



# PHARMACOGNOSY

## LECTURE 6AB

**SHERIF S. EBADA, PH.D.**

### Contact information:

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## Course Outline:

### Level III

Course Title: Pharmacognosy

Course Code: 1702363

Prerequisite: Pharmaceutical Organic Chemistry (1703216)

Semester: Summer 2018-2019 (1<sup>st</sup> Teaching day: 09.06.2019 / last Teaching day: 08.08.2019)

Credit Hours: Weekly 4 hrs Lecture (Sunday-Wednesdays 9:00 -10:00 am)

Total Grade: 100 pts.

- First Exam: 25 pts.
- Second Exam: 25 pts.
- Final Written: 50 pts. (2 hrs).

### Lecture Schedule and Content:

Sun. 09.06 - Wed. 12.06	Sun. 16.06 - Wed. 19.06	Sun. 23.06 - Wed. 26.06	Sun. 30.06 - Wed. 03.07
<p>➤ Introduction to Pharmacognosy.</p> <ol style="list-style-type: none"><li>Definition of Pharmacognosy.</li><li>Factors affecting plant growth.</li><li>Adulteration.</li><li>Secondary metabolites.</li></ol> <p>➤ Introduction to Medicinal Leaves.</p> <ol style="list-style-type: none"><li>Senna leaf.</li><li>Digitalis leaf.</li></ol> <p>Solanaceous leaves.</p>	<p>➤ Introduction to Medicinal flowers.</p> <ol style="list-style-type: none"><li>German chamomile.</li><li>Pyrethrum.</li><li>Santonica.</li><li>Clove.</li><li>Hibiscus.</li></ol> <p>➤ Introduction to Medicinal woods and barks.</p> <ol style="list-style-type: none"><li>Cinchona.</li><li>Cinnamon/Cassia.</li><li>Cascara/Frangula.</li><li>Salicis.</li><li>Guaiacum wood.</li></ol>	<p>➤ Introduction to Medicinal seeds.</p> <ol style="list-style-type: none"><li>Linseed.</li><li>Foenugreek.</li><li>Cardamom.</li><li>Black/White mustard.</li><li>Psyllium.</li></ol> <p>➤ Introduction to Medicinal fruits.</p> <ol style="list-style-type: none"><li>Fennel/Anise.</li><li>Capsicum.</li><li>Poppy.</li><li>Senna.</li><li>Ammi visnaga/majus.</li></ol>	<p><b>First Exam</b></p>
<p>Sun. 07.07 - Wed. 10.07</p> <p>➤ Introduction to Medicinal herbs.</p> <ol style="list-style-type: none"><li>Mentha/Thyme.</li><li>Lobelia.</li><li>Ergot.</li><li>Ephedra.</li></ol> <p>➤ Introduction to Medicinal Subterranean organs.</p> <ol style="list-style-type: none"><li>Ginger/Curcuma.</li><li>Liquorice.</li><li>Rhubarb.</li><li>Garlic.</li></ol>	<p>Sun. 14.07 - Wed. 17.07</p> <p>➤ Introduction to Medicinal Unorganized drugs.</p> <ol style="list-style-type: none"><li>Colophony.</li><li>Myrrh.</li><li>Gum Acacia.</li><li>Gum tragacanth.</li><li>e.</li></ol>	<p>Sun. 21.07 - Wed. 24.07</p> <p>➤ Introduction to Medicinal Unorganized drugs (Continued).</p> <ol style="list-style-type: none"><li>Agar.</li><li>Gelatin.</li><li>Aloes.</li><li>Opium.</li></ol>	<p>Sun. 28.07 - Wed. 31.07</p> <p><b>Second Exam</b></p>
<p>Sun. 04.08 - Wed. 07.08</p> <p>➤ Introduction to Medicinal Unorganized drugs (Continued).</p> <ol style="list-style-type: none"><li>Evening primrose oil.</li><li>Beeswax.</li><li>Honey.</li><li>Royal jelly.</li><li>Bee propolis.</li></ol>	<p>Sun. 11.08 - Wed. 14.08</p> <p><b>Final Exam</b></p>		

# Fruits (Fructus)

- Introduction on Fruit.
- Fruits containing Volatile oil (Umbelliferous Fruit).
- Fruits containing Alkaloids.
- Fruits containing Anthraquinone glycosides.
- Fruits containing Bitter principles.
- Fruits containing miscellaneous constituents.



# Fruit

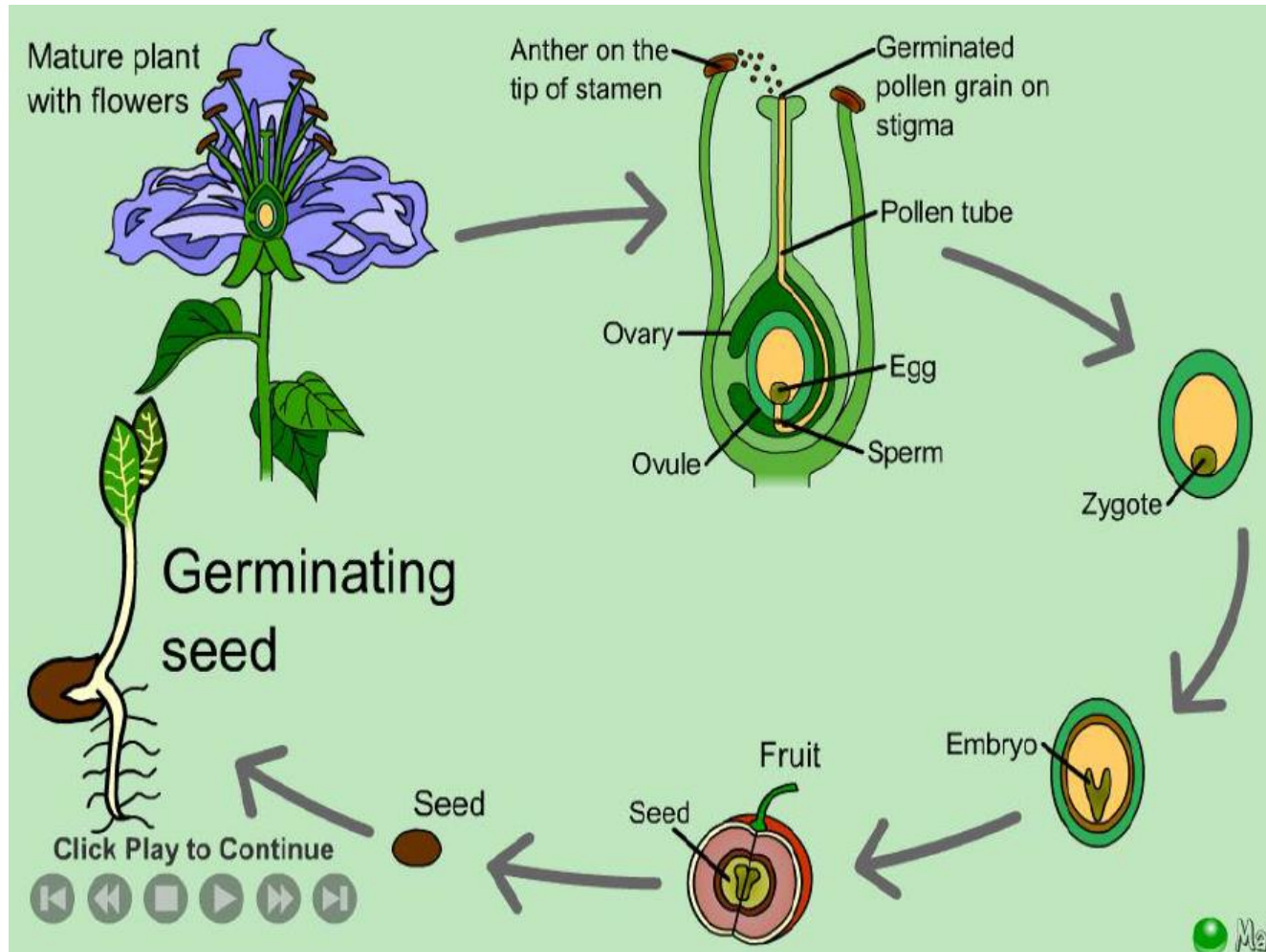
It is the **developed ripened** ovary or ovaries of a single flower or a whole inflorescence. It results from **fertilization** where the seeds are enclosed in the pericarp (ovary wall).

## **Functions of Fruit:**

**Protection** of the seeds.

**Nourishment** of the seeds during development.

# Origin of Fruit



# Fruit

- From the **gynaecium** (♀) of a **single** flower alone, **“True”** fruit.
- From an **inflorescence** not from a single flower; **“Composite”** fruit.
- From the gynaecium (♀) of a single flower **together with other parts** of the flower, **“False”** fruit.

# Origin of Fruit

Fruits are **only** produced by flowering plants

(**angiosperms**) where fertilized ovum develops into **seed** and the ovary wall forms the fruit tissue (**pericarp**).

Superior fruits result from superior ovary (inferior flower),  
e.g. **Flax fruits**.

