RESINS

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INTRODUCTION

- Definition: Complex amorphous product of more or less solid characteristics which on heating first gets softened & then melts.

- Resins are produced & stored in schizogenous glands or cavities of plants.

- Resins – unorganized drug
  more or less solid
  hard
  transparent or translucent
- Solubility – insoluble in water &
  petroleum ether
  Soluble in alcohol, solvent
  ether, benzene or chloroform

Classification

- Classified on basis of 2 imp features i.e. on basis of their chemical nature & secondly as per association with the other group of comps like essential oils & gums.

- Chemical classification of resins according to their functional groups given below:

Resin acids

Resin esters

Resin alcohols

Resin phenols

Glucoresins

Resenes

- Based on the association of resins with gums/ or volatile oils are given below:

Oleoresins

Gum resins

Oleogum resins

Chemical classification of resins according to their functional groups:

1. Resin acids:

- COOH group containing resinous substances which may or may not association with phenolic compounds.

- These comps are found in free state or as ester dvts.
- Soluble in aqueous solution of alkalies producing frothy solution.
- They derivatized to their metallic salts known as resinates, use in soap, paints & varnish industries.
- Ex. Colophony, Myrrh

2. Resin esters

- Esters of resin acids or other aromatic acid like benzoic, cinnamic, salicylic acid etc.
- Converted into free acid by treatment with caustic alkali.
- Ex. Benzoin, Dragon’s blood

3. Resin alcohols (Resinols)

- Complex alcoholic comps of higher molecular weight.
- Found as free alcohols or ester of benzoic, cinnamic acid.
- Insoluble in aqueous alkali solution but soluble in alcohol & ether.
- Ex. Benzoin – benzoresinol

  Storax – storesinol

4. Resin phenols (resinotannols)

- Higher molecular weight occur as free states or ester.

- Form phenoxides & soluble un aqueous alkali.
- Insoluble in H2O & soluble in alcohol & ether.
- Gives +ve reaction with FeCl3
- Ex. Balsam of Peru – peruresinotannol
  Tolu balsam – toluresinotannol

5. Glucoresins

- Resins combined with sugars by glycosylation & produce glucoresins.
- On hydrolysis gives glycone & aglycone.

6. Resenes

- Chemically inert resin products termed as resenes.
- Found in free state & never forms esters or other dvts.
- Soluble in benzene, CHCl3 & pet. Ether.
- Insoluble in H2O.
- Ex, Asafoetida – asaresene B (50%)

Based on association with gums &/or volatile oils given below:

1. oleoresins

- Homogenous mixture of resin with volatile oils.
- Ex. Ginger , Turpentine

2. Gum resins

- Mixture of resins with gums.
- Gum can be easily separated out from resin by dissolving the gum in water.
- Ex. Ammoniacum

3. Oleogum resin

- Mixture of resin, volatile oil & gum.
- Oleogum resin come out from the incisions made in bark & then hardens.
- Ex. Myrrh, Asafoetida

Balsams:

- Naturally occurring resinous mixtures contains high amount of balsamic acid like benzoic, cinnamic acid & their esters.
- Ex. Balsam of Peru

  Balsam of Tolu

Sr. no.	Resins	Examples
I	Chemical groups	
1.	Resin acids	Colophony, Myrrh, Sandrac
2.	Resin esters	Benzoin, Dragon's blood
3.	Resin alcohols	Benzoin, Storax
4.	Glucoresins	Jalap
5.	Resenes	Asafoetida
6.	Resin phenols	Balsam of tolu, Balsam of Peru
7.	Mixed composition	Shellac
II	Resins with Gum/Essential oil	
1.	Gum resins	Ammoniacum, Gamboage
2.	Oleoresin	Ginger, Turpentine
3.	Oleogum resin	Asafoetida, Myrrh
III	Balsams	Balsam of tolu, Balsam of Peru

Chemical composition

- Complex & diverse in nature
- Complex mixtures of acids, alcohols, phenols, esters, glycosides or hydrocarbons.
- Resin with volatile oils → monoterpenoids, sesquiterpenoids & diterpenoids
- gums associated with resins (Acacia gum)
- resins – physiological origin such as secretions of ducts.
- pathological product exuded through the incisions made on plant.

- Process of isolation of resin difficult task due to presence of various combinations.
- General technique can be extraction of drug with alcoholic solvents & then subsequent precipitation of resin by adding concentrated alcoholic extract to large proportion of water.
- Distillation or hydro distillation used for separation of volatile oil from resin.

- Colophony
- Podophyllum
- Jalap
- Cannabis
- Capsicum
- Myrrh
- Asafoetida
- Balsam of Peru
- Balsam of Tolu
- Benzoin
- Turmeric

CAPSICUM

Synonyms:

Chillies, Mirch, Marchun, Cayenne pepper, Fructus capsics

B.S.:

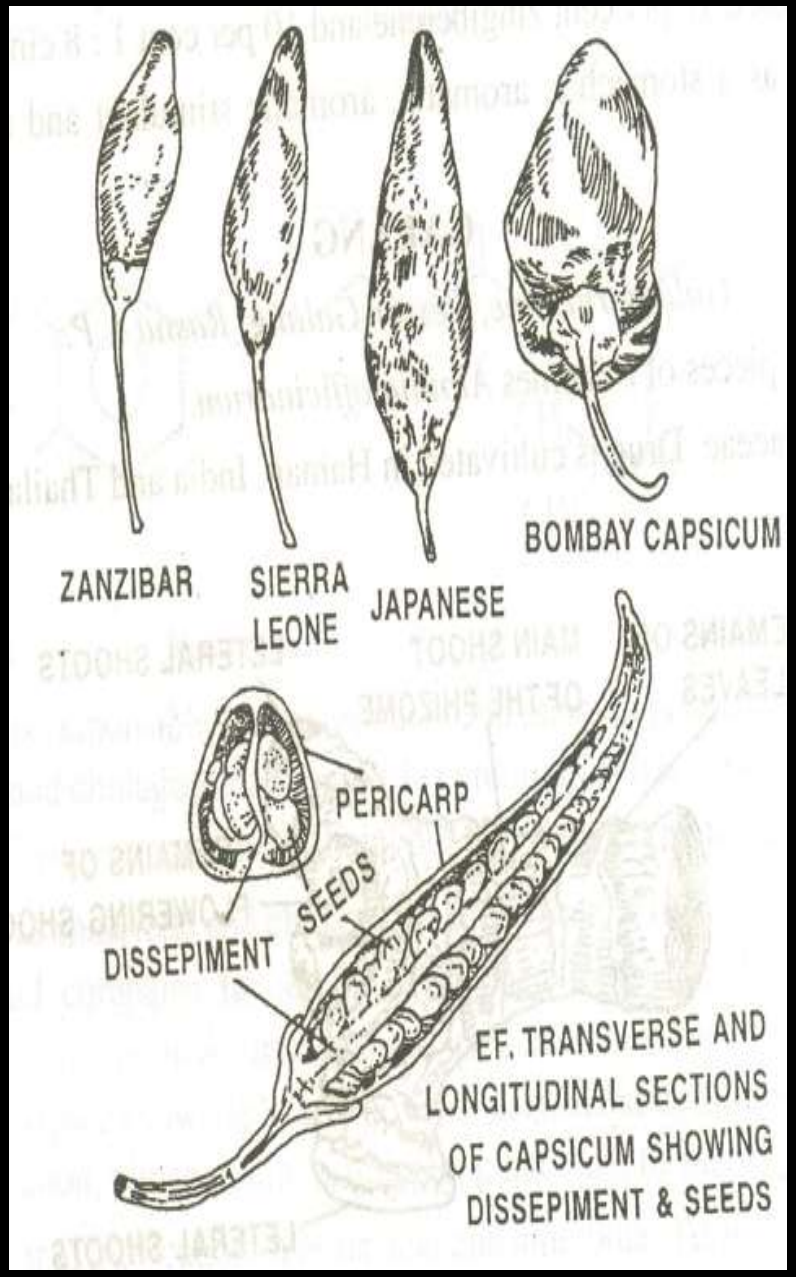
Consists of dried ripe fruits of ***Capsicum annum*** (Bombay) & ***C. minimum*** (African)

