the family Liliaceae.

Morphology

- **Colour:** White to pink.
- **Odour:** Aromatic.
- **Taste:** Pungent.
- **Size:** 1.5 to 2 cm.

Chemical Constituents

Allin, allicin, allyl propyl disulphide, diallyl disulphide, albumin.

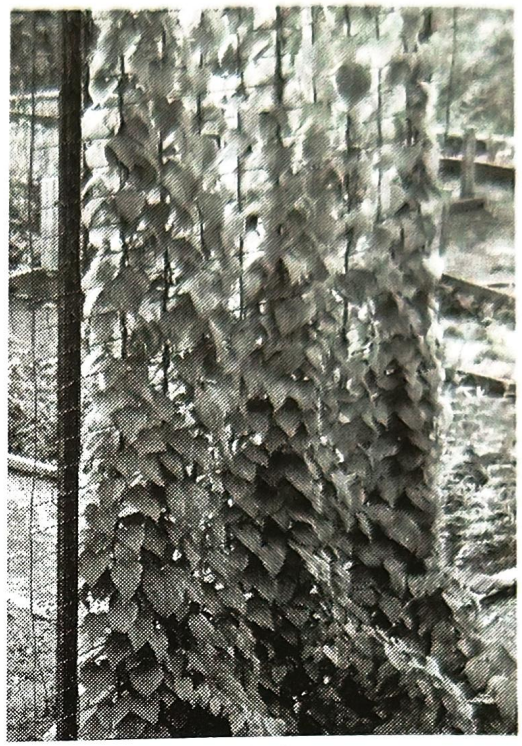
Uses

1. It is used as carminative, expectorant, stimulant and disinfectant.
2. It is used in the treatment of pulmonary diseases.
3. It is also used as anthelmintic and rubifacient.
4. It is also useful in high blood pressure.

DIOSCOREA

Synonyms

Yam, Rheumatism root.



Dioscorea

Biological Source

It is the dried tubers of *Dioscorea deltoidea, Dioscorea composita,* belonging to the family Dioscoreaceae.

Morphology

- **Colour:** Slightly brown.
- **Odour:** Odourless.
- **Taste:** Bitter.
- **Size:** Varies depending upon age of rhizomes.

Chemical Constituents

Diosgenin, dioscin, starch.

Uses

1. It is used as a precursor for synthesis of sex-hormones and oral contraceptives.
2. It is used in the treatment of rheumatic arthritis.

SHATAVARI

Synonyms

Shatmuli.



Shatavari

Biological Source

It is the dried roots and leaves of *Asparagus racemosus*, belonging to the family Liliaceae.

Morphology

- **Colour:** Green (leaves), yellowish-brown (roots).
- **Odour:** Characteristic.
- **Taste:** Characteristic.
- **Size:** 3-5 cm × 0.5-2 cm.
- **Shape:** Cylindrical (roots), needle like (leaves).

Chemical Constituents

Shatavarin I, shatavarin II, shatavarin III and shatavarin IV.

Uses

1. It is used as galactogogue, tonic and diuretic.
2. It is having antioxytocic property.
3. It is used in the treatment of rheumatism and nervine disorders.

TOBACCO

Synonyms

Tambaku, Tamak, Pokala.



Tobacco

Biological Source

It is the dried leaves of *Nicotiana tobacum*, belonging to the family Solanaceae.

Morphology

- **Colour:** Green or slightly brown.
- **Odour:** Characteristic.
- **Taste:** Bitter.
- **Size:** 60-80 cm × 35-45 cm.
- **Shape:** Ovate, elliptic or lanceolate.

Chemical Constituents

Nicotine, nornicotine and anabasine.

Uses

1. It is used as stimulant on cardiac and nervous system.
2. It is used for manufacturing of nicotinic acid and nicotinamide.
3. It is also effective against white files, months, termites, red-spider mites etc.

PYRETHRUM

Synonyms

Natural Pyrethrum, Insect flowers.



Pyrethrum

Biological Source

It is the dried flower-heads of *Chrysanthemum cinerariefolium, Chrysanthemum marshallii,* belonging to the family Compositeae.

Morphology

- **Colour:** Cream to straw coloured.
- **Odour:** Characteristic, aromatic.
- **Taste:** Bitter followed by numbness.
- **Size:** 10 to 15 mm in diameter.

Chemical Constituents

Pyrethrin-I, pyrethrin-II, cinerin-I, cinerin-II, jasmolin-I, jasmolin-II.

Uses

1. It is used as a natural contact insecticide.
2. It is used in the preparation of mosquito coils and sticks.
3. It is also used in the preparation of insect repellent formulations.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write short notes on dental analgesics.
2. Write a short note on cinnamon.
3. Write the synonyms, biological source, morphology, chemical constituents, uses and adulterants of black pepper.
4. Write the synonyms, biological source, morphology, chemical constituents and uses of black catechu.
5. Write short note on cannabis.
6. Write short note on nux-vomica.
7. Write a short note on anti-hypertensive drugs.
8. Write a short note on antitumour drugs.
9. Write a short note on antiseptics and disinfectants.
10. Write the synonyms, biological source, morphology, chemical constituents and uses of neem.
11. Write a short note on antimalarials.
12. Write a short note on oxytocis with example.
13. Write the synonyms, biological source, morphology, chemical constituents and uses of amla.
14. Write short note on enzymes with suitable example.
15. Write short note on acacia and guar gum.

16. Write a short note on starch.
17. Write a short note on arachis oil.
18. Write a short note on liquorice.
19. Write a short note on pyrethrum.

LONG ANSWER TYPE QUESTIONS

1. Write the synonyms, biological source, morphology, chemical constituents and uses of the followings:
   (a) Any two of the laxative drugs.
   (b) Digitalis and arjuna.
   (c) Any two of the carminative drugs.
   (d) Cardamom and ginger.
   (e) CNS stimulants.
   (f) Belladonna and ashwagandha.
   (g) Anti-tussive drugs.
   (h) Antirheumatic drugs.
   (i) Any two of the anticancer drugs.
   (j) Anti-diabetic agents.
   (k) Turmeric and myrrh.
   (l) Yeast and papaya.
   (m) Garlic and tobacco.
   (n) Picrorhiza and dioscorea.
   (o) Shatavari and linseed oil.
2. What are diuretics? How they act? Discuss any of the diuretic agents.
3. Discuss vitamins with suitable examples.

4. Write short note on pharmaceutical aids. Classify them with suitable examples.
5. Discuss briefly about gelatin and sodium alginate.

