Resins and resin combinations

Resins

- Resins are solid/semisolid amorphous products of complex chemical nature contaning large number of carbon atoms.
- They are mixtures of essential oils, oxygenated product of terpenes, and carboxylic acids.
- Resins are extensively distributed throughout the entire plant kingdom, specifically the *Spermatophyta* *i.e.*, the seed plants.
- Resins and related resinous products are produced in pants during normal growth or secreted as a result of injury to the plants.

Occurrence of resins in Plants

- In the plants resins usually occur in different secretory zones or structures such as
  - Resin Cells : *Ginger–Zingiber officinale* Roscoe (Family: *Zingiberaceae*);
  - Schizogenous Ducts : *Pine Wood–Pinus polustris* Miller.
    - or Schizolysogenous (Family: *Pinaceae*).
    - Ducts or Cavities
  - Glandular Hairs : *Cannabis–Cannabis sativa* Linne'. (Family: *Moraceae*)

Physical Properties of Resins

- Resins are hard, transparent or translucent brittle materials.
- They are heavier than water (specific gravity ranging from 0.9-1.25).
- **Resins** are amorphous materials but rarely crystalizable in nature.
- On heating at low temperature, they soften & melt forming an adhesive or a sticky massive fluid without decomposition.
- On heating in the presence of oxygen, they readily burn with a smoky flame by virtue of the presence of a large number of C-atoms.

Physical Properties of Resins....

- When heated in closed container in the absence of oxygen, they undergo decomposition and very often give rise to **empyreumatic products** *i.e.*, products chiefly comprising of hydrocarbons.
- They are poor conductors of electricity, but when rubbed become negatively charged.
- They are insoluble in water, but soluble in ethanol, volatile oils, fixed oils, & non-polar organic solvents

Chemical Properties of Resins

- Resins are enriched with carbon, deprived of nitrogen and contain a few oxygen in their respective molecules.
- Most resins undergo slow atmospheric oxidation whereby their colour get darkened with impaired solubility.
- Many resins, when boiled with alkalis yield soaps
- Resins are often associated with
  - volatile oils --oleoresins,
  - Gums---gum-resins, or
  - oil and gum---oleo-gum-resins
  - Sugars----glycosides.

Resin Acids

- They are resins that occur with carboxylic acid group
- Found in free states or as the esters derivatives.
- Being acidic, they are soluble in aqueous solution of alkalis producing frothy solution.
- Derivatized to their metallic salts known as resinates
  - Used in soap, paints and varnish industries.
- Examples
  - Abietic acid: found in colophony
  - Commiphoric acid: present in myrrh

Resin Esters

- They contain esters as chief constituent of the resins
- Can be converted to their free acids by the treatment with caustic alkali.
- Example:
  - benzoin contains benzyl benzoate
  - Storax contains cinnamyl cinnamate

Resin alcohols/resinols

- Are complex alcoholic compounds of high molecular weight.
- Found as free alcohols or as esters of benzoic, salicylic, & cinnamic acids.
- Insoluble in aqueous alkali solution but soluble in alcohol and ether.
- Resinols are present in benzoin as benzoresinol and in storax as storesinol.

Resin Phenols/resinotannols

- High molecular weight compounds occur in free states or as esters.
- Due to phenolic group they form phenoxoids and become soluble in aqueous alkali solution.
- However they are insoluble in water but dissolve in alcohol and ether.
- Resinotannols gives a positive reaction with ferric chloride.
- The resinotannol are found in
  - balsam of Peru as peruresinotannol,
  - Tolu balsam as toluresinotannol, and
  - benzoin as siaresinotannols.

Resenes

- Chemically inert resin products that are generally found in free state which never form esters or other derivatives.
- They are soluble in benzene, chloroform and to some extent in petroleum ether.
- Resenes are insoluble in water.
- Example: Asafoetida contains drug about 50% of asaresene B.

Oleoresins

- Homogenous mixture of resin with volatile oils.
- posses an essence due to volatile oils.
- A trace amount of gummy material may sometimes be found in oleoresins.
- Turpentine, ginger, copaiba, Canada resin are few important examples of oleoresins.

