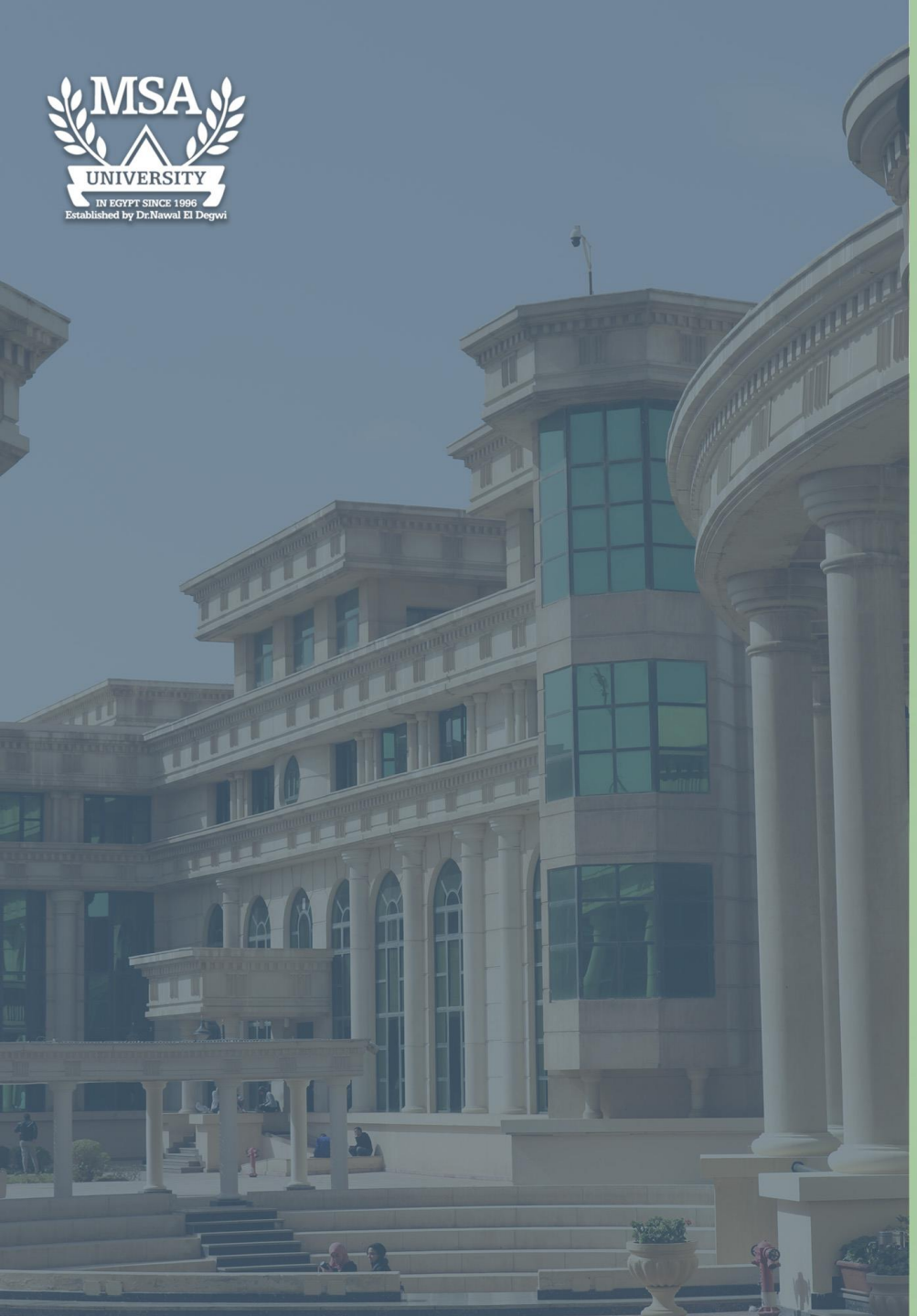

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جامعة أكتوبر للعلوم الحديثة والآداب



