

# Botany & Medicinal plants

Practical course  
For 1<sup>st</sup> Year, 1<sup>st</sup> Term

Assistant lecturer:  
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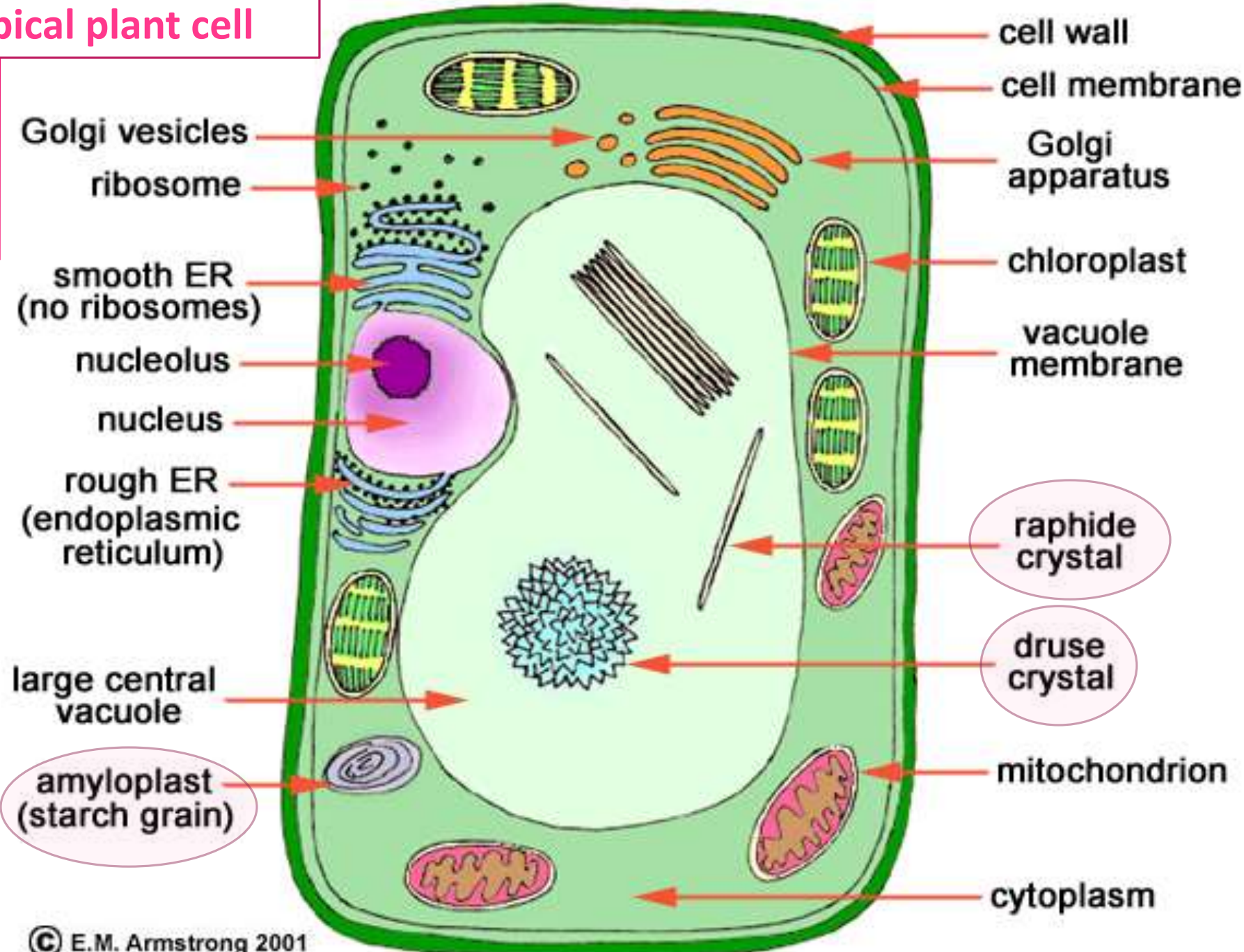
**SEC-1**

**Ergastic  
substances**

# Objectives:

- **To identify the ergastic component of plant cells.**
- **To recognize them under microscope.**

# Typical plant cell



# Component of the cell



**Living protoplasmic components:**

e.g. nucleus,  
mitochondria,...