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. Aloe contains:

(a) Barbaloin
(b) Aloe-emodin
(c) Isobarbaloin
(d) All of the above

Ans.: (d)

2. Example of laxative drugs:

(a) Aloe
(b) Senna
(c) Rhubarb
(d) All of the above

Ans.: (d)

3. Rhubarb is of _____ odour.

(a) Aromatic
(b) Fragrant
(c) nauseating
(d) None of the above

Ans.: (b)

4. Aloe is found in the colour of:

(a) Dark brown
(b) Brownish-black
(c) Black
(d) All of the above

Ans.: (d)

5. Digitalis is _____ in taste:

(a) Sweet

(b) Bitter
(c) Intensely bitter
(d) Mucilaginous

Ans.: (b)

6. Example of cardiotonic drug:

(a) Digitalis
(b) Arjuna
(c) Both (a) & (b)
(d) None of the above

Ans.: (c)

7. Which one is used as a dental analgesic?

(a) Clove
(b) Cardamom
(c) Coriander
(d) Cinnamon

Ans.: (a)

8. Devil's dung is the synonym for:

(a) Fennel
(b) Ginger
(c) Asafoetida
(d) Nutmeg

Ans.: (c)

9. Scientific name for Nutmeg is:

(a) *Myristica fragrance*
(b) *Frula foetida*
(c) *Zingiber officinale*
(d) *Piper nigrum*

Ans.: (a)

10. Black pepper belongs to the family of:

(a) Piparaceae
(b) Solanaceae

(c) Scrophulariaceae
(d) Rubiaceae

Ans.: (a)

11. Ginger is found as ____ in shape.

(a) Round
(b) Ovate
(c) Cylindrical
(d) Circular

Ans.: (b)

12. Adulterants used in cinnamon:

(a) Jungle cinnamon
(b) Cinnamon chips
(c) Saigon cinnamon
(d) All of the above

Ans.: (d)

13. Drugs having ellipsoidal shape is:

(a) Cinnamon
(b) Black pepper
(c) Nutmeg
(d) Clove

Ans.: (c)

14. Synonyms for Fennel is:

(a) Fennel fruits
(b) Fructus Foeniculum
(c) Saunf
(d) All of the above

Ans.: (d)

15. Eugenol is found in:

(a) Cinnamon
(b) Coriander
(c) Both (a) & (b)

(d) None of the above

Ans.: (a)

16. Kattha is the synonym for:

(a) Black pepper
(b) Black catechu
(c) Nutmeg
(d) Fennel

Ans.: (b)

17. Hyoscyamus is of the family of:

(a) Solanaceae
(b) Leguminaceae
(c) Rubiaceae
(d) None of the above

Ans.: (a)

18. Datura is ____ in taste.

(a) Sweet
(b) Acrid
(c) Aromatic
(d) Bitter

Ans.: (d)

19. Deadly night shade leaves is the synonym for-

(a) Hyoscyamus
(b) Datura
(c) Belladona
(d) Aconite

Ans.: (c)

20. Biological source for ashwagandha is:

(a) *Datura metel*
(b) *Atropa belladonna*
(c) *Aconitum napellus*
(d) *Withania somnifera*

Ans.: (d)

21. Ephedrine is found in:

(a) Opium
(b) Datura
(c) Ephedra
(d) Aconite

Ans.: (c)

22. Example of narcotic drug is:

(a) Opium
(b) Cannabis
(c) Both (a) & (b)
(d) None of the above

Ans.: (c)

23. The colour of nux-vomica is:

(a) Yellowish-brown
(b) Blackish-brown
(c) Greenish-brown
(d) Greyish-brown

Ans.: (c)

24. Snake-root is the synonym for:

(a) Rauwolfia
(b) Cannabis
(c) Opium
(d) None of the above

Ans.: (a)

25. *Ocimum sanctumis* the scientific name of:

(a) Vasaka
(b) Tulsi
(c) Both (a) & (b)
(d) None of the above

Ans.: (b)

26. Vasaka leaves also known as:

(a) Holy basil
(b) Sacred basil

(c) Adhatoda
(d) None of the above

Ans.: (c)

27. Rheumatism can be characterized by:

(a) Soreness of the skin
(b) Stiffness of muscles
(c) Pain in the joints
(d) All of the above

Ans.: (d)

28. Guggul is found in ____ shape.

(a) Flat
(b) Round
(c) Oval
(d) All of the above

Ans.: (b)

29. Example of globular shape of drug is:

(a) Vasaka
(b) Tulsi
(c) Indian colchicum
(d) None of the above

Ans.: (c)

30. Vinca is of _____ family.

(a) Apocynaceae
(b) Solanaceae
(c) Leguminosae
(d) Rubiaceae

Ans.: (a)

31. Example of anticancer drug is:

(a) Vinca
(b) Podophyllum
(c) Both (a) & (b)

(d) None of the above

Ans.: (c)

32. Example of anti-diabetic drug is:

(a) Gymnema
(b) Pterocarpus
(c) Indian kino
(d) All of the above

Ans.: (d)

33. Punarnava is used:

(a) As diuretics
(b) As stochic
(c) In case of jaundice
(d) All of the above

Ans.: (d)

34. Puncture vine is the synonym for:

(a) Punarnava
(b) Gokhru
(c) Both (a) & (b)
(d) None of the above

Ans.: (b)

35. Ipecacuanha is of ____ family.

(a) Apocynaceae
(b) Solanaceae
(c) Leguminosae
(d) Rubiaceae

Ans.: (d)

36. Example of antidysentrics:

(a) Kurchi
(b) Ipecacuanha
(c) Both (a) & (b)
(d) None of the above

Ans.: (c)

37. The major phytoconstituent of turmeric is:

(a) Curcumin
(b) Borneol
(c) Caprylic acid
(d) Eugenol

Ans.: (a)

38. Margosa is the synonym for:

(a) Turmeric
(b) Myrrh
(c) Neem
(d) None of the above

Ans.: (c)

39. Substitute of cinchona is-

(a) Cuprea bark
(b) False cuprea bark
(c) Both (a) & (b)
(d) None of the above

Ans.: (c)

40. Ergot contains:

(a) Ergotamine
(b) Ergometrine
(c) Ergosine
(d) All of the above

Ans.: (d)

41. Biological source for amla is:

(a) Hypoprion brevirostris
(b) Emblica officinalis
(c) Both (a) & (b)
(d) None of the above

Ans.: (b)

42. The size of yeast powder is:

(a) 1.5 μ
(b) 1.6 μ

(c) 1.7 μ
(d) 1.8 μ

Ans.: (a)

43. Papaya is soluble in:

(a) Water
(b) Alcohol
(c) Organic solvents
(d) Glycerin

Ans.: (d)

44. All are used as diluents, except:

(a) Saffron
(b) Lactose
(c) Glucose
(d) Sesame oil

Ans.: (a)

45. Caramel is used as:

(a) Diluent
(b) Colour
(c) Emulsifying agent
(d) Disintegrating agent

Ans.: (b)

46. Which of the following is of leguminosae family:

(a) Acacia
(b) Guar gum
(c) Both (a) & (b)
(d) None of the above

Ans.: (c)

47. Synonym for honey is:

(a) Madhu
(b) Honey purified
(c) Mel
(d) All of the above

Ans.: (d)