Inferior fruits result from inferior ovary (superior flower),  
e.g. **Umbelliferous fruits**.

# Structure of Fruit

**Pericarp** differentiated into:

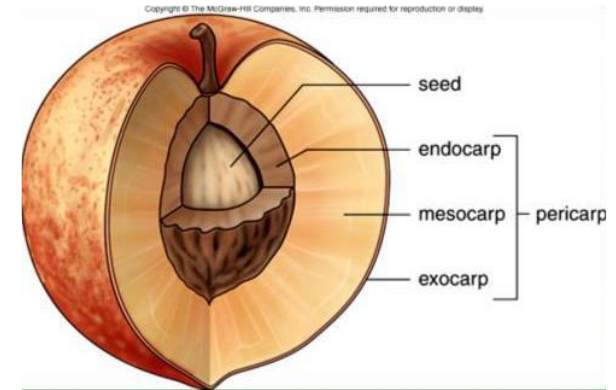
**Epicarp** (outer) layer.

**Mesocarp** (middle) layer.

**Endocarp** (inner) layer.

For example, in **peach**:

the **skin** is the epicarp, the **yellow flesh** is the mesocarp while the **stony layer** surrounding the seeds is the endocarp.





# Structure of Fruit

The **Fruit** has 2 scars:

1. **Basal**; marking the attachment to the **stalk**.
2. **Apical**; marking the remains of the **style** and **stigma**.

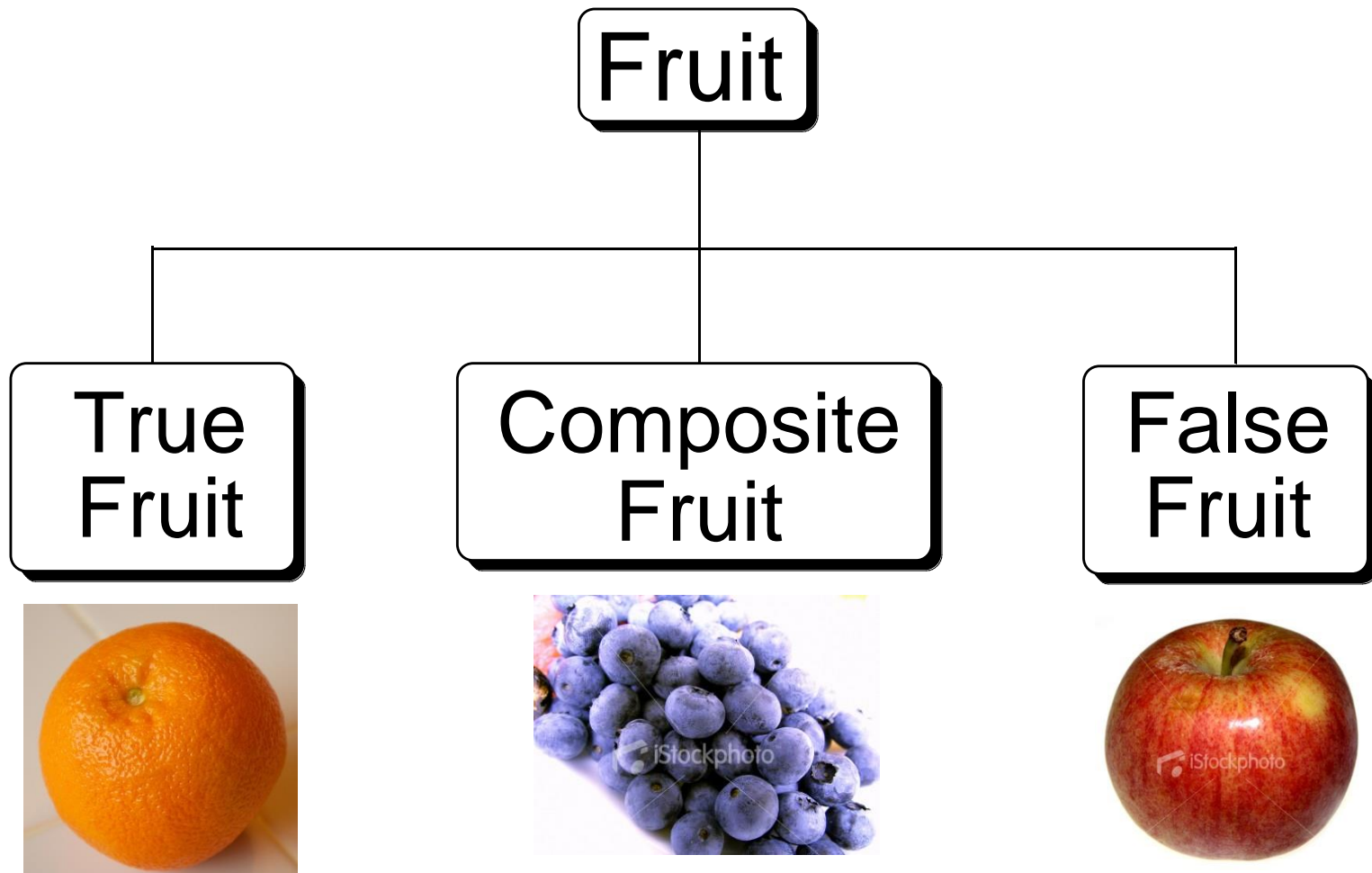
The **Placenta**:

Usually made of thin walled parenchyma. It can be either small e.g. **cardamom** or enlarged and fleshy e.g. **tomato**.

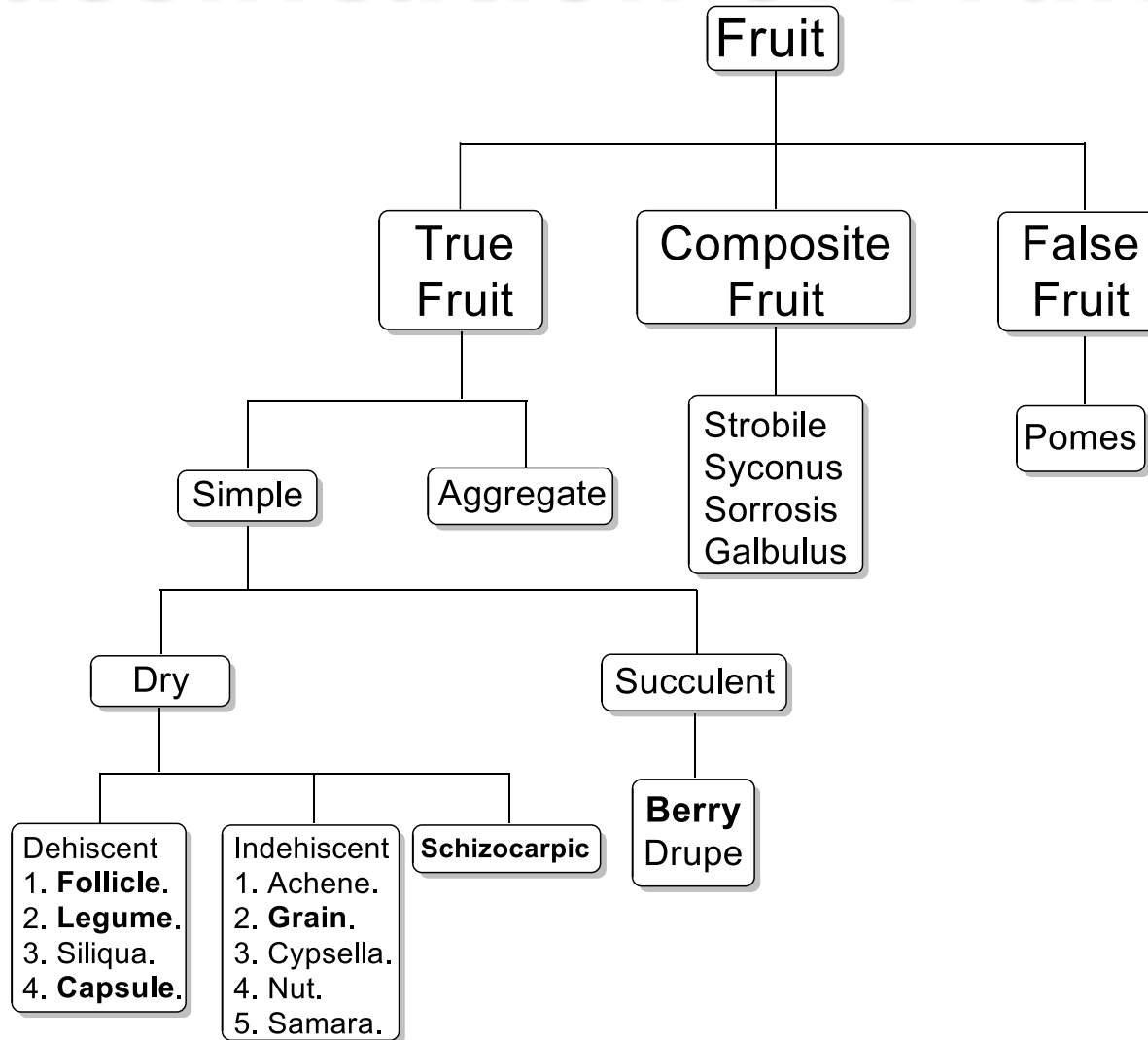
It may also contain vascular bundles, sclereids & secretory structures.



