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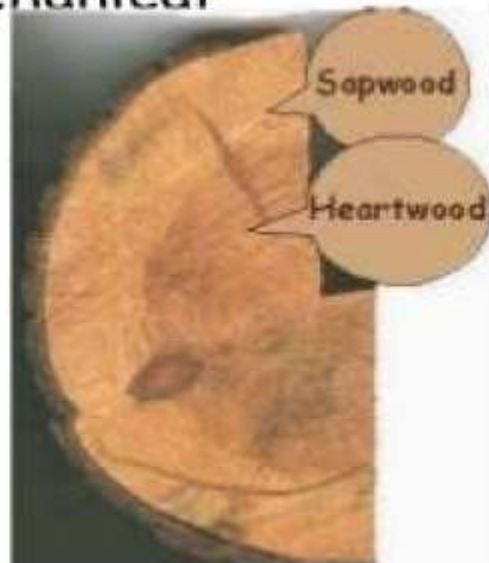
Volatile Oils

3. Sandal Wood

- **Synonym:** Chandan
- **B.S:** it is scented heartwood obtained from *Santalum album* Linn
- **Family:** Santalaceae
- **G.S.:** India (Karnataka, Mysore, Tamil Nadu, Kerala, AP), Indonesia, Ceylon, Australia & Pacific Island
- **Morphology:**
- **Size:** 15-20 cm in diameter
- **Color:** Pale yellowish
- **Odour:** pleasant & strong
- **Taste:** Bitter

HEARTWOOD AND SAPWOOD

- Central region of old trees forms heart wood.
- Also called duramen
- It is hard and durable
- The function of this region is mechanical support
- ✂ Outer region of old trees forms sapwood.
- ✂ Also called alburnum
- ✂ It is soft and not durable
- ✂ The function of this region is conduction of water and nutrients and also storage of food.



- **Macroscopic Characters:**

COLOUR- Pale yellow to colourless viscid(sticky consistency) liquid.

ODOUR- Characteristic and persistent.

TASTE- Unpleasant

- **Standards:**

SPECIFIC GRAVITY- 0.973 to 0.985

(ratio of the density of a substance to the density of a reference substance; usually water taken as standard)

OPTICAL ROTATIONS- 15° to -20°

(the rotation of the plane of polarization of plane-polarized light by an optically active substance.)

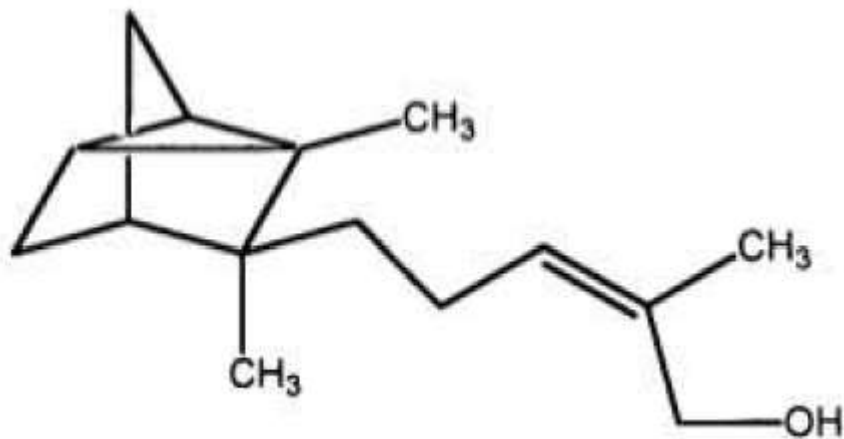
REFRACTIVE INDEX- 1.500 to 1.510

(the ratio of the velocity of light in a vacuum to its velocity in a specified medium.)