Pharmacognosy
PHG112





Course Instructors

Assoc. Prof. Dr. Soumaya Saad Zaghloul
Pharmacognosy
szaghloul@ msa.edu.eg

Dr. Passant Mohamed
Lecturer of Pharmacognosy
pabdelbaki@msa.edu.eg

Office: G42

References

Author	Date	Title	Publisher	ISBN
Michael Heinrich, Joanne Barnes, Simon Gibbons, Elizabeth M. Williamson.	2012	Fundamentals of Pharmacognosy and Phytotherapy	Elsevier Health Sciences	0702052310, 9780702052316
Biren Shah, Avinash Seth	2012	Textbook of Pharmacognosy and Phytochemistry	Elsevier Health Sciences	8131232603, 9788131232606
William Charles Evans	2009	Trease's Pharmacognosy, 16th edition	Elsevier Health Sciences	0702041890, 9780702041891



Lecture 5

Fruits Having Nutraceutical Applications

Interactive teaching methods and activities





Learning Outcomes

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

1. Remembering (Knowledge)

- **Define** nutraceutical fruits and their importance in pharmacognosy.
- **Identify** the botanical sources and families of important umbelliferous fruits
- **List** the major active constituents present in anise, star anise, coriander, and fennel.
- **Recall** the main pharmacological uses of these fruits in pharmaceutical and nutraceutical applications.

2. Understanding (Comprehension)

- **Describe** the macroscopic and powdered characteristics of anise fruit.
- **Explain** the role of volatile oils (e.g., anethole, linalool, fenchone) in the pharmacological activity of umbelliferous fruits.
- **Summarize** the medicinal uses of anise, star anise, coriander, and fennel in digestive and respiratory disorders.

Learning Outcomes

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

3. Applying (Application)

- **Use** diagnostic microscopic characters (vittae, endosperm fragments, hairs) to identify powdered anise fruit.
- **Apply** chemical tests to detect adulteration of anise with hemlock fruits.

4. Analyzing (Analysis)

- **Differentiate** between anise fruit and its common adulterant hemlock based on morphology, chemical constituents, and toxicity.
- **Compare** the chemical composition and therapeutic uses of anise, coriander, fennel, and star anise.

Learning Outcomes

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

5. Evaluating (Evaluation)

- **Evaluate** the medicinal importance of volatile oils present in umbelliferous fruits for pharmaceutical preparations.
- **Assess** the health risks associated with toxic adulterants such as hemlock.

6. Creating (Synthesis)

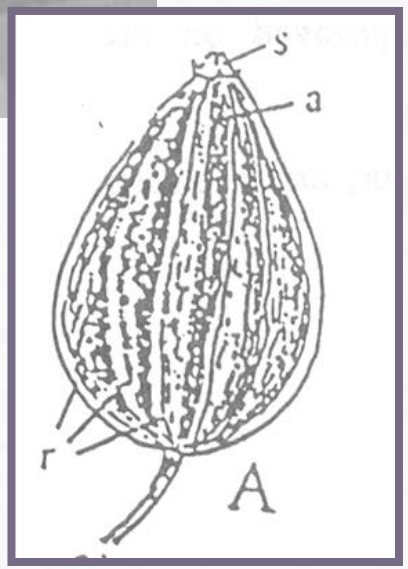
- **Construct** comparison tables summarizing the source, constituents, and uses of major umbelliferous fruits.
- **Develop** a systematic approach for the pharmacognostic identification of nutraceutical fruits.

Anise

Origin: The dried ripe fruit of *Pimpinella anisum* L. (Fam. Apiaceae).

It contains not more than 3 % of foreign organic matter, and yields not less than 1.5 % v/w of volatile oil





Powder:

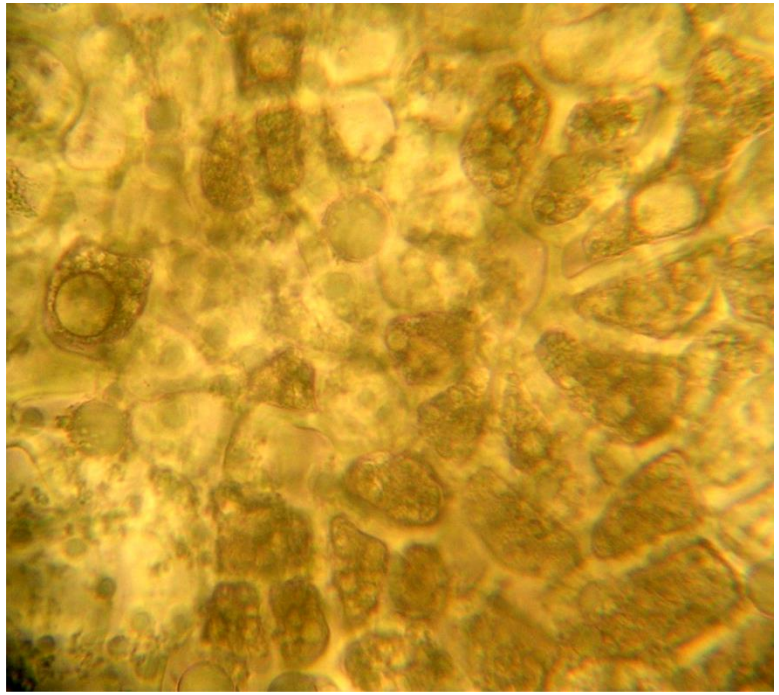
Color:Powdered Anise is greenish-brown or yellowish-brown,
Odour: having a strong aromatic agreeable
Taste : a sweet strongly aromatic.

1- Fragments of pericarp with yellowish-brown branching vittae, usually crossed by the cells of the parallel endocarp.



Powder:

2- Numerous fragments of endosperm.

