

UNIT-2

Alkaloids

Introduction!

Alkaloids are basic in nature because they contain nitrogen in their structure.

→ Most of the alkaloids are derived from the amino acids and they are biosynthesized inside the plant with amino acid.

Types of Alkaloid!

Basically three types.

- (i) True alkaloid
- (ii) proto alkaloid
- (iii) pseudo alkaloid.

① True Alkaloid!

True alkaloid are real alkaloid - usually they are derived from amino acid and they contain nitrogen atom inside the heterocyclic ring.

(i)



(ii)



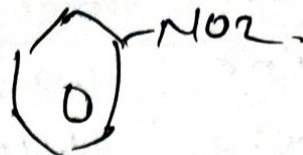
amino acid

② Proto Alkaloid!

Proto alkaloid they are derived from the amino acid.

→ But they do not contain the nitrogen atom inside the heterocyclic ring.

→ Besides that nitrogen atom is present outside of the ring.



Amino acid derived.

(iii) Pseudo Alkaloid!

Pseudo Alkaloid are the false Alkaloid because these are not derived from the amino acid. But they contain nitrogen atom inside the heterocyclic ring.



Amino Acid \times
Not derived

Example of Alkaloid Drugs!

Vinca!

Synonyms! Vinca rosea, Catharanthus madagascariensis, Periwinkle, Burmann's Soda plant.

Biological Source! Vinca is the derived entire plant of Catharanthus Roseus Linn. Belonging to family Apocynaceae.

Geographical Source! The plant is a native of Madagascar, and is found in many tropical and subtropical countries especially in India, Australia, South Africa, and North and South America. The plant is cultivated as garden plant in Europe and India.

Cultivation and collection:

- ⇒ It requires dry or moist soil and can tolerate drought.
- ⇒ It is cultivated either by directly sowing the seeds or sowing the seeds in nursery.
- ⇒ Nursery sowing method is found to be economical and the fresh seeds are sown in nursery in the month of February or March.
- ⇒ The seedling attain a height of 5-8 cm after two months and then they are transplanted into the field at a distance of 45 cm x 30 cm.
- ⇒ In order to collect the whole plant the stems are first cut about 10 cm above the ground and the leaves & seeds, stems are separated and dried.
- ⇒ The roots are collected by plugging which are later washed and dried under shade and packed.

CHARACTERISTICS

Leaves: Green in colour.

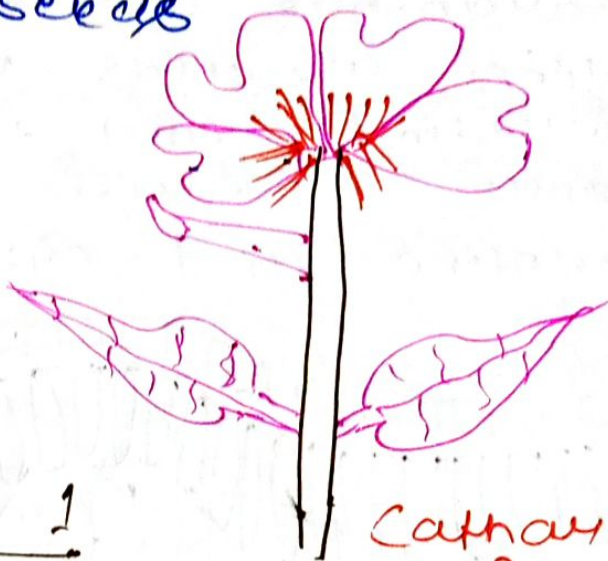
Flowers: are either violet, pinkish white or carmine red.

Roots: Same pale grey in colour.

Flowers: Hermaphrodite (Both male or female organs) and are pollinated by bees.

FRUIT!

Follicles with numerous
black seeds



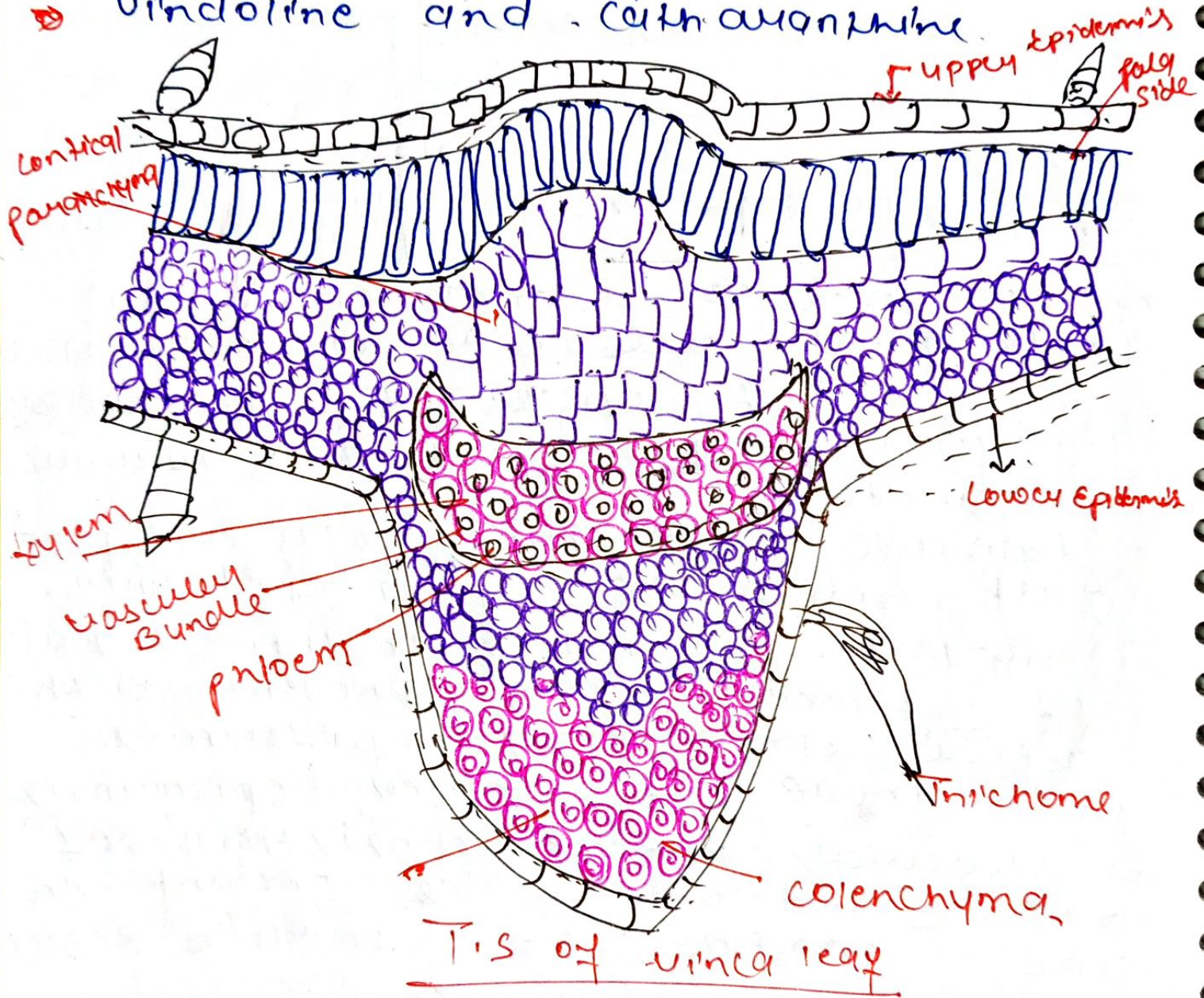
*Catharanthus
roseus.*

MICROSCOPY 1

- ⇒ Epidermis is a single layer of rectangular cells covered with thick cuticle. It consists of uni-cellular covering trichome and stomata.
- ⇒ Palisade parenchyma cells are present just below the upper epidermis.
- ⇒ midrib region two to three layers of collenchyma is present, both below the upper epidermis and above the lower epidermis.
- ⇒ vascular bundle consisting of xylem and phloem, is present in the middle of midrib region.
- ⇒ Leaves and roots contain more alkaloids.
- ⇒ About 90 alkaloids have been isolated. From Vinca like Asmaline Serpentine are known and are present in other species of apocynaceae.

2) The important alkaloids in Catharanthus are the vinorelbine, indole, indoline, alkaloids, vinblastine and vincristine and they possess anticancer activity.

3) Vinorelbine and Catharanthine



Chemical Constituents!

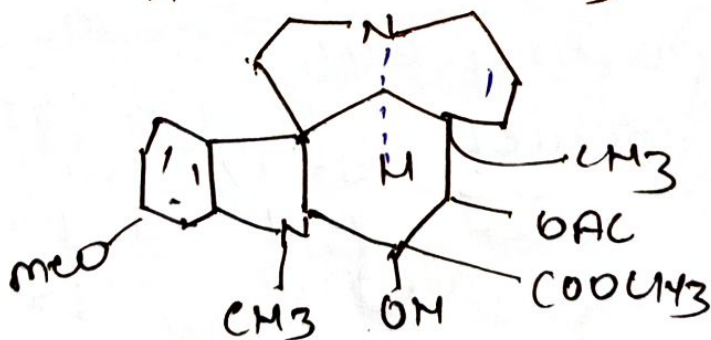
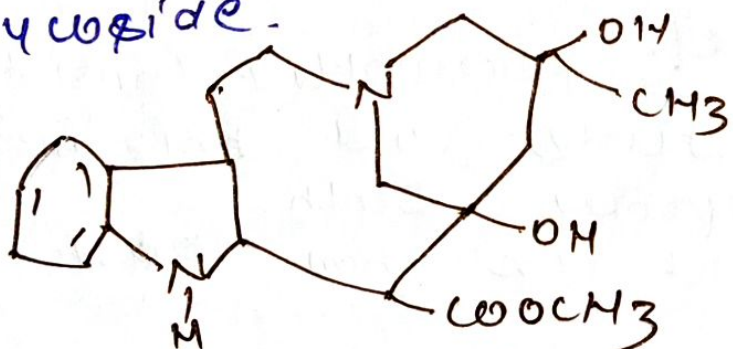
↳ leaves and roots contains more Alkaloids.