48. Starch is soluble in:

(a) Boiling water
(b) Cold water
(c) Alcohol
(d) Benzene

Ans.: (a)

49. The colour of arachis oil is:

(a) Colourless
(b) White
(c) Yellow
(d) Pale yellow

Ans.: (d)

50. Olive oil get solubilize in:

(a) Chloroform
(b) Ether
(c) Both (a) & (b)
(d) None of the above

Ans.: (c)

51. Scientific name of lanolin is:

(a) Ovis aries
(b) Olea europoea
(c) Arachis hypogea
(d) Gelidium amansi

Ans.: (a)

52. Gelatin is used as:

(a) Dietary supplement
(b) Antidote for halogen poisoning
(c) Both (a) & (b)
(d) None of the above

Ans.: (c)

53. Sodium alginate is soluble in:

(a) Water
(b) Alcohol

(c) Ether
(d) Chloroform

Ans.: (a)

54. Liquorice is of ____ taste.

(a) Sweet
(b) Bitter
(c) Mucilaginous
(d) Aromatic

Ans.: (a)

55. Picrorhiza belongs to ____ family.

(a) Lebiaceae
(b) Rubiaceae
(c) Scrophulariaceae
(d) Apocynaceae

Ans.: (c)

56. Allium is the synonym for:

(a) Ginger
(b) Garlic
(c) Turmeric
(d) Fennel

Ans.: (b)

57. Synonym for tobacco is:

(a) Tambaku
(b) Tamak
(c) Pokala
(d) All of the above

Ans.: (d)

58. Biological source for pyrethrum is:

(a) *Chrysanthemum cinerariefolium*
(b) *Chrysanthemum marshallii*
(c) Both (a) & (b)
(d) None of the above

s.: (c)

59. Shatavari is of ____ family:

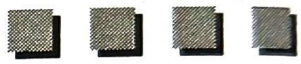
(a) Rubiaceae
(b) Meliaceae
(c) Liliaceae
(d) Solanaceae

Ans.: (c)

60. Diosgenin is found in:

(a) Shatavari
(b) Gymnema
(c) Dioscorea
(d) Pyrethrum

Ans.: (c)



9

Surgical Fibres, Sutures and Surgical Dressings

SURGICAL FIBRES

Fibres are obtained from three natural sources, i.e., plant, animal and mineral sources, which are used with reference to surgical dressings made up of natural or artificial origin. The fibres from various sources can be categorized as follows:

1. **Plant fibres:**
   - — Jute
   - — Flax
   - — Banana
   - — Cotton
   - — Hemp.
2. **Animal fibres:** Silk, wool.
3. **Regenerated and Synthetic fibres:**
   - A. Fibres regenerated from carbohydrate materials: Alginate yarn, rayon.
   - B. Fibres regenerated from protein materials: Aridil, fibrolin.
   - C. Synthetic: Nylone, terylene, orlon.
4. **Mineral fibres:** Glass, asbestos.

COTTON

Synonyms

Cotton wool, Purified cotton, Absorbent cotton, Surgical cotton.



Cotton

Biological Source

It consists of the epidermal trichomes or hairs of the seeds of *Gossypium herbaceum, Gossypium barbadensis,* belonging to the family Malvaceae.

Morphology

- **Colour:** White.
- **Odour:** Odourless.
- **Taste:** Tasteless.
- **Size:** 2.5-4.5 cm × 25-35 μ

Chemical Constituents

Cellulose, moisture, wax, fat and protoplasm.

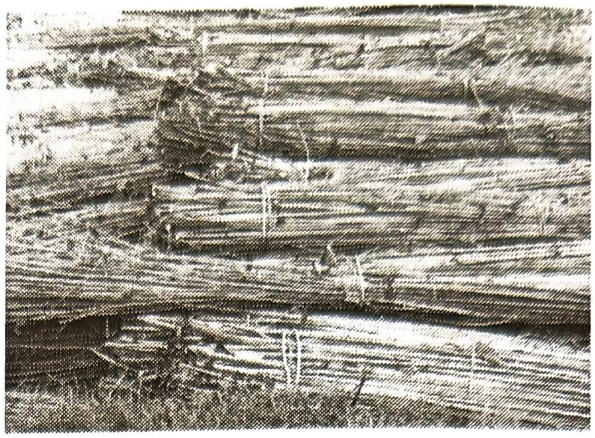
Uses

1. It is used as a filtering medium and in surgical dressings.
2. It also prevents the wounds from infection of micro-organisms.
3. It is also used an insulating material.

JUTE

Synonyms

Gunny.



Jute

Biological Source

It is thephloem fibres of the bark of *Corchorus olitorius* and *Corchorus capsularis,* belonging to the family Tiliaceae.

Morphology

- **Colour:** Yellowish-brown.
- **Odour:** Odourless.
- **Taste:** Tasteless.
- **Size:** 1-3 m × 10-25 μm.

Chemical Constituents

Cellulose, hemicellulose, lignin and moisture.

Uses

1. It is used for manufacturing the tows and padding splints.
2. It is also used in in the manufacture of filtering and staining medium.
3. It is also used to prepare coarse bags.

SILK

Biological Source

It is obtained from the cocoons of *Bombyx mori*, belonging to the family Bombycidae.

Chemical Constituents

Fibroin (protein).

Uses

1. It is used to sutures, sieves and ligatures.

RAYON

Synonyms

Regenerated cellulose, viscose rayon.

Uses

1. It is used mainly for making fabrics.
2. It is also used in the preparation of surgical dressings.

SURGICAL SUTURES

These are the sterile threads, strings or strands prepared for use in the surgery meant for sewing tissues together. Sutures may be absorbable or non-absorbable and or haemostatic. They should possess the following properties:

1. They should be sterilized.
2. They should not cause irritation.
3. They should have finest possible gauge and adequate strength.
4. They should be used for one occasion only.
5. If absorbable, the absorption time should be known.

SURGICAL DRESSINGS

These are the materials used alone or in combination to cover the wound for the purpose of protecting and its proper healing. Materials that hold the dressing in desired position called as bandage. Dressings having the following functions.

1. Reduction and prevention of infections.
2. Protection to wound healing.
3. Mechanical support to the tissues.

Classification of Surgical Dressings

1. **Fibres:**
   - A. **Non-medicated fibres:** Absorbent cotton, silk, wool, rayon etc.
   - B. **Medicated fibres:** Boric acid wool, capsicum wool.
2. **Fabrics:**
   - A. **Non-medicated:** Gauzes, bandages, plasters etc.
   - B. **Medicated:** Bandage, gauzes in form of fabrics.
3. **Bandages:**
   - A. **Non-medicated:** Crepe bandage, domette bandae, calico bandage etc.

