

## EXPERIMENT NO-6

### MORPHOLOGICAL, HISTOLOGICAL, POWDER CHARACTERISTICS, EXTRACTION AND DETECTION OF FENNEL FRUITS

**Aim of the experiment :** To study the morphological, histological, powder characteristics, extraction and detection of Fennel fruits.

**Requirements:**

**1. Apparatus:** Compound Microscope, Petri plate, cover slip, Glass-Slide, beaker, dropper, filter paper, forceps, tripod stand, wire gauze, dissecting needle, sharp razor, etc.

**Chemicals:** Conc. HCL, Fluoroglucinol, Glycerine, Ethyl acetate, toluene, conc. HNO<sub>3</sub>, vanilin- sulphuric acid, sodium sulphate, etc.

**Theory:**

**FENNEL**

**Synonyms:** Fennel fruit, Sweet fennel, large fennel, Saunf.

**Biological Source:** Fennel consists of the dried ripe fruits of *Foeniculum vulgare*, belonging to

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**Family:** Umbelliferae

**Chemical Constituents:** Fennel contains volatile oil (1-4%), fixed oil (9-12%) and proteins (20%). The chief constituents of volatile oil are a phenolic ether anethole (50-60%) and ketone fenchone (18-20%). Anethole has an aromatic odour and sweet taste whereas fenchone has a camphoraceous odour and taste. Volatile oil also contains methyl chavicol, anisic aldehydes,  $\alpha$  and  $\beta$ - pinene, ascorbic acid, niacin, riboflavin.

**Uses:** Fennel has been used as a flavoring agent, a scent, and an insect repellent. It has also been used as a stimulant to promote lactation and menstruation. Also used for upper respiratory tract infections, coughs, bronchitis, cholera, backache, bedwetting, and visual problems.

**MACROSCOPICAL CHARACTERS:**

**1. Colour:** Green to yellowish brown

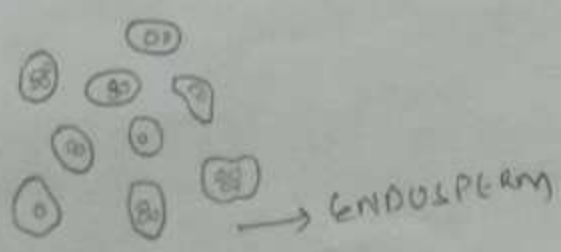
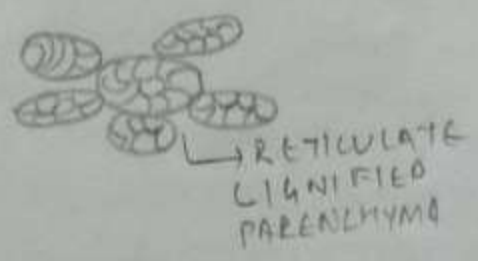
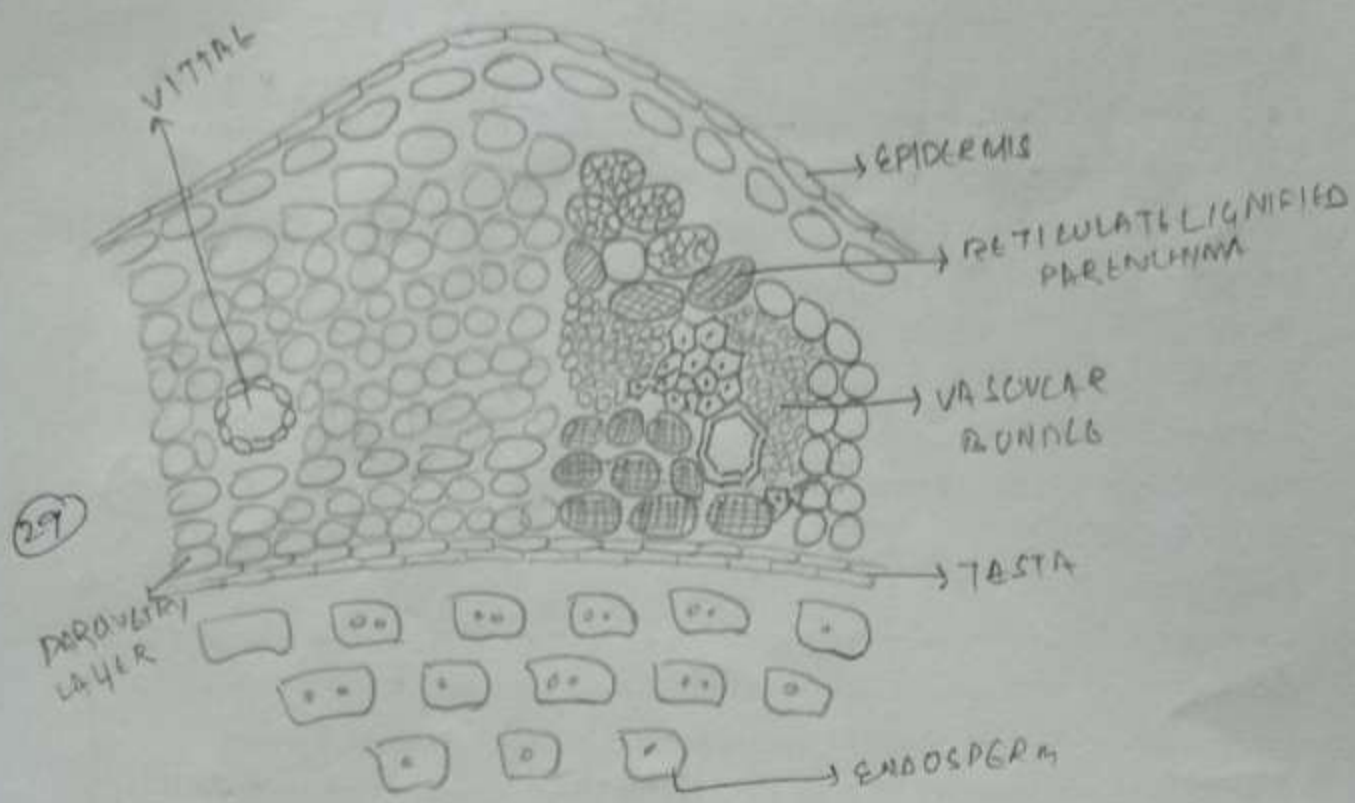
**2. Odour:** Sweet aromatic