↳ About 90 Alkaloids have been isolated from Vinca like Ajmalicine Scorpion are known and are present in other species of Apocynaceae.

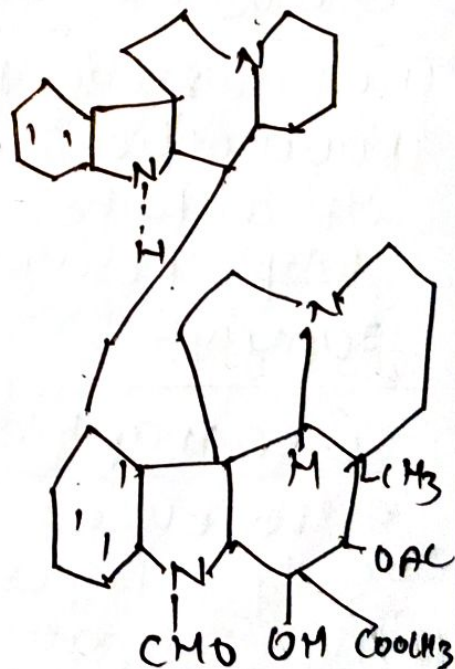
↳ The important Alkaloids in Catharanthus are the dimer indole ~~and~~ indoline Alkaloids. Vinblastine and Vincristine and they possess anticancer activity.

• Vinindoline and Catharanthine are indole monomeric Alkaloids.

↳ It also contains monoterpene sesquiterpene indole and indoline glycoside.



Vinblastine



Vincristine

Use!

- ⇒ It is stated is excellent as a gargle laxative for children
- ⇒ Vinblastin is an antitumor alkaloid used in the treatment of Hodgkin's disease.
- ⇒ Vinorelbine is used to treat leukemia in children
- ⇒ It may be used as a gargle
- ⇒ The powder of the Periwinkle are gently purgative.

Rauwolfia!

Synonyms and Vernacular Name!

Bengali - Sarpagandha, Tmi, Chinanmdpode
Sans. Choota-chand. Hind - Chandrika, Bihar
pagleki dawg

Biological Source! Rauwolfia consists of the dried ~~to~~ roots and rhizomes of Rauwolfia serpentina Benth.
It contains not less than 0.15% of Reserpine.

Family!

Apocynaceae.

Geographical Source! It is widely distributed in west and east and in shady forests in Punjab. To Nepal, Sikkim and India, Bhutan, Pakistan Thailand etc. Assam in Java and

Cultivation! It grows spontaneously in tropical forests (Tem. 10°C to 20°C) which are humid in summer at an altitude up to about 1200 meters.

- ⇒ ~~Rau~~ Rauwolfia plants can't tolerate Temp. below 5°C .
- ⇒ For cultivation rain must be enough and abundant in summer on it. Should have good irrigation.
- ⇒ Rauwolfia grows well in days, acidic (pH. 4 to 6) and well-manured soil.
- ⇒ ploughing must be deep for facilitating the development of the roots.

macroscopical characteristics!

- ↳ External features of roots and rhizomes are nearly similar but rhizomes can be made out by the presence of small central pith and 3 to 22 mm diameter.
- ⇒ Drug consists of mostly small pieces, which are 2 to 15 cm long and 3 to 22 mm diameter.
- ⇒ pieces are cylindrical, slightly tapering and tortuous.
- ⇒ outer surface is greyish yellow, pale brown or brown.
- ⇒ fracture short.

(vi) Fracture surface show yellowish to brown bark and dense - pale yellow radiating wood with 2 to 6 annual rings. occupying nearly three fourth of the diameter.

(vii) Odour - Odourless

(viii) Taste - bitter.

Chemical Constituents:-

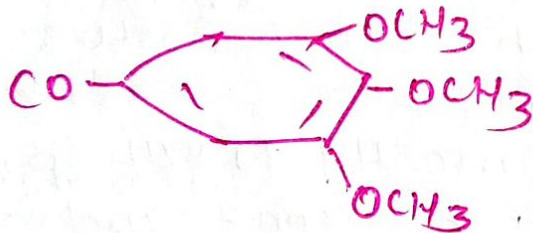
(i) Alkaloids - Indole alkaloids (1.5 to 3%) present

(ii) Weakly basic - Indole type. (pH 7 to 7.5)

(iii) Reserpine group - Reserpine, Reserpinone, Deserpidine

(iv) Tertiary indole alkaloid (pH 9) Arginine group Argolidine and Argoline

(v) Strongly basic piperidinium base (pH 11)



Reserpine

Use: (i) Rauwolfia. It's used as hypotensive and tranquillizer

(ii) Reserpine being the main alkaloid is responsible for the activity and it's used in anxiety condition and other neuropsychiatric diseases.

(iii) Sedative - calm down activities and excitements Reserpine group.

- (iv) Stimulates the central or peripheral nervous system. (Aymaline group)
- (5) The decoction of root is used to increase uterine contraction in difficult cases.
- (6) The extract is used for intestinal disorder and as an anthelmintic, better tonic and febrifuge.

Belladonna Herb

Synonyms! Belladonna leaf, Belladonna, Folium.

Biological source! Belladonna herb consists of dried leaves and other aerial parts of *Atropa belladonna* and it belongs to family Solanaceae.

Geographical source! It is indigenous to and cultivated in England and other European countries.

In India it is found in the Western Himalayas from Simla to Kashmir and adjoining areas of Himachal Pradesh.

Morphological characteristics

Color:
Leaves: Green to Brownish green.
Flowers: Purple to yellowish Brown.
Fruits: Green to Brown.

Odour: Slight and characteristic.
Taste: Bitter and acid.

Size:
Leaves → 5 to 25 cm long and 2.5 to 12 cm wide
Flowers → corolla 2.5 cm long 1.5 cm wide
Fruits → about 10 cm in diameter.

Shape:
Leaves: ovate, lanceolate, with acute apex decurrent lamina, entire margin.

Flowers: compound and small reflexed lobes of corolla.

Fruits: sub-globular in shape with numerous flat seeds.

Microscopical characteristics

epidermal cell with slightly sinuous anticlinal wall and striated cuticle, anisocytic stomata and occasionally uniseriate multicellular covering. Trichomes are present -

→ There are glandular trichomes which are uniseriate and with unicellular heads.

es The palksaderatio in 5 to 7.

Chemical Constituents!

The Total alkaloid content of drug is 0.4 to 1.0% and varies in different parts of plants, roots (0.6%), stems (0.05%), leaves (0.4-1%) unripe and ripe berries (0.19-0.21%) and seed (0.33%). The main alkaloids are Hyoscyamine and its racemic form atropine.

Use!

⇒ It is the parasympatholytic drug with anticholinergic properties.

⇒ It is used to reduce the secretion such as sweat, saliva and gastric juice, and also to reduce spasm, in cases of intestinal cramping. Due to strong purgatives

⇒ It is also used as an antidote in opium and chronic cyanide poisoning

Dose! 0.6 to 1ml in the form of.

Belladonna tincture 4 times a day

Opium

Synonyms:

poppy latex, gum opium.

Source:

Raw opium is the dried milky exudation obtained by incising the unripe but fully grown capsules of papaver somniferum family.

⇒ The quality of opium is judge by morphine content, which is required to be N. 1 + 9.5% by the USP.

⇒ Commercial varieties include Turkish, Persian, Indian and Yugoslavain opium

Cultivation and collection and preparation

⇒ The seed of opium are cultivated in ~~Batched~~ Batches. This is to ensure that the entire crop is not affected by climate condition like frost or drought.

⇒ The cultivation is done in the months between September and April

⇒ A gap of 25 cm should be ~~maint~~ maintained between two consecutive plants

⇒ Before sowing, the seed, they are mixed with sand properly

⇒ About five to six capsules appear on each plant and flowers in the month 0 - may - June

macroscopic Character!

