

Pharmacognosy

PHG 112

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Lecture 4



By the end of the lecture, students should be able to demonstrate knowledge of:

- **Fruit formation and key morphological and histological features**
- **Family Umbelliferea as important nutraceutical and cosmeceutical fruits**
- **Ammi visnaga and Ammi majus their chemical constituents & uses**

Fruit Formation

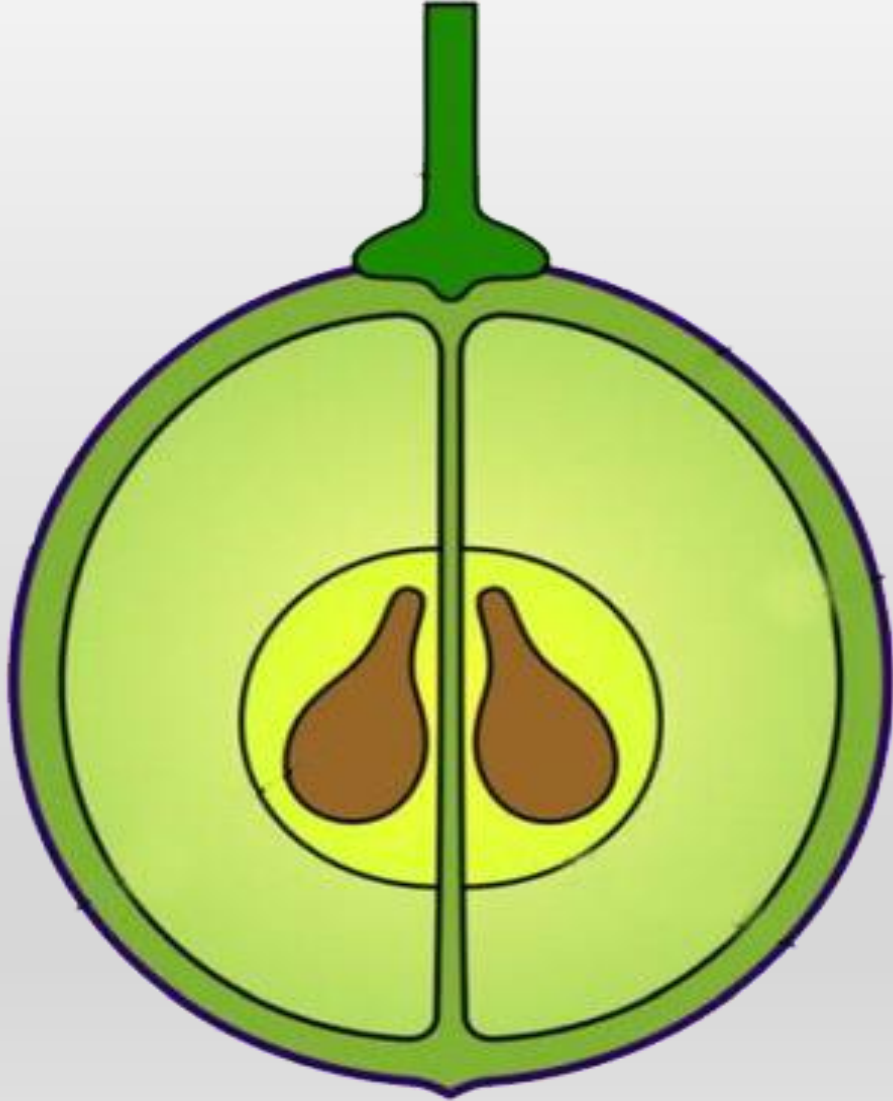


The Fruit

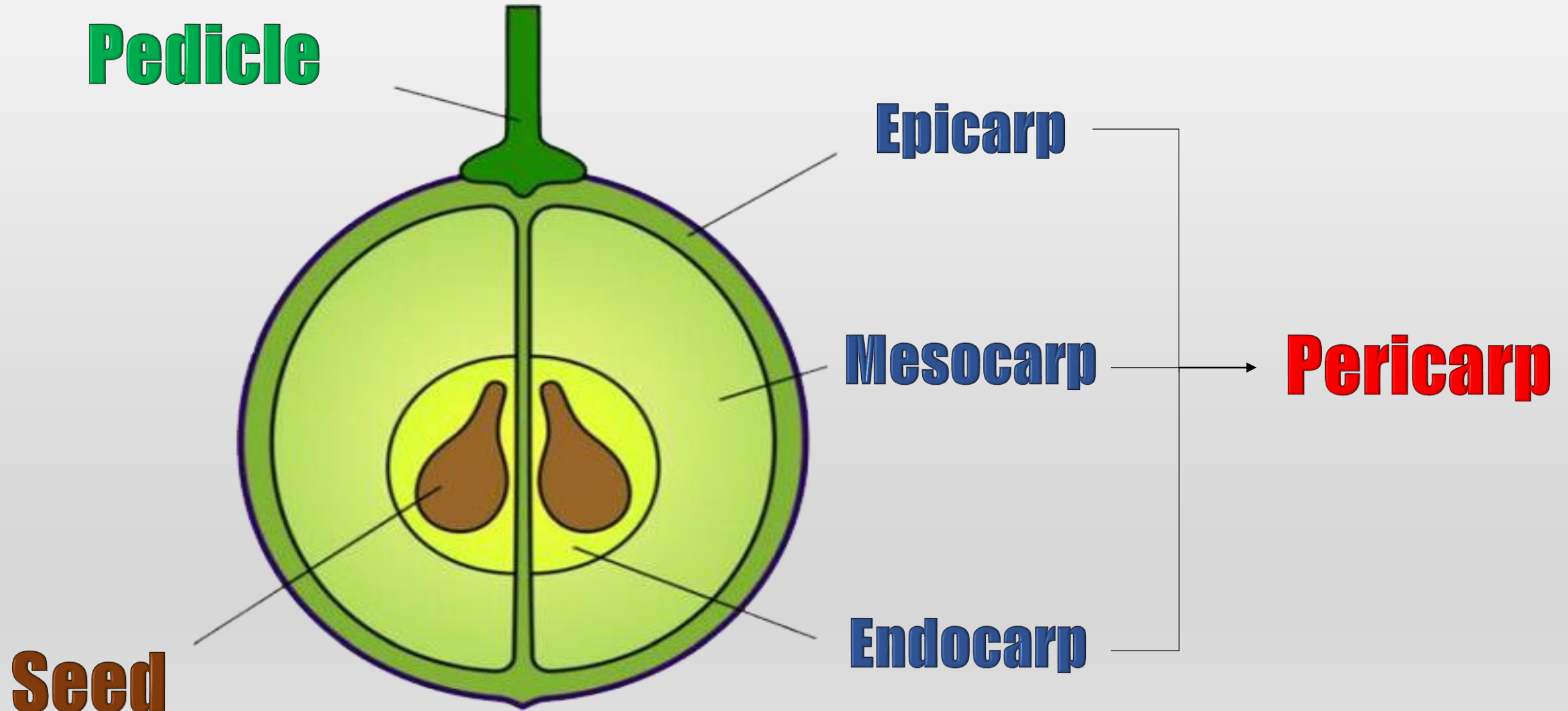
The whole product of the development of the **gynaecium** as a result of fertilization