Family:

Solanaceae

Capsicum annum - large fruits

C. minimum & C. frutescens – small fruits


ZANZIBAR
SIERRA LEONE
JAPANESE
BOMBAY CAPSICUM
PERICARP
SEEDS
DISSEPIMENT
EF. TRANSVERSE AND LONGITUDINAL SECTIONS OF CAPSICUM SHOWING DISSEPIMENT & SEEDS

G.S.: Found in tropical countries

India (U.P., A.P., Gujarat, Maharashtra),

West & East Africa

Macroscopic characters:

	C. annum	C. frutescens
Size	12-25 mm long 7 mm wide	5-12 mm long 2-4 mm wide
Shape	Conical or oblong	Wide & oblong to conical flattened
Surface	Shrievelled, glossy, orange red	Shrievelled, dark reddish brown

	C. annum	C. frutescens
Calyx	Usually absent, inferior, small with 5 short teeth	Firm & conspicuous
pedicel	2-3 cm long	Very prominent
Taste	Pungent Divided into 2loculli by longitudinal membranous	Less pungent Divided into 2 & sometimes 3 loculli

Chemical constituents:

- Capsaicin – an extremely pungent principle
  it is vanilylamide of isodecenoic acid
  crystalline nature
- Concentration – c. annum – 0.1 – 0.5%
  c. frutescens – up to 1.5%
- Effect of temp, - higher the temp. greater the % of capsaicin
- Pungency of capsicum is not affected by alkali but destroyed with oxidizing agents

- Also, contains - ascorbic acid (0.1 – 0.5%)
  capsanthin
  Fixed oil
  Flavones (eriodictyol & hesperidin)
  carotene (red pigments responsible for red colour)

Uses :

- As spice
- Externally – counter irritant in rheumatism, inflammation
- Internally – stomachic & carminative

JALAP

Synonyms:

Radix jalapae, Vera cruz

Biological source:

Dried tuberous roots of *Ipomoea purga (Exogonium purga)*

Family:

Convolvulaceae

Geographical source:

Indigenous to Mexico
India, Jamaica, West Indies &
South America

Cultivation & collection

- The plant is large & twinning herb & produce horizontal runners, nodes & internodes.
- Adventitious roots are produced from the nodes of runners.
- Some of roots thin but few swell due to storage of starch.
- They are collected in may after rainy season by digging & dried.
- Unfavorable condition they are dried by woodfire in nets.
- Hence, drug gets smoky odour.

Description:

Appearance – hard, compact & heavy

Shape – irregularly oblong, cylindrical, fusiform or napiform

Surface – outer surface – dark brown with furrows & wrinkles

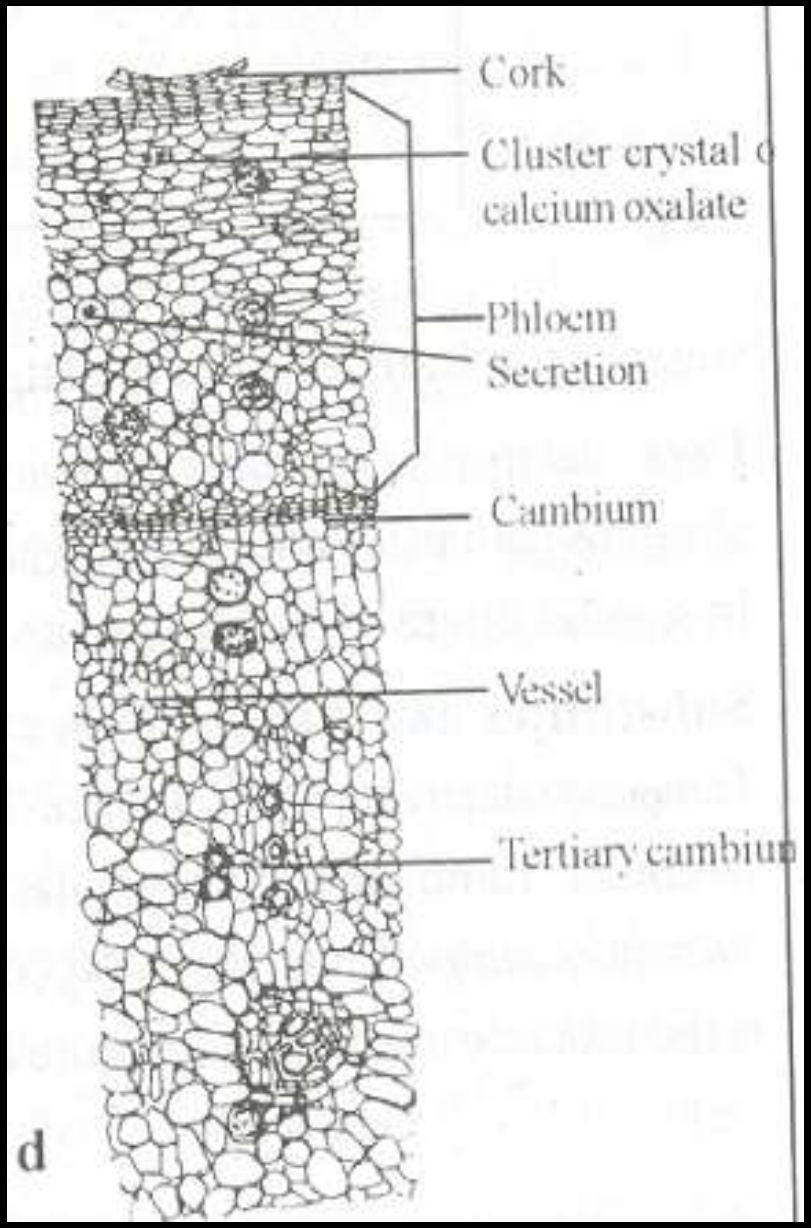
inner surface – yellowish green

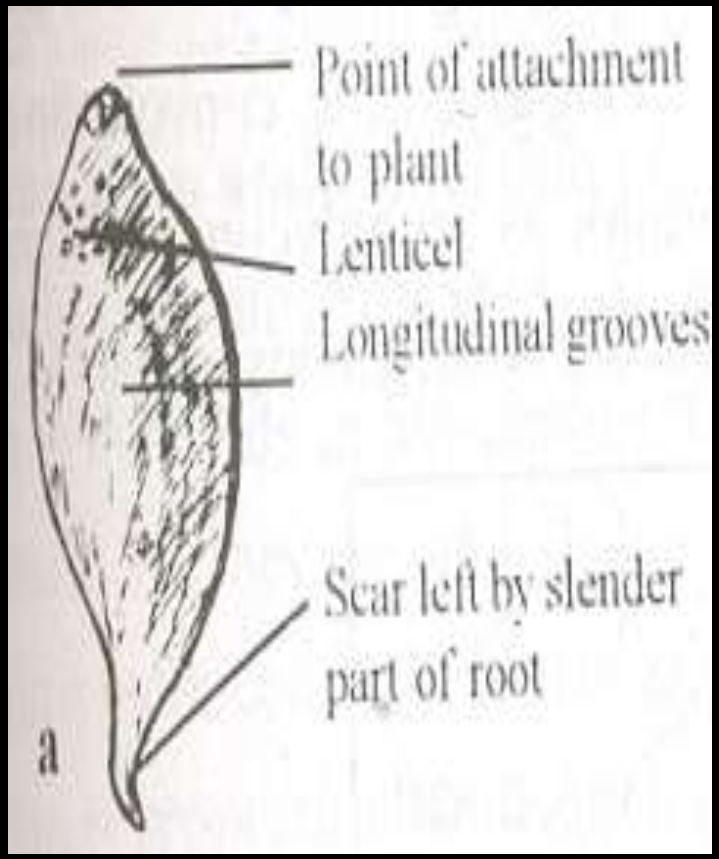
Odour – smoky

Taste – sweet & starchy in beginning & later it is acrid

Microscopy :

- Cork – outer most layer consisting of tabular polygonal cells which brown in colour
- Secondary phloem formed by circular cambium & about 2 mm wide
- Inside cambium has secondary xylem.
- secondary xylem has vessels which are small groups or scattered.
- Latex cells present in phloem.
- Parenchymatous cells contain starch, calcium oxalate crystals


Cork
Cluster crystal
calcium oxalate
Phloem
Secretion
Cambium
Vessel
Tertiary cambium
d


Point of attachment
to plant
Lenticel
Longitudinal grooves
Scar left by slender
part of root
a

Chemical constituents:

- Principal constituent of jalap is glucosidal resin (8-18%)
- Jalap resin & other resins are complex & on hydrolysis yield hydroxy fatty acids (containing 1 or more OH groups), sugars & volatile fatty acids
- Hydroxy fatty acids & sugars combined with glucosidal linkage
- Volatile fatty acids & sugars combined with ester linkage.

- Resin is soluble in ether up to 10% & is called jalapin.
- Ether insoluble portion is 90% & called convolvulin or jalapurgin which is complex ester of valeric acid, tiglic acid & exogonic acid.
- Convolvulin on hydrolysis yields convolvulic acid, ipuranol (aglycone), butyric, isovaleric & exogonic acid along with glucose & rhamnose sugars.
- Also contains β – methylaesculetin, ipurganol, mannitol, starch & ca. oxalate.

Uses:

- Used as a cathartic
- Its cathartic action by powerfully stimulating intestinal secretions.
- Smaller doses used as a laxative.
- In Ayurveda, it is used in oedema.

Jalap resin prepared from the powdered jalap by pptation with alcohol.

Adulterants:

1. *Ipomoea simulans* (Tampico jalap) – contains 10% resin tampicin which is similar to ether soluble resin of jalap.

2. Mirabilis jalapa (Marvel of Peru) F. Nyctaginaceae – 2-8% of resin

3. Orizaba jalap (*Ipomoea orizabensis*)

INDIAN JALAP

Synonyms:

Tyrpeth root, Nishoth (Hindi),

Nashotar (Guj.)

Biological source:

Dried tuberous roots of *Ipomoea turpethum (Black nishoth)* (Family: Convolvulaceae)& *Marsdenia tenacissima (White nishoth)* (Family: Asclepiadaceae)

White nishoth –

- Large sturdy twinning shrub
- Found in sikkim to ceylon
- Roots are dug out by natives & cork is sparated.
- Stem of plant contain fibres & used in preparation of fishnets.
- Pieces are channelled, quills or double quills.
- Roots – 1.5 to 9 cm long & 2-3 mm broad

- Outer surface – longitudinal furrows & ridges, colour – yellow to buff
- Stone cells present below cork & abnormal vascular bundles are absent.

Black nishoth –

- Cylindrical or spirally twisted pieces.
- Roots – 2 to 15 cm long & 3 to 5 mm diameter
- Outer surface – grayish brown to dark brown
  present longitudinal wrinkles & ridges
- Abnormal vascular bundles present in phelloderm.

Chemical constituents:

- Roots & rhizomes contain 7 -8% resin
- Alcohol soluble resin of roots of *Ipomoea turpethum* – 5 –glycosidic turpethinic acids
- turpethinic acids are –

11- hydroxy palmitic acid (jalapinolic acid)

3,12 – dihydroxy pentadecanoic acid (operculonic acid)

3,12 – dihydroxypalmitic acid

4,12 - dihydroxy pentadecanoic acid

4,12 – dihydroxypalmitic acid

- Volatile fatty acids also present

Use:

- Used as purgative (black & white nishoth)
- Black nishoth has greater activity.

PODOPHYLLUM

Synonyms:

American mandrake, May-apple root

Biological source:

Dried rhizomes & roots of *Phodophyllum peltatum*

Indian phodophyllum - *Phodophyllum hexandrum*

Family:

Berberidaceae

Geographical source:

indigenous to eastern part of USA & Canada.

grows widely in Virginia, North carolina & Tennessee

Collection & preparation:

- Perennial herb which grows in moist & shady places.
- Drug collected in autumn.
- Rhizomes dug up, washed with water to remove soil & cut into smaller pieces & dried in sun.
- For artificial drying they are placed on wire nettings & placed about 3 ft above the fire.

Description:

- Rhizomes are sub-cylindrical with irregular nodes.
- Length – 5-20 cm

Thick – 1 to 2 cm

- Yellowish brown in colour & consists of longitudinal wrinkles.
- On upper side shows three to five stem scars, which are circular or elliptical.
- It has slight, characteristic odour, bitter & acrid taste.

Microscopy:

- Shows darker epidermis & one to two layered cork made up of dead cells.
- Cortex – outer region – made up of thin walled parenchyma & collenchymatous tissues

  inner region – consist vascular bundles.
- Central pith – parenchymatous with narrow stone cells.
- Ca. oxalate & starch grains presence.

Chemical constituents:

- Contain 2-8% resinous material – phodophyllin
- Major constituents of Podophyllum resin are lignan dvts characterized as Podophyllotoxin, α &β – peltatin.
- Lignan – found as glycosides & their free aglycones.
- Also contain desmethyl podophyllotoxin, desoxy podophyllotoxin, podophyllotoxne, flavonoid quercetin & starch.

Uses:

- Cytotoxic activity
- Used in treatment of venereal & other warts.
- Podophyllotoxin is semi synthetically converted to potent anticancer agent etoposide which used in lung & testicular cancer.
- Acts as drastic purgative in moderate doses.