Gum Resins

- Gum resins are the naturally occurring mixture of resins with gums.
- Due to solubility in water, gums can be easily separated out from resin by dissolving the gum in water.
- Ammoniacum is an example of natural gum resin.

Oleogum Resins

- Naturally occurring mixtures of resin, volatile oil, and gum.
- Oleogum resins oozes out from the incisions made in the bark and hardens.
- Includes gum myrrh, asafoetida, gamboage, etc.

Isolation of resins

- Due to it complex chemical composition, they are difficult to isolate
- Generalized technique
  - Extraction of the drug with alcoholic solvents
  - subsequent precipitation of resin by adding concentrated alcoholic extract to a large proportion of water.
- The method of distillation or Hydrodistillation can be used for the separation of volatile oils from resins

Crude drugs containing resins And resin combinations

1. CANNABIS

Synonym – Ganja

Biological source –

It consists of dried flowering tops of the cultivated female plant s of *Cannabis sativa*

Chemical constituents -

It contains 15-20% of resin, which contain major active principle 1,3,4 Tetra hydro cannabinol

(Commonly known as Δ THC)

Cont...

The resin also contains cannabinol, cannabidiol, cannabidiolic acid etc

Indian hemp seeds contains about 20% fixed oil.

Uses –

1.Sedative

2. Narcotic analgesic

3.Hypnotic (Induce sleep)

4. It has psychotropic properties due to 1,3,4 Tetra hydro cannabinol

5.Used as an antibacterial agent

Cont...

2. Podophyllum

Synonym – Indian podophyllum

Biological source –

It consists of the dried rhizome and root of

Podophyllum hexandrum (*Podophyllum emodi*)

Cont...

Chemical constituents –

It contains 7-15% of resin known as podophyllin . Roots contain more resin than the rhizomes.

The active principle in podophyllin resin is known as podophyllotoxin(40%) in Indian variety , alpha and β peltatins in the American podophyllum.

It also contains Quercetin , Kaempferol, astragalin, essential oil

Uses –

Used in the treatment of cancer

Used as purgative

Used as bitter tonic

Cont…

3.Ginger

Biological source –

It consists of the rhizomes of *Zingiber officinalae*

Chemical constituents –

It contains 1-2% of volatile oil, 5-8% pungent principle, resinous mass and starch

The chief constituent of volatile oil is Zingiberine .

It also contains gingerol and traces of shogaol

Cont…

Uses –

1. Used as stomachic
2. Used as an aromatic
3. Used as a carminative
4. Used as stimulant
5. Used as flavouring agent
6. Ginger oil is used in mouth washes, ginger bevarages and liquors

Cont…

4.Capsicum

Synonym – Chillies

Biological source –

It consists of the dried ripe fruits of Capsicum frutescens or Capsicum annum or capsicum minimum

Chemical constituents –

It contains an extremely pungent principle Capsaicin, red colouring matter Capsanthin.

It also contains Ascorbic acid, carotin, red pigments etc

Cont…

Uses –

1. Used as a spice
2. Used as carminative
3. Used as nervine stimulant
4. Used as a source of vitamin- C
5. Used as an appetizer
6 . Used as a stomachic
7. Externally used as counter- irritant in rheumatism

Cont…

5.Benzoin

Synonyms –

Gum benzoin, Luban, Loban, Sambrani, Lobana (Sumatra benzoin)

Biological source- Benzoin is the balsamic resin obtained from the incised stem of *Styrax benzoin*, *Styrax paralleloneurus*

Chemical constituents –

It contains 23% of balsamic acids – Cinnamic acid and benzoic acid

It contains 70-80% resin consisting of triterpenoids, siaresinolic acid and suma resinolic acid

It also contains vanillin, sterol, phenyl propyl cinnamate responsible for the aromatic smell

Uses -

Used as an antiseptic

Used as an expectorant

Used as a stimulant

It is used in the preparation of Compound benzoin tincture

6. Asafoetida

Synonyms –

Heeng, hing, hingu

Biological source – It is the oleo-gum-resin obtained by incising the living rhizomes and roots of Ferula foetida, Ferula asafoetida

Chemical constituents -

It contains 4-20% of volatile oil, 45-60% of resin and 20% of gum.