# Classification of Fruit



# Classification of Fruit



# I- True Fruit:

## A- Simple Dry Dehiscent

The **pericarp** becomes **dry**, remains attached to the plant & splits (dehisces) when ripe to set free the seeds enclosed.

**Legume (pod):** Monocarpellary dehisces along **ventral & dorsal suture** e.g. **leguminous fruit**.

**Follicle:** Monocarpellary dehisces along **ventral suture only**. Usually occurs in aggregates e.g. **Star Anise**.

**Capsule:** syncarpous ovary formed of 2 or more united carpels with many seeds. Dehisces in many ways:

**Septifragal:** similar to previous 2 but seeds remain attached to central axis e.g. **Datura**.

**Porous:** opens by pores e.g. **Papaver**.



# I- True Fruit:

## B- Simple Dry Indehiscent

The pericarp becomes dry, they are usually detached from the plant but do not split open when ripe.

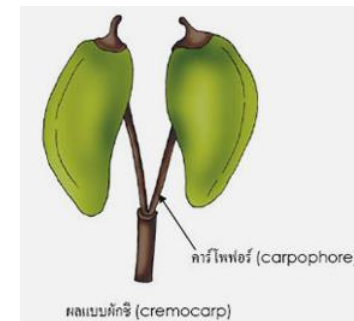
1. **Achene:** one seeded, one carpel. Pericarp is free, membranous or leathery and not fused with the testa e.g. Strawberry and blackberry.
2. **Nut:** Similar to achene but bigger, Pericarp is hard and woody e.g. **Hazelnut.**



# I- True Fruit:

## C- Simple Dry Schizocarpic

- The pericarp becomes **dry**. They are 2 or more seeded, bi to multilocular fruits. Upon ripening, they split up into a number of **one-seeded, indehiscent** parts called **mericarps**. They include several types but the most familiar type is:

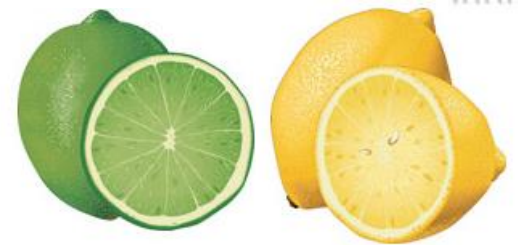


### Cremocarp:

- **Bicarpellary.**
- **Bilocular inferior ovary.** Splitting longitudinally between the **2 locules** into **2 one seeded** indehiscent mericarps e.g. **Umbelliferous fruit.**

# I- True Fruit: D- Simple Succulent

- The pericarp is **fleshy**.
- **Usually indehiscent**.
- 1. **Berry**: one or more carpels; Pericarp is fleshy; many seeded e.g. **Citrus & Capsicum**.
- 2. **Drupe**: one or more carpels, superior or inferior unilocular ovary. Epicarp is leathery, mesocarp fleshy or fibrous and endocarp is hard and encloses a single seed e.g. **Olives**.



## II- Composite Fruit (multiple, collective or compound fruit)

1. **Syconus:** Succulent hollow receptacle enclosing achene like fruits e.g. **Figs.**





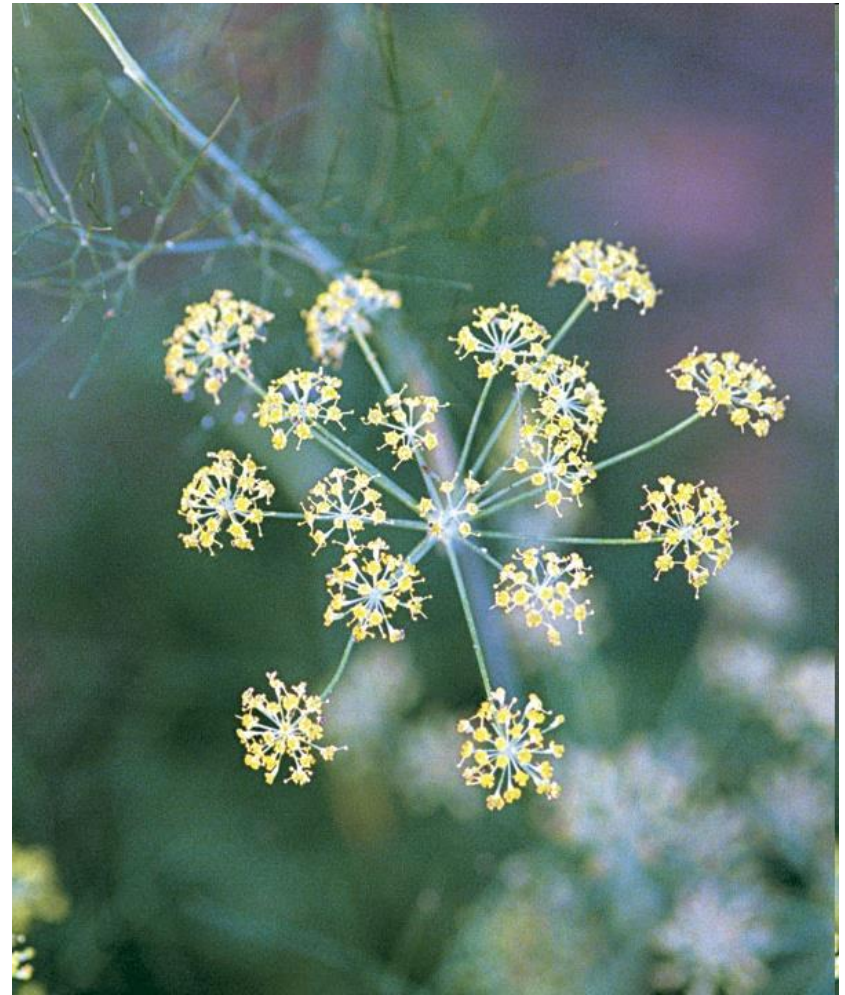
# III- False Fruit

- **From the gynaecium (♀) of a single flower together with other parts of the flower.**
- When ripen become swollen & fleshy.
- The receptacle becomes fleshy constituting the main part & enclosing a leathery or hard pericarp; **Pome** ; e.g. **Apple** & **Pear**.



# Fruits Containing Volatile Oil

# Umbelliferous Fruit



# General Characters of Umbelliferous Fruits

**True, Simple, Dry, Schizocarpic**

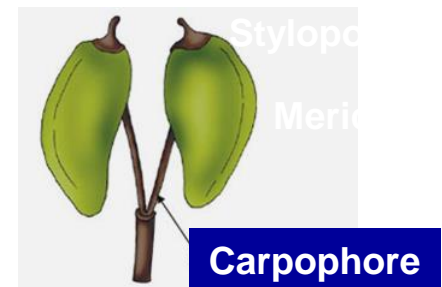
**Cremocarp** fruits.

Upon ripening, they split into 2 indehiscent one seeded parts called **Mericarps**.

Each mericarp is attached to the pedicel by a **Carpophore**.

Derived from an **inferior ovary**.

The cremocarp carries a nectary disc (**Stylopod**) which carries the style, stigma.



# General Characters of Umbelliferous Fruits

Each mericarp has a rounded dorsal surface with alternating **5** primary (**V.B.**) & **4** secondary (**vittae**) ridges. The ventral (commissural) surface is flat.

The number of vittae is characteristic of the fruit but usually is **4** on the **dorsal** side and **2** on the **ventral** side.

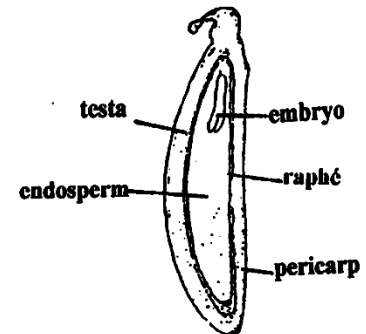
The endosperm is **oily** & the embryo is **apically placented**.

Main constituent is **volatile oil**.

Main use is **flavoring agent, carminative & antispasmodic**.



