

CLASSIFICATION OF CRUDE DRUGS

- The term crude drug generally applies to the products from plant and animal origin found in a raw form.
- Crude drugs are further grouped as organized (cellular) or unorganized (acellular) according to whether they contain a regular organized cellular structure or not.
- Organised drugs represent a part of the plant and they are made up of cells.
- Unorganized drugs are solid or liquid materials which do not consist parts of plants and are obtained from natural sources by a variety of extraction procedures.

The crude drugs are classified according to their;

1. Alphabetical status
2. Taxonomy of plants and animals from which they are derived
3. Morphology
4. Chemical nature of their active constituents
5. Chemo taxonomic status
6. Pharmacological actions and their therapeutic applications

1. Alphabetical classification

The crude drugs are arranged according to the alphabetical order of their latin and English names.

some of the pharmacopoeias and reference books which classify the crude drugs according to this system are as follows

1. Indian pharmacopoeia
2. British pharmacopoeia
3. British herbal pharmacopoeia
4. United states pharmacopoeia and National formulary
5. British pharmaceutical codex
6. European pharmacopoeia (latin titles)
7. Encyclopaedia of common natural ingredients used in drugs and cosmetics.

For example;

Acacia, Benzoin, Cinchona, Dill, Ergot, Fennel, Gentian, Hyoscyamus, Ipecacuanha, Jalap, Kurchi, Liquorice, Myrrh, Nuxvomica, Opium, Podophyllum, Quassia, Rauwolfia, Senna, Thyme, Uncaria gambier, Vasaka, Woolfat, Xanthan gum, Yellow bees wax, Zedoary.

2. Taxonomical (biological) classification

- The drugs are classified according to plants or animals from which they are obtained in phyla, orders, families, genera, species, sub species etc.
- This method of classification is based on the consideration of natural relationship or phylogeny among plants or animals.
- The crude drugs of plant origin are classified on the basis of one of the accepted systems of botanical classification.
- A large number of plant families to be studied at one time.
- The drugs obtained from plants having alternate leaves, cymose flowers and fruits that are berries or capsules (Hyosyamus, datura, belladonna and stramonium) are considered with other members of Solanaceae.

Phylum – Spermatophyta

Division – Angiospermae

Class – Dicotyledons

Order – Rosales

Family – Leguminosae

Sub family – Papilionaceae

Genus – *Glycyrrhiza*, *Astragalus*, *Myroxylon*

Species – *Glycyrrhiza glabra*, *Astragalus gummifer*,
Myroxylon balsamum.

Phylum – spermatophyta

Division – Angiospermae

Class – Dicotyledons

Sub class – sympetalae

Order – Tubiflorae

Family – Solanaceae

Genus – *Atropa, Hyoscyamus, Datura*

Species – *Hyoscyamus niger, Datura stramonium, Atropa belladonna.*

3.Morphological classification

- The crude drugs are grouped according to the part of the plant or animal represented in to organized and un organized drugs.
- The organized drugs are divided in to parts of plants like leaves, flowers, fruits, seeds, woods, barks and subterranean parts like root and rhizomes.
- The un organized drugs are dried latex, gums, extracts etc.
- Some of the examples of crude drugs under this type of classification are as follows;

Seeds – Nuxvomica, Isapghul, Strophanthus

Leaves – Senna, Digitalis, Vasaka, Eucalyptus

Barks – Cinchona, Kurchi, Cinnamon, Quillia

Woods – Quassia, Sandal wood, Sassafras

Roots – Rauwolfia, Ipecacuanha , Aconite, Jalap

Rhizomes – Turmeric, Ginger, Valerian, Podophyllum

Flowers – Clove, Pyrethrum, Saffron, Artemisia

Fruits – Coriander, Colocynth, Fennel, Bael

Entire drugs – Ephedra, Ergot, Belladonna, Cantharides

Dried latex – Opium, Papain

Dried juices – Aloes, Red gum

4. Chemical classification

- The crude drugs are divided into different groups according to the chemical nature of their most important constituent.
- Since the pharmacological activity and therapeutic significance of crude drugs are based on the nature of their chemical constituents.
- The crude drugs belonging to different morphological or taxonomical categories may be brought together provided there is some similarity in the chemical nature of active principles.