Volatile oil contains Pinene, organic disulphide (isobutylpropenyl disulphide responsible for alliaceous odour)

Resin contains free asaresinotannaol and in combination with ferulic acid

Uses –

As a carminative, an expectorant, an antispasmodic , as a laxative, nervine tonic

7.Colophony

Synonyms – Chir, long needle pine

Biological source –

Colophony is the solid residue obtained after distilling the oleo-resin from various species of pinus- pinus longifolia, pinus palustris, pinus maritima

Chemical constituents-

It contains resin acids – abietic acid , neutral inert substance – resenes, esters of fatty acid.

Uses –

Used in the preparation of plasters and ointments.

Used in the manufacture of varnishes and disinfecting liquids.

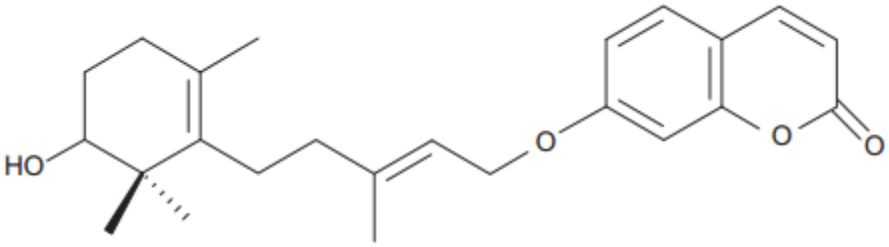
Cont…

Asafoetida

- An oleo-gum resin obtained as an exudation of *Ferula asafoetida* L, *F. foetida*, *F. rubricaulis* Boiss, & some other species of Ferula, belonging to family Apiaceae.
- Asafoetida occurs as a soft solid mass/sometimes almost semisolid.
- It is sometimes called "devil's dung“ due to its bad smell & bitter taste
- It contains volatile oil (4–20%), resin (40–65%), and gum (25%).
- It has garlic-like odour due to the presence of sulphur compounds.
- The main constituent of the oil is isobutyl propanyl disulphide ($C_6H_{16}S_2$).

Uses of Asafoetida

- carminative, expectorant, antispasmodic, and laxative
- Due to its respiratory stimulant & expectorant action it is used for treatment of asthma
- It also reduces blood glucose, blood pressure, treat IBS, and flatulence



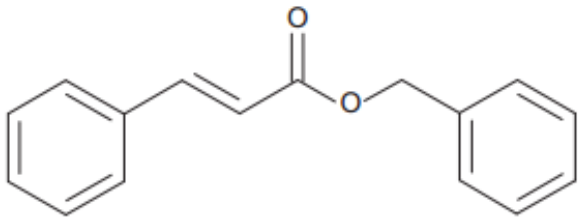
Assafoetidin

Balsam of Peru

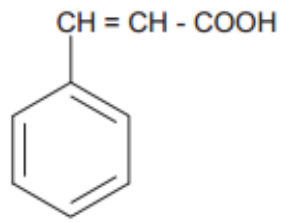
- Peru balsam is obtained by incision of the stem of *Myroxylon balsamum* var. pereirae (Royle) Klotsch (Papilionaceae fam.) at high temperature.
- It is a pathological resin formed when the plant is injured.
- Collection
  - The injured part is covered with cloths in which the resin is absorbed.
  - cloths saturated with exudates are removed and boiled with water.
  - On cooling the water extracted balsam is settled out.

Chemical constituent of Peru balsam

- The drug contains
  - **balsamic esters** (45–70%) like benzyl cinnamate(50–60%), benzyl benzoate, and cinnamyl cinnamate (styracin),
  - **resin** (28%) consisting of peruresinotannol combined with cinnamic and benzoic acids, alcohols [nerolidol (peruviol), farnesol, and benzyl alcohol], and small amounts of vanillin and free cinnamic acid.