**Non living component**

e.g. ergastic-  
substances

# Ergastic substances (cell inclusions)

- ❖ They are non-living organic or inorganic substances.
- ❖ May be present in soluble or insoluble state.
- ❖ They are raw materials, or arise as product of metabolism.
- ❖ They are present in:
  - Vacuoles
  - Cell wall
  - Associated with protoplasmic components
- ❖ They can be detected & identified by:
  - Microscopical examination
  - Physical and chemical test.

# Ergastic substances

(Ergastic bodies = cell inclusions)

## Reserve food

Starch

lipids

Protein

## Waste products (minerals)

Ca.OX  
crystals

CaCO<sub>3</sub>  
Crystals

## Other secretory products

Volatile  
oil cells

Resin


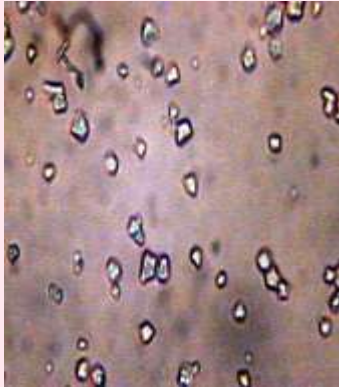


# I) Reserve food (storage)

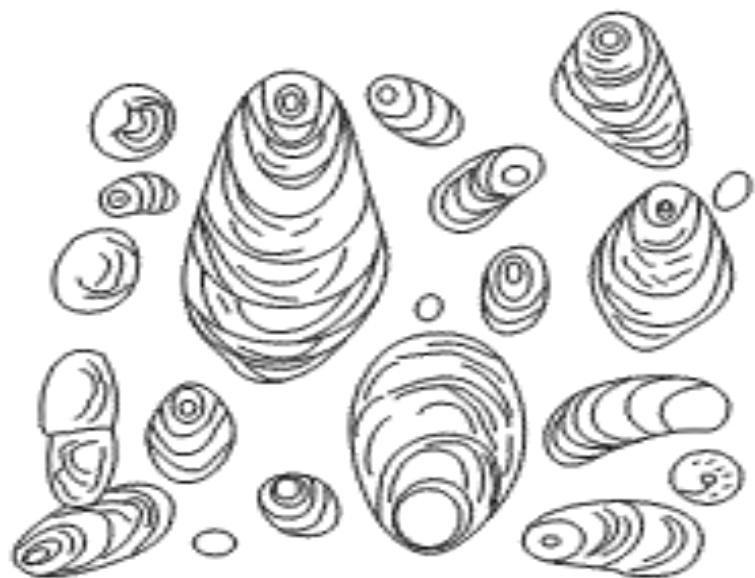
## 1- Carbohydrate form (Starch):

- \* Starch is simply a glucose polymer.
- \* It's present in different parts of the plant in the form of granules (either simple or compound) of varying sizes.
- \* Starch is found abundantly in:
  - \* Fruit, Seed, Root, Rhizome.
- \* Starches of pharmaceutical interest are obtained from:
  - \* Wheat
  - \* Potato
  - \* Maize
  - \* Rice