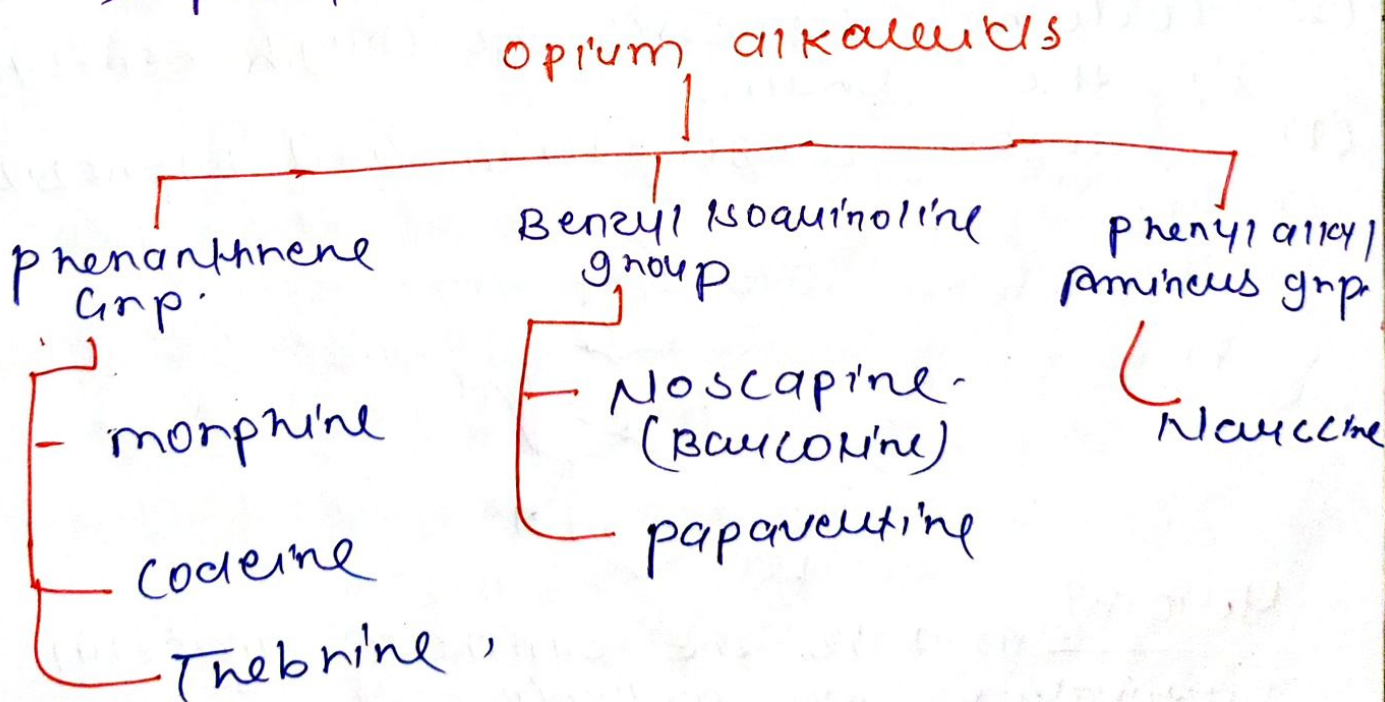
Odour - strong characteristic
Taste - Bitter
Colour - varies depending on the type of opium for instance, Indian opium is dark brown while manipulated Turkish opium is chocolate brown
In colour

Active Constituents!

⇒ opium contains more than 19 alkaloids, some of which are combined with meconic acid other with sulfuric acid and some as free alkaloids

⇒ There are 3 main classes! -

- phenanthrene
- Benzyl isoquinoline
- phenyl allyl amine

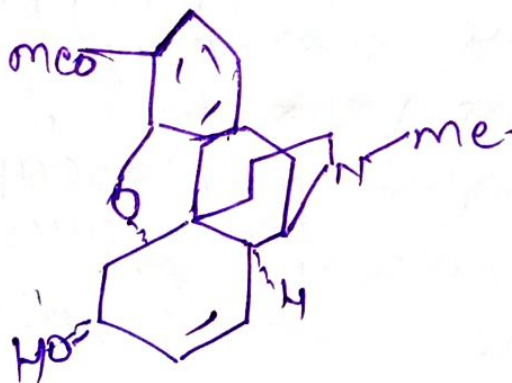


Use! Morphine!

- ⇒ most powerful analgesic used in case of severe pain operative pain, Bone fractures cancer patients and, In cases of angina.
- ⇒ Remedy in convulsions -
- ⇒ preclude the use of anesthetics to increase their efficacy.
- ⇒ used as an antagonist for poisonous effect of other alkaloids as strychnine Atropine, physostigmine

Codeine!

- (1) It is weaker in intensity than morphine.
- (2) produces less tendencies to addiction
- (3) codeine depresses the cough center in the brain.
- (4) causes constipation and hypnosis

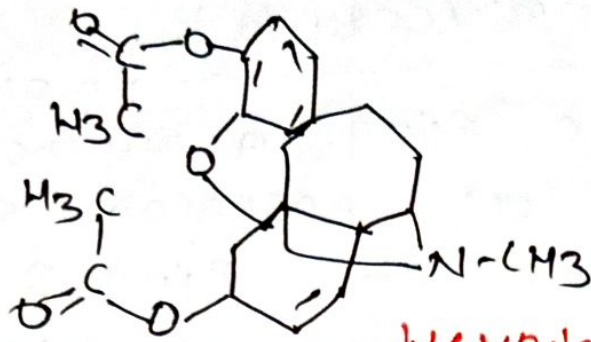


Heroin!

- (1) It is the synthetic diacetyl derivative of morphine
- (2) It is 5x more potent as morphine

Papaverine!

- (1) It is a smooth muscle relaxant



Mescaline

PHENYLPROPANOIDS and FLAVONOIDS/ FLAVONOL GLYCOSIDES

Poly phenols:

Poly phenolics are the secondary metabolised product in which they are present in synthesized in the plants and they have the more than 12 hydroxy group on aromatic ring.

They are basically polyphenols. Compound three types:

- (i) Flavonoid
- (ii) Non-flavonoid
- (iii) Phenolic acid

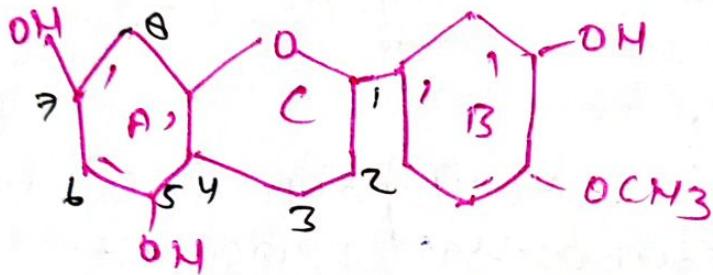
(i) Flavonoid:

Flavonoid are a heterocyclic compound which have the formula $C_6-C_3-C_6$. In which two benzene ring are fused ring C_6 which is the heterocyclic ring.



② Flavonoid glycoside.

In flavanol ring - add the ring. A hydroxy group is placed at position 5 and 7 ~~and~~ and add the ring B hydroxy and alkoxy group is attached. Then this is called flavonoid glycoside.



Flavonoid \rightarrow ~~Flav~~ Autochrome \leftarrow Blue Red
 \rightarrow Anthoxanthine \leftarrow White Yellow

③ Example of flavonoid Drug

1) TEA (i) Biological source!

- \Rightarrow The botanical name of tea is *Camellia sinensis*.
- \Rightarrow The biological source of tea is prepared leaves and leaf buds of it.
- \Rightarrow It belongs to the theaceae family.
- \Rightarrow Commonly it is known as tea plant on tea shrub.

2. Morphological features,

- ⇒ The leaves of Tea consist of these which is an enzymatic mixture containing an oxidase, which partly converts the polyphenol into, polyphenol, as chemical constituent
- ⇒ other chemical constituent present in tea, leaves are tannins, caffeine
- ⇒ It contain 2-5% of Tannin and 10-24% of Caffeine.
- ⇒ In Tea leaves Theobromine is also present in small amount.
- ⇒ Tea leaves also consist of Theophylline and volatile oil.
- ⇒ major chemical constituents are catechins and theoflavins.
 - ↳ physically, Tea has both qualities of solution and suspension
 - ↳ Caffeine is about 3% of tea, dry weight
 - ↳ Black Tea contain dietary mineral ~~mag~~ manganese about 0.5 milligram
 - ↳ Fluoride is also present in Tea in small amount.

Use

- ① Drinking black or green tea have beneficial effects on body
- ② It is - Non-alcoholic beverages -
- ③ ⇒ It also have some medical scavenging properties

① It helps in the inhibition of angiogenesis. It is the process involving the growth of blood vessel essential for tumour growth and metastasis.

Ruta

Synonyms:

Rue, Common Rue, Satap.

Biological source:

Ruta consists of entire plant botanically known as Ruta ~~grac~~ unavediens family, Rutaceae

Geographical source:

known throughout the world in garden as decorative and ornamental plant. Found abundantly in Egypt and Algeria. Cultivated in India.

Description:

It is strongly smelling herb. Leaves are linear alternate petioled bipinnate compound segments create sphaetule on linear oblong, yellowish leaves are ~~to~~ bluish. Fruits are capsules seeds are angled.

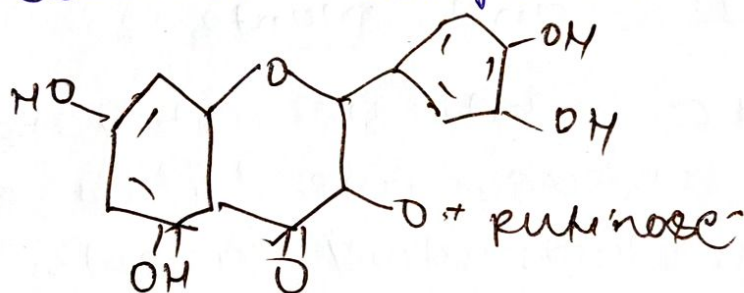
Chemical constituents:

~~plant consti~~

→ Plant contains very small amount of strongly smelling volatile oil which is not aromatic but is disagreeable

→ It also contains two acidone, alkaloids namely carbimine and oxoanthine coumarins and limonoids are the other constituents of Ruta.

→ Ruta also contains, Ruton about 2.0%. Boratin, burgapin, guaveolin, Rutin is a flavonoid glycoside and is a crystalline compound.



Uses: It is used as insect repellent volatile oil is emmenagogue and is said to be abortifacient oil is bitter on taste

It also can be used for culinary purposes. The medicinal use of oil was cited by well known scientist Pliny the Elder.