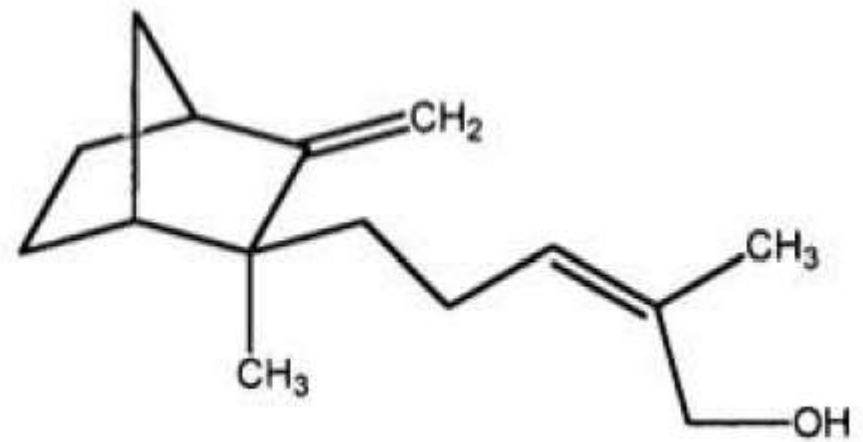
SOLUBILITY- It is very slightly soluble in water and soluble in alcohol and chloroform.

(chemical property referring to the ability for a given substance, the solute, to dissolve in a solvent)

CHEMICAL CONSTITUENTS



Alpha-Santalol



Beta-Santalol

Oil of sandal contains about 95% of two isomeric alcohols

- **Production:** max. amt. of oil is collected by steam distillation from older trees(>15 yrs old)
- **Cultivation & Collection:**
- They must be cultivated near host plant. The strategy known as inter planting.
- The best host for sandalwood are N₂ fixing tree bcz growth is depend on the availability of amino acids.
- Good hosts like Pine, citrus, mulberry, Acacia
- Grow well in full sun, tolerate 60-70% shade.(higher shade lower growth)
- Optimum shade require abt. 25-35 %.
- It require well drained soil.

STEAM DISTILLATION

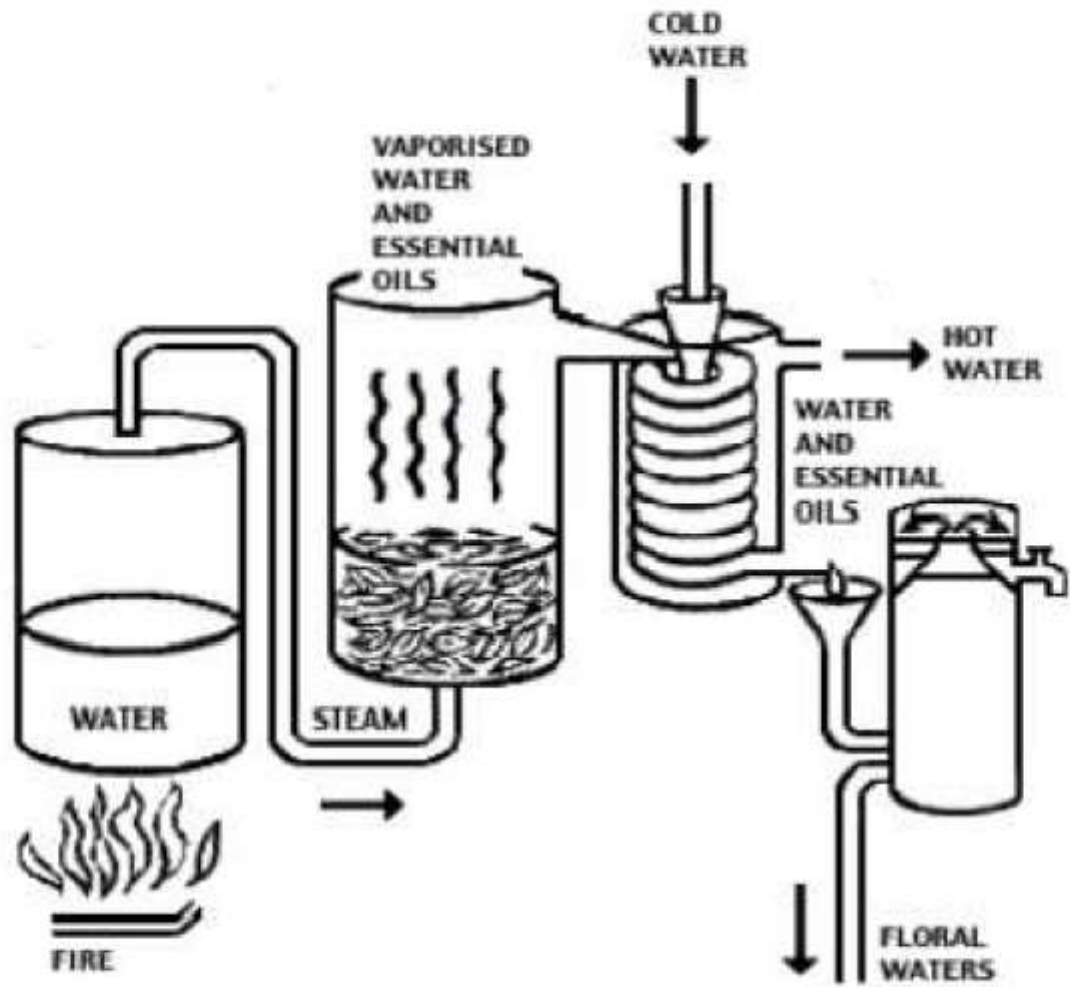
- Steam distillation is a process in which steam heated at extremely high temperatures (usually around 140-212° F) is passed through the powdered wood.
- The steam releases the sandalwood essential oil that is locked within the cellular structure of the wood.
- The mixture of steam and oil then flows through a condenser and cools, yielding a layer of oil and a layer of water.
- The sandalwood essential oil separates from the hydrosol (floral water) rises to the top so it can then be collected