# 1- Carbohydrate form (Starch):

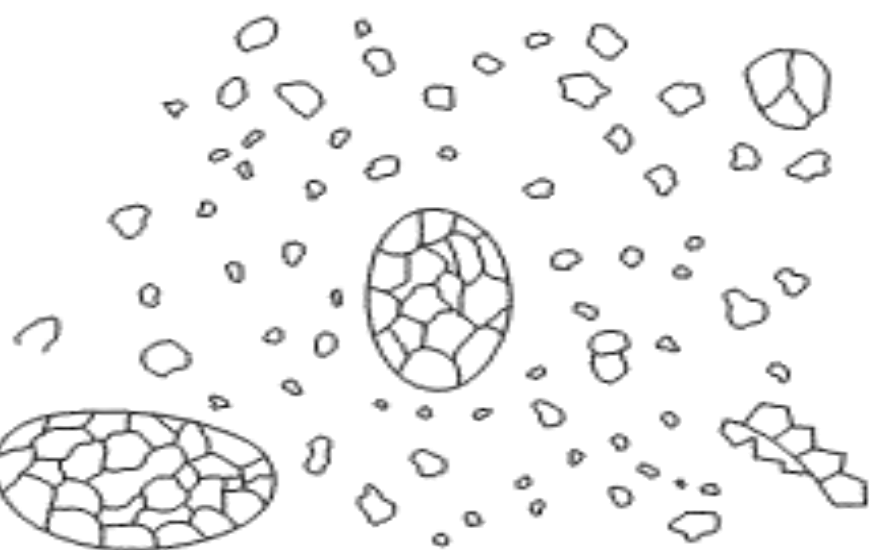
	<b>Maize starch</b> <u>(نشأ الذرة)</u>	<b>Rice starch</b> <u>(نشأ الأرز)</u>	<b>Wheat starch</b> <u>(نشأ القمح)</u>	<b>Potato starch</b> <u>(نشأ البطاطس)</u>
				
<b>Shape</b>	Polyhedral with blunt edges .	Polyhedral with sharp angles .	Spherical , rounded .	oval , sub-globular .
<b>Hilum</b> central protein area	Centric , cleft .	Invisible	Present , slit like	Pointed , eccentric .
<b>Striation</b>	Absent	Absent	Faint	Present



Patato starch



Wheat starch



Rice starch



Mai e starch

# 2-Lipid & fat form:

Lipids are esters of fatty acids with glycerol.

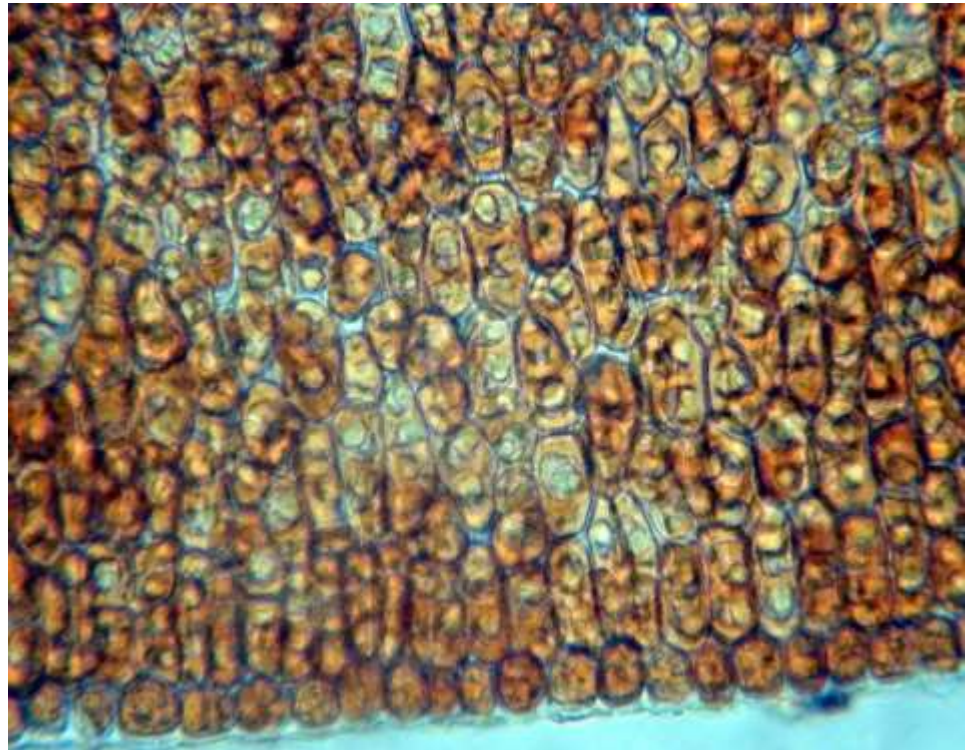
Fat droplets or globules occur abundantly inside the seeds