B. **Medicated:** Plasters of Paris bandage, zinc paste bandage etc.

4. **Rubber and oil impregnated materials:**
   A. **Fibres and related materials:** Viscose, wood cellulose wadding.
   B. **Carded products:** Absorbent cotton, viscose wadding etc.
   C. **Non-extensible, non-adhesive woven products:** Absorbent muslin, domette bandage etc.
   D. **Non-extensible adhesive woven products:** Belladonna adhesive plaster, zinc oxide surgical adhesive tape.
   E. **Extensible non-adhesive woven products:** Cotton bandage, elastic web bandage.
   F. **Extensible adhesive woven products:** Elastic adhesive bandage, extension plaster.
   G. **Non-woven products:** Impermeable plastic surgical adhesive tape, permeable plastic surgical adhesive tape etc.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write short note on surgical fibres and sutures.
2. Write short note on jute and silk.
3. Write short note on cotton and rayon.

LONG ANSWER TYPE QUESTIONS

1. Write a note on surgical fibres, sutures and surgical dressings.

2. Discuss briefly about surgical fibres with suitable examples.
3. Write the classification of surgical dressings.

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. All are plant fibres, except:

(a) Cotton
(b) Silk
(c) Hemp
(d) Jute

Ans.: (b)

2. Nylon is a:

(a) Plant fibre
(b) Animal fibre
(c) Synthetic fibre
(d) Mineral fibre

Ans.: (c)

3. Cotton is of ____ family.

(a) Malvaceae
(b) Rubiaceae
(c) Leguminosae
(d) Dioscoreaceae

Ans.: (a)

4. Jute is of ____ family.

(a) Malvaceae
(b) Rubiaceae
(c) Tiliaceae
(d) Solanaceae

Ans.: (c)

5. Biological source for silk is:

(a) *Gossypium herbaceum*
(b) *Corchorus olitorius*
(c) *Bombyx mori*
(d) *Corchorus capsularis*

Ans.: (c)

6. Which statement is not correct for sutures?

(a) They should not cause irritation.
(b) They should be used for one occasion only.
(c) They should have finest possible gauge and adequate strength.
(d) They should not be sterilized.

Ans.: (d)

7. Function of surgical dressings:

(a) Reduction and prevention of infections.
(b) Protection to wound healing.
(c) Mechanical support to the tissues.
(d) All of the above.

Ans.: (d)

10

Traditional Systems of Medicine

AYURVEDA

Ayurveda is an ancient science of life. It is believed to be prevalent for last 5000 years in India. It is the most utilized traditional systems of medicine in the world.

The principal of this system is based on the hypothesis that everything in the Universe are composed of five basic elements:

1. Space.
2. Air.
3. Energy.
4. Liquid, and
5. Solid.

They lie in the human body in three combination forms:

1. Vata (space & air).
2. Pitta (energy & liquid).
3. Kapha (liquid & solid).

These vata, pitta and kapha together are called as **Tridosha** (three pillers of life). Tridosha again exist in human body in seven forms called as saptadhatu. These are

1. Rasa means lymph.
2. Rakta means blood.
3. Meda means adipose tissue.
4. Mamsa means flesh.
5. Majja means nervine tissue.
6. Shukra means reproductive tissue.
7. Asthi means bones.

When these tissues are subjected to wear and tear, they form mala which means excretory material. When these tridosha, saptadhatu as well as mala are in the balance with each other, then the subject is said to be healthy, but the imbalance of the above causes diseases.

It is hypothesized in this system that five characteristics of medicinal herbs may be utilized in the treatment of various pathological conditions such as rasa, guna, virya, vipak and prabhava. Example of dosage forms are- Churna, Avaleha, Ghrita, Bhasma, etc.

SIDDHA SYSTEM OF MEDICINE

The term siddha means achievement. The proficiency of medicine is done by the practice of bhakti and yoga. Like Ayurvedic system of medicine, Siddha system of medicine also believes the role of three humors, i.e., vata, pitta and kapha, and everything in the Universe is made up of five basic elements:

1. Earth
2. Water

3. Sky.
4. Fire, and
5. Air.

In this system diseases are diagnosed by:

- Pulse reading.
- Colour of body.
- Study of voice.
- Urine examination.
- Status of digestive system.
- Examination of tongue.

Few natural drugs used in Siddha system of medicine are:

- Abini (*Papaver somniferum*)
- Ethi (*Strychnous nux-vomica*)
- Gomathi (*Datura stramonium*)
- Rotha polam (*Aloe barbadensis*)

AROMATHERAPY

It is called as holistic healing treatment that uses various herbal extracts to promote health as-well-as well-being. It is also called as essential oil therapy. Aromatherapy uses various medicinal aromatic essential oils for betterment of health, mind and spirit. Aromatherapy improves both the physical and emotional health. The various essential oils that are used in this therapy are- Black pepper, Eucalyptus, Fennel, Caraway, Garlic, Ginger, Jasmine, Lavender, Rosemary, Sandalwood, etc.

UNANI SYSTEM OF MEDICINE

Unani System of Medicine was originated in Greek which was further improved by Arabian physicians in Persia of Iran. This system is hypothesized on two theories:

1. **Hippocratic theory of four humours:**
   - Blood.
   - Phlegm.
   - Yellow bile.
   - Black bile.
2. **Pythagorian theory of four qualities:**
   - Hot (represents Earth).
   - Cold (represents Water).
   - Moist (represents Fire).
   - Dry (represents Air).

This system was further improved by Arabian physicians with seven working principles known as *Umur-e-Taiba*. It is believed that these principles are responsible for body constitution as well as pathological imbalances. These include:

(a) Elements

(b) Temperaments

(c) Humours

(d) Organs

(e) Life

(f) Spirit

(g) Energy and actions

The aim of this system is to treat the cause of the disease and not the symptoms, for which full history of the patient is recorded

along with his pulse, urine and stool examinations are carried out. Polyherbal formulations are used to treat the diseases in this system. Examples of Unani medicines are Madar, Fufal, Gilo, Kabab, Kulthi, Karanj, Lodh, Qust, Sana, Tagar, Zeera, Siyah, etc.

HOMEOPATHIC SYSTEM OF MEDICINE

This is a newer system of medicine, developed in 18th century by a German physician and chemist **Samuel Hahnemann.** The principle of this system is that the cause of disease itself can be utilized for its treatment. So, Samuel put the 4th law of Similars that represents like cures like (*Similae similibus curentur*). For example, cinchona can produce the symptoms of malaria while it is used as very potent drugfor the treatment of malaria. In this system, there is no specific drug treatment, but the drugs are selected based on the symptoms and clinical condition of the patient. The drug extracts are extremely diluted in terms of decimal or centesimal potencies during the treatment, which is believed for potent curative effect. Examples of Homeopathic drugs are Arnica, Belladonna, Marigold, Colchichum, Ergot, Aconite, Nux-vomica, Opium, Honeybees, Cantharis, Barium carbonate, Arsenic oxide, Kalashisa, Antimony Tartrate, Sulphur, Copper, Aluminium, Phosphorus, Platinum, etc.