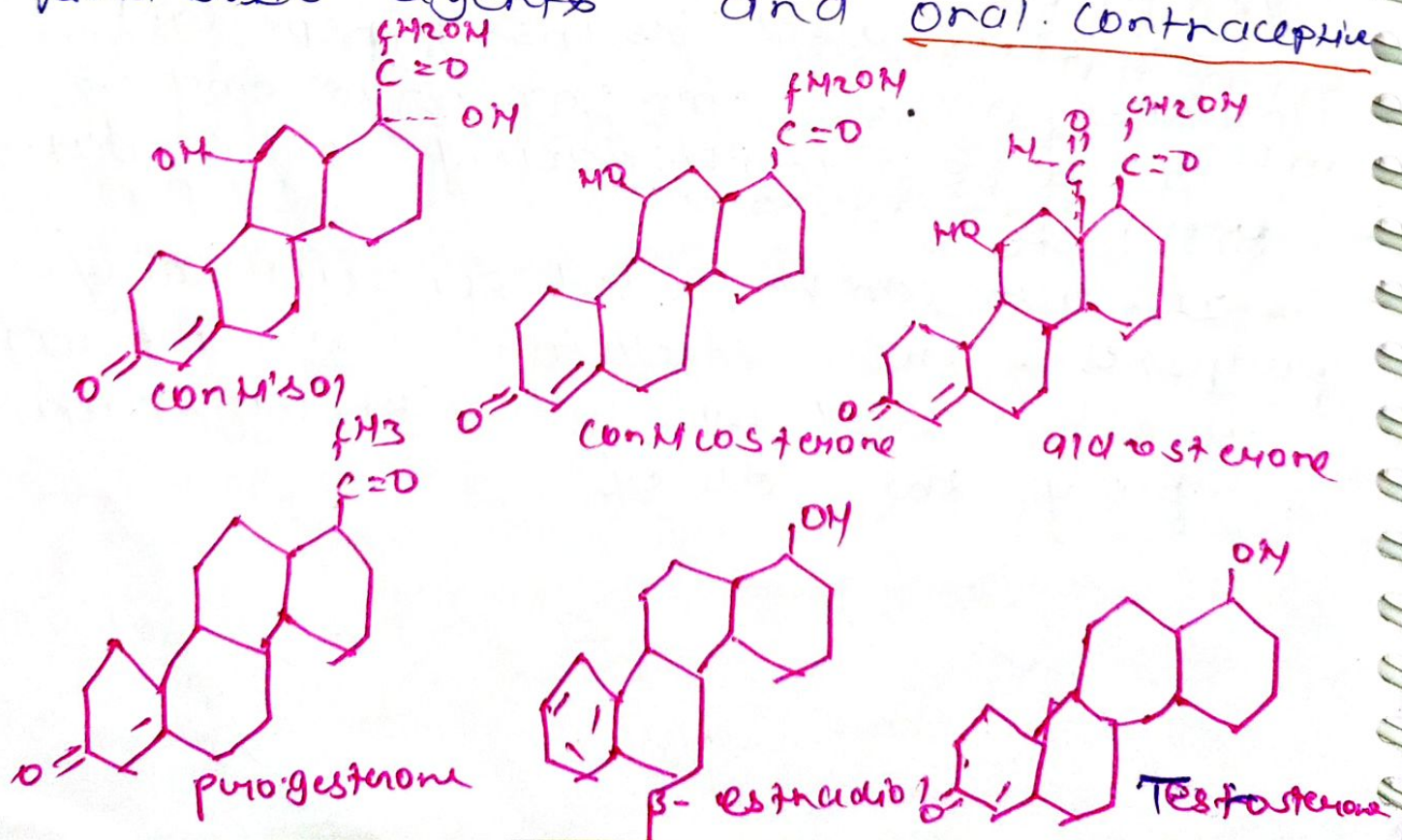
Example of Steroids Drugs

STEROID:

steroid, any of a class of natural or synthetic organic compound characterized by a molecular structure of 17 carbon atoms arranged in four rings.

↳ The steroid group includes all the sex hormones, adrenal cortical hormones, bile acids, and steroids of ~~vertebrates~~ vertebrates, as well as the moltling hormones of insects and many other physiologically active substance of animals and plants.

↳ Among the synthetic steroids of therapeutic value, are a large number of anti-inflammatory agents, anabolic agents and oral contraceptive.



Cardiac Glycosides:

- ⇒ Therapeutically, this group of compound may be considered as one of the most important of all natural occurring products.
- ⇒ Cardiac glycosides are steroids having the ability to exert specific powerful action on the cardiac muscle on injection into man or animal.
- ⇒ A very small amount can exert a beneficial stimulation on diseased heart, but an excessive dose may cause death. Drugs containing these glycosides are used in medicine primarily to increase the tone, excitability and the contractility of the cardiac muscle.
- ⇒ Secondly, most of them exert a diuretic action, due principally to the increased renal circulation.
- ⇒ Cardiac glycosides occurs in small amounts in the seeds, leaves, stems, root, bark of wide geographical distribution particularly of the families.
 - 1 - Apocynaceae
 - 2 - Scrophulariaceae
 - 3 - Liliaceae
 - 4 - Ranunculaceae

Triterpenoids

Triterpenoids, generally, are obtained by biogenesis from six isoprene units, they are found to share commonly the alicyclic precursor of Squalene (C₃₀). Based on the various possible modes, whereby ring closure in squalene takes place may ultimately give rise to a large number of triterpenoids having a variety of skeleton structures.

⇒ The triterpenoids may be categorized into two major groups - the tetracyclic and the pentacyclic compound:

The former ones of the steroidal types with C-27 carbon atom present in the skeleton while the latter are of the triterpenoid types with C-30 carbon atoms as shown below:

LIQUORICE

Synonyms! - Glycyrrhiza, Licuonice
Root: Glycyrrhizae radix

Biological Source! Licuonice is the dried
peeled or unpeeled, roots, rhizome
or stolon of Glycyrrhiza glabra
Linn.

Family! Leguminosae!

Microscopic Characteristics!

- ⇒ The Transverse section reveals several yellow-brown cork layers, and a layer of phelloderm that is 1 to 3 cells thick.
- ⇒ The cortex exhibits medullary rays, and obiterated sieve portions radiate alternately.
- ⇒ The ~~phloem~~ phloem exhibits groups of phloem fibres, which are surrounded by crystal cells with thick but incompletely lignified walls.
- ⇒ The vessels are accompanied by xylem fibres, which are surrounded by crystal cell and by xylem parenchyma cells.

→ The parenchyma cells contain starch grains and often contain single crystals of calcium oxalate.

→ Chemical Constituents:-

Liquorice or Glycyrrhiza

- Glycyrrhizin / glycyrrhizic acid,
- Glycyrrhizic acid
- Glucuronic acid
- Licarinoside, iso Licarinoside, Licarizin, iso Licarizin,
- Sugars
- Resin, volatile oil,
- Starch.

USE! ① Glycyrrhiza has demulcent and expectorant properties.

② It is used as a masking agent for bitter drugs in pharmaceutical formulation, such as Quinine, Quinine Ammonium chloride etc.

③ Ammoniated glycyrrhiza is employed as a flavouring agent in beverages, pharmaceuticals and confectionary.

④ The presence of glycyrrhetic acid exert mineralocorticoid activity and hence it is used in the treatment

of inflammation rheumatoid ~~arth~~ arthritis
and Addison's disease

- Other use
- Expectorant
 - demulcent
 - flavouring agent
 - anti-inflammatory
 - rheumatoid ~~arth~~ arthritis

Due to flavonoid content with
anti-gastric ulcer effect. It is used
in peptic ulcer, antispasmodic.

Dioscorea

Synonym :- YAM

Biological source :- part used
buried rhizome

Plant!

Dioscorea deltoidea

Dioscorea Tokona

Dioscorea Compositae

Family :- Dioscoreaceae

Colour - Slightly Brown

Odour - Odourless

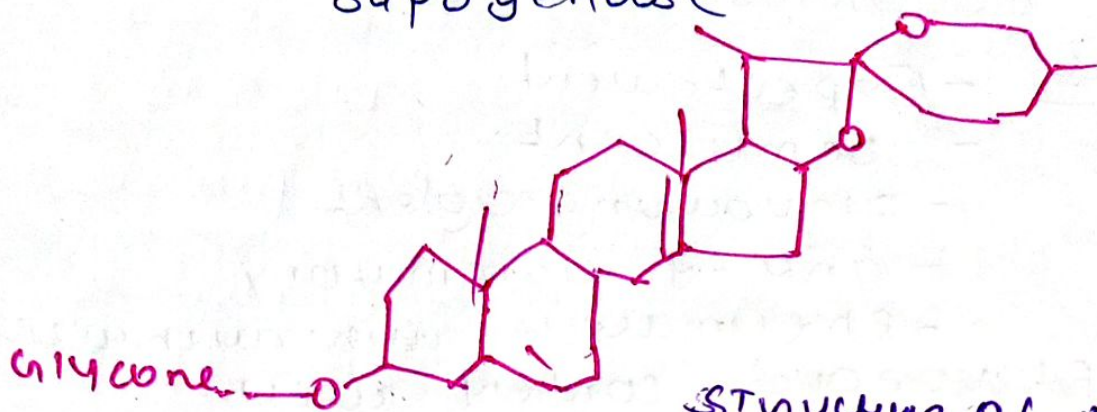
Taste - Bitter and acid

depending on the size - varies
rhizomes on the age of the
(Tubers)

Chemical constituents!

- Dioscin (major glycoside)
- Diosgenin (aglycone)
- Smitagenin
- Epi smitagenin
- β -yammogenin

- Starch
- Saponinase



Structure of Digoxin
(Digoxigenin + glycone part)

USES!

- Rheumatic ~~with~~ arthritis treatment.
- manufacturing of progesterone other steroid contraceptives
- > Asthma Treatment.

✓ Digitalis

Synonyms! - Foxglove leaves, Digitalis leaves.

Biological source! It is obtained from dried leaves of Digitalis purpurea.