**3. Taste:** Strongly aromatic

**4. Size:** 5 to 10 x 2 to 4 mm

**5. Shape:** Straight or slightly curved.

T-S of FENNEL FRUITS.



**6.Extra features:** It is five-sided fruit in the form of cremocarps with pedicels and rarely found in the form of mericarps. Fruits are glabrous with straight, prominent five primary ridges and a bifid stylopod at the top. It is an orthospermous fruit.

#### MICROSCOPICAL CHARACTERS:

##### 1. Pericarp:

- a) **Epicarp:** a layer of quadrangular to polygonal cells, with smooth cuticle
- b) **Mesocarp:** Reticulate, lignified parenchyma surrounding the vascular bundles
- c) **Vascular bundles:** Five in number, bi-collateral present below each ridge (Primary ridge)
- d) **Vittae:** Schizogenous oil cells, 4 on dorsal side, 2 on commissural surface/ ventral surface. About 250 microns in maximum width, the walls are brown
- e) **Endocarp:** Consist of narrow elongated cells having a parquetry arrangement (group of parallel cells arranged in different directions)

##### 2. Seed:

- a) **Testa:** Single layered yellowish brown in colour.
- b) **Endosperm:** Thick walled, polygonal, Cellulosic parenchyma containing oil globules (fixed oil), aleurone, grains and rosette crystals of calcium oxalate.
- c) **Raphe:** A single ridge of vascular strands appears in the middle of commissural surface.
- d) **Carpophores:** With very thick walled sclerenchyma in two strands

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#### POWDER CHARACTERISTICS:

**Mesocarp:** Reticulate, lignified parenchyma composed of ovoid elongated, sub rectangular cells, usually occur in groups.

**Endocarp:** Parquetry arrangement (group of parallel cells arranged in different directions) of the cells.

**Endosperm:** Polygonal, thick walled cells with oil globules and aleurone, grains. Microrosette calcium oxalate crystals are also present.

**Vittae:** Yellowish, brown fragments composed of thin walled cells. Irregular shape and scallered.

**Fibro vascular tissue:** Composed of lignified small tracheids and occasional large vessels with reticulate thickening.

#### EXTRACTION OF VOLATILE OIL:

100 gm of cleaned fennel seeds were used for essential oil extraction by hydro-distillation using a Clevenger apparatus for 3 h. After decanting and drying of the oil over anhydrous sodium sulphate the corresponding mild yellowish coloured oil were recovered and Calculated in terms of percentage (v/w). The presence of water and glycerin in the oil

## Microchemical test

Sr. No.	Reagents	Observation	Characteristics
1	Phloroglucinol + conc. HCl (1:1)	Red/pink	Lysed fib
2.	Alcoholic picric acid	Yellow	Mucone grains
3.	Sudan red <u>III</u>	Pink	o/p globules in the cells of

### Calculation

$$\% \text{ yield} = \frac{\text{Essential oil wt.}}{\text{Sample wt.}} \times 100$$

$$= \frac{1.284}{130} \times 100 = 0.856\%$$

(3)

$$R_f \text{ value} = \frac{\text{Distance travelled by solute}}{\text{Distance travelled by solvent}}$$

$$= \frac{4.0}{5.2}$$

$$= 0.77$$

Samples is very important because it indicates its degree of purity. If it does not meet any quality requirement, the sale value of the oil will be much cheaper.

The equipment which were used for TLC operation, Silica Gel 60 F 254 20x20 as stationary phase and Toluene: ethyl acetate (93:7) as solvent system has been used for mobile phase. Chromatography was done after 30 minutes on TLC tank and separated fractions were detected on UV 254 nm wave length in UV cabinet (Wagner H et al, 1996) (Anubhuti et al, 2010)

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Chromatography was done after 30 minutes on TLC tank and separated

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## Result

- From the above experiment the morphological, histological & powder characteristics of fennel fruit were studied
- The percentage yield of volatile oil from fennel fruit was found to be 0.856%.
- The extracted volatile oil were identified by TLC method &

Rf value is 0.74

Signature of Faculty

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