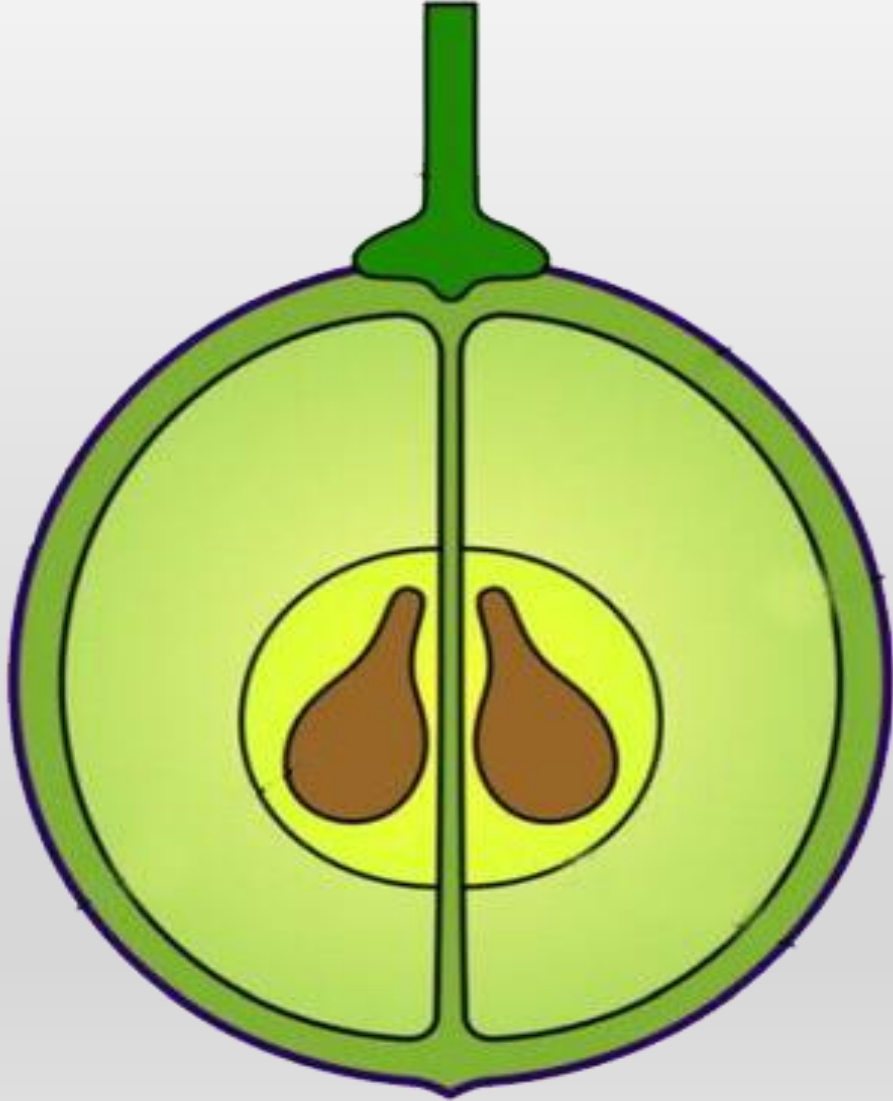
Parts of the Fruit

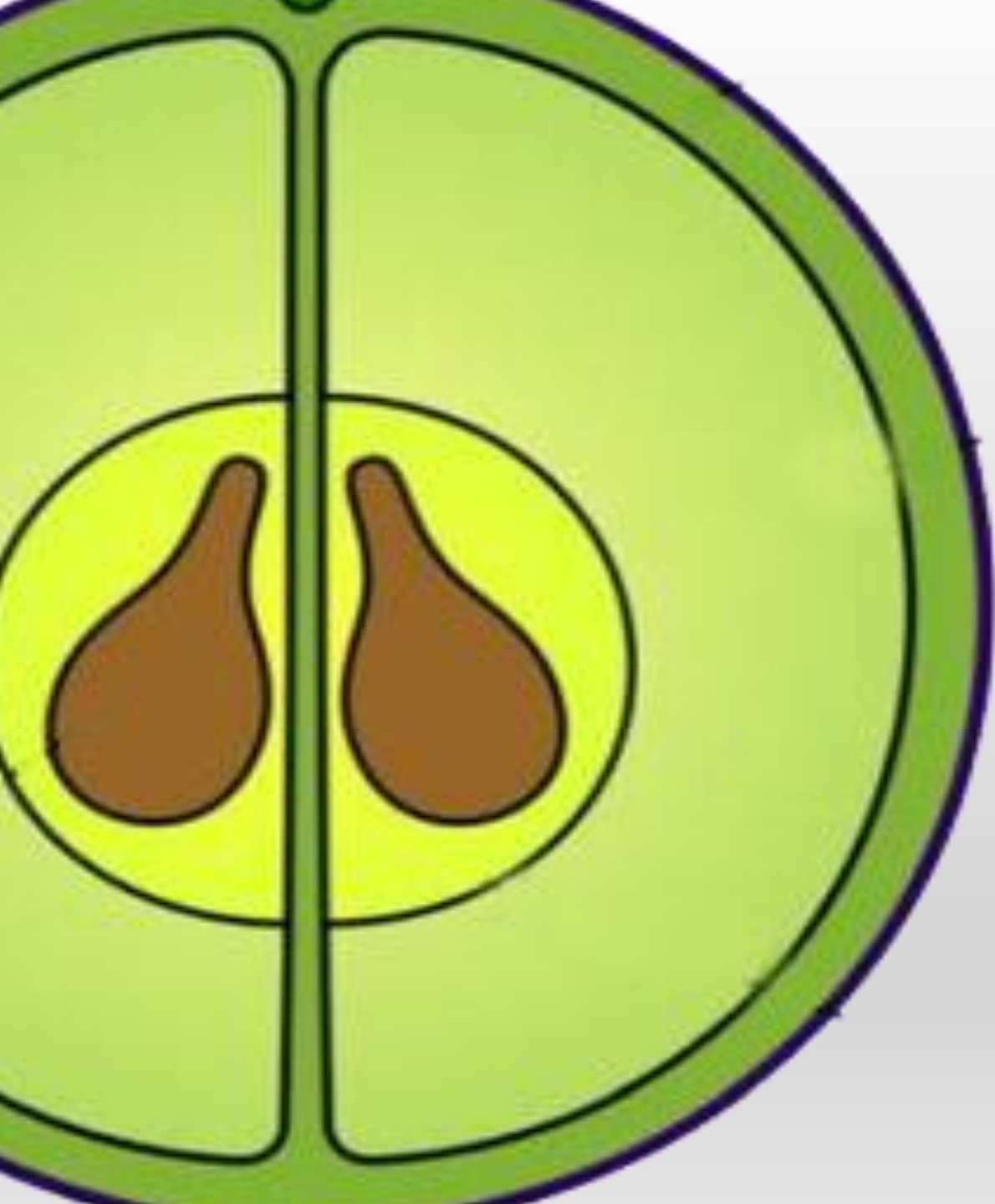


Parts of the Fruit



Parts of the Fruit

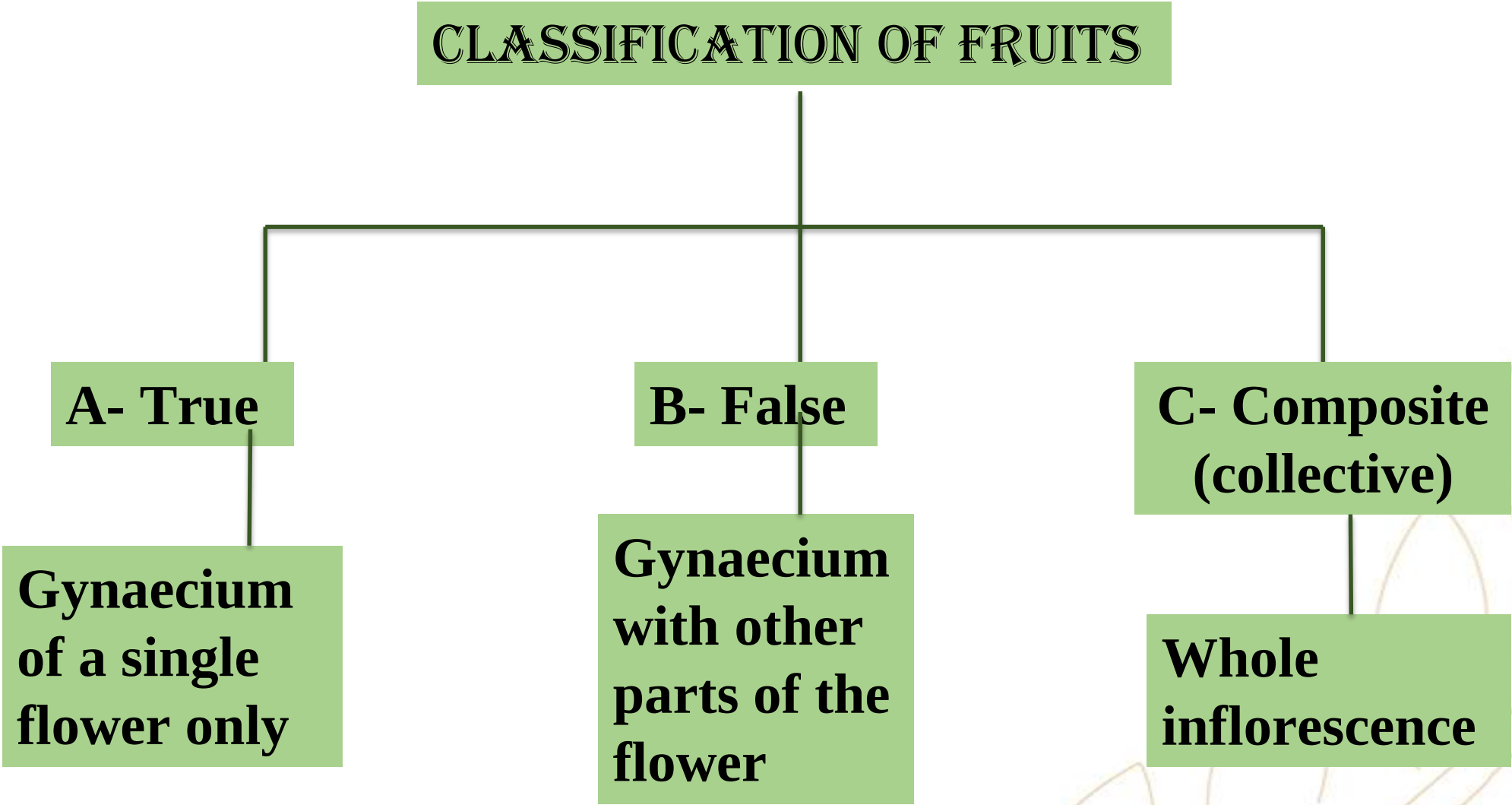




Pericarp

The fruit wall enclosing the seed and is typically made up of three distinct layers: the **epicarp**, which is the outermost layer; the **mesocarp**, which is the middle layer; and the **endocarp**, which is the inner layer surrounding the ovary or the seeds.