✂ The distillation process for sandalwood oil takes anywhere from 14 to 36 hours, longer than for many other essential oils.

✂ Despite the fact that this method requires a longer process than other distillation methods, it's known to produce superior quality oil, yielding 84.32% santalol.



STEAM DISTILLATION UNIT



■ **Use:**

- Tmt. of UTI
- Chest infection,
- Bronchitis,
- Helps in healing scar,
- Immunological stimulant,
- Perfumary in soaps, creams, & powders (facepack & beauty Product).
- If taken internally help as carminative, heartburn & diarrhoea

2. Mentha

- **SYNONYM-** Peppermint oil, Mint, Pudina, Brandy mint, Lamb mint.
- **B.S:**
- It is volatile oil obtained by steam distillation of fresh flowering tops of plant *Mentha Piperita Linn*
- **Family-** *Labiatae*
- **G.S.:** Asia, Europe, North America
- Cultivated in india, japan, Germany, France, Itly.



Morphology

- **Leaf:**
- **Color:** Dark green with reddish vein
- **Odour:** Aromatic
- **Size:** 3-8 cm long, 1.5-4cm broad
- **Shape:** Ovate oblong to oblong lanceolate
- **Apex:** Acute
- **Base:** Asymmetrical

- **OIL:**
- **Colour-** colourless to yellow
- **Odour-** charecterstic and pleasant
- **Taste-** pungent followed by cooling sensation
- **Solubility-** soluble in 3 parts of 70% alcohol, chloroform, fixed oil, insoluble in water.

Collection and preparation

- Plant produces abundant runners.
- Harvesting is done when crop reaches flowering stage.
- plant continues to yield product for three successive years
- It is quickly dried in shade or by artificial heat at temperature not exceeding 40c,
- Drying reduces time required for distillation.
- drug is steam distilled in 3 to 4 hours.

Chemical Constituents

- Herb contains **0.5 to 1%** (v/w) of oil
- Peppermint oil contains
- 70% of l- ***menthol***, both free and ester form, other are **menthone**,
- **Menthofuran & pulegone**
- **jasmon** – responsible for **pleasant flavor**
- ***menthyl isovalerate, menthyl acetate, other terpene,***

Uses:

- Carminative,
- Stimulant,
- Flavoring agent for pharmaceuticals and food products,
- Chewing gum, candies,
- Spasmolytic and smooth muscle relaxant,
- Nasal decongestant (relieve blocked nose), inhalation and topical use, lozenges for antitussive effect.

Allied drug

- Japanese peppermint from *Mentha Arvensis* DC var *piperascens*,
- it contains 85 % menthol.
- it is cultivated in india , brazil.

Lemongrass

- **SYNONYM-** indian melissa oil, fever grass
east indian lemon-grass oil
- **B. S.-**
- It is volatile oil obtained by distillation of leaves and aerial parts of plant of *Cymbopogon Flexuous* or *Cymbopogon Citratus*
- **Family- Graminae (Poaceae)**
- oil should contain **NLT 75%** of aldehyde as **citral**.