Family! Scrophulariaceae.

- ⇒ It is assumed to contain at least 0.3% of total cardenolids calculated as Digoxin.
- ⇒ After collection from the field, leaves are dried immediately at temp. not exceeding 60°C.

And are stored in moisture
proof container,

Colour - Dark greyish green,

Odour - Odourless.

Taste - Distinctly Bitter.

Size - Length - 10 to 30 cm

width - 4 to 10 cm.

Shape - ovate, lanceolate,
, petiole.

Base - Decurrent or dentate

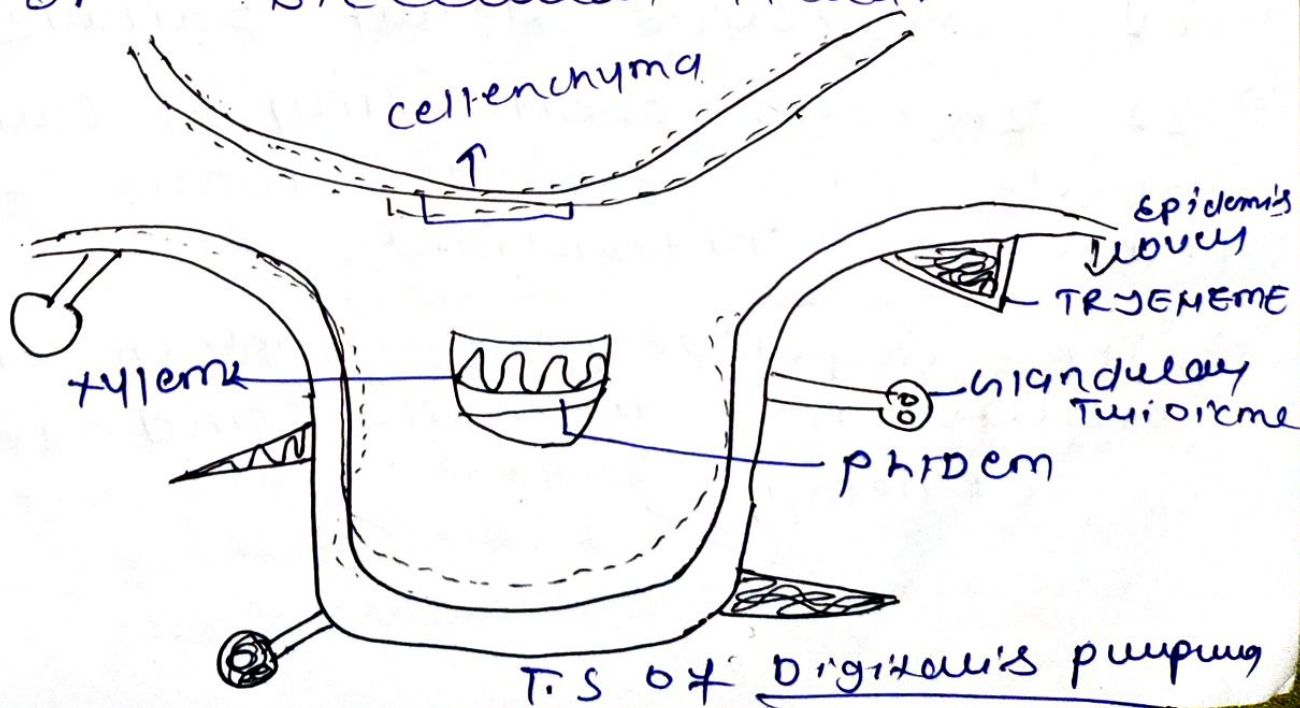
Apex - subacute.

margin - crenate or dentate.

Surface - Both surface are ~~pubescent~~
pubescent.

microscopy -

- > It is dorsiventral leaf.
- > It has anomocytic stomata.
- > covering and glandular trichomes on both sides.
- > Glandular trichomes are short, unicellular, stalk and unicellular or bicellular head.



CHEMICAL CONSTITUENTS

⇒ Digitalis contain 0.2 to 4.5% of both primary and secondary glycosides

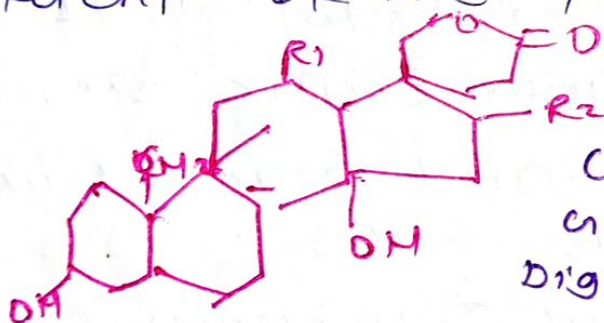
primary glycosides:

primary glycosides A and B, glycogetaloxin and secondary - are. digitoxin, gitoxin and getaloxin.

⇒ primary glycosides are less stable and less significant than secondary glycosides.

⇒ primary glycosides A and B, constituents of the principle active constituent of the fresh leaves.

⇒



Compound R1 R2
nitroxygenin M OH
Digitoxigenin M H

USES

⇒ It is used in the treatment of congestive heart failure.

⇒ It increases excitability of cardiac muscle and produce more powerful contractions.

⇒ The improvement through kidney results in diuretics and loss of oedema.

⇒ It is effective in congestive heart failure to increase cardiac output and to relieve venous congestion. Hence it is used as cardio tonic.

⇒ The major disadvantage of Digitalis is that it has a cumulative effect. So administration of drug should be under strict medical supervision.

Example of volatile oil Drugs

Volatile oil!

volatile oil are products which are generally complex in composition, consisting of the volatile principle contained in plant and are more or less modified during the preparation process.

→ The odorous volatile principle of plant and animal source are known as volatile oil.

⇒ As they evaporate when exposed to air at ordinary temp., they are also called ethereal oil.

→ volatile oil are also called essential oil because they produce essence.

Physical properties!

→ lighter than water.

→ optically active.

→ high refractive index.

→ specific rotation.

→ possess distinct ~~but~~ odours.

→ commonly found in the species like Labiatae, Rutaceae, Piperaceae, Zingiberaceae, Myrtaceae.

- ⇒ They are present in entire plant. or in any part of the plant.
- ⇒ Don't leave stains like fixed oil.
- ⇒ Insoluble with water and soluble in organic solvents like ether, alcohol, ethanol etc.
- ⇒ They should be stored in cool dry place in tightly stoppered, preferably full, amber glass.

Therapeutic Activities: (Uses)

- (A) AS a counter irritant.
- (B) Eucalyptus oil administered AS an Inhalant
- (C) Improves local circulation
- (D) AS Carminative, shows anti spasmodic
- (E) Thymol is used in mouth washes and gargles.
- (F) Local an. anesthetic
- (G) Reduce secretion of mucus in cough and asthma.
- (10) Anti-septic, anti bacterial, Anti fungal.
- (11) Anti-septic, anti bacterial, Anti fungal.
- (12) Anti Helminthes.
- (13) ALSO used in aroma.

Commercial use

- Perfume and cosmetic industry
- masking agent in cleaning mixtures.
- polishes and insecticides
- Flavours for food and confections (elaborate sweet/delicacy)

CLOVE BUD

Synonyms Caryophyllum

Clove flower - ~~leaf~~ clove buds.
Lauang.

Biological source!

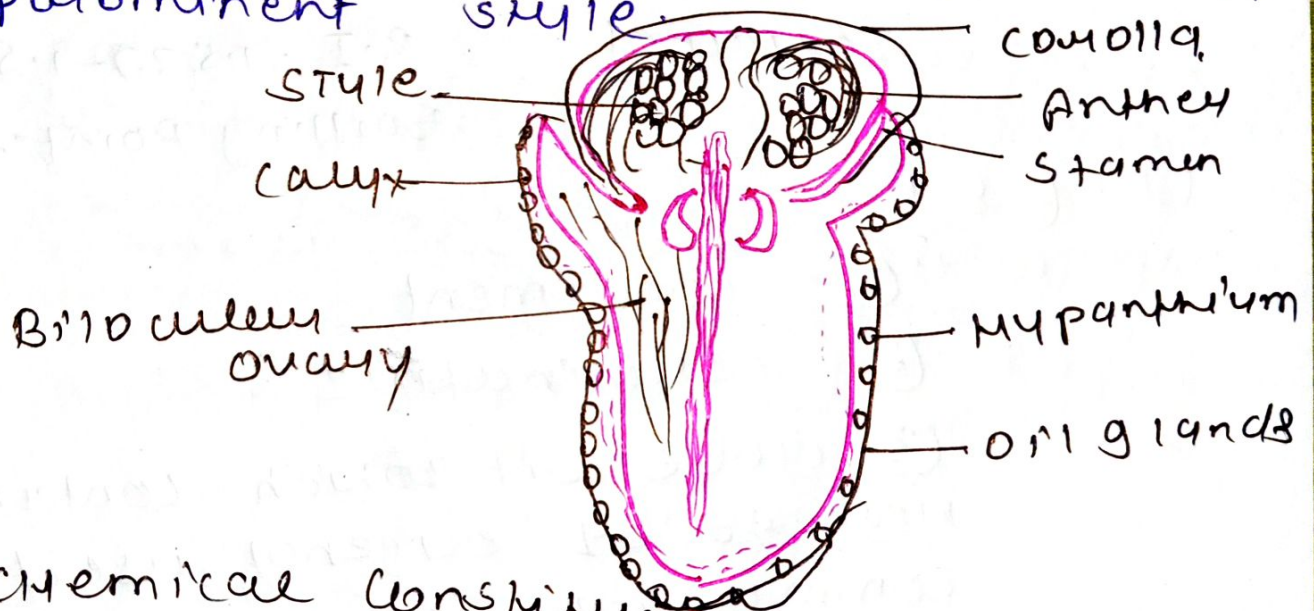
Bud of Eugenia Caryophyllum
Family myrtaceae.

should contain NLT 15% v/w of
~~oil~~ clove oil.