CLASSIFICATION OF FRUITS



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graph TD; A[CLASSIFICATION OF FRUITS] --> B[A- True]; A --> C[B- False]; A --> D[C- Composite (collective)]; B --> E[Gynaecium of a single flower only]; C --> F[Gynaecium with other parts of the flower]; D --> G[Whole inflorescence];
```

The diagram is a hierarchical flowchart titled 'CLASSIFICATION OF FRUITS'. It starts with a central box at the top, which branches into three categories: 'A- True', 'B- False', and 'C- Composite (collective)'. Each category then leads to a more specific description: 'A- True' leads to 'Gynaecium of a single flower only', 'B- False' leads to 'Gynaecium with other parts of the flower', and 'C- Composite (collective)' leads to 'Whole inflorescence'. The background features a faint, stylized illustration of a plant with large, pointed leaves.

A- True

**Gynaecium
of a single
flower only**

B- False

**Gynaecium
with other
parts of the
flower**

**C- Composite
(collective)**

**Whole
inflorescence**

CLASSIFICATION OF FRUITS

A- True

I- Simple
(one carpel or
united carpels)



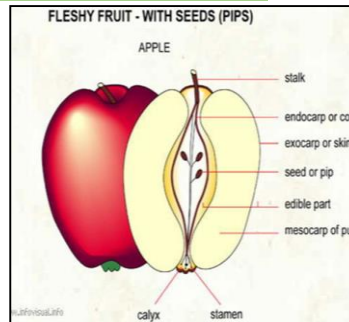
Of achenes

II- Aggregate
(free carpels)



Of follicles

B- False



Synconium



Figs

C- Composite (collective)

Sorosis



Mulberry

I- Simple Fruits

Dry
(Leathery or
woody pericarp)

Succulent
(Fleshy pericarp)

Nuts

Anise

Indehiscent

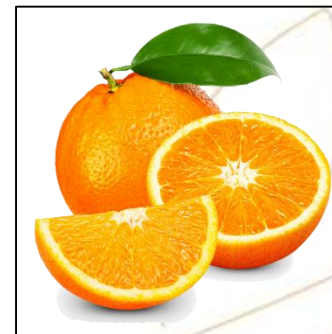
Dehiscent

Wheat Grain

Schizocarpic

Berry

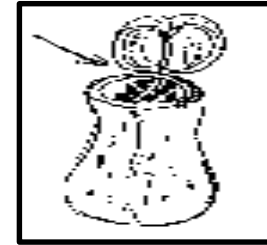
Drupe



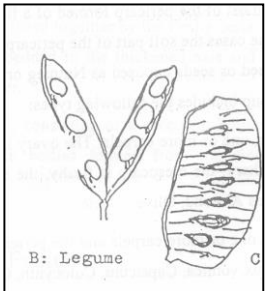
Dry

Dehiscent

Hyoscyamus



1- Legume



Senna



2- Follicle

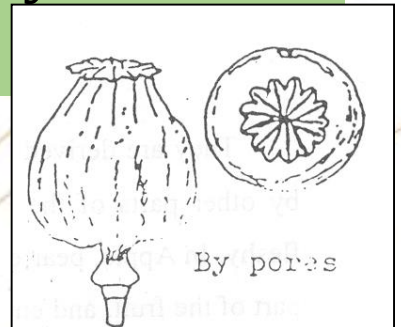


Milkweed

**3- Capsule
by valve
by Lid
by holes**



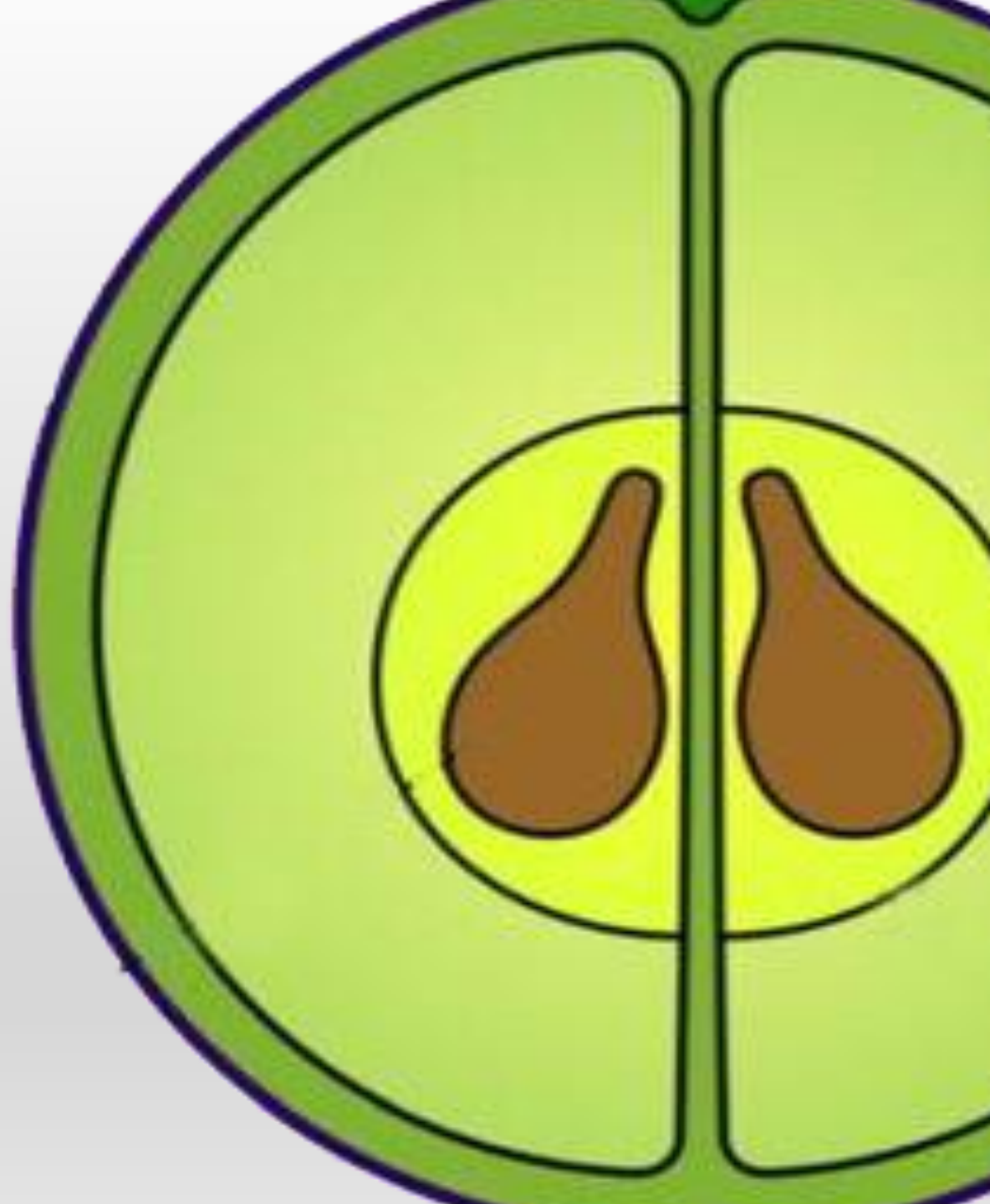
Cardamom

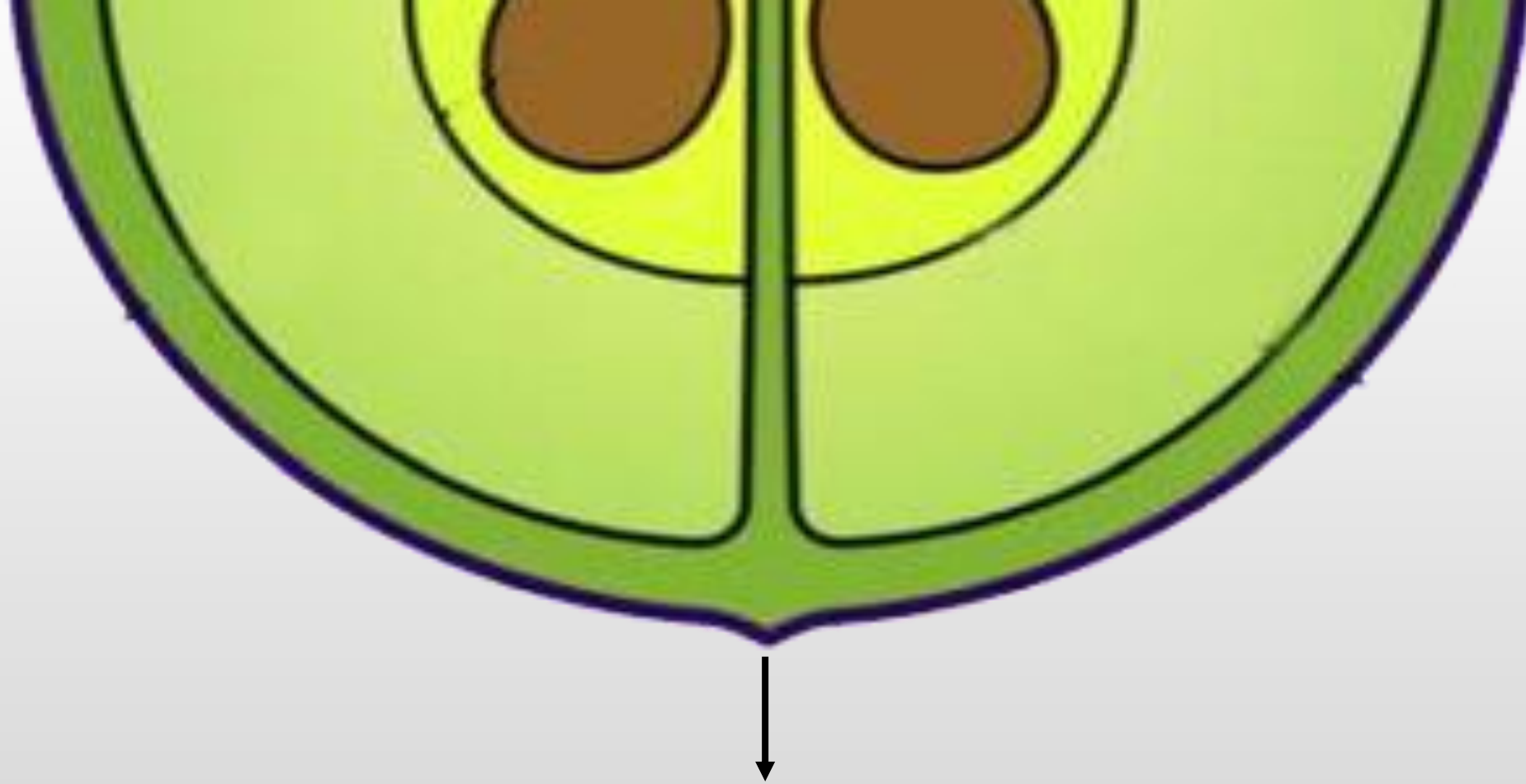


Poppy

Seeds

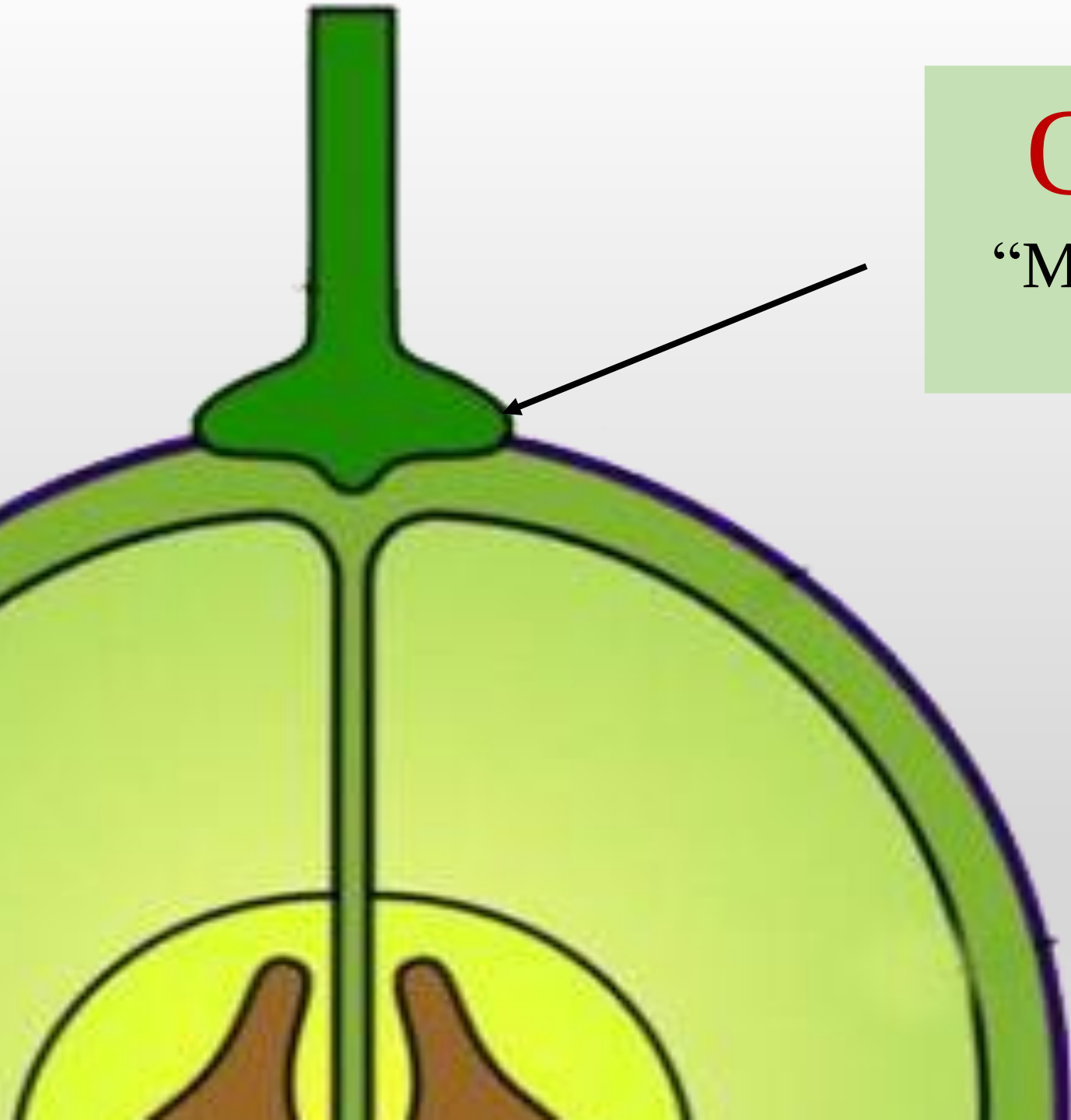
Mature fertilized plant **ovules** and they are considered the unit of reproduction of a flowering plant, capable of developing into another such plant





Apical and minute

“Marking the remains of style and stigma.”

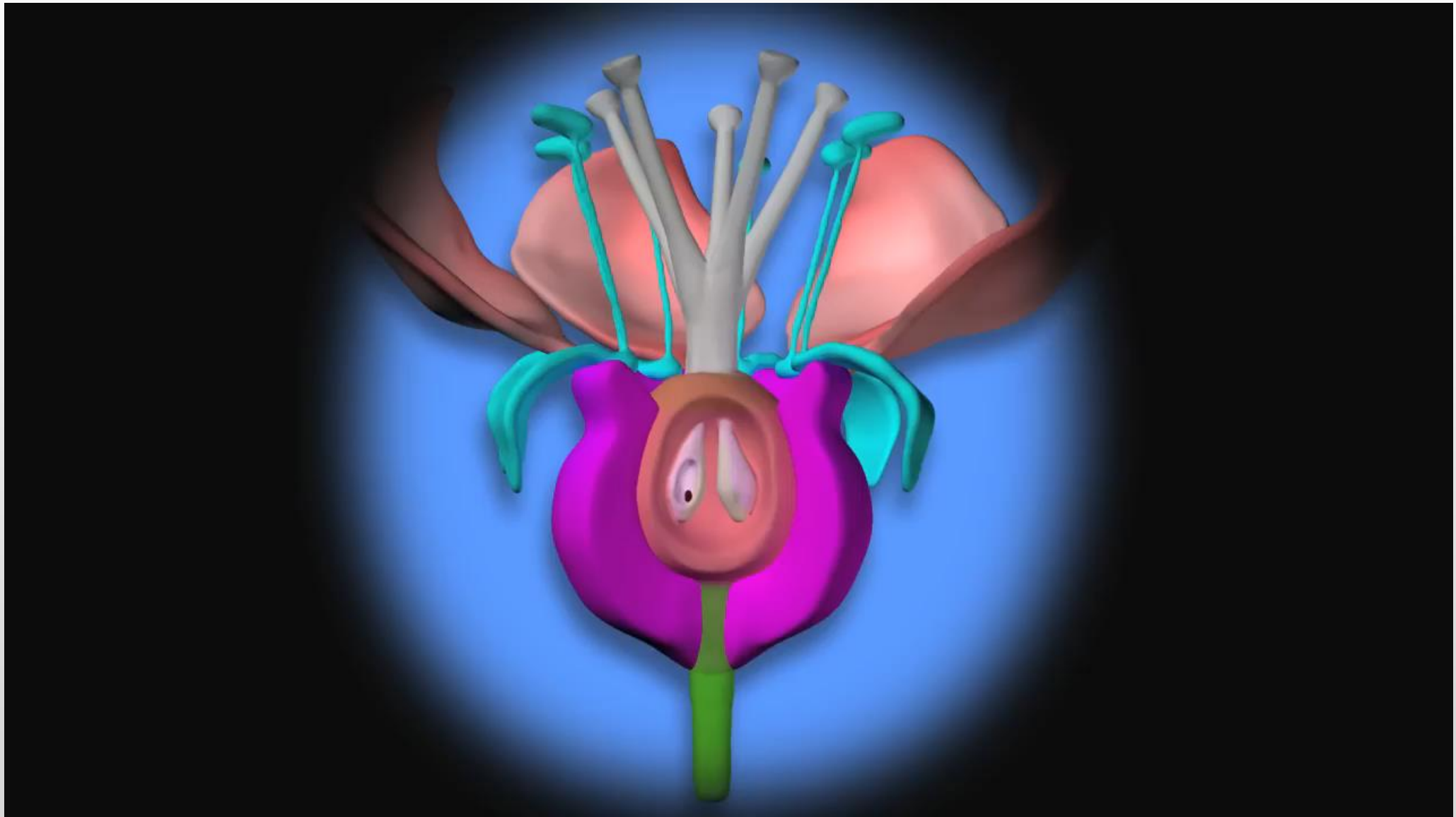