AYURVEDIC FORMULATIONS

- **Arista:** This type of formulation is made by soaking the powdered form of drugs or in the form of decoction of the herbs in sugar solution for a specific time period.
- **Asava:** Asavas are also made by soaking the powdered form of drugs or in the form of decoction of the herbs in sugar solution for a specific time period.

- **Gutika:** Medicinal herbs in the form of tablets or pills are called as gutika or vati which are prepared using one or more drugs from plant, animal or mineral sources.
- **Taila:** This type of formulation is prepared by decoction and kalkas of herbal drugs in oils as per standard formula of the Ayurvedic formulary.
- **Churna:** Drugs that are prepared in the powdered form are known as churna. These formulations are prepared by cleaning the herbs and other ingredients followed by drying and then powdered by mechanical methods to the fineness of at least 80 mesh.
- **Lehya:** These are the semi-solid dosage form of drugs, also known as avaleha. Preparation of lehya done by adding jagger sugar or sugar dandy, drugs or herbs, honey if required, boiled and then kept aside for cooling and mixed well.
- **Bhasma:** Bhasmas are prepared by three processes i.e. shodhana, dravana and marana. Here, gold leaves are heated to red hot and dipped in sesa oil, this process is continued for seven times and then the leaves are dried by means of heat.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write short note on aromatherapy.
2. Write short note on Siddha system of medicine.
3. Write the principle of Ayurvedic system of medicine.

LONG ANSWER TYPE QUESTIONS

1. Discuss in details about Ayurvedic system of medicine.

2. Discuss briefly about SSM and Aromatherapy.
3. Write short note on Ayurvedic formulations.

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. Vata is composed of:

(a) Space & air
(b) Energy & liquid
(c) Liquid & solid
(d) None of the above

Ans.: (a)

2. Meda means:

(a) Flesh
(b) Blood
(c) Adipose tissue
(d) Bones

Ans.: (c)

3. In Ayurveda, excretory materials are known as:

(a) Mala
(b) Rakta
(c) Rasa
(d) Majja

Ans.: (a)

4. Pitta is composed of:

(a) Space & air
(b) Energy & liquid
(c) Liquid & solid
(d) None of the above

Ans.: (b)

5. Example of Ayurvedic dosage form:

(a) Churna
(b) Ghrita
(c) Bhasma

(d) All of the above

Ans.: (d)

6. In SSM, diseases are diagnosed by:

(a) Pulse reading
(b) Colour of body
(c) Urine examination
(d) All of the above

Ans.: (d)

7. Abini is dosage form of:

(a) Ayurveda
(b) Siddha system of medicine
(c) Aromatherapy
(d) None of the above

Ans.: (b)

8. Kapha is composed of:

(a) Space & air
(b) Energy & liquid
(c) Liquid & solid
(d) None of the above

Ans.: (c)

9. Example of drug used in aromatherapy is:

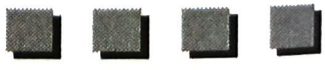
(a) Sandalwood
(b) Black pepper
(c) Lavender
(d) All of the above

Ans.: (d)

10. Shukra means:

(a) Flesh
(b) Bones
(c) Lymph
(d) Reproductive tissue

Ans.: (d)



11

Medicinal and Aromatic Plants: National Economy and Export Potential

ROLE OF MEDICINAL AND AROMATIC PLANTS IN NATIONAL ECONOMY

- Medicinal plants are utilized by 80% of the population over the countries for their primary health care needs.
- They generate income to the people of many Asian countries.
- About 80% of the medicinal plants used by industries are collected from wild sources and remaining are collected from the commercial sources.
- The medicinal plants influence local, national and international economics.
- In developing countries, plants are the main source of alternative medicine.
- Medicinal plants based medicines also have significant role in most Latin American countries.

MEDICINAL PLANT EXTRACTS DEMAND

Item	Demand value (million US$)		
	1989	1993	1998
Aloe extract	38	46	63
Botanical extract	180	230	345
Others	22	34	67
Plant acids/enzymes	19	37	65
Essential oils	101	113	150
Other natural products	85	115	180
Total	**445**	**575**	**870**

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write the Role of medicinal and aromatic plants in national economy.
2. Write a short note on medicinal plant extracts demand.

12

Herbs as Health Food

INTRODUCTION

The basic requirements for humans to survive are food, clothing and shelter. Among these food tops the list. Humans can eat almost anything. The early man lived by gathering, hunting and fishing and later cultivation. Now-a-day, the demand is that any food product should be as natural as possible, thus, people gains the knowledge for the preparation of healthy foods.

NUTRACEUTICALS

The term nutraceutical is derived from the word nutrition which is coined in 1989 by Dr. Stephen De Felice, Chairman of the foundation for Innovation in Medicine. A nutraceutical is the substances which can be considered as a food or part of a food that provides improved heath, by the prevention and treatment of diseases. They are also sometime referred as functional foods.

Nutraceuticals are classified as follows:

1. **Antioxidants:** Vitamins like vitamin C, vitamin E and carotinoids are known as antioxidant vitamins. These

vitamins are rich in many fruits and vegetables and provide their protective action by free radical scavenging mechanism. Vitamin C donates hydrogen atom to lipid radicals, quenches singlet oxygen radical and removes molecular oxygen.

2. **Pro-biotics:** A probiotic can be defined as a live microbial food supplements which on administration provides microbial balance of the intestine. Probiotics are available in the form of powder, liquid, gel or paste or in the form of granule, capsule, etc. Probiotics generally includes the bacteria, Lactobacilli such as *L. acidophilus, L. casei, L. delbrueckii subsp. bulgaricus, L. brevis, L. cellobiosus,* Bifidobacteria such as *B. bifidun, B. adolescentis, B. infantis, B. longum,* etc.
3. **Pre-biotics:** These are the dietary ingredients that beneficial affect the host by metabolism of the gut microbiota. Prebiotics are the short chain polysaccharides having identical chemical structures and these cannot be digested by human, but in the fructose-based oligosaccharides which lie in food generally or are given in the foods. Prebiotics have a beneficial effect growth of Lactobacillus and Bifidobacterial in the gut which is helpful in the biotransformation. Fructo-oligosaccharides are highly found in various herbal products such as chicory, banana, tomato, allium, etc.
4. **Dietary fibres:** These are the herbal food materials which are not hydrolyzed by enzymes that are secreted by the digestive tract, but they can be digested by microorganisms in the gut. Dietary fibres consist of non-starch polysaccharides like celluloses, hemicelluloses, gums and pectins, lignin, resistant dextrins, etc., and resistant starches. For example, oats, barley and beans are the rich source of soluble dietary fibres.