Solid fat:

- Wax
- Suberin
- cutin

Liquid fat:

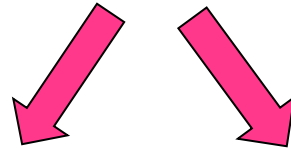
- Lipid
- oils



# 3-Proteins form:

It is found in the form of solid granules known as aleurone grain which is of common occurrence in seeds.

The typical aleurone grain present in the form of



## Amorphous

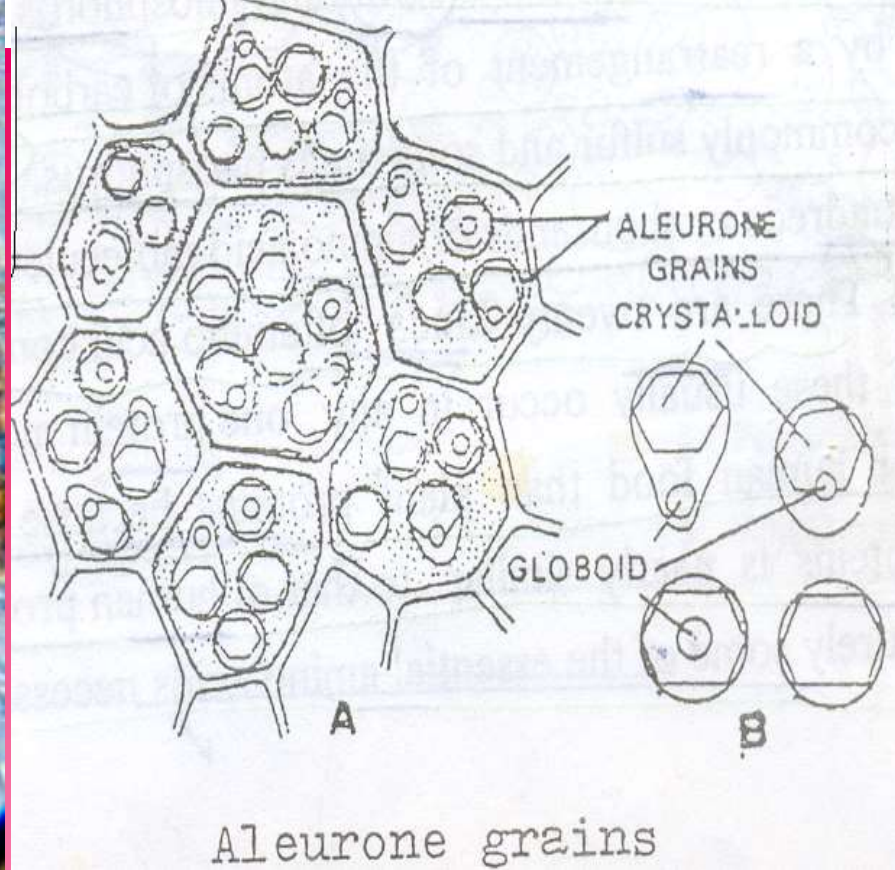
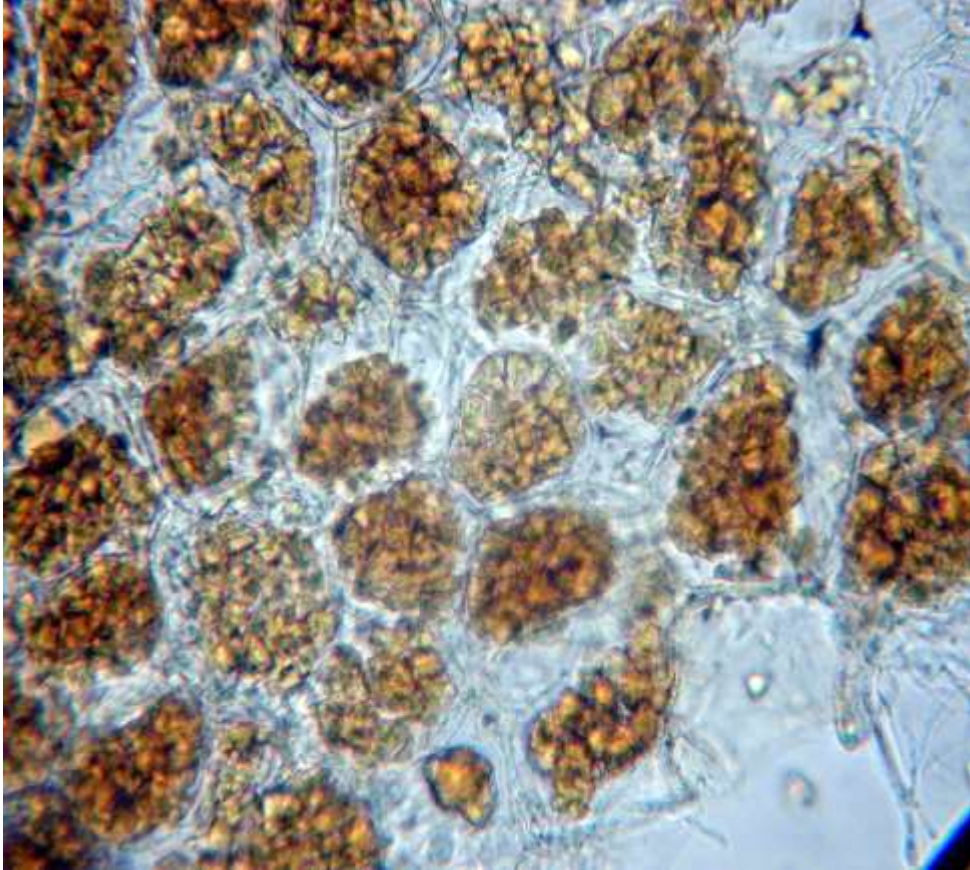
(globoid : mineral in nature)