Geographical source!

- Indigenous to Amboyna and Molucca islands.
- Cultivated Zanzibar, Pemba, Penang, Madagascar, Caribbean Islands, Sri Lanka, India.

- In India, mainly areas of Tamil Nadu, Kerala and Karnataka.
- Colour - **crimson to dark brown**
- Odour - **slightly aromatic**
- Taste - **pungent and aromatic**
- Shape - **hypanthium** is surrounded with 4 thick acute divergent. Surrounded by dome shaped corolla. The corolla consists of unexpanded membranous petals with several ~~stam~~ stamens and single short prominent style.



Chemical constituents!

1. **Volatile oil (Clove oil): 15% - 20%**
 - (a) Eugenol 70% - 90%
 - (b) Vanillin
 - (c) Caryophyllene
 - (d) Acetyl eugenol 4%

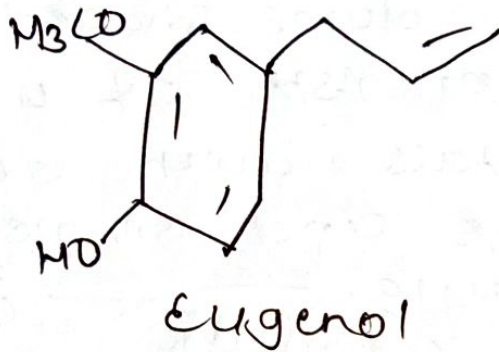
② Tannin - 10-13% (gallo-tannic acid)

③ Resin

④ Chymomone

⑤ Eugenol

⑥ Small quantities of esters, ketones & alcohols



Cloué oil

colourless to pale yellow

1.030 - 1.06

R.I. 1.527 - 1.535

Boiling Point - 250°C

USES!

① Condiment

② - Carminative

③ Cloué oil which contain high % of eugenol used commercially to produce ~~oil~~ vanillin.

④ Antiseptic

⑤ Flavouring agent

⑥ Dental uses! as filling material with ZnO

⑦ Local anesthetic (dental analgesic)

Cinnamon

Synonyms - Cinnamon bark
- Kalmi - Dalchini
- Ceylon Cinnamon

Biological Source!

→ Dried inner bark of the shoots of trees of *Cinnamomum zeylanicum* belonging to the family Lauraceae.

- > must contain less than 1.0% of volatile oil.
- > Found in Sri Lanka, and Malabar coast of India.

Chemical Constituents!

Contains! → 0.5% - 1.0% of volatile oil

- 1.2% of Tannins
- mucilage
- calcium oxalate
- starch and
- mannitol. (sweet substance)

→ Cinnamon oil contain 60-70% of cinnamaldehyde 5-10% eugenol benzaldehyde, cuminaldehyde, and other terpenes like pinene, cymene, camphor, etc.

STANDARDS

- Foreign organic matter, less than 2.0%
- Total ash, less than 6.0%
- Acid insoluble ash, less than 4.0%
- Sulphated ash, less than 6.0%

Chemical Test

Ferric chloride solution + a drop of volatile oil = pale green colour.

→ Ferric chloride solution + a drop of cinnamic aldehyde = brown colour.

→ Ferric chloride solution + a drop of Eugenol = blue colour.

⇒ It results in pale green colour.

uses

Bark is used as:-

- Carminative
- Stomachic
- mild Astringent
- Flavouring agent
- Stimulant
- Antiseptic
- Losses weight

Commercially used as:-

- Spice and condiment
- In preparation of candy, ~~etc~~ dentifrices and perfumes.

FENNEL

Botanical name: *Foeniculum*
Family: Umbelliferae ^{vulgare}
English name: Fennel, Sweet fennel
Bitter fennel
Urdu name: ساخنہ
part used: Dried ripe fruit
Chemical class: Volatile oil

Types of Fennel

Sweet fennel

- ⇒ Sweet fennel is derived from *F. vulgare*
Subsp. *vulgare* var. *dulce*
- ⇒ Sweet fennel contains more than 90% anethole, 10% estragole and less than 5% fenchone.

Bitter fennel

- ⇒ Bitter fennel is derived from dried ripe fruit of *F. vulgare*
Subsp. ^{Subsp.} *vulgare*, var. *vulgare*
- ⇒ Bitter fennel contains 60% anethole, 10-30% fenchone and less amount of ~~estragole~~ estragole.

Major constituents!

Anethole.

Other constituents!

Fenchone

limonene

estragol

volatile oil

Coumarin.

Vitamin A and C

Uses

- ⇒ Anethole is used as anti-cancer and anti-inflammatory
- ⇒ Fennel contains Vitamin C. When it's used as anti-oxidant.
- ⇒ Coumarin shows anti-coagulant effect.
- ⇒ Fennel has bronchodilatory effect.
- ⇒ Anethole may influence milk secretion.
- ⇒ Salts containing phosphorus lowers the level of sodium, which is essential for maintaining the blood pressure.

CORIANDER

The Coriander or cilantro is an annual herb of the family Apiaceae. Have straight stems, compound leaves, white flowers and aromatic fruits.

⇒ All parts of the plant are edible. But are generally used the fresh leaves and the dried seed. In some countries it is known as Chinese or Japanese parsley.

→ The Coriander is native to the Mediterranean region, eastern and central Europe, East Asia, North, and South America.

→ The active ingredients of Coriander are:-

Volatile oil! (0.9 to 1.2%) main component

D(+)-linalool (Coriandrol 60-70%)

Also includes borneol, p-cymene

Alpha-pinene, camphor, geraniol, Limonene.

Fatty oil (13-21%) acid, oleic and

linoleic furanocoumarins

umbelliferone, scopoletin

Use and Effectiveness

- Insufficient evidence for
- constipation
- Irritable bowel syndrome (IBS)
- stomach upset
- loss of appetite
- spasms
- Intestinal gas
- Diarrhea
- Bacterial or fungal infection
- measles
- hemorrhoids
- toothaches
- nausea
- worms
- painful menstruation
- joint pain

L-7 Example of Tannin Drug

Tannins

Tannins are polyphenolic substance found in many plants product of secondary metabolism. Its water soluble nature allows easy extraction and is useful in various application in the chemical and pharmaceutical industry.

Definition!

The complex, organic, non-nitrogenous, polyphenolic substances of higher molecular weight. They are used as antiseptics and on gut diseases like diarrhoea and also used in leather industries.

Properties!

⇒ pale yellow to light brown - used amorphous substance, widely distributed in plants and used chiefly in tanning leather, dyeing of fabrics, and making ink.

- ⇒ Their solution are acid and have an astringent taste.
- ⇒ They are isolated from oak bark, sumac, and galls.
- ⇒ Tanning give tea astringency, colour and flavour. Tannins are phenol glycosides.

Important of Tannins

Medicinal Uses

- Antidote
- Antiseptic
- Algicidal
- Astringent
- Anti-carcinogen

Industrial Uses

Ink manufacture
Vegetable Tanning
Preservatives

Biological Activities

- Inhibition of lipid oxidation
- Decrease in blood urea nitrogen content
- Inhibition of plasmin
- Lipolysis in fat cell

CATECHU

Synonyms:- pale catechu, gambier

- कट्ठा

Biological source

- It consists of the dried achenous extract prepared from the leaves of Uncaria
Gambier

Family

Rubiaceae

Chemical constituents!

- ⇒ It contains Tannins like catechins and catechu (Tannic acid).
- ⇒ It contains flavonoids like Quercetin and fluorescent substances Gambier, Fluorescein.
- ⇒ It also contains catechu, red pyrogallol, fixed oil and waxes.

USE! → used as astringent
→ used in the treatment of diarrhoea
→ used in the preparation of lozenges.

PTEROCARPUS

Synonyms Bigasal, Indian Kino Tree, malabar kino

Biological source! It consists of dried juice obtained by making vertical incisions to the stem bark of the plant *Pterocarpus marsupium* Linn. belonging to family Leguminosae.

Geographical Distribution

It is found in hilly regions of
Suzmat, Madhya Pradesh, Uttar
Pradesh, Bihar, and Orissa.

It is also found in forests of
Karnal, Kerala, West Bengal
and Assam.

Morphology

Color - → Ruby-red
Odour - → Odourless.
Taste - → Astringent
Shape - → Angular grains.
Size - → 3 to 5 to 10 mm
granules.

Solubility - → It is partly
soluble.

External Features - → The pieces of
kino are angular,
glistening / transparent,
breaking with vislow
fracture.

Chemical Constituents

Kino contains about
70-80% of kinotannic acid kinomed.
K-pyrocatechin (catechol), mesin. and
gallic acid.

Kinnotannic acid is glucosidal tannin whereas kino-med. is anhydride of kino. Kino is an insoluble phlobaphene and is produced by the action of oxydase enzyme. It is darker in colour than kinotannic acid.

Chemical Test!

- ⇒ when the solution of drug is treated with ferrous sulphate, green colour is produced.
- ⇒ with alkali (like potassium hydroxide) violet colour is produced.
- ⇒ with mineral acid, a precipitate is obtained.

USE

- ⇒ kino is used as powerful astringent and also in the treatment of diarrhoea, and dysentery passive haemorrhage and in diabetes.
- ⇒ It is used in dyeing, tanning and printing. The aqueous infusion of the wood is considered to

Be of much use in diabetes.