- Harvesting time depends on planting time and growth.
- in first year two cutting can performed.
- plant should not be allowed to flower as it reduces yield by 30%.
- dry leaves can also be harvested for steam distillation.
- steam distillation for fresh herb for 2.5 to 3 hours yeild lemongrass oil.
- average yield is 0.2%

Morphology

- **Colour**- yellowish brown(umber) liquid
- **Odour**- lemon like
- **Taste**-similar to lemon
- **Solubility**- soluble in 3 parts of 70% alcohol, chloroform, fixed oil, insoluble in water.

CHEMICAL CONSTITUENTS-

- **85% citral (lemonal)** is chief constituent,
■ (starting material of Synthesis of **Vitamin A**)
- others are citronelal,
- Geraniol,
- Nerol,
- Methylheptenol

BENEFITS OF LEMONGRASS

Controls obesity

Cures stomach disorders

Maintains cholesterol levels

Boosts nervous and immune system



Reduces fever

Cleanses harmful toxic wastes

Treats various types of cancers

Treats infections with antiseptic properties

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WAYS TO USE

LEMONGRASS ESSENTIAL OIL

INSECT REPELLANT



Add 10-15 drops of lemongrass essential oil to a spray bottle of water, and use as a natural bug spray. It can also be diffused aromatically to keep bugs away. For use on pets, dilute 5 drops of lemongrass oil with water, or a carrier oil, and apply to pets fur to keep fleas away.

MUSCULOSKELETAL COMPLAINTS

Combine equal parts essential oil and carrier oil, and apply topically to area of concern.



SKIN HEALTH

Add a couple drops of lemongrass oil to shampoos, conditioners, soaps, deodorants, lotions and/or other topical personal care products.



NATURAL DEODORIZER

Combine 5 drops of lemongrass and 5 drops of lavender in a spray bottle of water, and use as a mist, or diffuse aromatically.



FEVER REDUCER



Combine 2 drops lemongrass, 2 drops black pepper and 2 drops lavender, diffuse aromatically, or dilute with a carrier oil and apply to the back of neck and/or reflex points.

CHOLESTEROL BALANCE

Add 1 drop of lemongrass to water & consume.



BLADDER, KIDNEY & URINARY HEALTH

Add 1 drop of lemongrass oil to water and consume or dilute with equal parts carrier oil and apply topically over kidneys and low back.



DIGESTIVE HEALTH

Add 1 drop of lemongrass essential oil to soups, smoothies, teas and/or water to ease stomach pain, nausea and digestive discomfort.

Lemongrass oil contains high levels of an aromatic terpene known as **linalool** that some of the latest science suggests is as effective as chemo in targeting cancer cells – without the toxic side effects.

**Antibacterial. Anti-inflammatory.
Anti-fungal. Anti-cancer.**

The **TRUTH** About
CANCER
educate • expose • eradicate



Lemon peel

- **Synonym:**
- Fructus Limonis, Oleum Limonis
- Motunimbu

- **B.S.:** It is Fresh or dried peel of *Citrus limon*

- **Family:** Rutaceae

- **G.S.:** Asia, cultivated in whole word.
- India, Australia, Italy, California, Spain, Jamaica, France, Brazil, Mexico.
- Distillation done by **expression** process.



Morphology

- **Size:** 6-10 mm thick, 4-7 cm long
- **Shape:** Curved, spiral (smooth, small pits)
- **Color:** outer : yellow/dark yellow
- inner: white
- **Odour:** Pleasant aromatic
- **Taste:** Bitter pungent

- **Chemical constituents:**
- 90% Limonene
- Citral

USES OF LEMON PEEL

Did you know?

Lemon peels contain as much as 5 to 10 times more vitamins than the lemon juice itself

- **Cancer**
- **Bone Health**
- **Oral Health and Hygiene**
- **Weight loss**
- **Internal parasites and worms**
- **Bacterial infections and fungi**
- **Antidepressant**
- **Regulate blood pressure**
- **Cysts and tumors**
- **Rich source of vitamin C**
- **Deodorize garbage disposal**
- **Keep insects out**
- **Acne**



Macroscopical characters:

- **1. Seeds:**
- **Shape:** Irregularly angular
- **Size:** upto 4 mm length and 3 mm broad.
- **Colour:** dark brown or reddish –brown
- **Surface:** on one side there is a longitudinal groove, which indicates the position of raphe. The hilum is situated in a depression at the narrower end. The seeds are transversely rugose with 6 to 8 rugae in the length of seed
- **Odour:** Aromatic
- **Taste:** Aromatic

2. Fruit:

Condition: Dry

Type: Trilocular capsule.