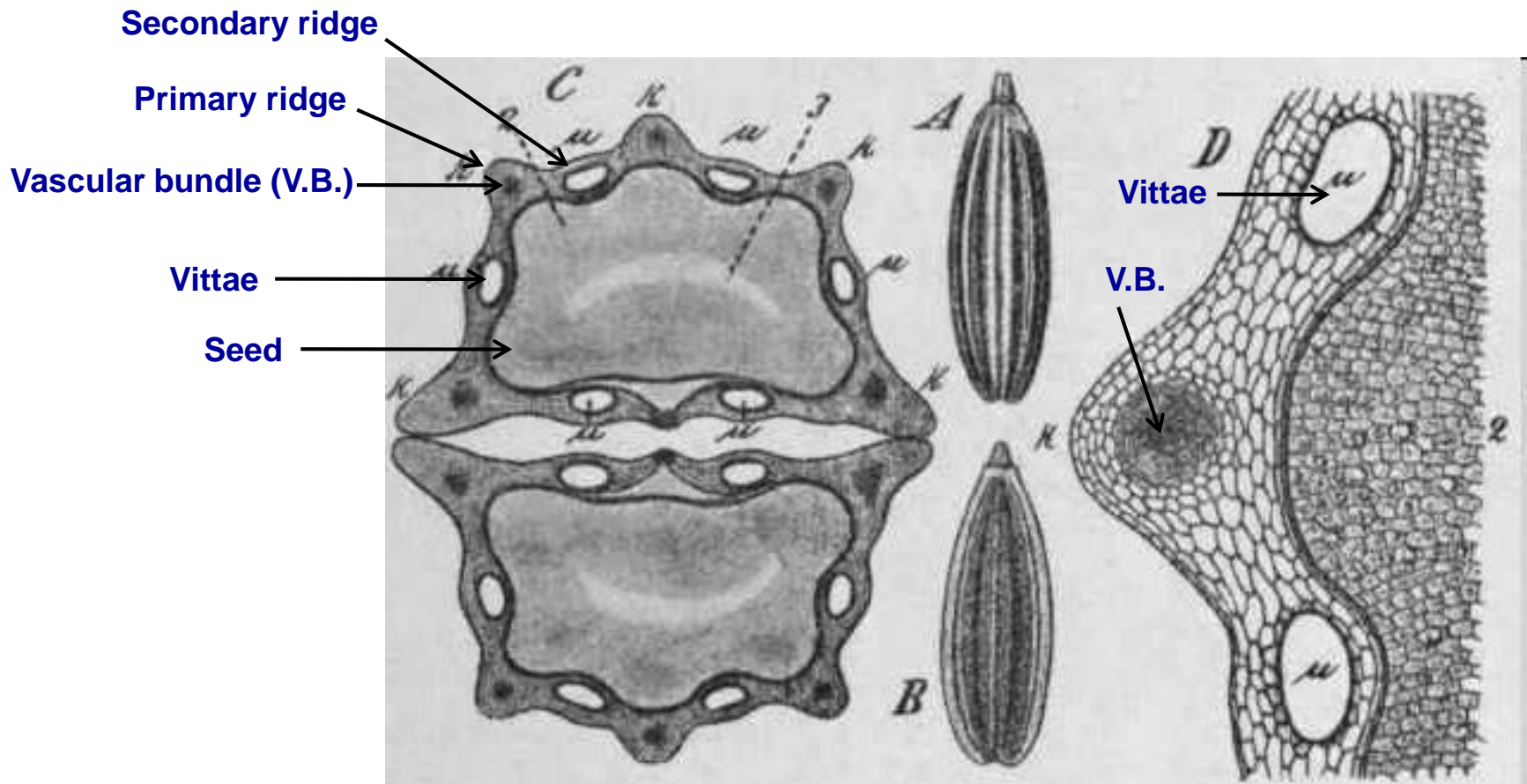
M L C in Fennel Mericarp



# General Characters of Umbelliferous Fruits

- **Epicarp** is usually **one row** (epidermis).
- Glandular & non-glandular **trichomes**.
- Schizogenous secreting duct (**vittae**) in the mesocarp containing volatile oil or bitter principles.  
They are **6** in each **mericarp**.
- **Endocarp** is composed of one row of narrow elongated cells arranged in groups either in **parquetry** or **non-parquetry** manner.





**Umbelliferous Fruit T.C. Diagram**

# Fennel

•**Syn.:** Fructus Foeniculi.

•**Origin:**

Dried ripe fruits of *Foeniculum vulgare*, family Umbelliferae (Apiaceae).

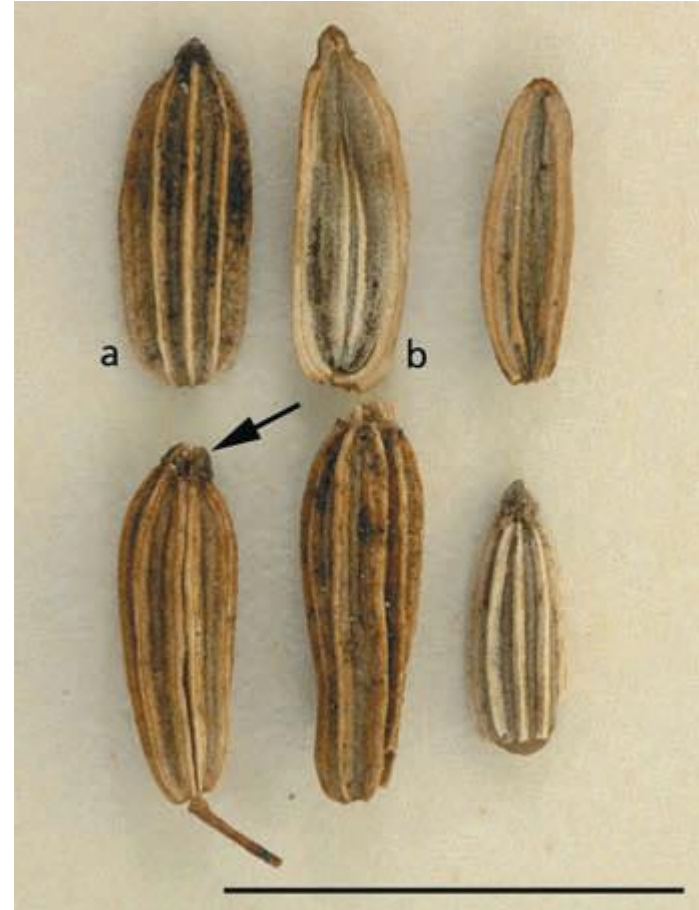
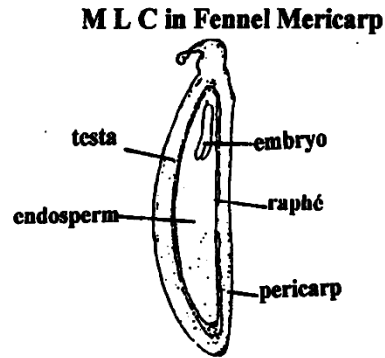
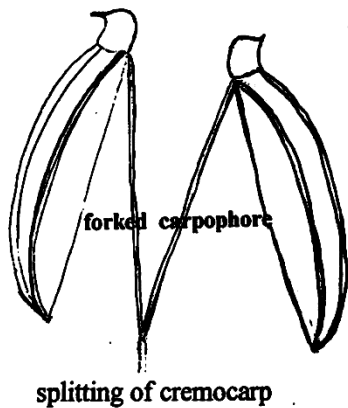
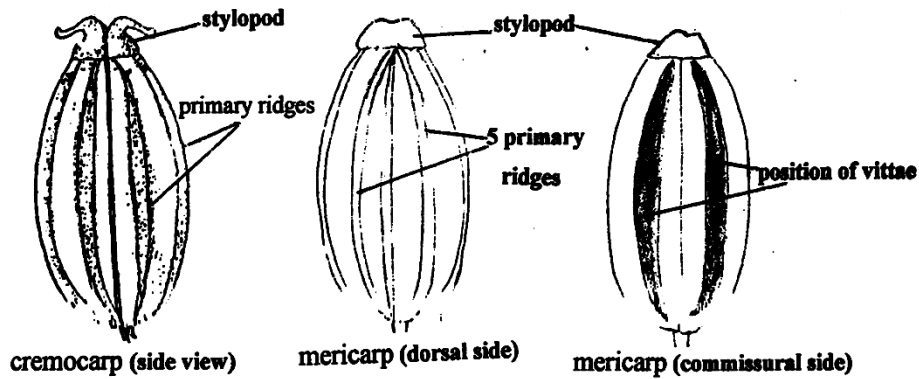
•**G.S.:**

Mediterranean countries & cultivated in Europe.