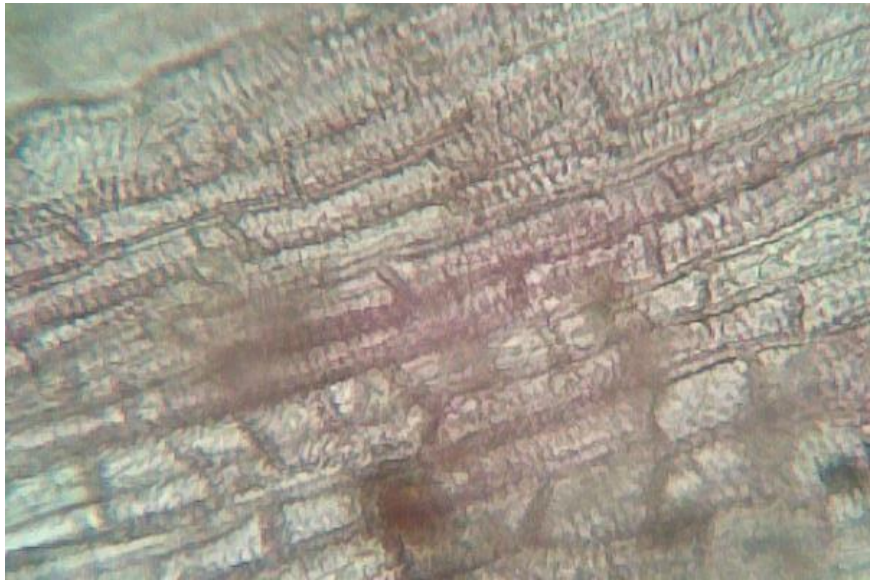


3- Numerous warty simple hairs

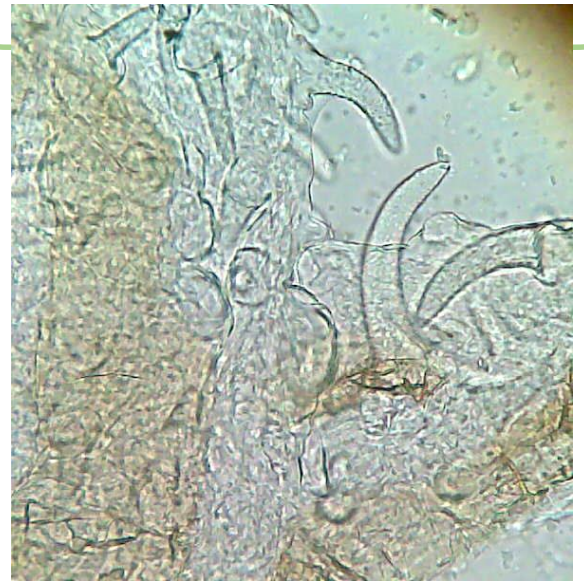


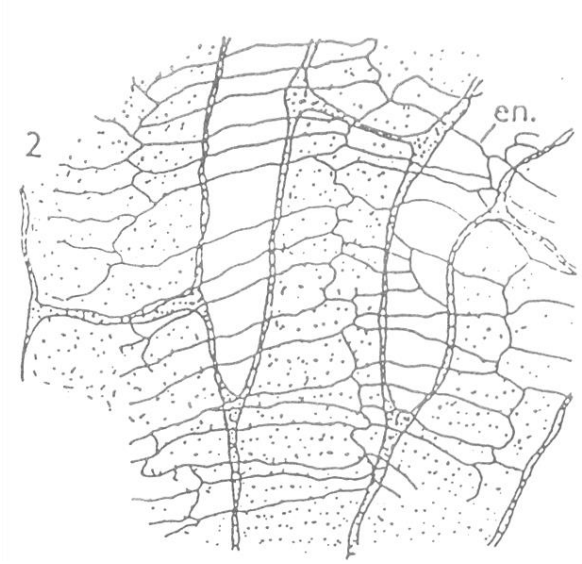
Powder:

4- Few fibers and very scanty pitted lignified parenchyma

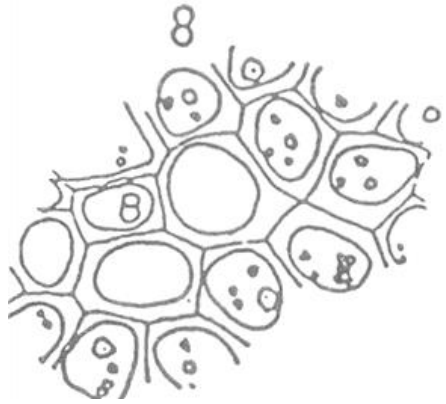


5- Epicarp cells with striated cuticle and non glandular hairs

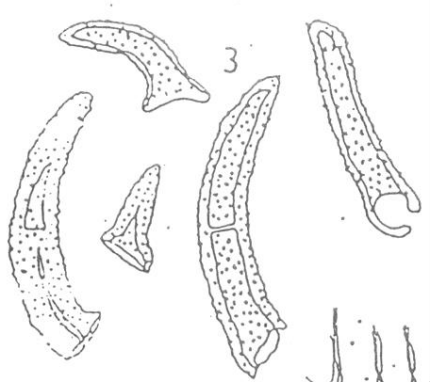




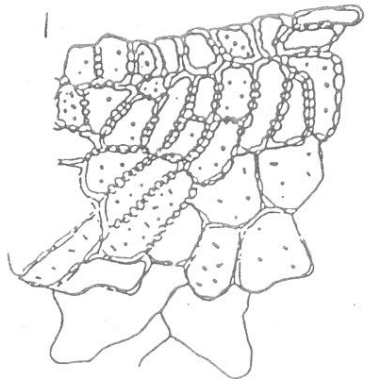
Branched vittae crossed by parallel endocarp



Endosperm



Non glandular hairs



Pitted lignified parenchyma



Epicarp

Active constituents:

1-Essential oil (1.5-5%) containing:

- **Trans- anethole (80-90%) ,responsible for the taste and smell.**
- **Methyl chavicol (1:2%), which also smells like anise but doesn't taste sweet.**
- **Anisaldehyde (1%).**
- **Sesquiterpene hydrocarbons (2%) and less than (1%) monoterpene hydrocarbons**
- **The dimers of anethole (dianethole) and anisaldehyde (Dianisidine)**

2- Fixed oil & proteins

3- Coumarins

Uses:

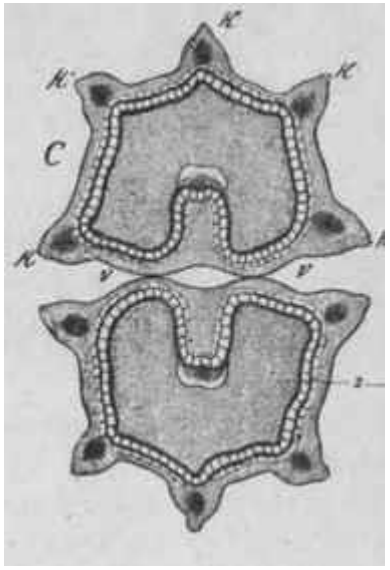
1- For respiratory tract infections, cough and bronchitis
2-Carminative & relieves colic in children.
3- Has a sedative action.
4- In folk medicine, lactagogue, emmenagogue
5- Oil is also employed in food & drink industry as flavoring agent