Contain the narrower portion of molecule

## Crystalline

(crystalloide: protein in nature)

Contain the major portion of the molecule



# Aleurone grains

**It stains**

**Red with Millon's reagent**

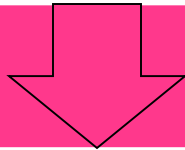
**Yellowish brown with Iodine**

**Yellow with picric acid**

## II) Waste products (minerals)

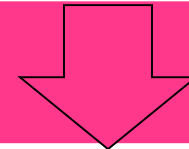
# Inorganic deposits in plants

## Calcium crystals



It dissolve In dil. Acid.

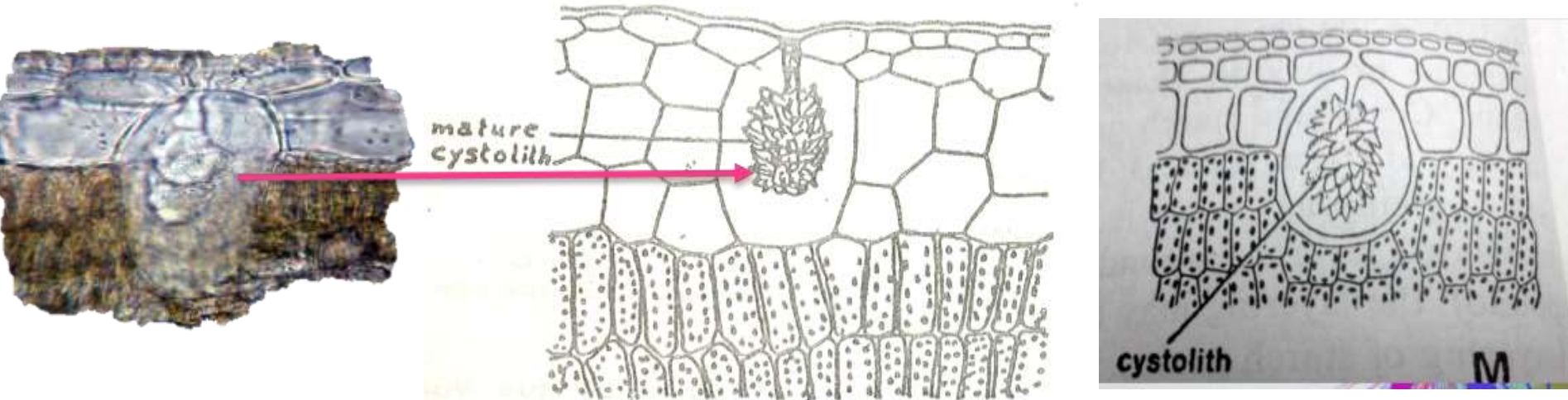
It gives effervescence.



It is dissolves in conc. Acid.

Without effervescence.

# 1-CaCO<sub>3</sub>



## Calcium carbonate (Cystolith):

- Internal outgrowth of cell wall occur in many plants as in Ficus
- Sacs-appear like bunch of Grapes

# 2-Ca-OX

## Ca. Oxalate

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graph TD; A[Ca. Oxalate] --- B[a-Prisms]; A --- C[b- Raphides & Styloids]; A --- D[c- Cluster];
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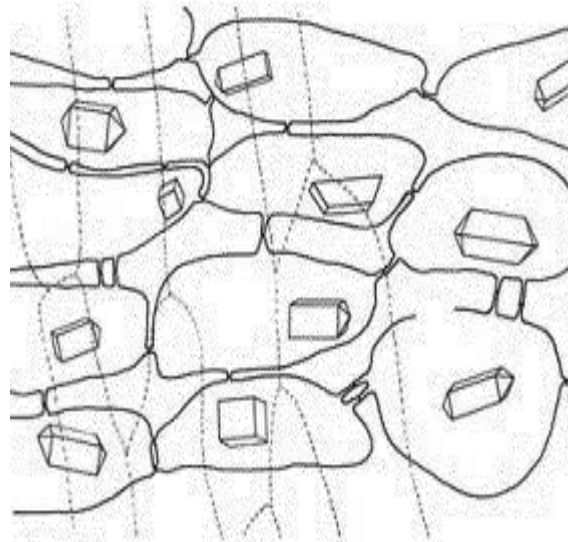
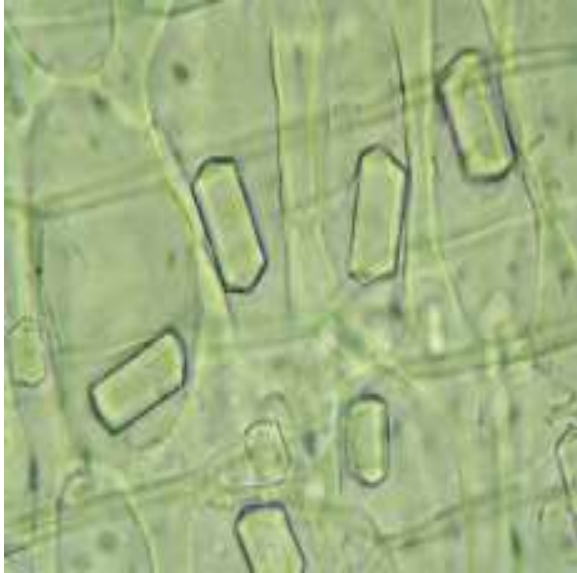
**a-Prisms**