Size: Varies from 1 to 2 cm.

Shape: Ovoid or oblong

Apex: Slightly pointed and beak like

Base: Rounded and shows the remains of a stalk.

Surface: Smooth with thin longitudinal striation.

Colour: Pale buff to pale greenish buff.

Cultivtion & collection

- The altitude is about 600 & 1200 m.
- Rainfall: 150-600 cm
- Temp.: 50-100 °F
- Soil: Loamy acidic soil (pH 5.5-6.5)
- Mulching is require for cultivation
- Cultivation done by broadcasting method(seedbeds → nursery → open field)
- Germination take place after 4 months
- Fresh seeds are used to cultivate
- Sowing is done from August to October
- Then seedlings transplanted in nursery bed by keeping distance 15 to 40 cm
- Provide sheds in the begaining

- When reach abt 130 cm height or bear 8-10 leaves & are 1-1.5 year old, they are transplanted in open field.
- plant starts bearing from third year of planting
- fruits are picked up just before ripening to prevent capsules from splitting on floor.
- collected capsules are dried after harvesting.
- during drying fruits shrink and shrink appearance seen in final product
- in sun drying color bleaches while in artificial drying green color is maintained.
- fruit loses 70-80 weight during drying.
- fruits are sieved to remove foreign matter. life of plant is 20 to 25 years