One at the base

“Marking the attachment to the stalk or parent plant”

Sometimes **other parts**
of the flower in
addition to the
gynaecium participate
in the production of the
fruit.





False Fruit

False Fruit



Apple



Pear

FAMILY UMBELLIFERÆ(APIACEÆ)



Family Umbelliferea



Fennel



Anise



Ammi visnaga

Type of fruit: True, Dry, Simple, Schizocarpic

Name of fruit: Cremocarp

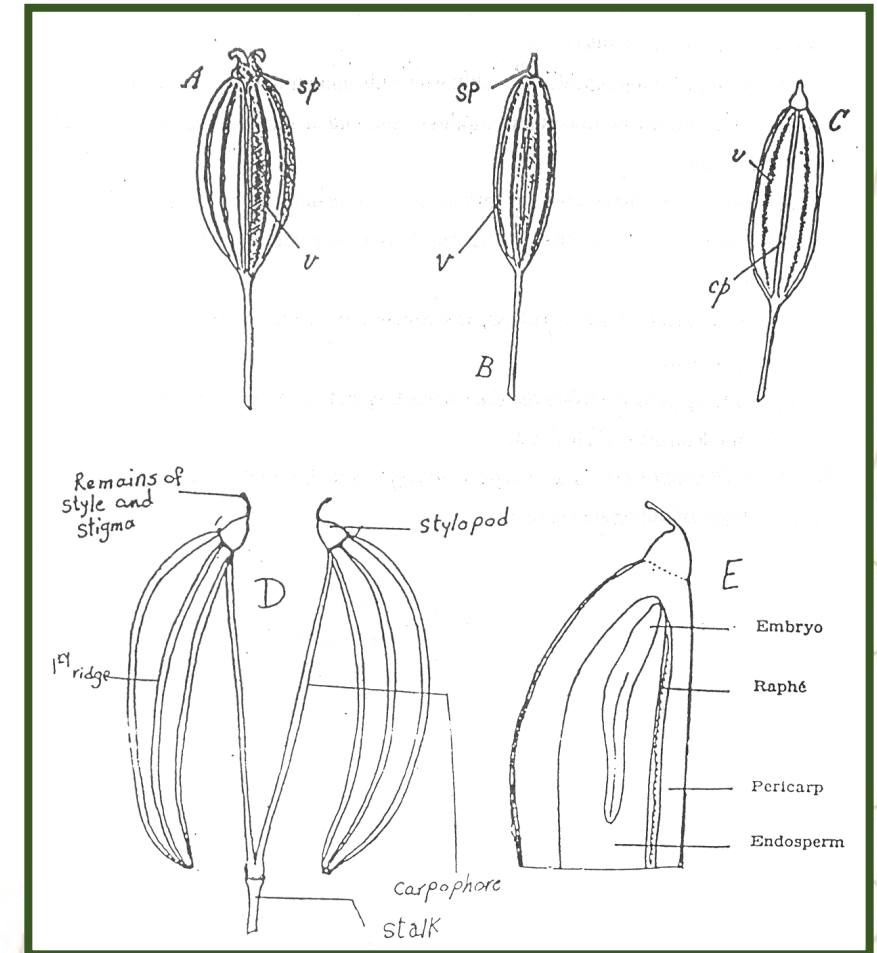


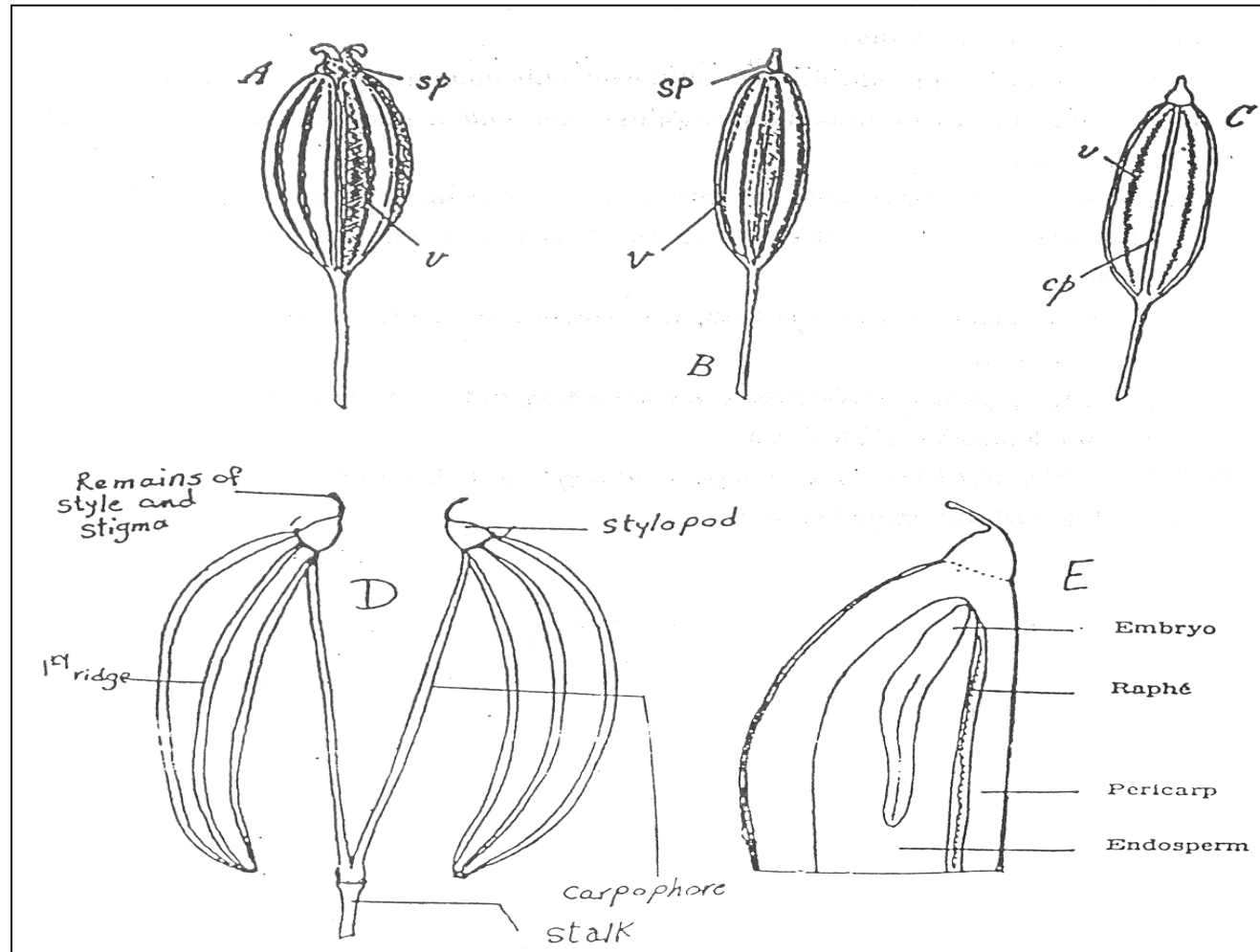
GENERAL CHARACTERS OF UMBELLIFEROUS FRUITS (APIACEAE)

Morphological Features:

1) The fruit is true, simple, dry, schizocarpic, cremocarp that splits upon drying into two indehiscent one seeded mericarps.

2) The apex of the fruit is crowned with a conical structure named stylopod (represents the remains of the style, stigma and nectary disc).





Cremocarp

A, lateral view; B, dorsal view; C, Commissural surface of a mericarp; D, splitted cremocarp showing carpophore; E, L. S. of mericarp

General Characters of Umbelliferous Fruits (Apiaceae)
Morphological Features (⊗cont.)

3) The fruits are derived from inferior ovary as clear from the presence of remains of floral parts just beneath the stylopod at the fruit apex.

4) Each mericarp has a flat surface, the commissural surface, and a rounded surface, the dorsal surface

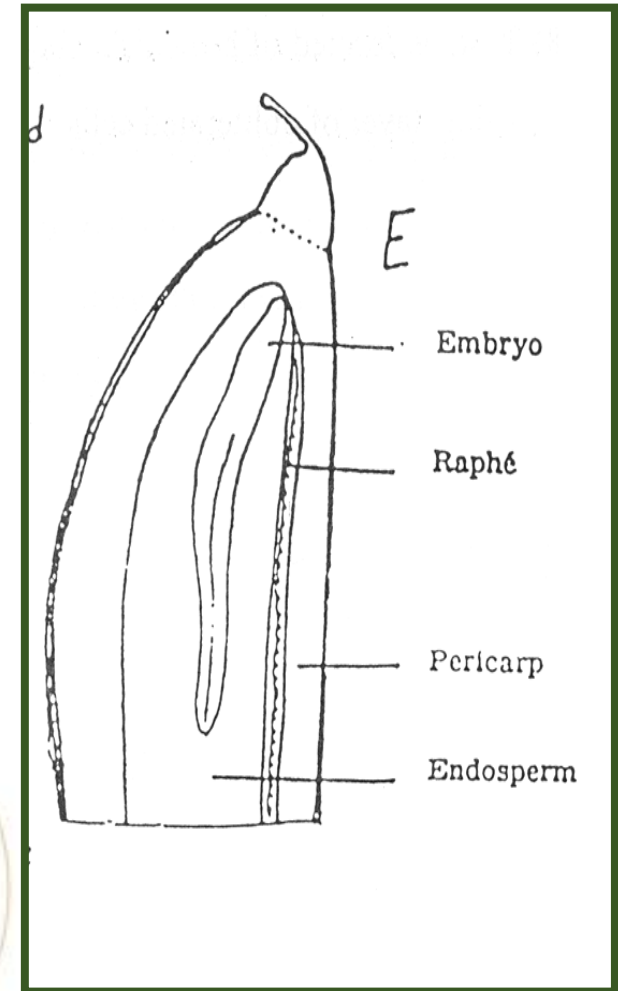
5) Surface of the cremocarp is characterized by the presence of 10 primary ridges(5 on each mericarp) over the vascular bundles & 8 secondary ridges over the vittae

General Characters of Umbelliferous Fruits (Apiaceae)
Morphological Features (⊗cont.)

6) Each mericarp is one-seeded.

The seed is attached by its testa to the pericarp so that it completely fills the locule

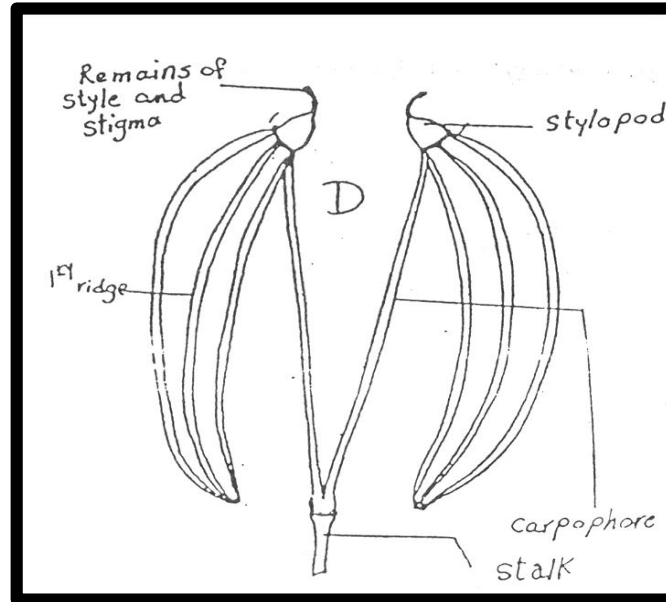
7) The seed is apically placented and contains a small embryo that is embedded in an oily endosperm. It is derived from anatropous ovule; consequently, a fine vascular strand, the raphe, extends on the commissural surface of each seed



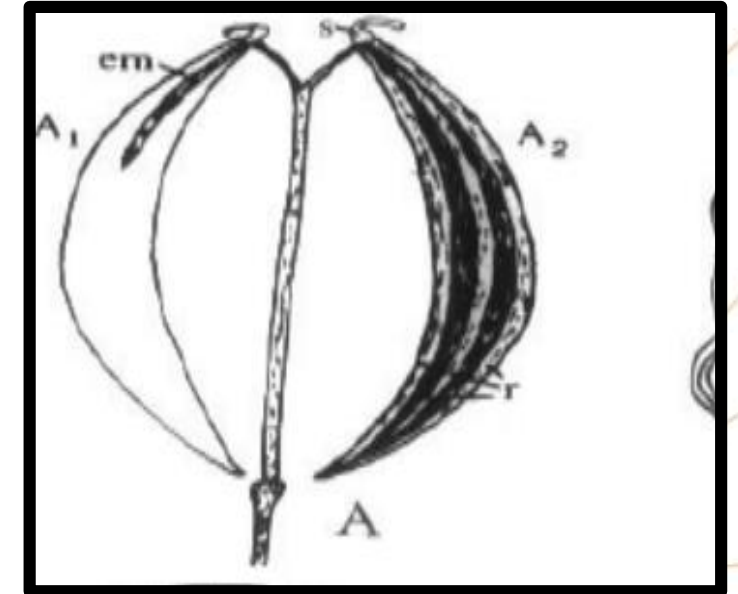
General Characters of Umbelliferous Fruits (Apiaceae)