INDIAN PHODOPHYLLUM

Synonyms:

Rhizoma Podophylli Indici,
Indian podophyllum

Biological source:

Dried rhizomes & roots of *Phodophyllum hexandrum.*

Family:

Berberidaceae

Geographical source:

India, Pakistan, Afghanistan

Description:

Long – 2-4 cm

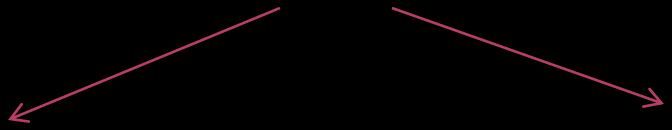
1-2 cm diameter

colour- - brown

Taste – bitter

Chemical test:

Alcoholic extract of Podophyllum resin + copper acetate



brown ppt (Indian Podophyllum)

green colour without ppt (American Podophyllum)

Microscopy: **T.S. of rhizomes shows** –

Outer – cork - thin walled, polygonal & tubular cells.

Cortex – parenchymatous tissue with starch grains & ca. oxalate crystals

Inner side – vascular bundles

Xylem vessels – irregularly shaped & short.

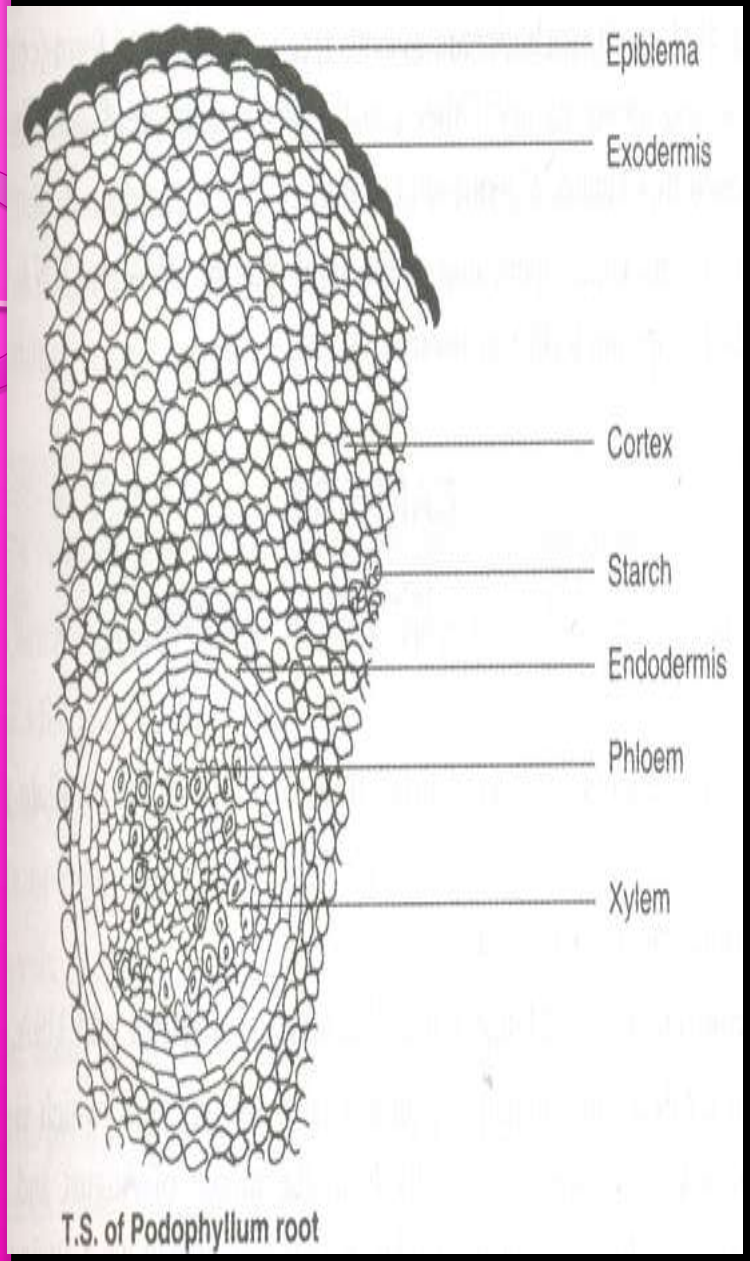
T.S. of root shows –

Presence of slightly papillose epiblema has thick & anticlinal walls.

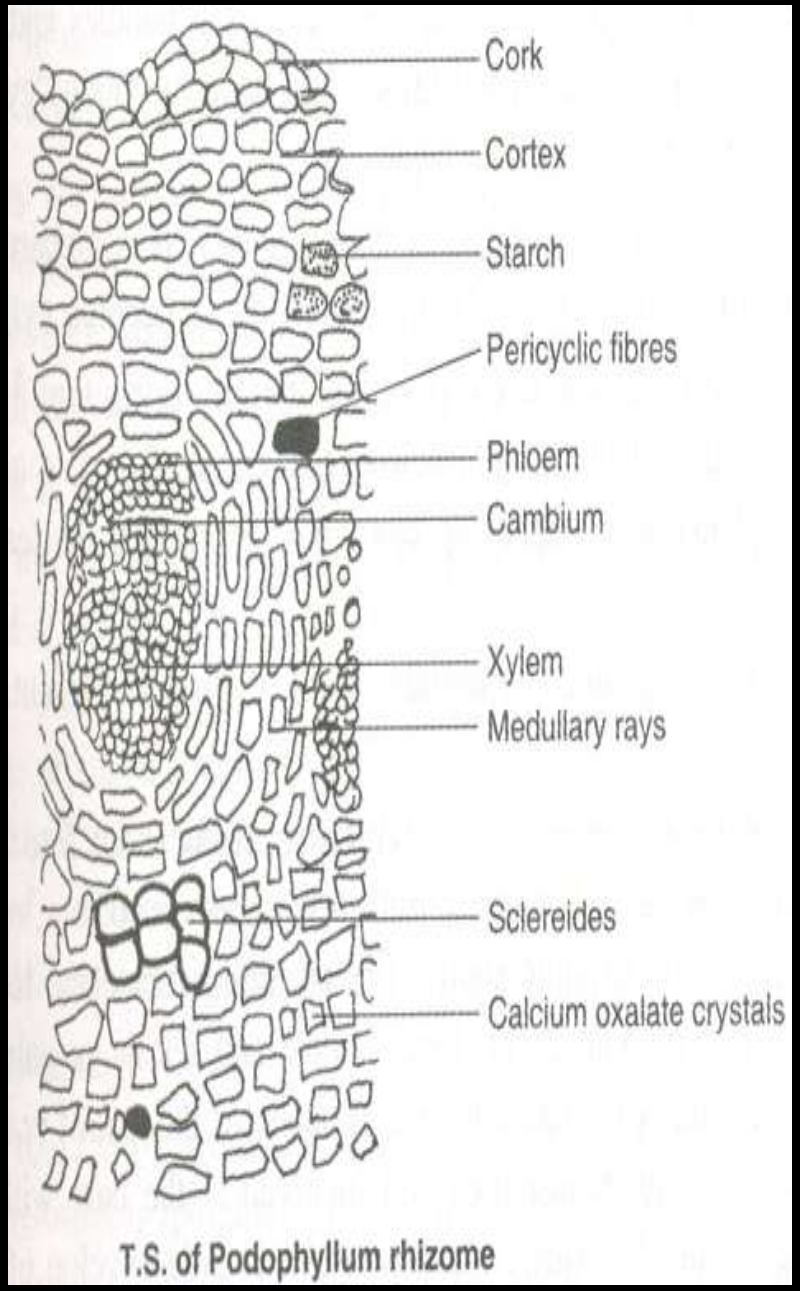
Exodermis & endodermis are suberised & wavy longitudinal wall.