Microscopical characters

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L.CUT

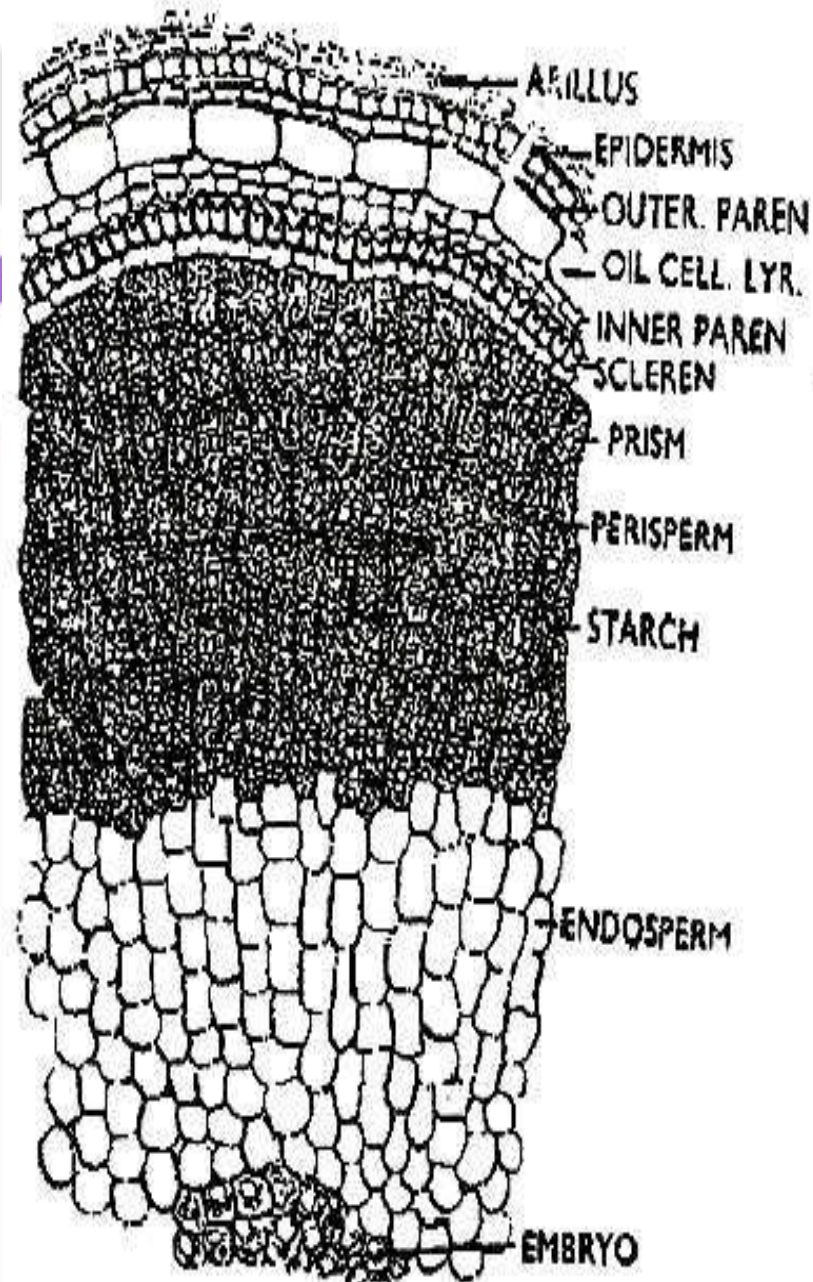
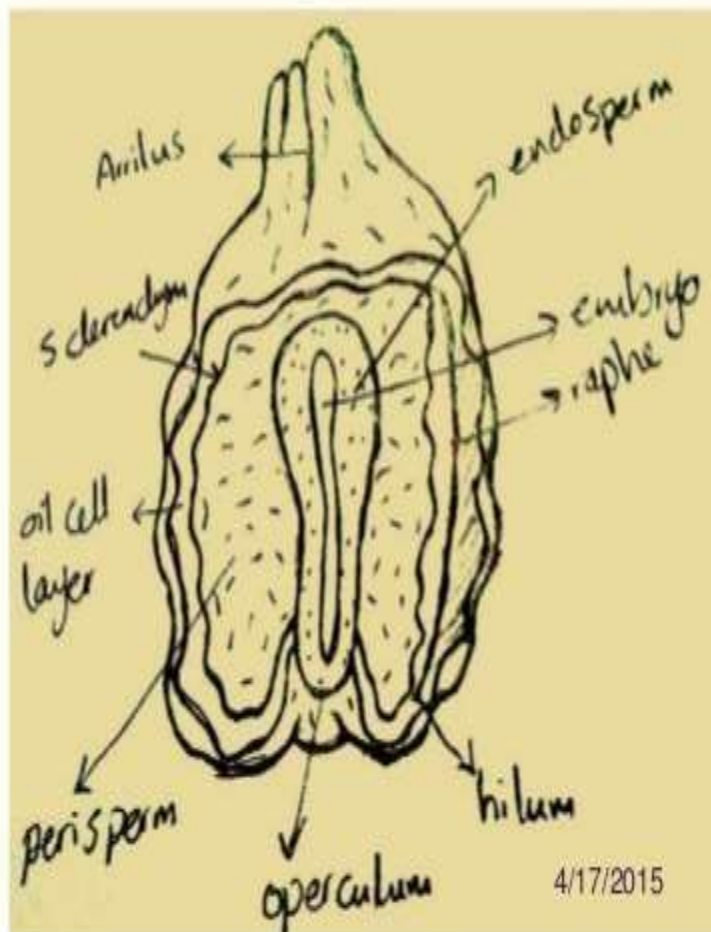
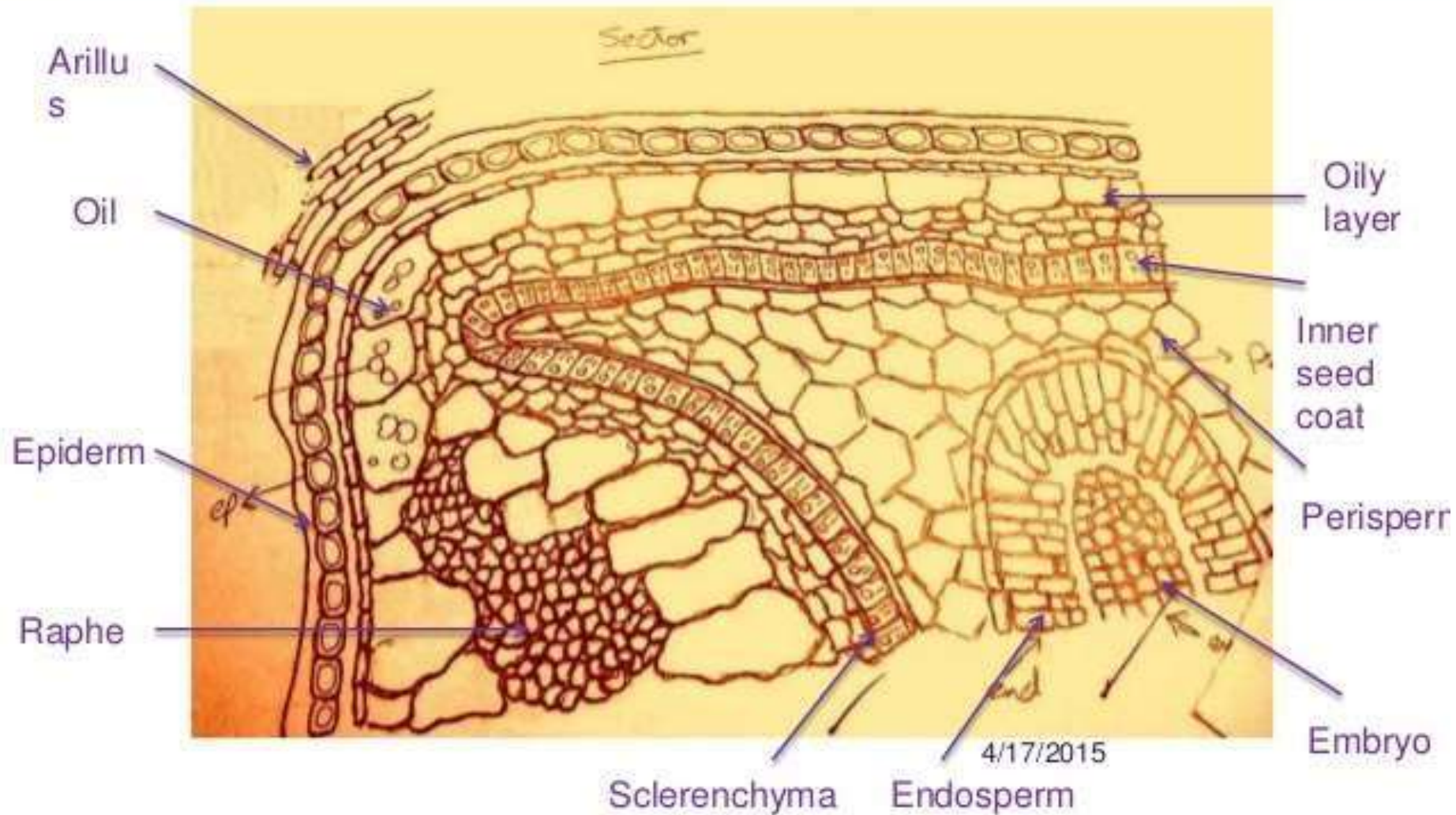