⇒ The alcoholic, as well as, Aqous. extracts of Heartwood are known to possess ~~hypoglycemic~~ hypoglycemic action.

The cup made of wood are ~~available~~ available with Khadi and Gramodyog-Commission. For treatment of diabetes.

6.0 Example of Resin drugs

Resin Drugs!

- resins may be defined as a complex, amorphous product of more or less solid characteristics which, - on heating, must get soften and then melts.
- resins are produced and stored in schizogenous or schizoly ~~signous~~ - signous glands, or cavities of the plant.

Properties of Resins!

Isolated or resin products, which come as unorganised crude drugs in the market are more or less solid, hard, ~~trans~~ transparent, or translucent materials

- most of resins are heavier than water.
- resins are insoluble in most polar, and non polar, solvents, such as water and petroleum ether, respectively but, dissolve completely in alcohol, solvent ether, benzene or chloroform.

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Classification of Resins.

Classification based on!

- ① Their chemical nature.
- ② As per their association with the other group of compounds such as essential oil and gums.

Resins

CHEMICAL GROUPS.

Resin Acids
Resin esters
Resin Alcohol
Resin phenols
Resins mixed composition

Colophony, myrrh,
Sandarac, Benzoin,
Dragon's blood,
Benzoin, storax,
Puru, Jalap,
Mastic, Shellac

Resins with gum
| Essential oil

~~Amor~~ ammoniacum
Gamboge Turpentine
Cinger.

Bales
BALSAMS

54
TOLU BASAM
PERU BALSAM

④ Guggul

- ⇒ Syn! salai gagi'
- ⇒ Regional Name! Hindi - guggal
marathi - mahishaksh
- ⇒ Source! Gum resin obtained by
Incision of the bark of "Commiphora
mukul"
- ⇒ Family! Burseraceae
- ⇒ Dist! Distributed Throughout
India
- ⇒ Constituents! 32% Gum, 1.75% ^{Oil} essential
Steroids, beta sitosterol, 12-E-guggulsterone
Sugar, Ellagic acid, Amino acid,
myricin, alcohol, Flavonoids
- USE! > Lowers serum Triglycerides
cholesterol, LDL, VLDL and raises HDL
- ⇒ Inhibits platelet aggregation increase
Thrombogenesis through stimulation
of thyroid. & potentially resulting in
weight loss
- ⇒ GUM! Astringent, anti-rheumatic
Antiseptic, expectorant, demulcent
Emmenagogue

Resin Form Lotion. For indolent ulcers,
Caries in teeth, disorder
Tonsillitis, pharyngitis and
ulcerated Throat
→ market Formulation :- Dikroḡ.

Amogyanandhini = guntka dabai

Zingiber (अमृतक)

Biological Source: Ginger consists of
The rhizomes of Zingiber officinale
Roscoe and dried in the sun.

Family Zingiberaceae.

macroscopical characters

- (i) General appearance: Sympodial,
Branching, horizontal rhizome.
- (ii) Size - length 5-15 cm.
width 3 to 6 cm.
thickness 0.5 to 1.5 cm.
- (iii) Shape - laterally flattened on
The upper side with short
flattened oblique, obovate branches
or 'fingers'. Each branch is

1 to 3 cm long and at its apex shows a depressed scar of the stem.

- (v) Surface - longitudinally striated with occasional projecting fibres.
- (vi) Fracture - short, starchy fibrous
- (vii) Fractured surface - show a narrow bark, a well marked
- (viii) Colour - buff.

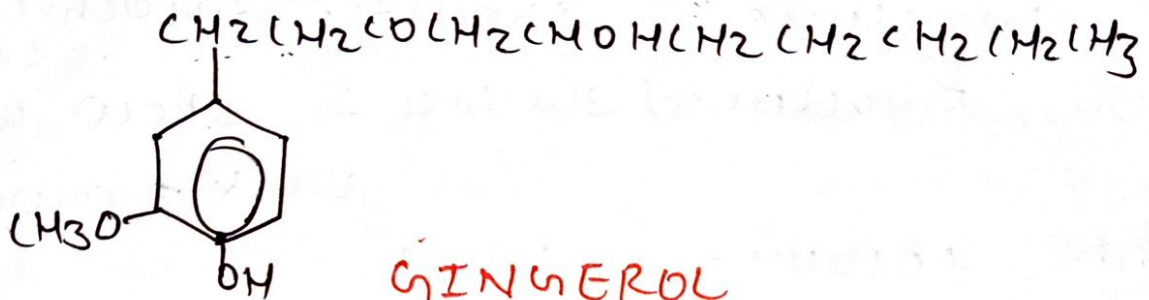
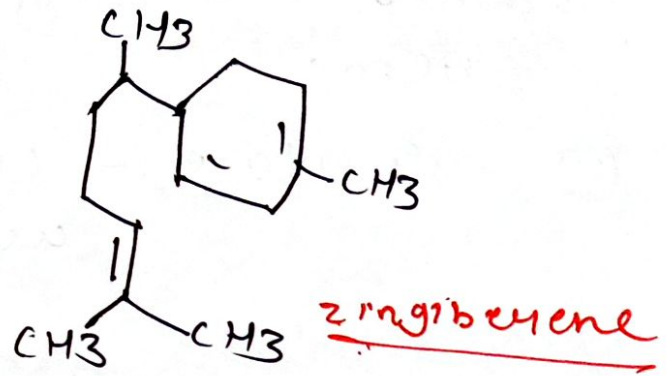
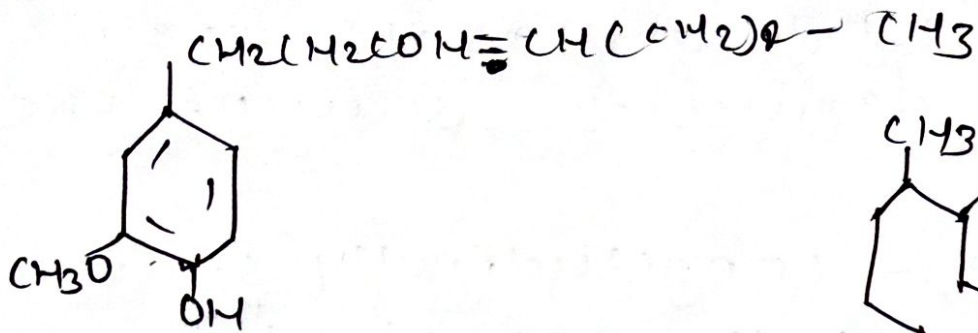
Chemical constituents

Ginger contains 1 to 2% volatile oil
5 to 6% pungent principle.

Resinous mass and starch.

Volatile oil is responsible for the aromatic smell and consists of Zingiberene, b.i. ~~see~~ sesquiterpenes hydrocarbon Zingiberol a sesquiterpenes Alcohol and bisabolene.

Zingiberol is a yellow pungent oily liquid and yields gingerone a ketone and aliphatic aldehyde. Shagaol is formed by loss of water from Zingiberol. Shagaol and ~~ginger~~ gingerone are less pungent.



USE!

- ① Ginger is stomachic, stimulant and carminative aromatic.
- ② It is used more as a spice.
- ③ Ginger oil is used in mouth washes, ginger beverages, and liquors.
- ④ It is used as a flavouring agent.
- ⑤ Ginger powder has been reported to be effective in motion sickness.

ASAFŒTIDA - ming

Synonyms Devil's dung, food of the gods, asafoda, asant, ming

Biological source

Asafoetida is an oleo-gum resin obtained as an exudation by incision of the decapitated rhizome and roots of *Ferula asafoetida* L., *F. foetida*, Royel, *F. nubicaulis* Boiss, and some other species of *Ferula*, belonging to family *Apiaceae*.

Geographical source

Known in Iran, Turkestan and Afghanistan (Kashan and Chagar districts)

Characteristics

Asafoetida occurs as a soft solid mass of irregular lumps or tears. Sometimes almost semiliquid.

~~Few~~ Tears are rounded or flattened and about 5-30 mm in diameter. Grayish - white on dull yellow or reddish brown in colour.

Asafoetida mass is mixed with
Fruits, Fragments of wood sand
And other impurities.

Asafoetida has a strong, garlic
like (alliacous) odour and a
Bitter acid and alliacous
Taste.

When triturated with water,
It makes a milky emulsion.
It should not have more than
50% of matter insoluble in
Alcohol (90%) and not more
than 15% of ash.

USE! Asafoetida is used as
Carminative - Emeticant,
Antispasmodic and Laxative
As well as externally to prevent
Bandage chewing by dogs,
For flavouring curries,
Sauces and pickles, as an
enema for intestinal flatulence
In hysterical and epileptic
Affections in cholera, Asthma
Whooping cough and Chronic
Bronchitis.

Myrrh Drugs

Synonyms:

gum myrrh, myrrina
(Mirabol)

- ⇒ Sources - myrrh. is an oleo-gum
- resin obtained from the stem
And branches of Commiphora
molmol (Berg) Engler or from
other species of Commiphora
Belonging to family Burseraceae

Geographical source

North east Africa
Southern Arabia

Collection and preparation

- ⇒ The tree is small about 3m in height.
- ⇒ The pith contains schizogeno-
ducts and "lysiogeno" canals
which are filled with yellowish
granular material.
- ⇒ After proper incisions are made in
the bark of a tree, oleo gum
resin exudes.
- ⇒ It gradually hardens and becomes
dark or reddish-brown in ~~tree~~
Appearance
- ⇒ collected by natives in goat skin.