8) Carpophore is a minute thread lies between the two mericarps.

It is an elongation of the receptacle between the carpels



Forked carpophore

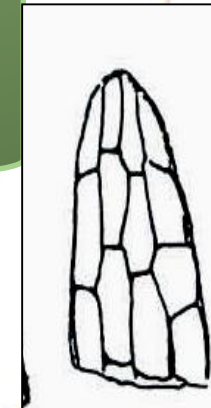


simple carpophore

General Characters of Umbelliferous Fruits (Apiaceae) Histological Features

1) Epicarp is usually one row (epidermis)

2) Glandular trichomes are rare, while non-glandular trichomes occur as unicellular to multicellular having a shaggy form



General Characters of Umbelliferous Fruits (Apiaceae) Histological Features

3) The fruits are characterized by the presence of schizogenous secreting ducts (vittae) in the mesocarp, containing volatile oil or bitter principles; they are six in number in each mericarp.

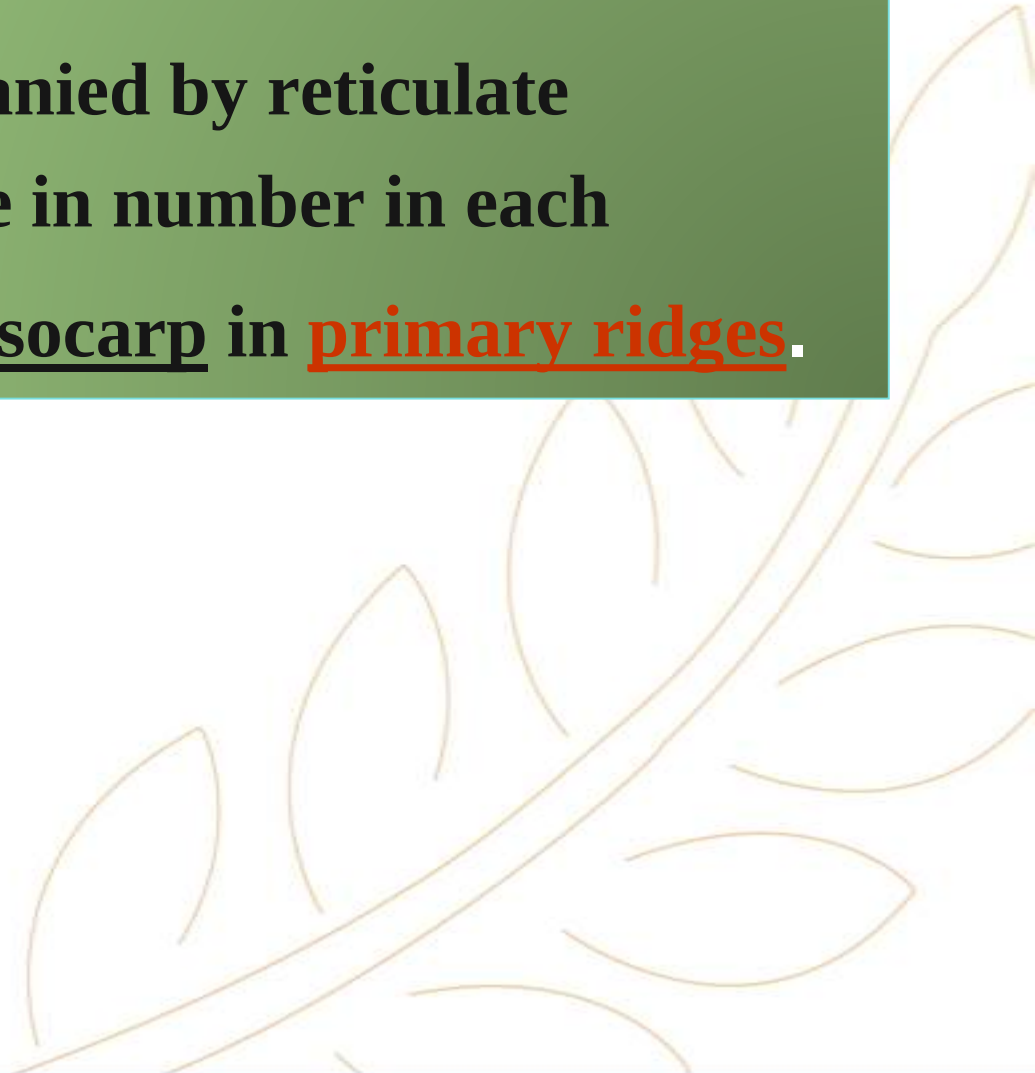
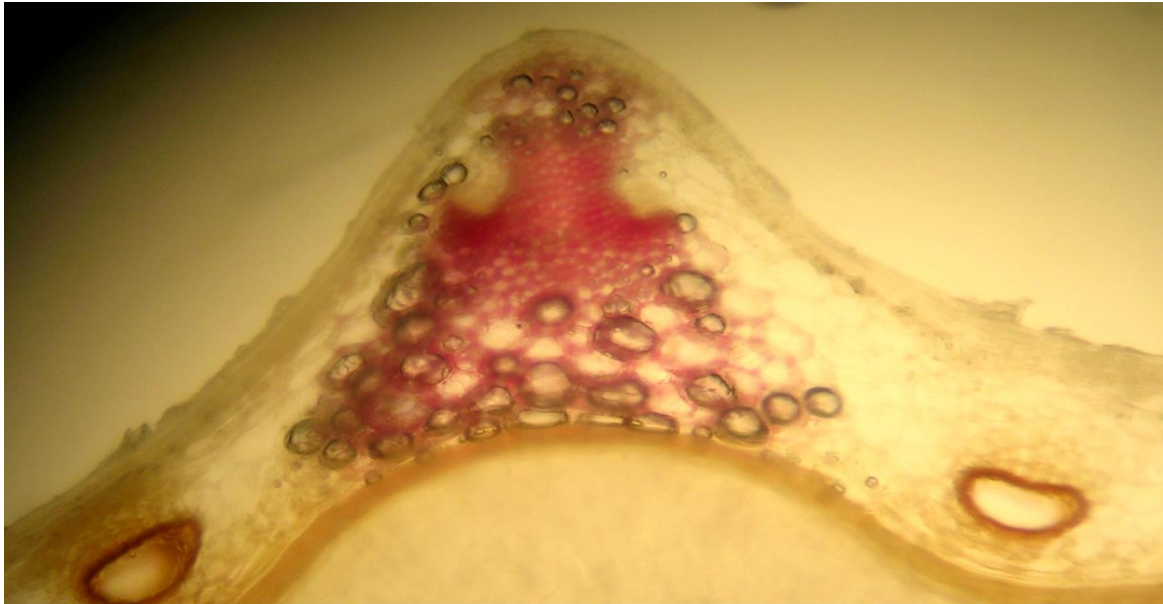


schizogenous secreting ducts vittae)

General Characters of Umbelliferous Fruits (Apiaceae)

Histological Features

4) The vascular bundle is bicollateral fibro-vascular bundle and sometimes accompanied by reticulate parenchyma cells. They are five in number in each mericarp and located in the mesocarp in primary ridges.



General Characters of Umbelliferous Fruits (Apiaceae)

5) The endocarp is composed of one row of narrow elongated cells. It appears in surface view as parallel cells, arranged in groups, either in parquetry or non parquetry manner.

6) Testa is formed of brownish, single row of polygonal, flattened cells followed by a hyaline layer of obliterated cells.

7) Endosperm is composed of thick cellulosic cells containing fixed oil and aleurone grains. Each aleurone grain contains one or more microrosette crystals of calcium oxalate.

Ammi visnaga
Thamarul Khellah

**Origin: The dried ripe fruit of
Ammi visnaga Lam.**

F. Umbelliferae (Apiaceae).

**It contains not more than 3 % of
foreign organic matter,
and yields not less than 0.5 % of the
bitter principle, khellin.**



Description:

A- Morphology

Cremocarp: It is usually separated into its mericarps

Mericarp: It is small, ovoid, (2 x 1 mm),

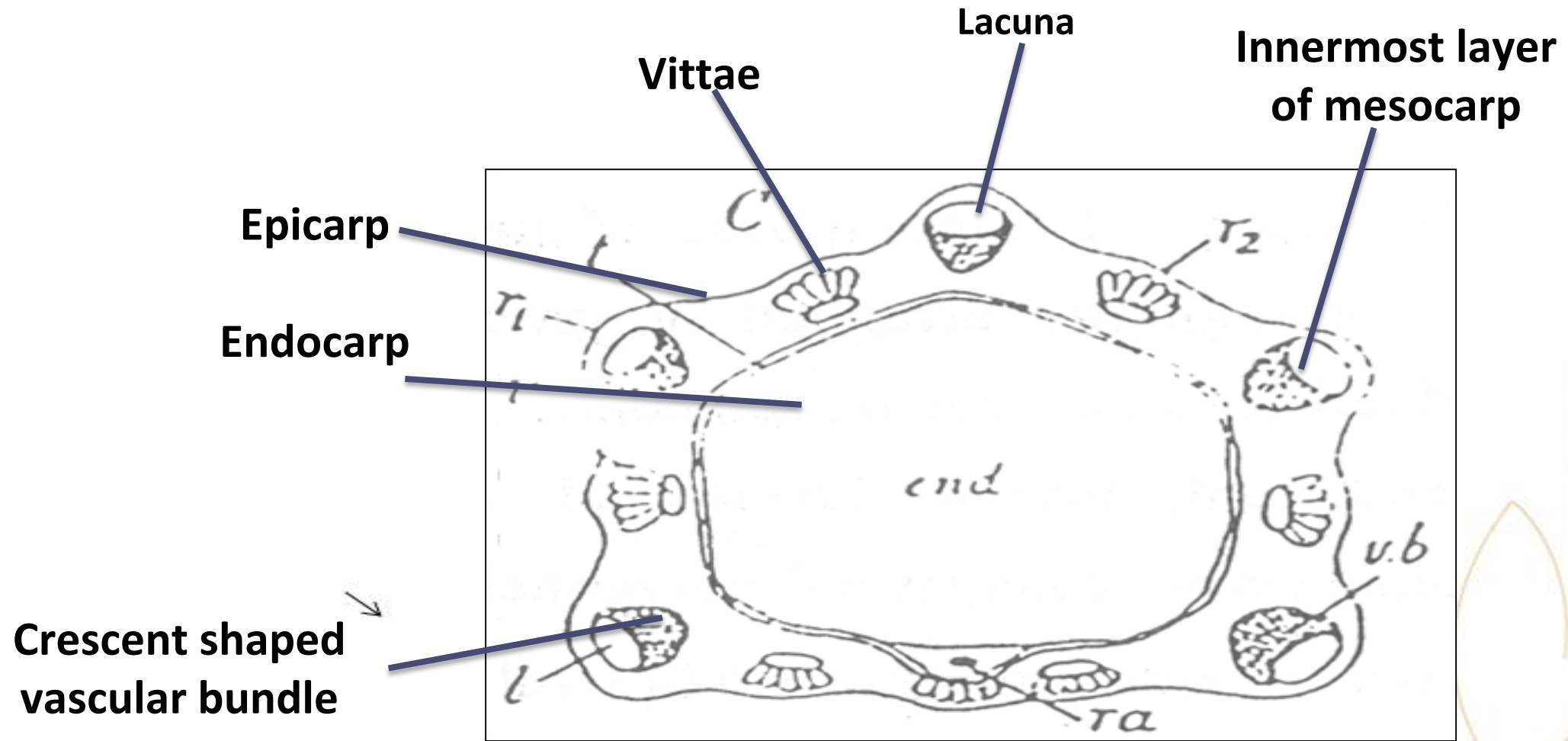
Colour: brownish to greenish-brown, with a violet tinge.