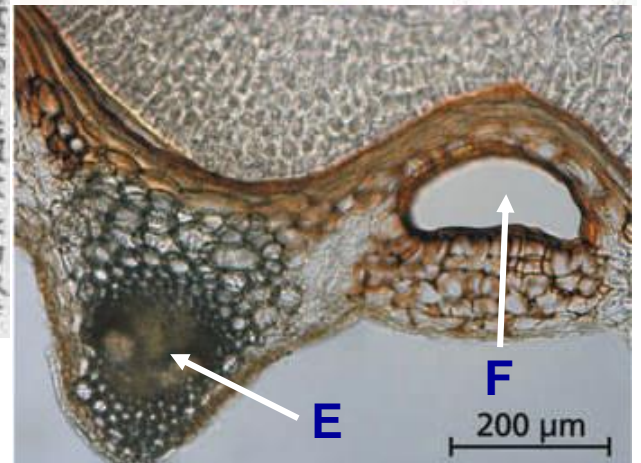
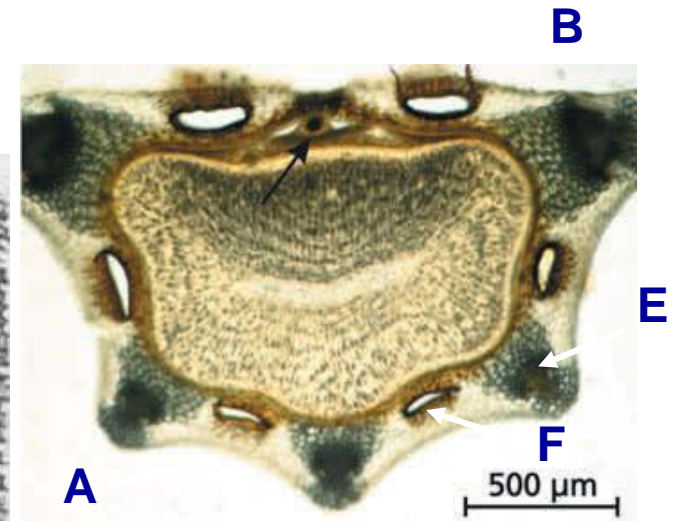
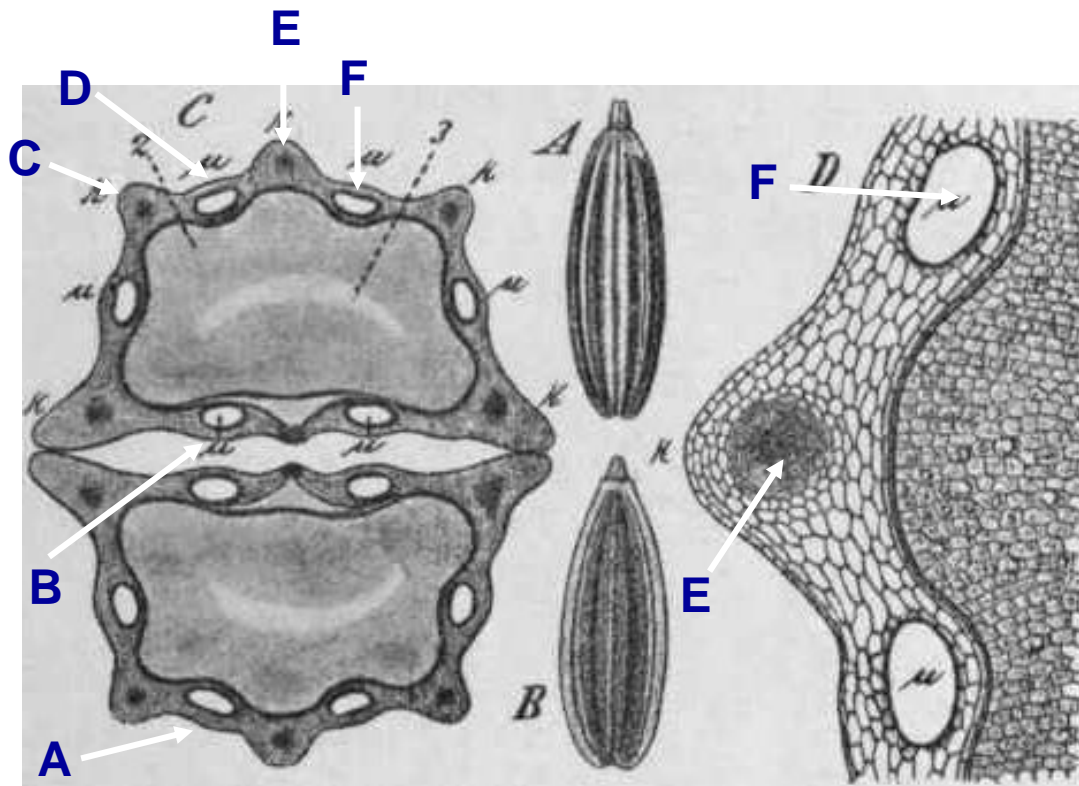
# Fennel



a, dorsal surface; b, commissural surface; c, stylopod; d, primary ridge; e, secondary ridge; f, cremocarp; g, mericarp

## Morphology of Fennel Fruit

# Fennel

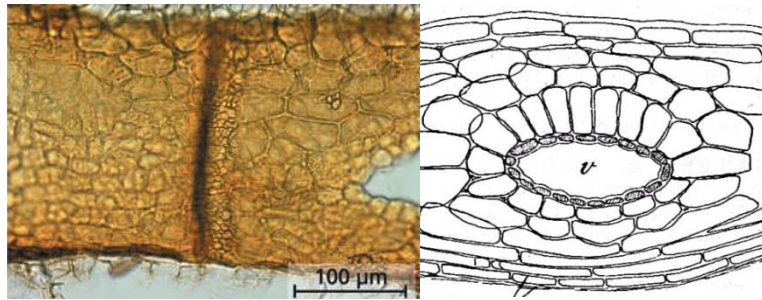


**A**, Dorsal surface; **B**, commissural surface; **C**, primary ridge; **D**, secondary ridge; **E**, vascular bundle; **F**, vittae

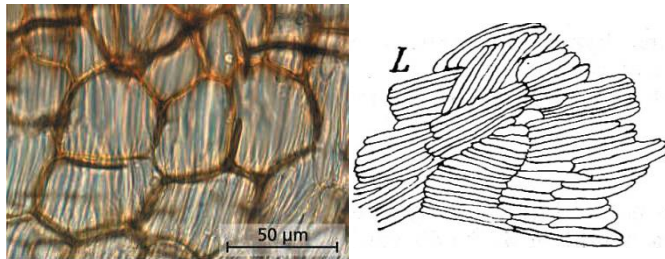
## T.C. Diagram of Fennel Fruit



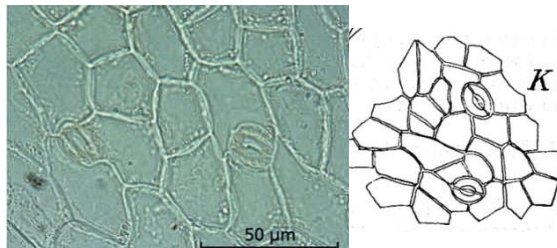
# Fennel



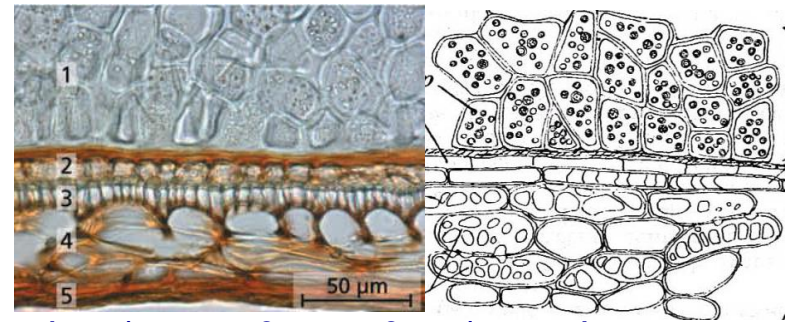
Vittae



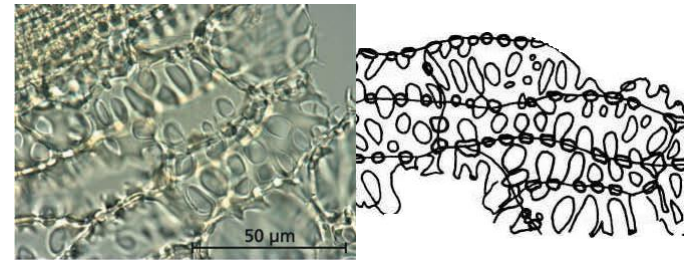
Parquetry endocarp



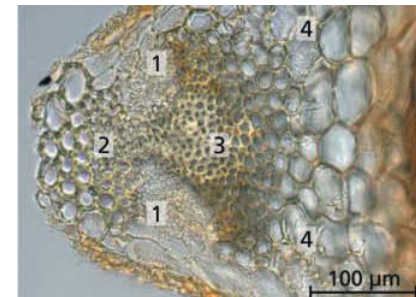
Anisocytic stomata



1, endosperm; 2, testa; 3, endocarp; 4, mesocarp; 5, epicarp  
Pericarp & Endosperm



Reticulate parenchyma



1, phloem; 2, xylem; 3, sclerenchyma; 4, mesocarp  
Vascular bundle

## Microscopical Key Elements of Fennel Fruit

# Fennel

## Active Constituents :

1. Volatile oil (4–5%) composed of **anethole, fenchone & estragol**.
2. Fixed oil & Protein.
3. Flavonoids.
4. Minerals & vitamins.

## ➤ Extra uses:

1. It promotes the **function of liver & kidney**.
2. It **clears the lungs (anethole & fenchone)** has secretolytic activity so infusion of the fruit used as a **gargle in sore throat & mild expectorant**.
3. **Anti-inflammatory** activity.
4. Mild **lactagogue** activity.