Fig. 21: T.S. of Cardamom seed

Microscopical characters

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Microscopical characters

1. **Testa:** The entire is covered on the external side by thin colourless, flattened or collapsed parenchyma also called as membranous arillus. Testa can be broadly divided into outer and inner integuments.
2. **Outer integument:**
 - (i) Epidermis: Epidermis single layered, thick walled, narrow and axially elongated cells.
 - (ii) Outer parenchymatous layer: 1 or 2 layers, tangentially elongated cells.
 - (iii) Oil cell layer: Single layered which however become 2 to 3 layered near raphe, large rectangular thin walled parenchymatous cells containing volatile oil.
 - (iv) Inner parenchymatous layer: Several layers of thin walled often obliterated parenchyma.

3. Inner integument:

- (i) Sclerenchymatous layer: Sclerenchymatous layer dark brown, single layered bowl shaped cells, radially elongated with anticlinal and inner walls very strongly thickened thus exhibiting a narrow lumen, in which are present nodules of silica
- (ii) Parenchyma: Single layered flattened cells.

4. Periderm:

Several layered thin walled parenchymatous cells packed with starch grains and single prism of calcium oxalate.

5. Endosperm:

Thin walled colourless parenchymatous cells containing masses of protein.

6. Embryo:

Small cells containing aleurone

Chemical constituents:

1. Volatile oil:

- (i) 1,8-cineole
- (ii) Limonene
- (iii) Borneol
- (iv) 1-terpeneol
- (v) Terpenyl acetate
- (vi) Geraniol.

2. Starch

3. Fixed oil

4. Resin

5. Calcium oxalate

Use

- Carminative (Relieve the excessive collection of gas in the stomach).
- Flavouring agent.
- Aromatic and stimulant.
- Used in the preparation of compound cardamom tincture.