Odour : slightly aromatic

Taste :aromatic, bitter, slightly pungent

Externally: glabrous, with 5 distinct brownish, broad 1ry ridges, 4 inconspicuous dark 2ry ridges.

Carpophore: is simple
The fruit is crowned at apex by pyramidal stylopod bearing at its apex a reflexed style.



T. S. of *Ammi visnaga* mericarp

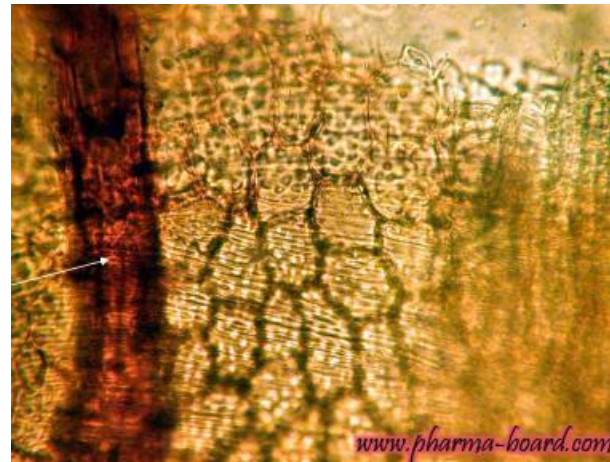
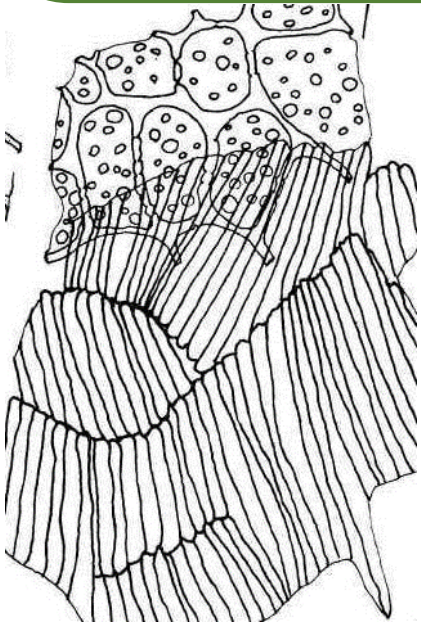
Powder

Color: brown

Odor: slightly aromatic

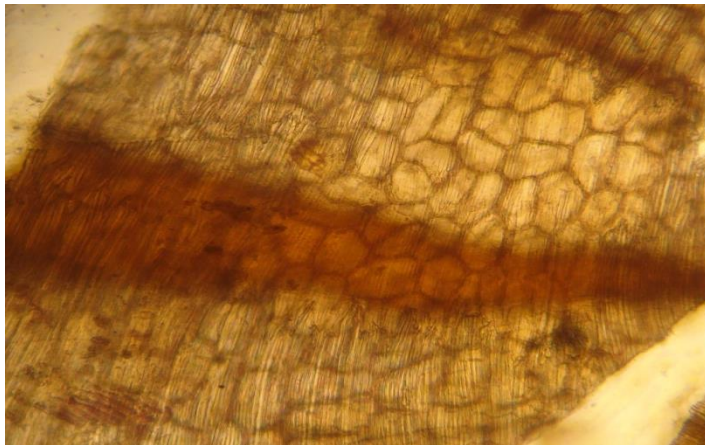
Taste: aromatic, bitter and slightly

1- Fragments showing the inner porous cells of the mesocarp crossed by, and intimately united with parquetry endocarp



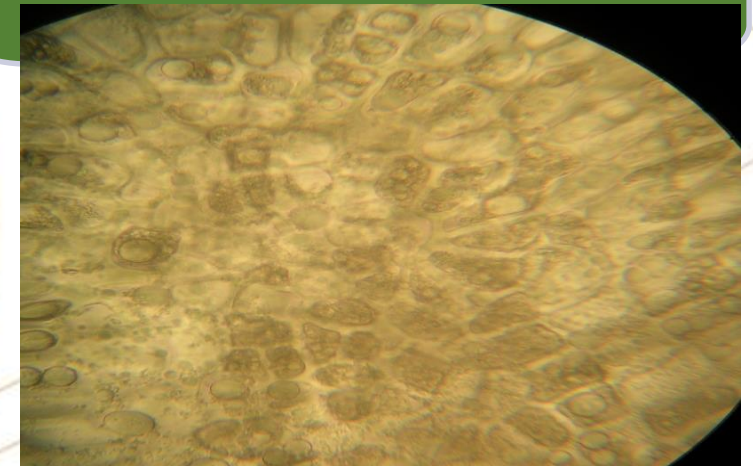
Powder

2- Fragments showing innermost layer of mesocarp (porous layer) accompanied by parquetry endocarp and vittae



3- Fragments showing cells of the brown seed coat.

4- Numerous fragments of endosperm showing aleurone grains, containing micro-rosette crystals of calcium oxalate



Ammi majus

Origin: The dried ripe fruit of
Ammi majus Lam.

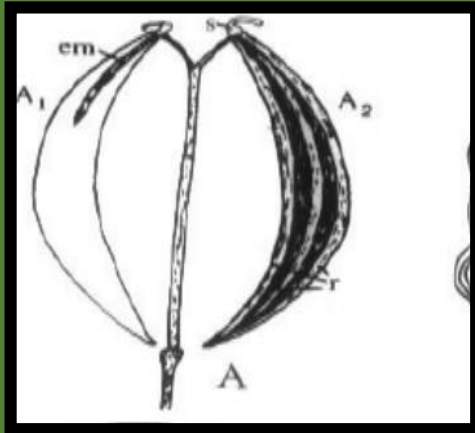
F. Umbelliferae (Apiaceae).



Ammi visnaga

1-Colour: brownish to greenish-brown, with a violet tinge.

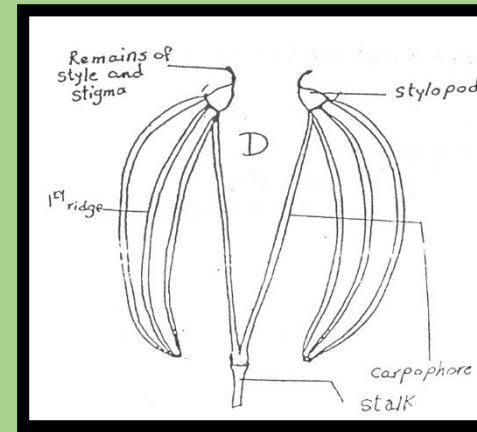
2-Carpophore: is simple and is crowned at apex by pyramidal stylopod bearing at its apex a reflexed style.



Ammi majus

-greyish brown to reddish brown in colour without a violet tinge.

-forked ,crowned by the stylopod, and showing reflexed style



Ammi visnaga

3-Crescent shaped bicollateral fibro vascular bundles, with lacuna and accompanied by reticulate, lignified cells.

4-Innermost layer of the mesocarp: Large, polygonal, brown-walled cells, with thick porous inner walls.

Ammi majus

-The vascular bundles appear in T.S. oval or circular and not accompanied by lacuna.

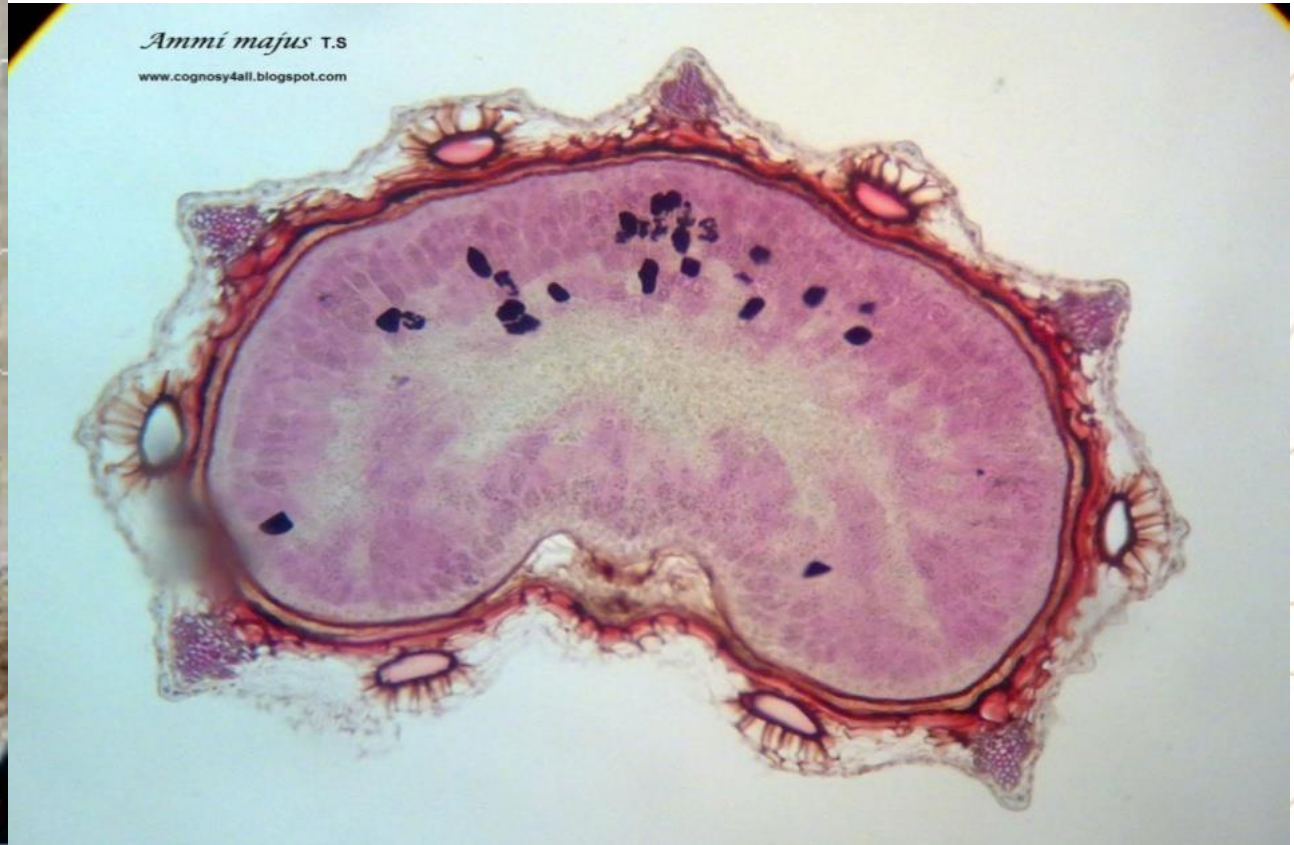
-The innermost layer of the mesocarp is non-porous



Ammi visnaga



Ammi majus



ACTIVE CONSTITUENTS

Ammi visnaga

1-Bitter principles: Khellin, visnagin, khellol & its glucoside.

2- Flavonoids: quercetin ,
kämpferol

3- Essential oil containing α -