Benzyl cinnamate



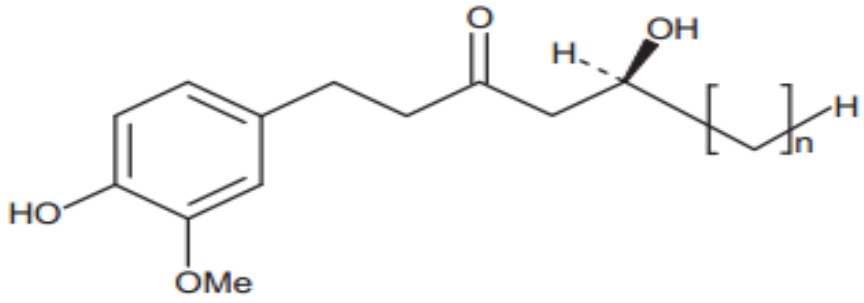
Cinnamic acid

Uses of Peru Balsam

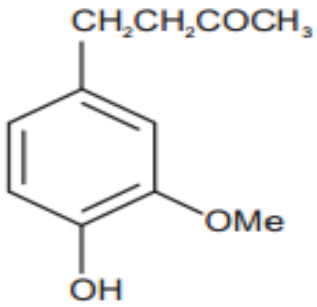
- used as miticide, scabicide, and parasiticide
- Healing of wound, diarrhea, and ulcer therapy,
- local protectant, antiseptic, and stimulating expectorant.
- Employed in perfumery and some chocolate flavorings and odours.

Ginger

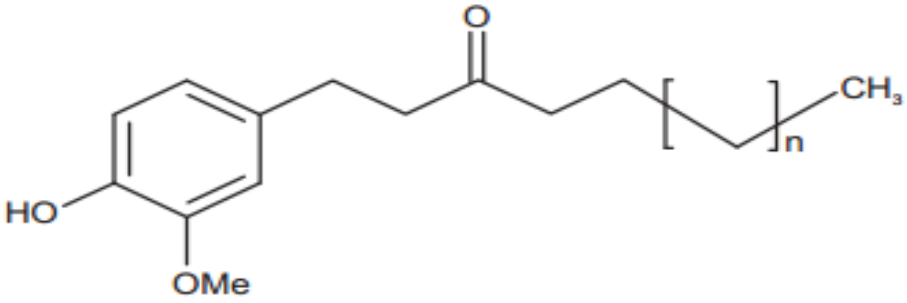
- Dried rhizomes of the *Zingiber officinale* Roscoe (Zingiberaceae).
- Ginger contains
  - 1 to 2% volatile oil: responsible for the aromatic odour
    - composed of sesquiterpene hydrocarbon like α-zingiberol; α-sesquiterpene alcohol α-bisabolene, α-farnesene, α-sesquiphellandrene.
  - 5 to 8% pungent resinous mass and starch.
    - Its pungency is due to the yellowish oily body called gingerol.
    - Less pungent components (gingerone and shogaol) are also present.
    - Shogal is not present in fresh rhizome but formed by the dehydration of gingerol



Gingerols (n = 0,2,3,4,5,7,9)



Zingerone



Shogaols (n = 4,5,7,9,10)

- Ginger is used as an antiemetic, positive inotropic, spasmolytic, aromatic stimulant, carminative, and flavoring agent.
- It is prescribed in dyspepsia, flatulent colic, cough, and asthma.
- To relief Sore throat, hoarseness, and loss of voice

Myrrh

- Oleo gum-resin obtained from the stem of *Commiphora molmol* Eng. or *C. abyssinica* or other species of Commiphora (Burscraceae)
- Myrrh contains resin (25–40%), gum (57–61%), & volatile oil (7–17%).
  - Resin: containing α-, β-, and γ-commiphoric acids, resenes, the esters of another resin acid and two phenolic compounds.
  - The volatile oil is a mixture of cuminic aldehyde, eugenol, cresol, pinene, limonene, dipentene, and two sesquiterpenes.
  - Gum contains proteins and carbohydrate (64%) which is a mixture of galactose, arabinose, glucuronic acid, and an oxidase enzyme.

Uses

- Myrrh is used as carminative and local stimulant
- Due to its disinfecting and deodorizing effect it is used in tooth powder and mouth wash.
- Topically it is astringent to mucous membranes.
- In incense, perfumes, and paint
- Alcoholic extracts are used as fixatives in the perfumery industry