## ➤ Contraindicated:

**Pregnancy** due to the **uterine stimulating activity**.

# Anise

- **Syn.:** Fructus Anisi.

- **Origin:**

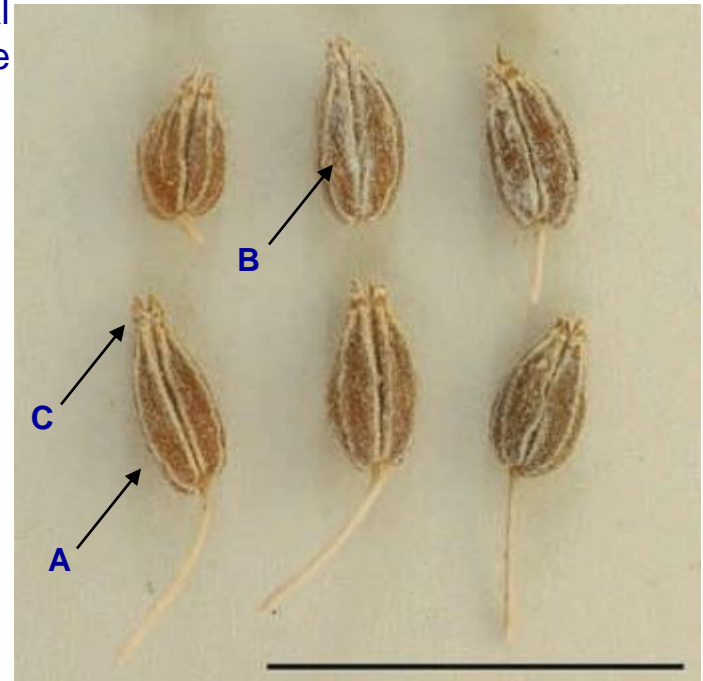
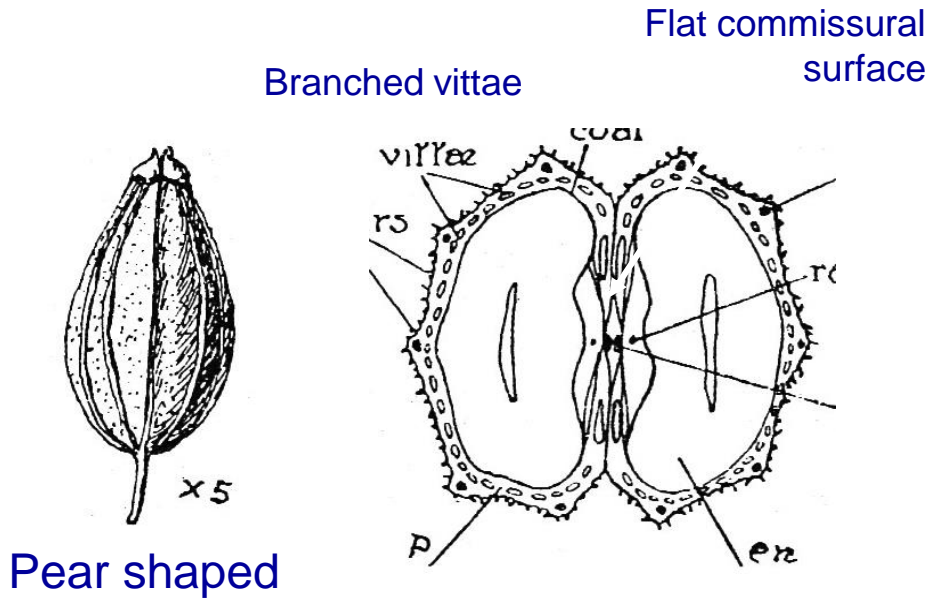
Dried ripe fruits of *Pimpinella anisum*, family Umbelliferae (Apiaceae).

- **G.S.:**

Egypt, Turkey, Greece & Europe.



# Anise

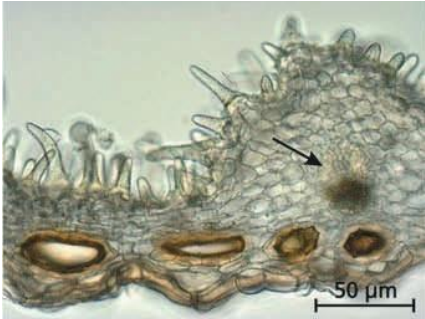


**A**, cremocarp; **B**, mericarp;  
**C**, stylopod

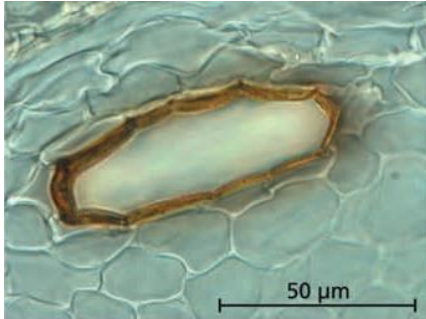
## Morphology of Anise Fruit



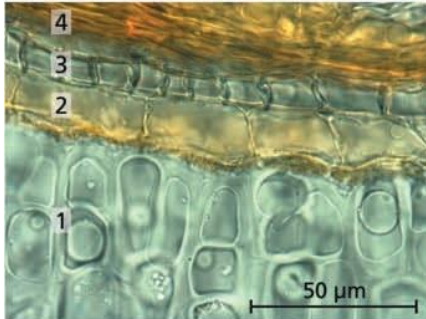
# Anise



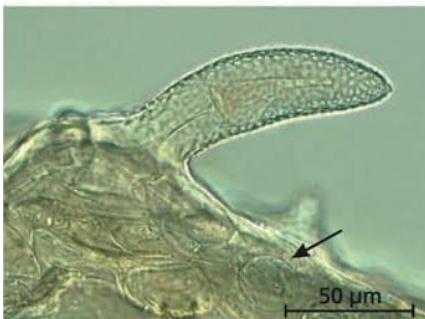
A



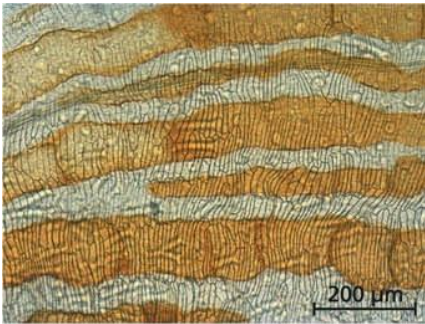
B



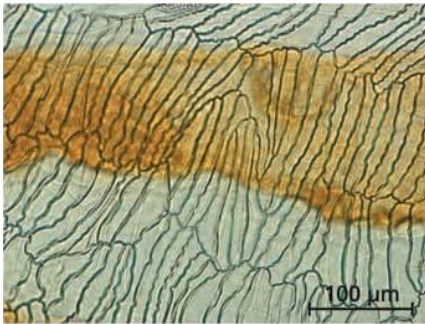
C



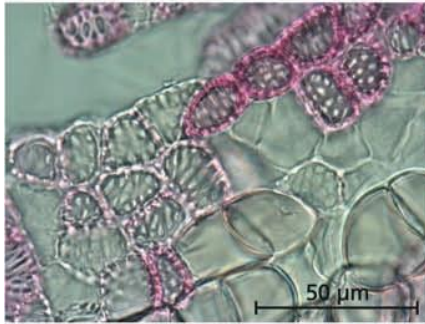
D



E



F



G

# Anise

## ➤ Active Constituents:

1. Volatile oil (2-3%); 80-90 % anethole.
2. Coumarins.
3. Fixed oil & proteins.

## ➤ Extra uses:

1. Expectorant; used in irritating dry whooping cough.
2. Sedative.

## ➤ Adulteration of Anise by:

1. Conium.
2. Star anise.



# Hemlock

- **Syn.:** Fructus Conii.
- **Origin:**  
Dried ripe fruits of *Conium maculatum*, family Umbelliferae (Apiaceae).
- **G.S.:**  
Britain & Europe.