terpineol , linalool

4-Fixed oil & protein.

Ammi majus

1- Bitter principle: Psoralene
xanthotoxin (ammoidin)

2-Fixed oil and protein

ACTIVE CONSTITUENTS

3- Flavonoids: quercetin and isorhamnetin and their 3-sulphates, kampferol

4- Essential oil containing α -terpineol , linalool , cis- & trans-linalool oxides.

5- Fixed oil & protein.

3- Fixed oil and protein



USES AND ACTIONS

Ammi visnaga

Spasmolytic especially on the muscles of the bronchi, GIT, biliary tract, urogenital system and the coronary vessels

- 1- Whooping cough It is now given for bronchial asthma and is safe even to children
- 2- Cramp-like conditions of GIT, biliary colic, and painful menstruation.

Ammi majus

Psoralene stimulates pigment production in skin exposed to UV light.

It is used externally as liniments and lotions made of alcoholic extracts of fruits as well as ammoidin, for treatment of vitiligo (leukodermia) alopecia and psoriasis.



USES AND ACTIONS

3- It is used for the removal of gall bladder and kidney stones by relaxing the muscles of the ureter.

4- The drug relaxes the coronary arteries, helps to improve the blood supply to the heart muscle and thereby eases angina pectoris





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Contraindications

In pregnancy due to uterine stimulating activity of khellin

Side effects

1- Photodermatitis in sensitive individuals

2- Prolonged use or an overdose may cause nausea, vertigo, constipation, lack of appetite, headache, allergic symptoms (itching) and sleeplessness

-In sensitive persons it may cause photodermatitis

Chemical Tests

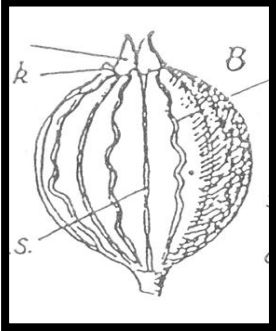
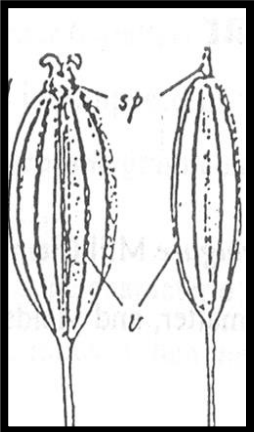
Ammi visnaga

Boil about 0.1 g. of *Ammi visnaga* fruits with 5 ml of water for a minute, strain add 1 to 2 drops of this decoction to 1 ml solution of sodium hydroxide (1 in 1) and shake, a rose red color is produced within 2 minutes

Ammi majus

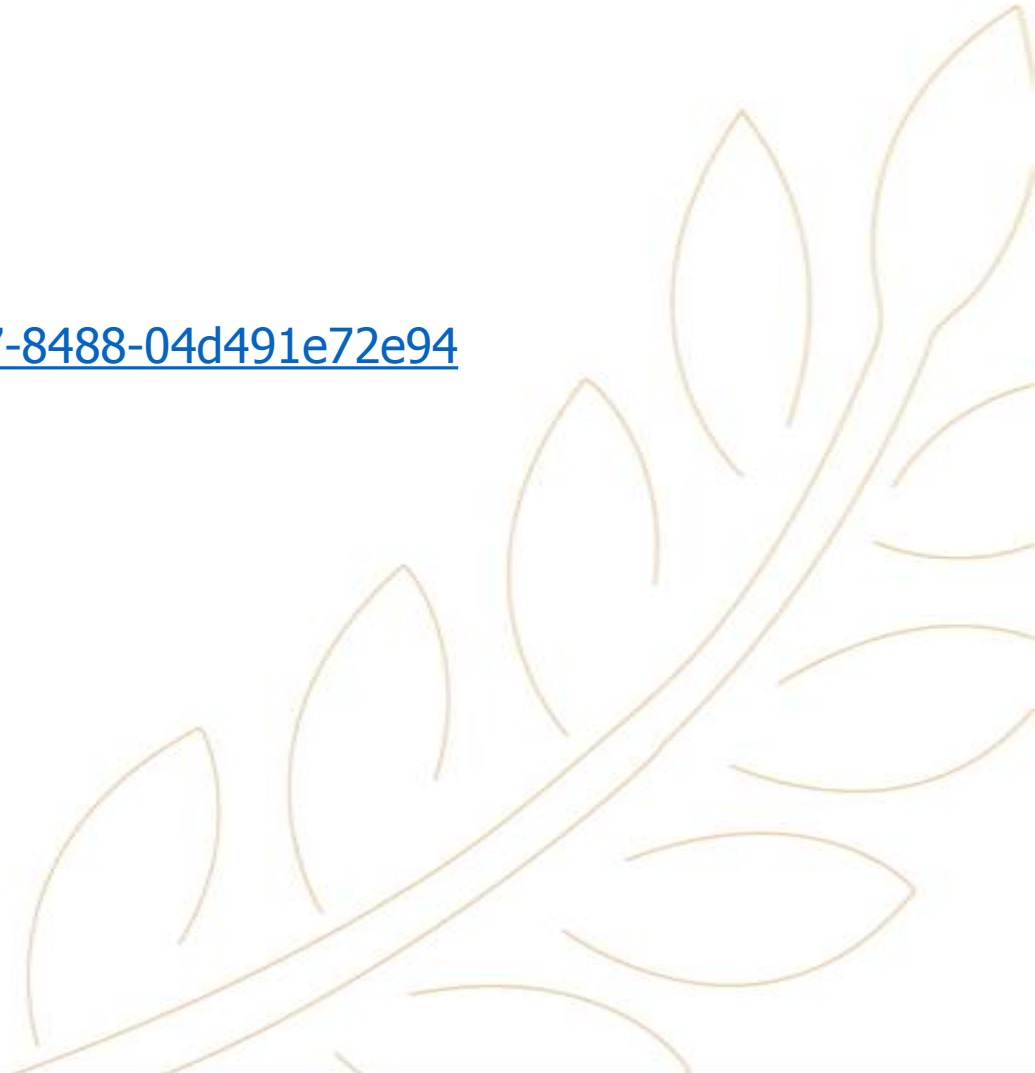
- 1- Boil about 0.1gm of *Ammi majus* fruit with 5 ml of water for a minute, strain, add 1 to 2 drops of this decoction to 1mL solution of sodium hydroxide (1 in 1) and shake, no rose red colour is developed.