5. **Omega-3-fatty acids:** These are the essential fatty acids as these are crucial to body's function and are introduced externally through the diet. The major omega-3-fatty acids are Alfa-Linolenic Acid (ALA) and Eicosapentanoic Acid (EPA), Docosahexanoic Acid (DHA). ALA is found in flaxseed, soyabeans, canola, walnuts, etc. while EPA and DHA are found in fatty fishes like mackerel, salmon, herring, trout, blue fin tuna, etc.

HERBAL NUTRACEUTICALS

1. SPIRULINA

It consists of a biomass of cyanobacteria obtained from *Arthrospira platensis* and *A. maxima.*

Chemical Constituents

5% water, 24% carbohydrates, 8% fat, and (51-71)% protein.

Uses

- It is used as a source of dietary protein, B-vitamins and iron.
- It is also used for weight loss, attention deficit-hyperactivity disorder.
- It is also used in case of hayfever, diabetes, stress, anxiety, depression and premenstrual syndrome.
- It is also used for treatment of precancerous growths inside the mouth.

2. GARLIC

It is obtained from *Allium sativum*, native to central Asia and northeastern Iran.

Chemical Constituents

Carbohydrates, sugars, dietary fibre, fat, protein, vitamins like Thiamin (B_1), Riboflavin (B_2), Niacin (B_3), Pantothenic Acid (B_5), Vitamin B_6, Folate (B_9), Vitamin C and minerals like calcium, iron, magnesium, manganese, phosphorus, potassium, sodium, zinc.

Uses

- It is used for the treatment of blood pressures, coronary heart disease and heart attack.
- It is also used in case of high cholesterol and inherited high cholesterol level.
- It is also used to reduce high blood flow due to narrowed arteries and hardening of the arteries.

3. Soya

It consists of dried seeds of *Glycine soja* seib. belonging to the family Papilionaceae

Chemical Constituents

18% fixed oil, 38% proteins and an enzyme urease.

Uses

- It is used as a food for diabetic patients.
- It is also used to extract edible fixed oil commercially.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write short note on Omega-3-fatty acids.
2. Write short note on spirulina and soya.

LONG ANSWER TYPE QUESTIONS

1. Write a brief introduction to nutraceuticals.
2. Write a note on herbal nutraceuticals.

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. The basic requirement for human to survive is:

(a) Food
(b) Cloth
(c) Shelter
(d) All of the above

Ans.: (d)

2. The term nutraceutical was coined in the year of:

(a) 1987
(b) 1988
(c) 1989
(d) 1990

Ans.: (c)

3. Nutraceutical was coined by:

(a) Sydler
(b) Dioscorides
(c) Dr. Stephen De Felice
(d) Hippocrates

Ans.: (c)

4. Vitamin C & E are also known as:

(a) Antioxidants
(b) Pro-biotics
(c) Pre-biotics
(d) None of the above

Ans.: (a)

5. Omega-3-fatty acids include:

(a) ALA
(b) EPA
(c) DHA
(d) All of the above

Ans.: (d)

6. The moisture content of spirulina is:

(a) 4%
(b) 5%
(c) 6%
(d) 7%

Ans.: (b)

7. Soya contains ____ of proteins.

(a) 35%
(b) 38%
(c) 45%
(d) 77%

Ans.: (b)



13

Herbal Formulations

INTRODUCTION

The WHO defines "herbs as of fresh or dried, fragmented or powdered form of plant product, which can be utilized in its original state or further processed and formulated to prepare the finished herbal formulation". Herbal formulations represent the dosage forms containing one or more than that of herbal products or some processed herbs in the required quantities that provide nutritional, cosmetic benefits as-well-as used to diagnose, treat and mitigate diseases. These can be prepared by extraction, distillation, expression, fractionation, purification, concentration or fermentation. Herbal formulations consist of mixtures or decoction or bitter, capsule, powder, teas, tincture, soap, ointment and cream. Production of herbal formulations includes the following stages-collection, processing, sterilization, preservation and packaging.

HERBAL FORMULATIONS

1. **Syrups:** These are the sweet infusions or decoctions. These are effective in disguising unpleasant taste of unpalatable

herbs. Syrups are prepared with equal proportion of herbal infusion or decoction and honey or sugar. Some examples of syrups are raspberry syrup, cherry syrup, orange syrup, tolu syrup, sarsaparilla syrup, glycyrrhiza syrup, mulberry syrup, etc.

2. **Powders:** These are the finest particles of the medicinal herbs at least of 80 mesh used for treatment of several chronic diseases like diabetes, asthma, etc., powders are prepared using one or more medicinal herbs. Some of the Ayurvedic powdered formulations are bhasmas, churnas, etc.
3. **Tablets:** These are the solid dosage forms of the herbal formulations prepared by powdered herbs, herbal extracts or compounds of the herbs. Pharmaceutical aids are added in the preparation of tablets. They are circular in shape and may be flat or sometimes biconvex.
4. **Phytosomes:** These are the novel herbal formulations. Phytosomes are prepared by converting the water soluble phytoconstituents into lipid compatible molecule complexes.
5. **Nanoparticles:** These are also novel herbal formulation. These type of herbal formulations are preferred for their efficient delivery of both hydroplilic and hydrophobic drugs. The particle size of nanoparticles ranging from 10 to 1000 nm.
6. **Niosomes:** These are also novel herbal formulation. Niosomes are multicellular vesicles from non-ionic surfactants of alkyl or dialkyl polyglycerol ether or cholesterol. Niosomes are developed and preferred over liposomes because of the very high cost and various problems like unstable nature.
7. **Proniosomes:** These formulations are one step forward to the niosomes. They are used for various applications in

delivery of active constituents at the desired site of action. Proniosomal gels are the formulations, that on in-situ hydration with water from the skin are converted into niosomes.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write short note on the preparation of herbal syrups and tablets.
2. Write short note on niosomes and proniosomes.

LONG ANSWER TYPE QUESTIONS

1. Write briefly about the preparation of herbal formulations.
2. Write a short note on novel herbal formulations.

14

Herbal Cosmetics

INTRODUCTION

The term "cosmetic" came from the Greek word "kosm tikos", means having the power, arrange and skill in beautifying. Herbal cosmetics are prepared using various permissible ingredients for the formation of the base in which one or more herbal products are used to beautify the skin and hair. It is believed that synthetic cosmetic products are harmful and so people are aware of using herbal products as cosmetics.

ALOE

Synonyms

Aloe

Biological Source

It is the dried juice of the leaves of *Aloe vera, Aloe ferox, Aloe Barbadensis, Aloe perryi,* belonging to the Family Liliaceae.

Morphology

- **Colour:** Dark brown, brownish-black and black in colour.
- **Odour:** Charastrastics.
- **Taste:** Intensly bitter.
- **Size:** Found in the form of masses of various sizes.

Chemical Constituents

Barbaloin, Aloe-emodin, Resin, Isobarbaloin.

Uses

1. It is used as irritant purgative.
2. It is used in cosmetic as a protective.
3. It is also used in skin blemishes.
4. It is used in the treatment of burns.
5. It is also applied for painful inflammations.