ANISE ADULTERATION









Anise may be adulterated by Hemlock fruits [*Conium maculatum* F. Apiaceae]

Comparison between Anise & Hemlock

Anise	Hemlock
❑ Larger in size	❑ Smaller in size
❑ Strong aromatic, agreeable odor	❑ Slight odor and taste
❑ Branched vittae, non glandular hairs	❑ Absence of vittae and hairs
❑ Essential oil, Fixed oil, protein & coumarins	❑ Coniine alkaloid which is highly toxic
❑ Test for volatile oil	❑ Test for coniine

Actions of Coniine

- Coniine is a poisonous alkaloid found in poison and contributes to hemlock's fetid (mice-like) smell.
- It is a neurotoxin which disrupts the peripheral nervous system.
- Death is caused by respiratory paralysis (Socrates was put to death by means of this poison in 399 BC.)
- A poisoned person will recover if artificial ventilation (breathing) is maintained until the toxin is removed from the receptor.

Detection:

1-by chemical test for alkaloids (Mayer's test)

2-Rubbing the fruits with solution of caustic alkali, it develops a strong mice-like odor

Star Anise

Origin: The ripe fruits of *Illicium verum* or (Chinese star anise) F. Magnoliaceae

Japanese star anise (*Illicium anisatum*), a similar tree, is highly toxic and inedible

The fruit is true, dry, aggregate of follicles





Active Constituents:

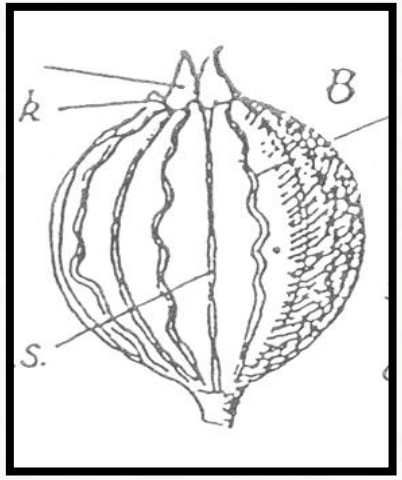
Volatile oil mainly anethole more than 4.5%., which is the same ingredient that gives the anise (*Pimpinella anisum*) its distinctive odor

Actions and uses:

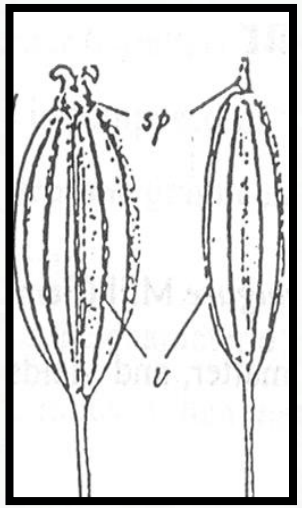
1- Expectorant & in treatment of hard dry cough, bronchitis & in whooping cough
2-For digestive tract problems including upset stomach, loss of appetite & relieving colic in babies
3-Antimicrobial &Antiviral activity
4- Oil is also employed in food & drink industry as flavoring agent

It is a good source of shikimic acid, which is used in the manufacture of oseltamivir (Tamiflu), a flu treatment

Coriander

Name	Active constituents	Uses
Coriander 	- Volatile oil containing linalool ,α and β pinene, γ-terpenene, p-cymene, limonene, anethole, camphor, geraniol and geranyl acetate. - Fixed oil (up to 26%); its main fatty acids are oleic and linolenic acids - Flavonoid glycosides (quercetin, isoquercetin and rutin) - Proteins	1-Spice & flavoring agent. 2- spasmolytic, carminative added to purgative preparations to prevent the gripping effect 3- It has strong lipolytic activity 4-The high percent of fats and protein makes distillation residues suitable for animal feed

Fennel

Name	Active constituents	Uses
Fennel 	1- Volatile oil (4 - 6 %), containing fenchone, estragol (methyl chavicol) 2- Fixed oil (17-20%) 3- Flavonoids (Kaempferol, quercetin) 4- Protein (16-20%) & minerals (relatively high Ca and K)	1- Carminative. It regulates the peristaltic function of GIT and relieves the associated pain and cramping. Used with purgatives to allay their gripping effect 2- Lactagogue 3-Clears the lungs 4-weight loss.