Glycosides – Digitalis, Senna, Cascara, Liquorice

Alkaloids – Nuxvomica, Ergot, Cinchona, Datura

Tannins – Myrobalan, Pale catechu, Ashoka

Volatile oils – Peppermint , Clove, Eucalyptus, Garlic

Lipids – Castor oil , Bees wax , Cod liver oil, Kokum butter, Lanolin

Carbohydrates – Acacia, Agar, Pectin, Honey, Isapghul

Resins and resin combinations – Balsam of tolu, Colophony

Vitamins and hormones – Yeast, Shark liver oil, Oxytocin, Insulin

Proteins and enzymes – Casein, Gelatin, Papain, Trypsin

5. Pharmacological classification

- This system of classification involves the grouping of crude drugs according to the pharmacological action of their chief active constituent or their therapeutic uses.
- The drugs differing in mechanism of action but with the same pharmacological effect is grouped together (for example)
- Bulk purgatives, irritant purgatives, emollients etc

1. Drugs acting on autonomic nervous system

Adrenergics – Ephedra

Cholenergics – Physostigma, Pilocarpus

Anti cholinergic – Belladonna, Datura

2. Drugs acting on gastro intestinal tract

Bitters – Gentian, Quassia, Cinchona

Carminatives – Dill, Mentha, Cardamom

Emetics – Ipecacuanha

Anti amoebics – Kurchi, Ipecacuanha

Bulk laxatives – Agar, Isapghul, Banana

Purgatives – Senna, Castor oil

Peptic ulcer treatment – Liquorice, Raw banana

3. Drugs acting on respiratory system

Expectorant – Liquorice, Ipecacuanha, Vasaka

Anti expectorants – Stramonium leaves (Atropine)

Anti tussives – Opium (Codeine, Noscapine)

Broncho dilators – Ephedra, Tea(Theophylline)

4. Drugs acting on cardio vascular system

Cardio tonics – Digitalis, Squill, Strophanthus

Cardiac depressants – Cinchona (Quinidine) ,Veratrum

Vaso constrictors – Ergot(Ergotamine), Ephedra

Anti hypertensives - Rauwolfia

5. Drugs acting on central nervous system

Central analgesics – Opium (Morphine)

CNS Stimulant – Coffee (Caffeine)

Analeptics – Nuxvomica, Lobelia, Camphor

CNS depressants – Hyosyamus, Belladonna, Opium, Morphine

Hallucinogenics – Cannabis, Poppy latex

6. Anti spasmodics

Smooth muscle relaxants – Opium (papaverine), Datura

Skeletal muscle relaxants – Curare

Anti cancer – Vinca, Podophyllum, Taxus

Anti rheumatics – Aconite, Colchicum, Guggal

Anthelmintics – Quassia, Malefern, Vidang

Immuno modulatory agents – Ashwagandha, Tulsi, Ginseng, Asparagus, Picrorhiza kurroa

7. Drugs acting on skin and mucous membrane

Olive oil, Wool fat, Beeswax, Arachis oil, Sesame oil, Balsam of tolu, Balsam of peru

Astringents – Myrobalan, Black catechu

Anti malarial – Cinchona, Artemisia

Immunizing agents – Vaccines, Sera, Toxoids, Anti toxins

8. Drugs acting chemotherapeutically – Antibiotics

Local anaesthetics - Coca

6.Chemo taxonomical classification

- Phytochemical screening has revealed the existence of close relationship between constituent of plants and their taxonomical status.
- Chemotaxonomy establishes a relationship between position of the plant and attempts to utilize chemical facts.
- The characters more often studied in chemotaxonomy are secondary metabolites of pharmaceutical significance such as alkaloids, glycosides, flavanoids etc

7. Serotaxonomical classification

- Based on serology, serology is a branch of biology which deals with the nature and interactions of antigens and antibodies.
- **Antigens** – foreign substances stimulating antibody formation
- **Antibodies** – protein molecules produced by plasma cells of the immune system
- Antigens are storage proteins obtained from the seeds, stem, tubers, pollens, fruits, leaves etc

- This protein introduced in the form of emulsion in mice.
- Nature of precipitate formed is observed as antigen antibody complex.
- A high dilution in the precipitate density means close relationships and formation of no precipitate means no relationship.
- The similarities and dis similarities among different taxa (family) are understood by serological reactions.
- These data are taxonomically benefecial.
- Contrasting single proteins from different plant taxa is also achievable by this technique.

- In **1902**, **Nuttal** identified the importance of serology in plant systematics.
- In **1926**, **Mex** and **Ziengenspect** (Germany) published stommbaum (a family tree of plant relationships) based on their serological studies.
- In **1954**, **Boyden** proved that Michelia and Magnolia are the 2 genera closely related by serological analysis.

- In **1968**, **Tucker** recorded serological relationships among Solanaceae genera drugs like datura, hyosyamus, solanum.
- In **1968**, **Jenson** did phytochemical survey on 20 ranunculacean genera.
- In **1971**, **Kloz** identified different protein characters and made significant contributions to the serology of fabaceae family.