Characteristic Features

- Colour!** - externally reddish brown
internally brown.
- Odour** - Aromatic and Agreeable.
- Taste** - Aromatic, bitter and astringent.
- Surface** - Rough
- Size** - About 1.5-3 cm in diameter
- Shape!** - Round in the form of -
rounded or irregular
Teardrop

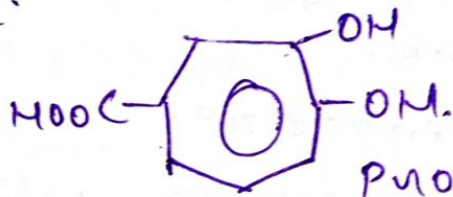
Chemical Constituents!

- myrrh. contains volatile oil (7-17.1)
Resin (20-25%) , gum (57-61%) and bitter
principle (3 to 4%). The volatile oil
consists of eugenol - m-cresol and
cuminaldehyde.
- ⇒ The resin is found to consist of
a mixture of α -, β - and γ camphron
acids (resin acid) which are
either soluble. Besides, it also
contains two phenolic resins α and
 β metabomyrrhinolic acids which
are either insoluble.
- ⇒ The oleo-gum resin yields alcohol
-soluble extract not less than 30%.
- ⇒ It also contain phenolic compounds
such as! - pyrocatechin and

protocatechuic acid.

→ The crude alcohol-insoluble fraction
is Gum.

Composed of protein (10%) and ~~carbohydrate~~
carbohydrate (64%) made up of
arabinose, galactose and glucuronic
acid. However, the gum is found
to be associated with an oxidase
enzyme.



protocatechuic acid.

USES!

→ It is used chiefly in perfumes and
Incense.

⇒ It is frequently employed as an
Antiseptic and stimulant.

⇒ myrrh. act as an astringent to the
mucous membrane and hence.

It find its application in oral
hygiene formulations such as gargles
mouth washes.

→ It is also used as a coagulative

COLOPHONY

SYN- Rosin, Amber resin.
Colophonum, Abietic anhydride

Source- Solid residue obtained after
Distillation of volatile oil.

(Turpentine) From the oleo-gum-resin of
various species of pinus like

P. palustris, *P. pinaster*, *P. halepensis*,
P. camibecae.

Family! Pinaceae.

CS! North American, North Europe
Pakistan, India (Himalaya)

CHARACTERISTICS

- **OCUR!** Translucent
- **COLOUR** - yellow or amber colour
- Specific action.
- Burn at 100°C .
- Produce smoky flame at Temp.
Above 100°
- NMT - Oil - ash.
- Soluble in alcohol, ether, CS₂,
Benzene and insoluble in water.

CHEMICAL CONSTITUENTS

- 90% Resin acid.
- Esters of fatty acid.
- Resene.

→ 90% α , β , γ - abietic, ~~pin~~ pimaric acid, saponic acid hydrocarbon

→ powder + acetic anhydride → dissolve in a dry test tube → conc. HCl → purple colour.

→ Alcoholic solution is acidic to litmus paper.

→ powder + light petroleum → dissolve

→ filtered → dilute copper acetate.

→ petroleum layer shows emerald green colour. (due to formation of the copper salt of abietic acid)

USE

⇒ preparation of zinc oxide, adhesive plaster, ointment.

⇒ much mosin is chemically modified by hydrogenation or polymerization products involving printing inks, rubber, linoleum, thermoplastic floor tiles and surface coating

⇒ The abietic acid shows ~~anti~~ antimicrobial, antitumor and CNS activity.

→ Stimulant - and diuretic

Glycosides!

Glycosides are compound that yield one or more sugar upon hydrolysis. The term glycoside is a generic term for natural product that is chemically bound to a sugar. Thus the glycoside consists of two parts! -

- The sugar and aglycone. The aglycone may be a terpene, a flavonoid, a coumarin or any other natural product. ~~glycoside-s~~

- Glycoside shows entire chemical diversity. Among the sugar found in natural glycosides, D-glycoside is the most abundant one. ~~to the~~ L-rhamnose and L-fucose also occur quite frequently of the pentoses.

L-arabinose is more common than D-xylose. The sugar part can be disaccharide

Introduction

A glycoside is an organic compound usually of plant origin that is composed of a sugar portion linked to a non-sugar moiety.

sugar position - - - - - glycone.
non sugar position - - - - - aglycone

Linkage btw sugar and mon-sugar
is usually an 'oxygen linkage'
|
oxygen

TYPES

Based on atoms involved in glycosidic linkage -

- O - glycosides
- C - glycosides
- S - glycosides
- N - glycosides

SENNA LEAVES

Origin The dried leaflets of Cassia acutifolia (Alexandrian Senna) and Cassia angustifolia (Indian Senna)

Family ~~Leguminosae~~
Leguminosae (Fabaceae)

① Morphology

Colour Green
Insulation Cauline.
Phyllotaxis Alternate
Leaf base Stipulate
Leaf petiole petiolate.
Lamina

Composition - Compound paripinnate
Shape - ~~lanceolate~~ lanceolate - ovate
Apex - mucronate.
margin - entire
Base - asymmetric
venation - pinnate unilobate
surface - pubescent (hairy)
Texture - papery

Active Constituents

- (1) Anthraquinone derivatives glycosides
(a) dianthrone (Sennosides A, B, C and D)
- (2) Anthranol (also-emodin and when aglycones).

2. Flavonoid - kaempferol
3. mucilage.

Aloe Vera

Common names Aloe, gandal etc.

Botanical source: *Aloe vera*, *Aloe barbadensis*
Aloe ferox, *Aloe pernyi*

Family: Liliaceae

Geographical source: Indigenous to East
And South Africa, West Indies, and
Tropical countries, countries bordering
on the Mediterranean.

General description: Aloe is the solid

Residue (dried juice) obtained by
Evaporating the liquid which drains
from the transversely cut leaves
of various species of Aloe (Liliaceae)

The juice is usually concentrated by
Boiling and solidifies on cooling.

Chemical constituents:

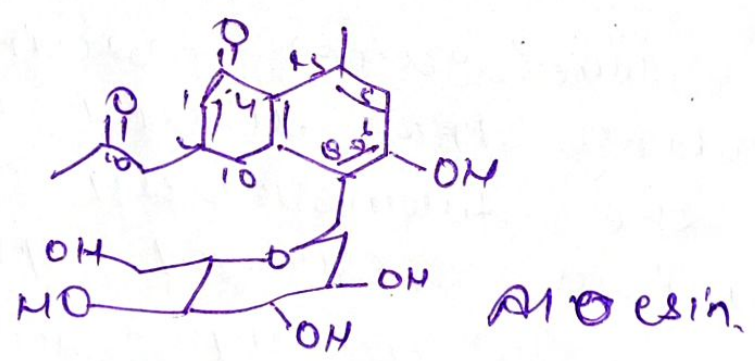
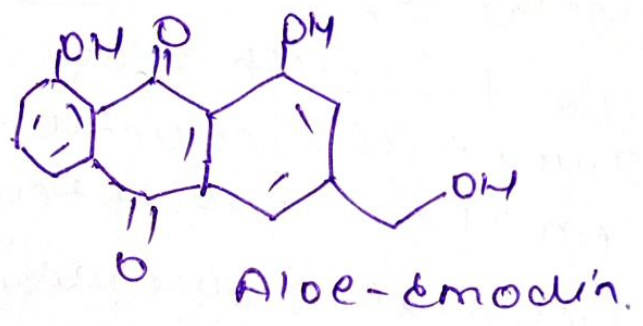
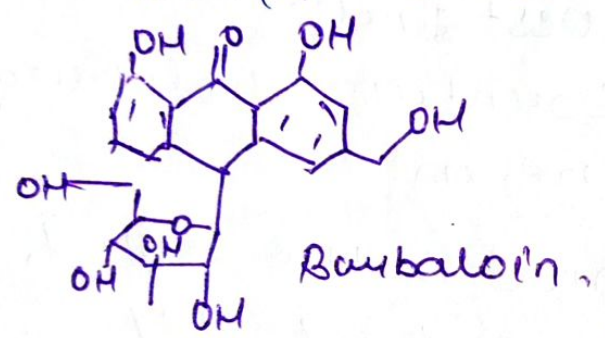
⇒ Small quantities of aloe-emodin are
sometimes present in aloe, and aloe
contains aloeinosides A and B,
which are O-glycosides of barbaloin

⇒ In South African Sapp. eg. (Aperox) aloesin (now often written to as aloesin) was identified ^B

⇒ other isolated from ~~cape~~ - cape aloes include aloesin A and C.

⇒ Aloesin A ~~was~~ was isolated from A ambrosensis leaves.

⇒ Aloesin B has been obtained from Kenya aloes.



Uses

- Aloes is employed as purgative but is seldom prescribed alone.
- ⇒ Vermifuge
- ⇒ Emmolient
- ⇒ Stimulant
- ⇒ Stomachic
- ⇒ Tonic
- ⇒ Antibacterial.

- primarily
- Treatment of wounds, burns and other skin disorders.
- soothing effect on burns.

Almond

Biological source: Almond oil is a fixed

Fixed oil obtained by expression from the seeds of *Prunus amygdalus* (Rosaceae) var. *Dulcis* (sweet almonds) or *P. amygdalus* var. *amara* (bitter almond).

Geographical source: The oil is mainly produced from almonds grown in the countries bordering the Mediterranean (Italy, France, Syria, Spain and North Africa) and Iran.

Chemical constituents: Both varieties of almonds contain 40-55% of fixed oil, about 20% of protein, mucilage and emulsin. The bitter almonds in addition 2.5-4.0% of the colourless, crystalline, cyanogenic glycoside amygdalin.

uses

→ Expressed almond oil is an emollient and an ingredient in cosmetics

→ Almonds oil is used as a laxative emollient, in the preparation of toilet article and as a vehicle for oily injections

→ The ~~volatile~~ volatile almonds oil are used as flavouring agents.