ALMOND OIL

Synonyms

Bitter Almond, sweet Almond, Amygdala amara.

Biological Source

It consists of a fixed oil obtained by expression from the seeds of *Prunus amygdalus* (sweet almonds), or *P. amygdalus* (bitter almonds), belonging to the family Rosaceae.

Morphology

- **Colour:** Brown.
- **Odour:** Odourless.
- **Taste:** Sweet and bitter.
- **Size:** 20 mm × 125 mm ×10 mm.
- **Shape:** Flattened, oblong, ovoid with markings on testa.

Chemical Constituents

Bland fixed oil, proteins, emulsin, and amygdalin.

Uses

1. It is used in demulcent skin lotion.
2. It is also used as sedative.

LAVENDER OIL

Synonym

Comman Lavendor.

Biological Source

It consists of the volatile oil obtained by steam distillation of fresh flowering tops of *Lavandula officinalis* belonging to the family Labiatae.

Morphology

- **Colour:** Colourless or yellow liquid.

- **Odour:** Characteristic pleasant aroma.
- **Solubility:** Slightly soluble in water, soluble in 70% alcohol, carbon disulphide.

Chemical Constituents

Linalyl acetate, linalool, pinene, geraniol and cineol.

Uses

1. It is used as cosmetics.
2. It is also used as aromatic, carminative and flavouring agent in perfumery.

OLIVE OIL

Synonym

Oleum Olivae.

Biological Source

It is the fixed oil of the ripe fruits of *Olea europoea,* belonging to the family Oleaceae.

Morphology

- **Colour:** Pale yellow or greenish-yellow.
- **Odour:** Slight and characteristics.
- **Taste:** Bland, faintly acrid.
- **Solubility:** Soluble in chloroform, ether and insoluble in alcohol.

Chemical Constituents

Olein, palmitin and linolein.

Uses

1. It is used as an emollient and soothing agent.
2. It is used to soften the skin and crusts in eczema and psoriasis.
3. It is also used as nutrient, demulcent and mild laxative.

ROSEMARY OIL

Biological Source

It is the volatile oil obtained from fresh flowering tops of *Rosmarinus officinalis* belonging to the family Labiatae.

Morphology

- **Colour:** Colourless or pale yellow liquid.
- **Odour:** Characteristic rosemary flavour.
- **Taste:** Camphoraceous.
- **Solubility:** Insoluble in water, soluble in 80% alcohol.

Chemical Constituents

Borneol, bornyl acetate, camphor, eucalyptol, pinene, d-camphene, cineol, terpenes, resin, ursolic acid and bitter principal.

Uses

It is used as carminative, rubefacient, stimulant and flavouring agent for the preparation of:

1. Cosmetics.
2. Liniments and inhalers.
3. Hair lotions and soaps.

SANDAL WOOD OIL

Synonyms

Yellow sandal wood, Lignum Santali.

Biological Source

It is the dried heart wood of *Santalum album*, belonging to the family Santalaceae.

Morphology

- **Colour:** Yellowish or pale reddish.
- **Odour:** Strong and pungent.
- **Taste:** Slightly bitter.
- **Solubility:** Soluble in alcohol, chloroform and insoluble in water.

Chemical Constituents

α-santalol, β-santalol, santalal, santene, santenone, teresantol.

Uses

1. It is used as perfume.
2. It is used in the treatment of dysurea.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write short note on rosemary oil.
2. Write short note on almond oil.
3. Write short note on olive oil.
4. Write short note on lavender oil.
5. Write short note on aloe.

LONG ANSWER TYPE QUESTIONS

1. Give a brief introduction to herbal cosmetics with suitable examples.
2. Write a note on almond oil and lavender oil in respect to herbal cosmetics.

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. Aloe belongs to the ____ family.

(a) Apocynaceae
(b) Rubiaceae
(c) Liliaceae
(d) Leguminosae

Ans.: (c)

2. Almond oil is ____ in colour.

(a) White

(b) Brown
(c) Yellow
(d) Grey

Ans.: (b)

3. Linalyl acetate is found in:

(a) Aloe
(b) Almond
(c) Lavender oil
(d) Rosemary oil

Ans.: (c)

4. The taste for rosemary oil is:

(a) Camphoraceous
(b) Mucilaginous
(c) Bitter
(d) Sweet

Ans.: (a)

5. Strongly bitter taste is found for:

(a) Amla
(b) Aloe
(c) Olive oil
(d) Sandal wood oil

Ans.: (d)

6. The scientific name for sandal wood oil is:

(a) Santalum album
(b) Rosmarinus officinalis
(c) Olea europoea
(d) Lavandula officinalis

Ans.: (a)



15

Cultivation and Collection of Natural Drugs

CINCHONA

The Cinchona plant is cultivated by maintaining the following parameters:

- **Altitude:** 1000-3000 m.
- **Temperature:** 60-70°F.
- **Rainfall:** 250-380 cm.
- **Soil type:** Light, well drained forest soil.
- **Soil pH:** 4.2-5.6.
- **Propagation:** Sowing the seeds or budding or layering.
- **Germination:** 3-6 weeks.
- **Collection:** The barks are collected from 4-20 years, after the cultivation by coppicing method. Then they are dried artificially and packed.

Cardamom

Cardamom plants are cultivated by maintaining the following parameters:

- **Altitude:** 600-1600 m.

- **Temperature:** 50-100°F.
- **Rainfall:** 150-600 cm.
- **Soil type:** Full of moisture and well drained.
- **Propagation:** Sowing the seeds.
- **Germination:** 7-8 weeks.
- **Collection:** Fruits are collected just before their ripening. Then they are dried artificially for 48 hours and then packed.

RAUWOLFIA

The Rauwolfia plants are cultivated by maintaining the following parameters:

- **Altitude:** 500-1800 m.
- **Temperature:** 10-38°C.
- **Rainfall:** 250-500 cm.
- **Soil type:** Clay loamy soil with moisture and good drainage.
- **Propagation:** Seeds, roots, cutting etc.
- **Fertilizers:** Ammonium sulphate and urea.
- **Collection:** The roots are collected during 3-4 years, after the cultivation. Then they are dried artificially or naturally and packed.

CLOVE

Clove is cultivated by maintaining the following parameters:

- **Altitude:** 900 m.
- **Rainfall:** 150-250 cm.
- **Soil type:** Sandy loam and laterite soils.

- **Propagation:** Sowing the seeds.
- **Germination:** 4-5 weeks.
- **Fertilizers:** Ammonium sulphate, super phosphate and potas.
- **Collection:** The flower buds are collected during 15-20 years, after the cultivation by hand-picking method. Then they are dried naturally (sun drying) and then packed.

QUESTIONS

SHORT ANSWER TYPE QUESTIONS

1. Write the cultivation and collection of cinchona.
2. Write the cultivation and collection of cardamom.
3. Write the cultivation and collection of rauwolfia.
4. Write the cultivation and collection of clove.