Center – large pith – consist of pitted sclerides.

Starch grains present but ca. oxalate absent.



T.S. of Podophyllum root



T.S. of Podophyllum rhizome

Chemical constituents

similar to *P. Peltatum.*

Resin content – 6-12% (40% phodophyllotoxin)

Uses: *similar American phodophyllum*

CANNABIS

Synonyms:

Indian hemp, Bhang, Ganja, Charas, Hashish

B.S.:

Consists of dried flowering & fruiting tops of ***Cannabis sativa***

Family:

Cannabinaceae

G.S.:

India (Maharashtra, North India, Bengal), Africa, America

Morphology:

- Cannabis occurs in flattened cylindrical mass, green in colour
- Stem bears bracts, bracteoles, flowers & fruits
- Leaves are absent, if present they are few & broken
- Surface – uneven, rough, resinous & harsh to touch
- Size – 3 – 10 cm length
  5 – 10 cm width
- Shape – stem is straight, cylindrical, longitudinally furrowed
- Bracts are simple or bilobed & bear small stipules.
- Pair of bracteoles is produced in axil of bracts
- Flowers are produced in axil of bracteoles & hairy & membranous

Chemical composition:

- Resin – 2.5 – 20%

  semisolid, brown coloured & amorphous

  contains many constituents like cannabidiol (anti bacterial against gm +ve bacteria)
- Cannabidiolic acid (sedative & antibiotic)
- Cannabinol (inactive)
- Cannabigerol (antibiotic)
- Cannabichromene (sedative)
- Δ^1 – trans tetrahydrocannabinol (psychotropic & analgesic)

Δ^8 – tetrahydrocannabinol
Δ^9 – tetrahydrocannabinol

} hallucinogenic activity

- Also contains vol. oil, trigonelline & cholene
- Drug must dried thoroughly &store in well closed containers
- If not stored drug deteriorate under ordinary condition by undergoing oxidation.

Uses:

- Having analgesic, sedative, narcotic action
- Psychotropic properties similar to LSD & mescaline
- The psychotropic action due to increased nor adrenaline & dopamine in brain
- When administered at beginning it causes intoxication, euphorbia, & mental disturbances. These action more by smoking & inhalation than taking it orally.

MYRRH

Synonyms:

Arabian or Somali Myrrh, Gum-resin myrrh, Hirabol (Guj.), Bol(Hindi)

B.S.:

Oleo gum resin obtained by incision from the stem of ***Commiphora molmol, C. abyssinica & C. schimperi***

Family:

Burseraceae

G.S.:

Somaliland (North – East Africa), Nubia, Arabia, Abyssinia

Collection & preparation:

- The tree is small about 3 meters in height.
- As all the Burseraceous pant contains schizolysigenous cavities containing granular secretion of gum resin.
- The cavities enlarged by merging with other ducts to produce big lysigenous cavities.
- Gum resin exudes from natural cracks & fissures of bark but sometimes incisions made on bark for deriving gum resin.
- Gum resin oozes as yellowish whitsih viscid fluid which immediately hardens to reddish brown material.
- Material collected in goatskin

- The natives simultaneously collect bdellium or bissabol, which separate later.
- Sometimes bdellium gets admixed in the drug.

Description:

- Occurs in irregular tears or mass form.
- Reddish brown with rough, dull & dusty surface.
- They are brittle & break with granular fracture
- Fractured surface is waxy & oily with whitish mark.
- Thin pieces are translucent or almost transparent.
- Odour – aromatic
- Taste – aromatic, bitter & acrid.

Microscopy:

Outer layer – presence of sclerenchyma layer with thin walled parenchyma

Inner layer – presence schizolysigenous cavities

medullary rays & sclerenchymatous fibers

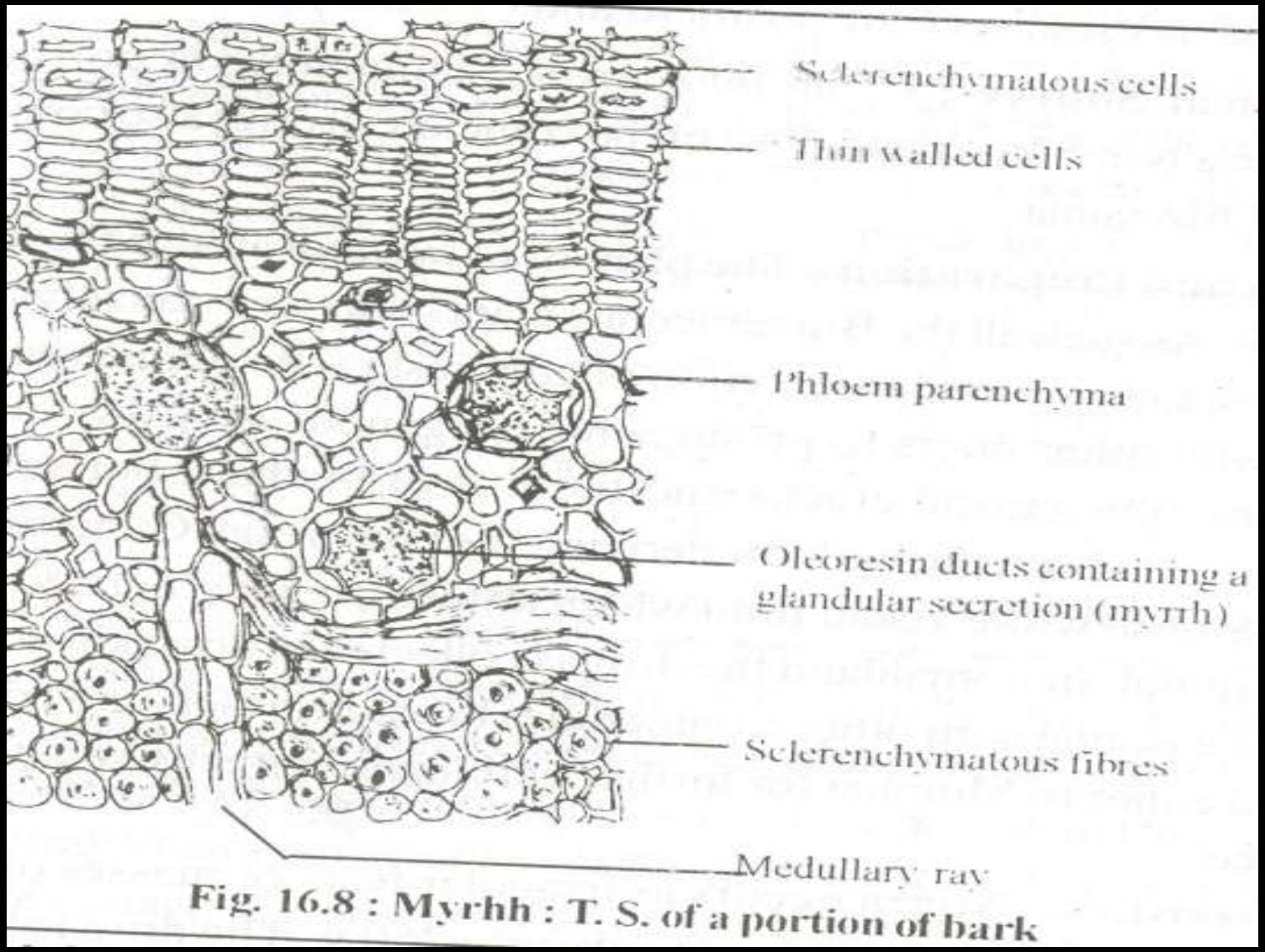


Fig. 16.8 : Myrhh : T. S. of a portion of bark

Standards:

Solubility – not less than 30% soluble in 90% alcohol

Ash value – NMT 5%

Chemical constituents:

- Contains about 7-17% volatile oil

  25-40% resin

  57-61% gum

  3-4% impurities

- Volatile oil contains terpenes – cuminic aldehyde, eugenol, metacresol, pinene, limonene, dipentene & 2 sesquiterpene.

- Because of volatile oil, myrrh stored in air tight containers.
- Some portion of resin soluble in ether. Ether soluble contents of myrrh are α, β & γ – commiphoric acids & esters of other acids.
- Also consists of phenolic resins such as α, β – heerabomyrrhol.
- Ether insoluble fraction of myrrh consists of α, β – heerabomyrrholic acids.
- gum similar to acacia gum & contains oxidase enzyme.
- On hydrolysis gum yields arabinose, galactose & glucuronic acid.

Chemical tests:

1. Triturate drug with water - yellowish brown emulsion
2. Ethereal solution of myrrh + Br2 – vapor becomes reddish
3. Ethereal solution of myrrh + HNO3 – purple colour

   2 & 3 tests are negative in case of bdellium

Uses:

- Stimulant & antiseptic properties
- Because of astringent & disinfectant, its alcoholic tincture used in skin applications & in inflammation of mouth & pharynx.
- Used in incense & perfumes.
- As a uterine stimulant.

Substitutes & adulterants:

1. Perfumed bdellium – known as bissabol resembles as myrrh.

Source – C. erythroea

Colour – yellowish

Break with waxy fracture

2. Arabian myrrh – known as ‘Fadhli’ comes from east Aden in small pieces.

Odour & taste resemble to official drug but less prominent.

3. Yemen myrrh

Large pieces of dark reddish brown colour & dusty surface.

Taste – bitter

Odour – resembles to myrrh

Less aromatic

4. Opaque bdellium

5. Indian bdellium

6. Gum hotai – sent in large quantities to bombay

Contains acid resin & saponin

Used for washing hair

turmeric

Microscopy:

- Characters & structures is similar to ginger.
- Cork – multilayered thin walled cells arranged in radial rows
- On outer side, tangential epidermal cell layer which are oblong in shape
- Cortex – thin walled parenchyma cells which contain starch grains
- Endoderm – central cylinder of parenchyma cells
- Oleoresin cells present
- Vascular bundles present but fibres are absent.

ASAFOETIDA

Synonyms:

Devil's dung, Asfoda, Asant, Hing

B.S.:

Oleo gum resin obtained from the rhizome & root of ***Ferula foetida. F. rubricaulis, F. asafoetida*** & other species of ferula.

Family:

Umbeliferae

G.S.: Iran, Pakistan, & Afghanistan

Collection:

- It is a perennial umbelliferous plant – 3 m height.
- Develops root system in ground.
- This resin present in rhizomes & root of plant.
- Collection is carried about at end of march before flowering.
- The stem & root consists of schizogenous cavities filled with white resinous emulsion.

- Resin is exudes from the freshly cut surface.
- Vertical rootstock is cut & the Oleogum resin exuded out is allowed to harden on rootstock.
- After few weeks Oleogum resin is scrapped off & the root stock is again allowed to exude by cutting fresh slice.
- The process is repeated about 10 days.
- It is dried & packed in suitable containers.

Description:

- Found in 2 varieties: tear & mass form

1. Tear form – purer drug

- colour – grayish yellowish to reddish brown
- round or flat pieces.
- grayish yellowish derived from F. rubricaulis
- reddish brown from F. foetida.
- When fresh the tears are tough at normal temp. but softer after warming.
- Odour – alliaceous
- Taste – bitter & acrid

2. **Mass form** – comes as agglutinated mass mixed with fragments of stem, root & soil.

- Inferior quality

Chemical constituents:

- Contains volatile oil, resin & gum
- volatile oil – 10-17%
- resin – 40-64%
- Gum – 25%
- Volatile oils contains pinene & organic disulphide including isobutyl propenyl disulphide C7H14S2 – responsible for alliaceous odor.

- Resin consists of asaresinol ferulate (ester of asaresinol & ferulic acid) & resene - asaresene A (crystalline).
- coumarins of nonvolatile resin – farnesiferol A,B & C & asacoumarin A&B
- Drug contains no free umbelliferone.
- Drug contains ferulic acid. When treated with Con. HCL(ferulic acid converted into umbellic acid which loose water & forms lactone 7 OH coumarin or umbelliferone)
- when drug treated with HCl & addition of NH3 – it shows blue fluorescence due to formation of umbelliferone. This test is used to distinguish asafoetida from galbanum.

Chemical tests:

1. Fractured surface of Drug + H_2SO_4 – reddish brown colour
2. Fractured surface of Drug + 50% HNO_3 – green colour
3. Drug + water – forms yellowish orange emulsion
4. Combined umbelliferone test – blue fluorescence

   boil drug (0.5 g) with sand & HCl (3 ml) & water (3 ml) for several min.

   ↓

   Filter & in filtrate add alcohol & strong NH_3

   ↓

   Blue fluorescence produced

Uses:

- Used in gastric diseases in flatulence as a carminative.
- Because of intense smell used as a sedative in hysteria & other nervous diseases.
- Used in culinary as an ingredient of sauces & curries.