Capsicum Fruit

Thamarul Shatta



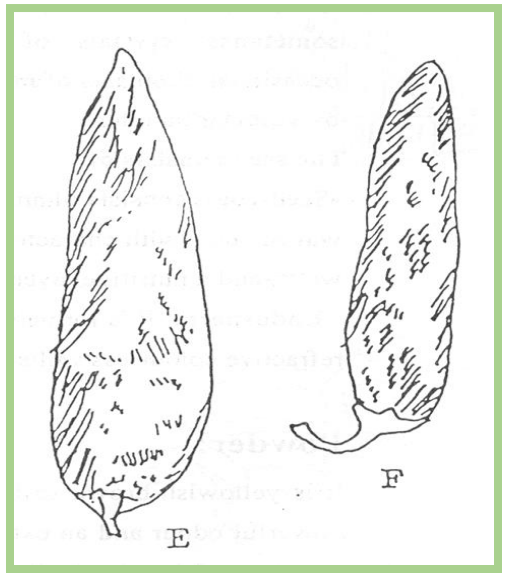
Chillies, Cayenne pepper

Capsicum is the dried ripe fruits of

Capsicum minimum **F. Solanaceae.**

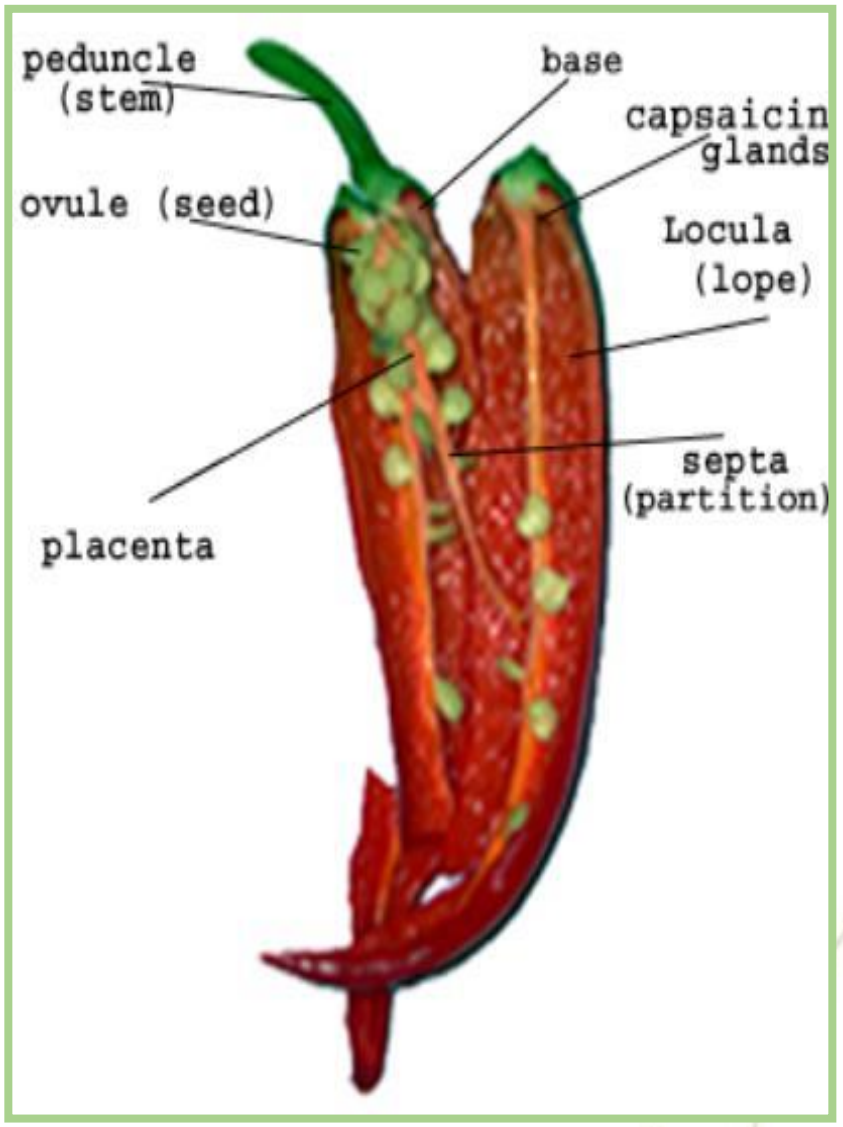
The fruit is true, succulent, berry.