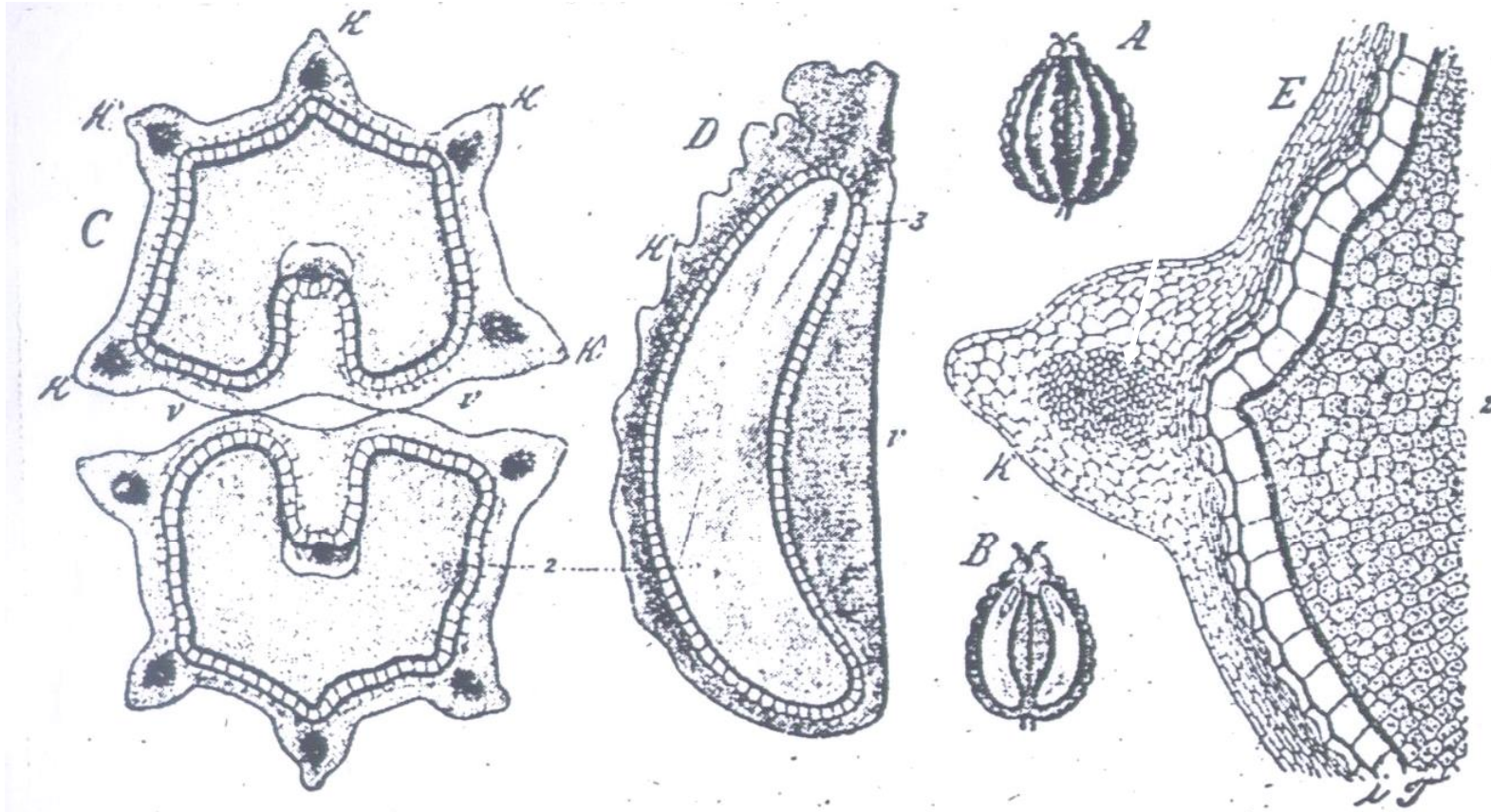
# Hemlock

➤ Key Features:

1. Morphologically, smaller in size with beaded appearance.
2. Histologically, absence of branched vittae & hairs; with deep groove on the commissural surface and campylospermous endosperm.
3. Chemically, coniine alkaloid can be detected by moistening with **KOH solution**, a **mice-like odour** develops.



# Hemlock



# Hemlock

- **Active Constituents:**

  - Coniine alkaloid (toxic).**

- **Uses & Actions:**

  - Analgesic, antiemetic & antispasmodic.**

- **Toxicity:**

  - Paralysis of breath.**

  - Teratogenic activity.**

# Fruits Containing Alkaloids



# Capsicum

➤ **Syn.:**

Fructus Capsici, Chillies, Cayenne Pepper & African Capsicum.

➤ **Origin:**

Dried ripe fruits of *Capsicum minimum*, family Solanaceae.

➤ **G.S.:**

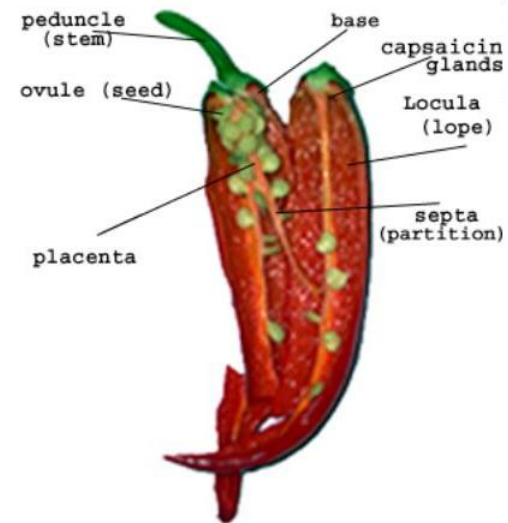
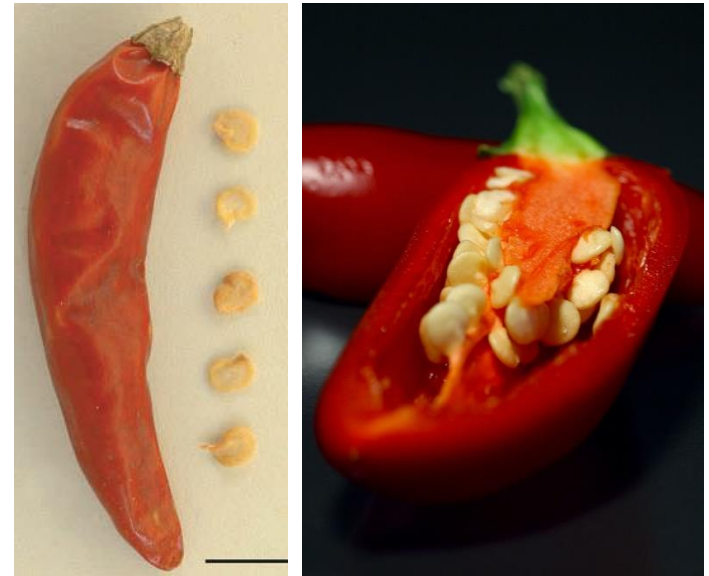
Cultivated in India, South America & Africa.



# Capsicum

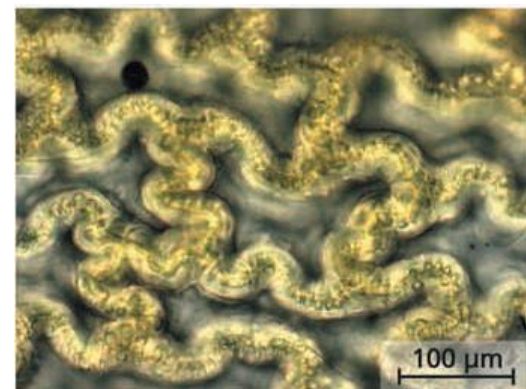
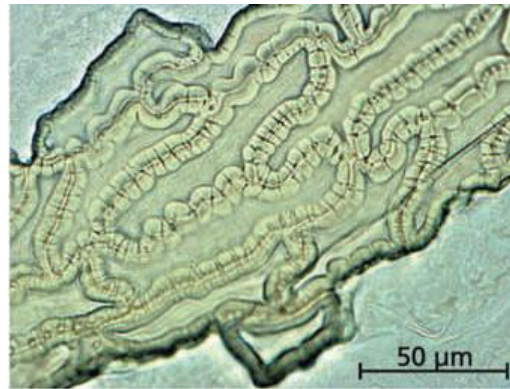
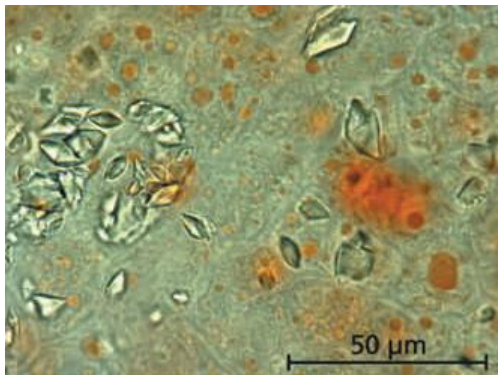
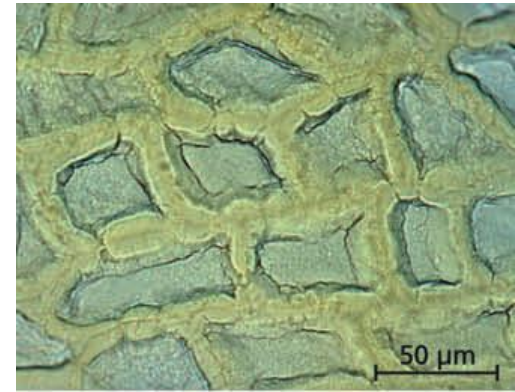
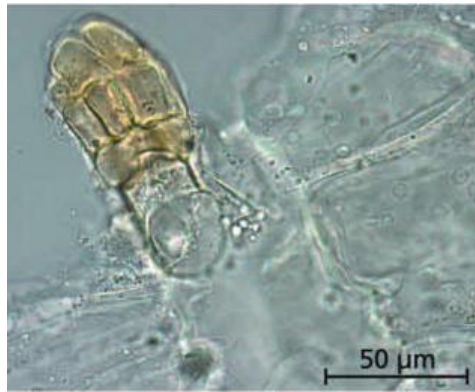
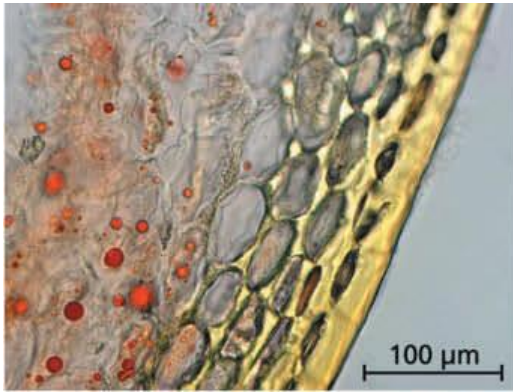
## ➤ Macroscopic Characters:

- **Berry**, oblong conical fruit.
- Calyx & pedicel usually attached.
- **Pericarp:**
  - Thin, glabrous **orange/red** shiny surface.
  - Internally divided by membranous dissepiments carrying seeds in 2 locules.
- Seeds are 10-20 in number.
- Sternutatory & intensely pungent in taste **especially in dissepiments.**





# Capsicum



# Capsicum

## ➤ Active Constituents:

- An intensely pungent phenolic principle: **capsaicine**.