TURMERIC

Synonyms:

Rhizoma curcumae, Curcuma

Indian saffron, Haldi

B.S.:

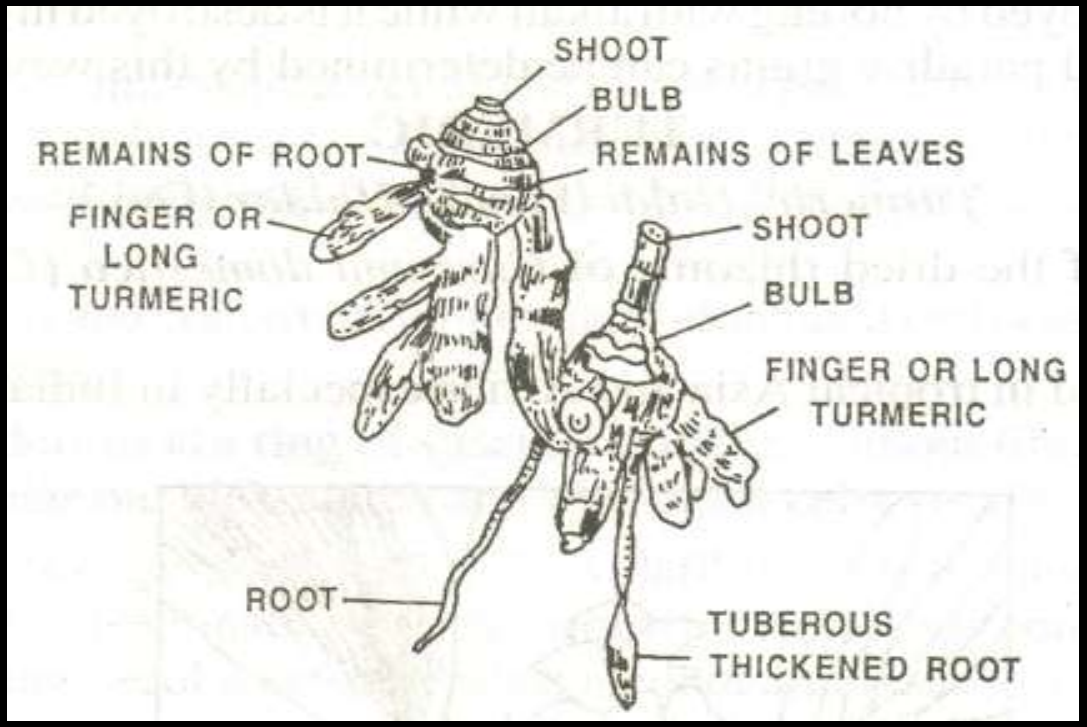
Consists of dried as well as fresh rhizomes of ***Curcuma longa (C. domestica)*** & other species of Curcuma like ***C. amada, C. angustifolia, C. aromatica, C. caesia, C. zedoaria*** etc.

Family:

Zingiberaceae

G.S.:

Cultivated in tropical Asia & Africa especially in India, China, West Pakistan & Malaya



Cultivation & collection:

- Propagation of turmeric done by bulbs.
- Requires deep rich loam & well manured with farmyard manure.
- They planted in October .
- Then immediately irrigated after plantation.
- The sprouting seen on surface of soil after 15 days.
- Weekly irrigation required.
- Rhizomes are ready to dug when plant just fruiting.
- Rhizomes are separated, washed with water & boiled in water for 2-3 hrs.
- Then dried in sun for 15 days.

Macroscopy:

- Fingers or long turmeric is tapering on both ends.
- Outer surface – deep yellow with longitudinal wrinkles.
- Leaf scars occur as a transverse ring.
- Inner rhizomes show brick reddish – yellow appearance.
- Odour – aromatic
- Taste – pungent & slightly bitter.

Chemical constituents:

- Curcuma contains 5% volatile oil, resin & yellow coloring matter known as curcumin & starch grains.
- Volatile oil contains phellandrene, borneol, cineol.
- Also contains sesquiterpene hydrocarbon Zingiberene & 65% two ketones i.e. turmerone & ar-turmerone.
- Curcumin responsible for colour of drug & consists of curcumin I, II, & III.
- Curcumin I – 60% i.e. diferuloylmethane
- Curcumin II – 24 % i.e. hydroxycinnamoyal feruloylmethane
- Curcumin III – 14% i.e. dihydroxy dicinnamoylmethane

- Curcuminoids present to extent of 3 to 5% & responsible for biological activity.
- Curcumin ($C_{21}H_{20}O_6$) m.p. – 184 to 185°c, insoluble in water & soluble in ethanol & acetone.

Chemical tests:

1. Powder drug + H_2SO_4 – crimson colour
2. Alcoholic solution of drug + boric acid – reddish brown colour – then add alkali – greenish blue color

3. Powder drug + acetic anhydride + conc. H_2SO_4 – violet colour

when this test seen in UV light, intense red colored fluorescence seen. This due to curcumin II & Java turmeric yellowish fluorescence seen & thus turmeric & java turmeric distinguished.

Uses:

- Used as spice & as coloring agent.
- It has great reputation in Ayurveda & used in diabetes & liver diseases.
- Volatile oil is responsible for aromatic & pungent properties of drug.
- Turmeric also used in cough & bronchitis.
- Has anti-inflammatory action & compares with phenylbutazone
- In china C. aromatica used in cervical cancer.
- it is used in creams & ointments.

- Turmeric used for identification of boric acid & ammonia.
- Turmeric paper gives red colour with boric acid & fumes of ammonia becomes blue.

COLOPHONY

Synonyms:

Rosin, Amber resin

B.S.:

Resin obtained from the residue left after the distillation of turpentine oil from crude oleoresin of ***Pinus palustris*** & other species of pinus

Loblolly pine – *P. toedo*

Short leaf pine – *P. echinata*

Cuben pine – *P. cubensis*

Family: Pinaceae

G.S.:

- North America, Spain, Greece, France, Morocco, Russia

Collection & preparation:

- Pine is large tree attaining height 45-55 m & girth of 3-4 m.
- Oleoresin is produced as a normal physiological product in pines but increases if injuries or cuts are given to plant.

- In this method, deep cut is given with suitable axe & the metal cups or clay cups are fixed closely to the tree trunk with suitable foil of galvanized iron - give direct the flow of oleoresin into containers.
- Oleoresin flows directly into the cup & after 8 to 10 days flow of oleoresin reduces.
- The cup moved higher up trees & new cuts are made into the tree.
- Last portion of oleoresin exudes very slowly which dry on blazed surface. Thos product known as ‘Gum Thus’, ‘Thus Amercanum’ or common frankincense.

- This process known as ‘Box method’ or ‘Cup & Gutter’ method.
- Blazing may be continued for about 40 years.
- The flow of oleoresin can be increased by spraying the blazes with 50% H_2SO_4 or by infection of cut surface with Fusarium species.

Description:

- Transparent or translucent irregular shaped pieces with different sizes.
- Colour – amber, pale yellow or brown colour & powder remains grey if exposed to air
- Odour – turpentine like
- Taste – bitter
- Solubility – insoluble in water but soluble in organic solvents like alcohol, ether, $CHCl_3$

- Acid value : 136 to 180
- Saponification value : 157 to 200
- Colophony stored in airtight containers because in presence of O2 oxidation occurs which results in increase of weight & decrease of solubility in light petroleum ether.

Chemical constituents:

- 90% abietic acid, 5% of resene & some amount of volatile oil
- Mixture of dihydroabietic acid & dehydroabietic acid present.
- Abietic acids has three isomers forms α,β & γ abietic acids.
- The acids are diterpene acids & phenanthrene dvts.
- Abietic acid on reduction with sulphur yield reten, hydrocarbon.
- French colophony contains pimaric acids which are isomers of abietic acids.

Identification tests:

1. Drug (1 g) & dissolve in 10 ml acetic anhydride by heat & add drop of H_2SO_4 – violet colour produced
2. Alcoholic solution of drug give acidic reaction with litmus
3. Dissolve colophony in light petroleum ether & add 2to3 times dilute solution of copper acetate.

   petroleum layer shows emerald green colour.

Uses:

- Used in making cements, varnishes, paints, adhesive & some soaps
- Used in ointments, plasters.
- Athletes rub it upon their hands or soles of their shoes to prevent slipping.