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. The soil requirement for cultivation of cinchona is:

(a) Light soil
(b) Well drained forest soil
(c) Both (a) & (b)
(d) None of the above

Ans.: (c)

2. The germination time for cultivation of cinchona is _____ weeks.

(a) 1-3
(b) 3-6
(c) 6-9
(d) 9-11

Ans.: (b)

3. **The optimum temperature for cultivation of cardamom is:**
   (a) 15-30°F
   (b) 40-500°F
   (c) 50-100°F
   (d) 100-200°F

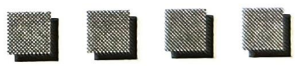
Ans.: (c)

4. **Fertilizers used in the cultivation of rauwolfia is:**
   (a) Ammonium sulphate
   (b) Urea
   (c) Both (a) & (b)
   (d) None of the above

Ans.: (c)

5. **The altitude requirement for cultivation of clove is:**
   (a) 900 m
   (b) 700 m
   (c) 500 m
   (d) 400 m

Ans.: (a)



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Phytochemical Investigation of Drugs

ALKALOIDS

1. **Mayer's test:** Drug + Mayer's reagent (potassium mercuric iodide solution), cream or pale yellow precipitate.
2. **Dragendorff's test:** Drug + Dragendorff's reagent (potassium bismuth iodide solution), brown or reddish-brown colour or precipitate.
3. **Wagner's test:** Drug + Wagner's reagent (iodine and potassium iodide solution), yellow precipitate.
4. **Hager's (Picric acid) test:** Drug + Hager's reagent (saturated solution of picric acid), yellow precipitate.

CARBOHYDRATES

To perform various tests for carbohydrate the solution of plant extracts were prepared by dissolving in 5 ml of distilled water and filtered.

(a) **Molisch's test:** Drug + 1% alcoholic alpha naphthol + concentrated sulphuric acid.

(b) **Fehling's test:** Drug + Fehling's solution-A + Fehling's solution-B, heated for 5-10 minutes, reddish orange ppt. appeared.

GLYCOSIDES

(a) **Cardiac glycoside (Keller-Killani test):** Drug + glacial acetic acid + ferric chloride + concentrated sulphuric acid. The reddish brown colour appeared at the junction of the two layers shows the presence of cardiac glycosides.

(b) **Anthraquinone glycosides (Borntrager's test):** Drug + dilute sulphuric acid, boiled and filtered, filtrate + equal volume of benzene or chloroform. Then the benzene layer was removed and ammonia solution was added. Appearance of pink or red colour of the Ammonical layer indicates the presence of anthraquinone glycosides.

(c) **Saponin glycosides:** Extract as well as powdered drugs were mixed in water. Formation of foam was observed.

(d) **Coumarin glycosides:** Drug + ammonium hydroxide, appearance of blue/green coloured fluorescence was observed.

PHYTOSTEROL

Drug + acetic acid + acetic anhydride + concentrated sulphuric, bluish green colour observed.

FIXED OILS AND FATS

(a) Extracts were placed between two membrane filter papers and thenpressed; formation of oil stain on the filter papers was observed.

(b) Drug + 0.5 N alcoholic potassium hydroxide + 1 drop of phenolphthalein, heated for 1-2 hours. The production of soap or partial neutralization of alkali was observed.

TANNINS

Test solution was prepared by dissolving the extract with water and treated with the following:

(a) Dilute ferric chloride solution (5%) produced violet colour.

(b) Gelatin with 10% NaCl produced white precipitate.

(c) Lead acetate solution produced white precipitate.

PROTEINS

Test solution was prepared by dissolving the extract with water and treated with

(a) Millon's reagent: Drug + Millon's reagent; development of red colour observed.

(b) Biuret test: Drug + 5% solution of sodium hydroxide + 1% copper sulphate. Pink or purple colour was observed.

GUMS AND MUCILAGES

Drug + ethanol, filtered. The ppt. formed wasair dried in and examined for its swelling properties.

FLAVANOIDS

(a) Drug + sodium hydroxide solution, formation of blue to violet colour (Anthrocyanins), yellow colour (Flavones), yellow to orange colour (Flavonones).

(b) Drug + concentrated sulphuric acid, the appearance of yellowish orange colour (Anthrocyanins), orange to crimson (Flavonones).

(c) **Shinoda's test:** Drug + ethano + piece of magnesium + concentrated hydrochloric acid, heated. Formation of magenta colour was observed.

LIGNIN

Drug + alcoholic phloroglucinol + concentrated hydrochloric acid, formation of red colour was observed.

TERPENOIDS

Noller's test: Drug + tin + thionyl chloride. Appearance of pink colour was observed.

STEROIDS

Libermann – Burchard test: Drug + chloroform + acetic anhydride + conc. sulphuric acid. The appearance of red, then blue and finally green colour was observed.

QUESTIONS

MULTIPLE CHOICE QUESTIONS (MCQ's)

1. **Mayer's reagent is:**
   (a) Potassium mercuric iodide solution
   (b) Potassium bismuth iodide solution
   (c) Iodine and potassium iodide solution
   (d) Picric acid

Ans.: (a)

2 Wagner's reagent is:

(a) Potassium mercuric iodide solution
(b) Potassium bismuth iodide solution
(c) Iodine and potassium iodide solution
(d) Picric acid

Ans.: (c)

3. Dragendorff's reagent is:

(a) Potassium mercuric iodide solution
(b) Potassium bismuth iodide solution
(c) Iodine and potassium iodide solution
(d) Picric acid

Ans.: (b)

4. Which is not a test for carbohydrates:

(a) Molisch's test
(b) Fehling's test
(c) Millon's test
(d) All of the above

Ans.: (c)

5. Keller-Killani test is done for identification of:

(a) Cardiac glycosides
(b) Anthraquinione glycosides
(c) Coumarin glycosides
(d) None of the above

Ans.: (a)

6. Millon's test performed for identification of:

(a) Alkaloids
(b) Glycosides
(c) Proteins
(d) Tannins

Ans.: (c)

7. Saponins are identified by mixing the extract and powder with:

(a) Water

(b) Alcohol
(c) Glycerin
(d) Chloroform

Ans.: (a)

8. **When extract is mixed with gelatin and NaCl, it produces:**
   (a) Yellow ppt.
   (b) White ppt.
   (c) Cream coloured ppt.
   (d) Black ppt.

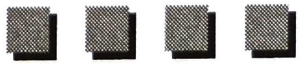
Ans.: (b)

9. **Which is the identification test for proteins:**
   (a) Millon's test
   (b) Biuret test
   (c) Both (a) & (b)
   (d) None of the above

Ans.: (c)

10. **Shinoda's test is done to identify:**
    (a) Gums
    (b) Lignins
    (c) Terpenoids
    (d) Flavonoids

Ans.: (d)



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