The pungency of capsaicine is **not destroyed** by treatment with **alkalis** but by oxidation with potassium dichromate ( $\text{K}_2\text{CrO}_7$ ) or potassium permanganate ( $\text{KMNO}_4$ ).

- Fixed oils.
- Carotenoids.
- Fats, proteins, Vitamin A & C.

## ➤ Uses:

**1. Condiment & spice.**

2. Internally, the drug is given in **dyspepsia & flatulence**.

3. Externally, used in **plasters & ointments** as counter irritants for the relief of **lumbago & rheumatism**.

4. The drug is also **deterrent** in thumb sucking & nail biting.

# Capsicum

## ➤ **Contraindication:**

- Allergy to spices.
- Burning of mouth & running of tears.
- Cautious in patients with **peptic ulcers, heart burn & gastritis.**

## ➤ **Chemical test:**

Capsaicine +  $\text{FeCl}_3 \rightarrow$  **bluish green colour**

Capsaicine +  $\text{KMnO}_4$  /  $\text{K}_2\text{Cr}_2\text{O}_7 \rightarrow$  **??**

# Poppy

➤ **Syn.:** Fructus Papaveris, Poppy capsule.



➤ **Origin:**

Dried unripe fruits of *Papaver somniferum*, family Papaveraceae.



➤ **G.S.:**

Turkey and Asia.



# Poppy

## ➤ Active Constituents:

- The latex (opium) which contains 40 medicinally active alkaloids: **morphine**, **codeine**, **papaverine**.
- **Meconic acid**.
- The seeds contain no alkaloids.

## ➤ Uses:

1. Opium & opiates are **potent analgesic** (pain killer) e.g. **Morphine**.
2. **Codeine** is a strong **cough depressant**.
3. **Papaverine** is a **smooth muscle relaxant**.



# Fruits Containing Anthraquinone Glycosides



# Senna Pods

➤ **Syn.:** Fructus Sennae.

➤ **Origin:**

Dried ripe fruits of *Cassia acutifolia*

(Alexandrian Senna) & *Cassia angustifolia*

(Indian Senna), family Leguminosae

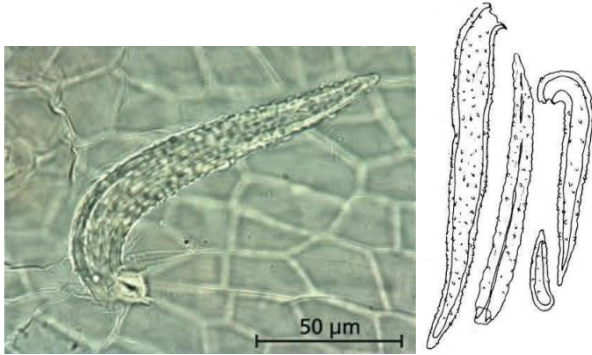
(Fabaceae).

➤ **Morphology:**

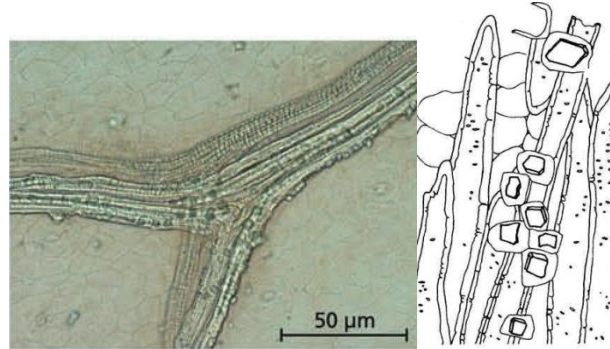
Legume entire compressed laterally.



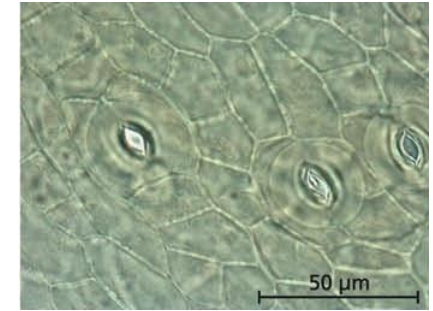
# Senna Pods



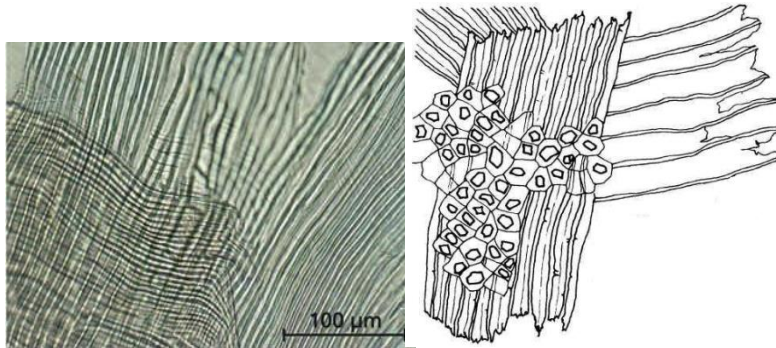
A. Non-glandular hairs with **warty** cuticle.



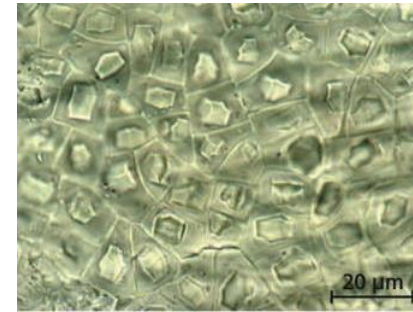
B. Crystal sheath (mesocarp).



C. Anomo- & paracytic stomata.



D. Crossing fibers of endocarp.



E. Ca Oxalate crystals.

## Microscopical Key Elements of Senna Pods

# Senna Pods

## ➤ Active Constituents:

- Anthraquinone glycosides (**Sennosides A, B, C & D**).
- Flavonoids.
- Mucilage.

## ➤ Uses:

- **Laxative** in small doses.
- **Purgative** in large doses.
- **Mechanism:** Anthraquinone **glycosides** are **not absorbed** in the upper gut but are converted by the micro-flora of the large intestine into active aglycones which exert their laxative effect (stimulation) on colon. **Pods < less gripping effect than the leaves.**



# Senna Pods

## ➤ **Chemical Test:**

- Born-Trager test.
- Modified-Born-Trager test.

## ➤ **Contraindications:**

1. Intestinal obstruction.
2. Crohn's syndrome.
3. Pregnancy.
4. Lactating mother.
5. Children under 12 years.



# Fruits Containing Bitter Principles



## ***Ammi visnaga***

### **الخلّة البلدي**

Dried ripe fruits of *Ammi visnaga*,  
family Umbelliferae (Apiaceae).

Official in E.P.



## ***Ammi majus***

### **الخلّة البري**

Dried ripe fruits of *Ammi majus*,  
family Umbelliferae (Apiaceae).

Adulterant of *Ammi visnaga*.





# *Ammi visnaga*

## الخلّة البلدي

5. **Furanochromone** bitter principles: **khellin & visnagin.**
6. **+ve Khellin test**  
Aqueous or alcoholic extract or powder will give a **rose red colour** with KOH pellets.  
**-ve fluorescence test.**
7. Used as smooth muscle relaxant in cases of **renal colic** (relaxation of the ureter) & in **bronchial asthma** & induces **vasodilatation.**

# *Ammi majus*

## الخلّة البري

5. **Furanocoumarin (Psoralene)**, bitter principle; **ammoidin, xanthotoxin & bergapten.**
6. **-ve Khellin test.**  
**+ve fluorescence test:** Alcoholic extract gives **blue fluorescence** in UV light.
7. **Leukodermia** as it stimulates pigment production.