- 2- The alcoholic extract of *A. majus* fruit (1 in 10), gives a blue fluorescence in ultraviolet light (due to furanocoumarin content)

OTHER IMPORTANT UMBELLIFEROUS FRUITS

Name	Active constituents	Uses
1-Coriander 	- <u>Volatile oil containing linalool</u>, α and β pinene, γ-terpenene, p-cymene, limonene, anethole, camphor, geraniol and geranyl acetate. - <u>Fats</u> (up to 26%); its main fatty acids are oleic and linolenic acids - <u>Flavonoid glycosides</u> (quercetin, isoquercetin and rutin) - <u>Proteins</u>	1-Spice & flavoring agent. 2- <u>spasmolytic, carminative</u> added to purgative preparations to prevent the gripping effect 3- <u>It has strong lipolytic activity</u> 4-The high percent of fats and protein makes distillation residues suitable for <u>animal feed</u>
2- Fennel 	- 1- <u>Essential oil</u> (4 - 6 %), containing - <u>fenchone</u>, estragol (methyl chavicol) - 2- <u>Fixed oil</u> (17-20%) - 3- <u>Flavonoids</u> (Kaempferol, quercetin) - 4- <u>Protein</u> (16-20%) & <u>minerals</u> (relatively high Ca and K)	1- <u>Carminative. It regulates the peristaltic function of GIT and relieves the associated pain and cramping. Used with purgatives to allay their gripping effect</u> 2- <u>Lactagogue</u> 3-<u>Clears the lungs</u> 4-<u>weight loss.</u>

Mind map:

<https://notebooklm.google.com/notebook/65bc9eeb-559e-4d67-8488-04d491e72e94>





Home work

- Suggest the types of the following fruits:
apple- peas- wheat-pear- senna- tomato- olive
- How can you differentiate between seeds & fruits morphologically
- How can you identify an umbelliferous fruit morphologically
- Mention the uses & contraindications of *Ammi visnaga* fruit
- Mention the uses & contraindications of *Ammi majus* fruit
- How can you test for *Ammi visnaga* & *Ammi majus*



Faculty of **Pharmacy**





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October Univeristy for Modern Sciences and Arts
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↙

Thank You!

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