ORGANISED DRUGS

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- The organized drugs are divided in to parts of plants like leaves, flowers, fruits, seeds, stems, woods, barks, roots and rhizomes.
- The un organized drugs are dried latex, gums, extracts etc
- Seeds – Nuxvomica, Strophanthus, Isaphghul, Castor
- Leaves – Senna, Digitalis, Vasaka, Eucalyptus
- Barks – Cinchona, Kurchi, Cinnamon, Quillia
- Woods – Quassia, Sandalwood, Sassafras, Red sanders

- Roots – Rauwolfia, Ipecacuanha, Aconite, Jalap
- Rhizomes – Turmeric, Ginger, Valerian, Podophyllum
- Flowers – Clove, Pyrethrum, Artemisia, Saffron
- Fruits – Coriander, Colocynth, Fennel, Bael
- Entire drugs – Ephedra, Ergot, Cantherides, Belladonna
- Dried latex – Opium, Papain
- Resins and Resin combinations – Balsam of tolu, Myrhh, Benzoin, Asafoetida
- Dried juices – Aloes, Red gum, Kino
- Gums – Acacia, Tragacanth, Ghatti gum, Guar gum
- Dried extracts – Gelatin, Catechu, Agar

UN ORGANISED DRUGS

GUMS AND MUCILAGES

- Gums are translucent and amorphous substances produced by plants.
- Gums are usually pathological products and are produced when the plant is growing under unfavourable conditions or injured.
- They are the abnormal products of plant metabolism.
- The gums are produced by the process known as “**Gummosis**”
- Gums are soluble or partly soluble in water.
- They are insoluble in alcohol and in most of the organic solvents.

- Mucilages are also plant products similar to gums and they are normal products of plant metabolism.
- They are produced inside the cells of the plant.
- Mucilages form masses with water but do not dissolve.
- Mucilages are esters of sulphuric acid ester group is a polysaccharide complex.
- **From the cell wall of the seed epidermis** – Isaphgul, Linseed
- **From endodermis** – Fenugreek
- **From leaf epidermis** – Senna
- **From bark** – Cinnamon
- **From special secretion cells** – Squill
- **From algae** – Agar, Chondros

RESIN AND RESIN COMBINATIONS

The resins are of 2 types

1.Synthetic resins 2.natural resins

1.Synthetic resins

- They are obtained from plant or animal sources.
- The resin of animal source is shellac or lac.
- Plant resins are natural or induced exudates.
- They are solids, liquids and semi viscous materials from plants and are the end products of plant metabolism.
- They are very clear translucent yellow or brown materials insoluble in water.

- They are soluble in most of the organic solvents like alcohol, chloroform, carbon di sulphide, benzene etc.
- On heating they soften, melt and finally burn with a flame.
- On storage some of them darken in colour due to chemical changes.

(For eg) – Podophyllum resin, Jalap resin, Colophony, Sandarac

OLEO RESINS Natural plant resins with volatile oils

Eg – Canada balsam and copaiba

PREPARED OLEO RESINS Prepared by percolating drugs containing volatile oil and resin together.

Eg – capsicum, podophyllum, ginger oleo resin.

BALSAMS Aromatic resinous substances containing balsamic acids (benzoic and cinnamic acid)

Eg – Balsam of tolu, Benzoin, Storax, Balsam of peru

OLEO GUM RESINS Combination of volatile oils, gums and resins.

Eg – Myrrh, Asafoetida

DRIED JUICES The juices are obtained from fleshy leaves (aloes) or from stems of the trees(kino)incisions are made to respective part of the plant and juice coming out is collected and dried.

DRIED EXTRACTS The extracts obtained by extracting the plant parts with water while pharmaceutical preparations were prepared by using alcoholic or hydro alcoholic solutions.

Eg – Agar, Catechu, Gelatin (Animal source extract)

DRIED LATEX

- The latex is a product contained in special secretory tissues of certain plants.
- It is usually a white aqueous suspension where in microscopically small particles of oil globules are suspended.
- These natural suspensions of milky consistency may contain proteins, sugars, minerals and alkaloidal salt in the true solution where as gums, starch and resins in the suspended form.
- Eg – opium, papain, ficin and gutta percha

Difference between organized and unorganized drugs

(1) Organised drugs are obtained from plants or animals and are made up of cells or definite structure

Eg – leaves, flowers, seeds, fruits etc

- Unorganized drugs are derived from parts of plant or animal by extraction followed by purification

Eg – juices, extracts, resins etc

(2) Organised drugs are solid in nature

- Unorganized drugs are solid, semi solid or liquids in nature

Eg – oils, gums and balsams

(3) Botanical or zoological can be used to describe organized drugs

- Physical characters are observed such as solubility, density, optical rotation, refractive index etc

(4) Microscopic characters are one of the criteria for the identification of organized drugs

Eg – Digitalis, Cinchona, Clove, Fennel, Ephedra, Jalap etc

- Chemical tests and physical standards are confirmatory tests for unorganized drugs

Eg – Aloes, Agar, Colophony, Opium, Castor oil, Bees wax, Pepsin etc