Tolu balsam

Synonyms:

Balsamum tolutanum

Biological source:

balsam derived from the incisions in the tree trunk of ***Myroxylon balsamum.***

Family:

Leguminosae

Geographical source:

- Indigenous to Columbia
- Also grow in Venezuela, central America, Florida & Shrilanka.
- Name Tolu derived from the name of place Tolu near Cartagena on the north coast of Columbia.

Collection & preparation:

- M. balsamum is large tree resembles Peru balsam tree.
- There are no secretary ducts in bark of tree but formed in young wood after injury to yield a pathological product known as tolu balsam.
- V shaped incisions made on tree & bark is left out as a v-shaped protruded tongue downward.
- A vessel is attached for collection of transparent exudates from wound.
- Yield per tree is about 8-10 kg.

Characteristics:

- Fresh sample – soft yellowish resinous mass
- On storage – becomes brownish brittle mass gets softened on warming
- Softened Tolu mass is pressed between glass slides & observed under microscope shows colorless crystals of cinnamic acid.
- Soluble in alcohol to yield acidic solution.

Chemical tests:

1. Dissolve tolu balsam in alcohol by heating.

   solution shows acidic reaction with litmus.

2. Boil tolu balsam with water & filter. To the filtrate add 1% KMnO4 & heat & smell.

Cinnamic acid present in balsam oxidized to benzaldehyde showing bitter almond smell.

3. Alcoholic solution of balsam add FeCl3 develops green colour due to +nce of resinotannol

Chemical constituents:

- Tolu balsam contains 75-80% resin.
- Resin contains resin ester of toluresinotannol esterifies with benzoic acid & cinnamic acid
- Contains 7-8% cinnamein (mixture of benzyl benzoate & benzyl cinnamate), vanillin, styrol, Ferulic acid & eugenol.
- Tolu balsamic acids in drug, both free & combined, are 35 to 50%

Uses:

- Tolu balsam included in the US pharmacopeia in 1820 as well & used in as antitussive & in respiratory for lozenges for coughs & sore throats & as a vapor inhalant for respiratory ailments.
- Shows antiseptic properties due to presence of cinnamic & benzoic acids.

Adulterants:

1. Exhausted tolu balsam:

- From tolu balsam cinnamic acid is removed by extraction.
- Small quantity of this exhausted drug is heated, softened, put on side & seen under microscope, crystal of cinnamic acid are not seen.

2. colophony:

- Adulteration of colophony detected as follows:
- Boil 5 g of drug in 25 ml carbon disulphide on water bath fitted with air condenser.

- Filter & evaporate the filtrate in porcelain dish.
- Dissolve the residue in 6 ml light petroleum ether & add 10 ml copper acetate solution & shake.
- Bright green colour of p. ether layer shows adulteration of colophony.

Peru balsam

Synonyms:

Balsamum peruviamum

Biological source:

balsam derived from the incisions in the tree trunk of ***Myroxylon pererae.***

Family:

Leguminosae

G.S.:

widely grows in Guatemala & Honduras in central America.

Collection & preparation:

Like tolu balsam tree, the bark or wood of tree is devoid of schizogenous ducts.

Balsam is formed as a pathological product to patch up the injuries produced on trunk.

The bark of trunk is beaten with the back of an axe in November-December.

The balsamic secretion is soaked up by rags.

Flow of secretion continues for about six weeks.

The rags of barks are boiled in water to obtain the balsam of bark.

The separated balsam settles at bottom of water is separated & strained.

Characteristics:

Blackish or brown , viscous, oily liquid, transparent

Pleasant aromatic vanilla like odor & acrid bitter taste

Soluble in CHCl3 & 90% alcohol.

Specific gravity – 1.137 to 1.158

Chemical constituents:

Contains 56 to 96% benzyl benzoate & benzyl cinnamate.

Contains cinnamyl cinnamate (styracin), 28% of esters of cinnamic & benzoic acids with peruresinnotanol

Other terpene alcohols are nerolidol, farnesol & benzyl alcohols, traces of vanillin, peruviol & free cinnamic acids.

Uses:

- Used in topical preparations of scabies, treatment of wounds, ulcers & cosmetics.
- Used as flavoring agent in candy, dairy desserts, alcoholic & nonalcoholic beverages (limit 15 ppm)

Benzoin

- Benzoin
  - Sumatra
  - Siam

- Benzoin is a balsamic resin obtained from several well defined commercial varieties like Sumatra benzoin & Siam benzoin
- The tree from benzoin is obtained do not contain any special secreting cells thus, it is pathological product (formation of this pdt is induced by injury to the tree)

Synonyms:

Loban, Benzonium

B.S.:

Sumatra B. - is obtained from Styrax benzoin

Siam benzoin – balsamic resin obtained from S. tonkinesis & other species.

Family:

Styraceae

G.S.: Sumatra this trees are indegenous to & cultivated in Sumatra, although the tree is also native to Java & Borneo.

Siam benzoin – Thailand & Vietnam

Collection & preparation:

- Benzoin is a pathological resin, secreted in secretary ducts & secretary cells of tree after injury.
- Some evidence showing that fungus also takes part in production of benzoin.
- Collection of resin is carried out from 7-10 yrs old trees.
- It is collected by making incisions near base of tree.
- Initial produce is yellow in colour which is not used in medicine.

- Next flow is collected & utilized for medicinal purposes.
- Single tree produce 10 kg material.

Description:

	Sumatra benzoin	Siam benzoin
Colour	Greyish brown or grey	Yellowish brown
Odour	Aromatic & characteristic	Agreeable & vanilla like
Taste	Sweetish & slightly acrid	Sweetish & slightly acrid

Standards

Benzoic acid content – Not less than 60% (Sumatra)

Not less than 12% (Siam)

Alcohol soluble matter - Not less than 76% (Sumatra)

Not less than 90% (Siam)

Loss on drying – Not more than 10%

Acid insoluble ash - Not more than 10%

Chemical constituents:

Sumatra benzoin – benzoic & cinnamic acid

Summaresinolic acid

Siam benzoin – ester coniferyl benzoate (76%)

Siaresinolic acid

Drug also contains styrol, vanillin & phenyl Propyl cinnamate

Siam benzoin differs from Sumatra variety in that it contains insufficient amount of benzoic acid.

Identification

1. Alcoholic solution of benzoin with water – gives milky white solution

2. Benzoin (2.5 g), add 10 ml ether & pour 2 to 3 ml this extract in porcelin dish, add 2 to 3 drops H_2SO_4.

Deep brown colour – Sumatra benzoin

Deep purplish colour – Siam benzoin

3. Heat small quantity of benzoin in test tube & cover with glass plate. Cool & examine under microscope – crystals of cinnamic acid observed

4. 1 g benzoin + 4 ml $KMnO_4$, then warm it – odor of benzaldehyde (Sumatra benzoin)

Uses:

- Expectorant, Carminative & diuretic
- Externally as an antiseptic & protective
- Used in tincture of benzoin
- Used in inhalation in treatment of upper respiratory tract infection
- To retard rancidity of fats & oil in preparation of Benzoinated lard.
- Used in perfumes, soaps, incense, cosmetics & mask the taste of pharmaceutical preparations.