It should contains not more than 3% of calyces and pedicels, and not more than 1% of foreign organic matter.





Capsicum Fruit



L. Cut of Capsicum fruit

ACTIVE CONSTITUENTS

1- Pungent principles named Capsaicinoids (up to 1.5%), including capsaicin (0.1 - 1 %), 6,7 - dihydrocapsaicin, nordihydrocapsaicin, homodihydrocapsaicin , and homocapsaicin

The capsaicin content of fruits varies in a range up to 1.55 and is much influenced by environmental conditions and age of the fruit. It occurs principally in the dissepiment

The pungency of capsicum is not destroyed by treatment with alkalis (distinction from gingerol, the phenolic pungent principle of Ginger) but destroyed by oxidation with potassium dichromate or permenganate

ACTIVE CONSTITUENTS

2- Fixed oils.

3- Carotenoid pigments (including capsanthin, capsorubin, alpha- and beta-carotene).

4- Steroid glycosides (capsicosides A, B, C, and D).

5- Fats (9 -17%), proteins (12 -15%), vitamins A and C, and trace of volatile oil.

USES AND ACTIONS

1- Condiment (pungent spice)



2- <u>Internally</u>, In dyspepsia and flatulence.



USES AND ACTIONS (cont.)

3- <u>Externally,</u> It is used in different formulations (e.g. ointments and plasters) as a <u>pain controller</u> for the relief of rheumatism, lumbago, and after *Herpes Zoster* infections and counter irritant







Topical application of capsaicin <u>relieves pain and itching by acting on sensory nerves for a range of conditions, including nerve pain in</u> diabetes (<u>diabetic neuropathy</u>), post-surgical pain, <u>muscle and nerve pain</u>, osteoarthritis pain and <u>rheumatoid arthritis.</u>

USES AND ACTIONS

Side effects

- Allergic reaction to the cream, so the first application should be to a very small area of skin.

-Oral intake can cause burning in the mouth and throat, and can cause the nose to run and eyes to water.

People with ulcers, heartburn, or gastritis should use any cayenne-containing product cautiously as it may worsen their condition.

CHEMICAL TESTS

1- Capsaicin gives a bluish-green colour on addition of few drops of $FeCl_3$





2-Capsaicin dissolved in H_2SO_4 and small piece of sucrose sugar is added, a violet colour is developed after few hours.

Wheat grain

Origin : the dried caryopsis (grain) of *Triticum vulgare* F.Graminae

The fruit is **true , simple, dry indehiscent, grain** (caryopsis)

- **Active constituents**: **starch, protein, vitamins A, B,B2,E, enzymes, wheat germ oil**
- **Uses** :

Starch production

wheat germ oil

wheat bran production





Wheat germ oil

- Is extracted from the germ (embryo) of the wheat kernel
- Very long chain fatty alcohols have been reported to lower plasma cholesterol in humans.
- Wheat germ oil is also very high in **vitamin E** (255 mg/100g),
- Wheat germ oil contains the following **fatty acid :Linoleic acid** (omega-6),Palmitic acid, **Oleic acid, Linolenic acid** (omega-3)
- **Uses include treatment of certain skin conditions**

↘



Home work

- Suggest the types of the following fruits:

  Star anise- wheat- capsicum - hemlock
- How can you differentiate between anise & hemlock
- Mention the uses & contraindications of *capsicum* fruit
- Mention the uses of *coriander &fennel* fruits



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