**b- Raphides  
& Styloids**

**c- Cluster**



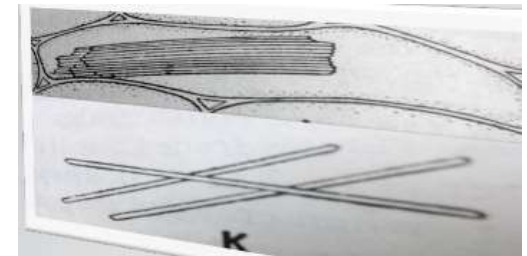
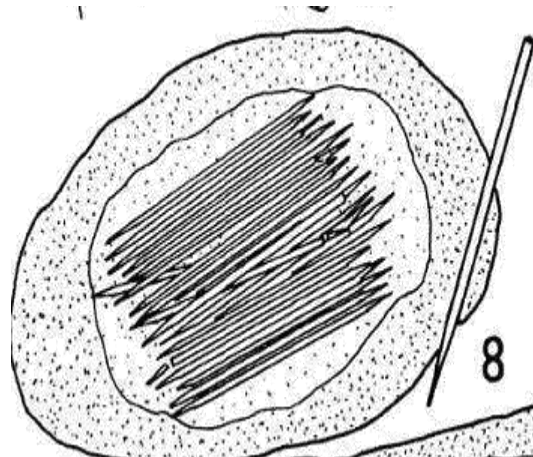
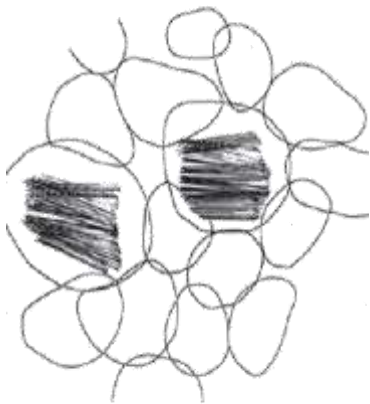
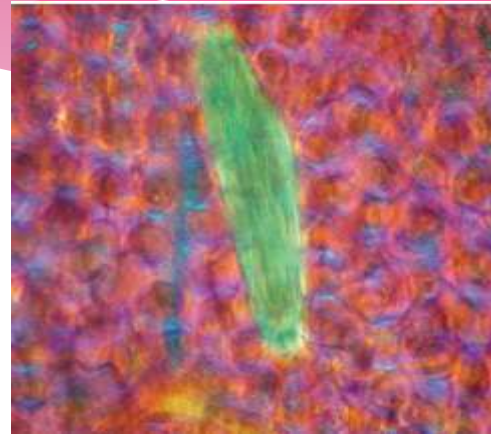
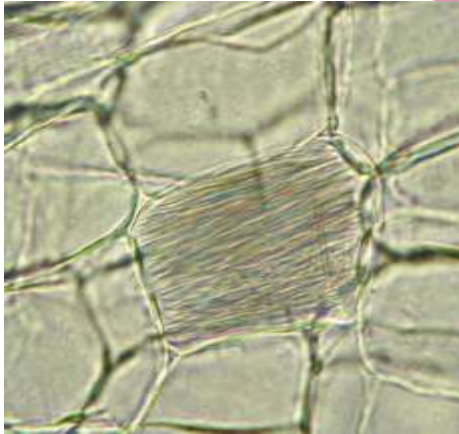
# a- Calcium oxalates prisms



**Ca.Ox Clusters in Senna leaves**

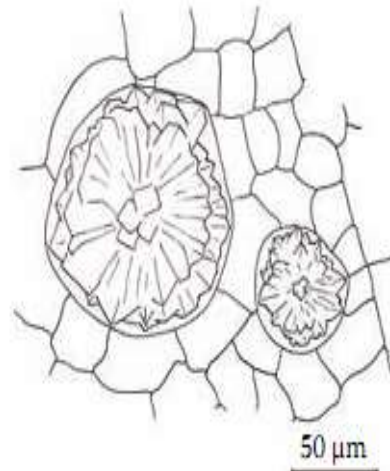
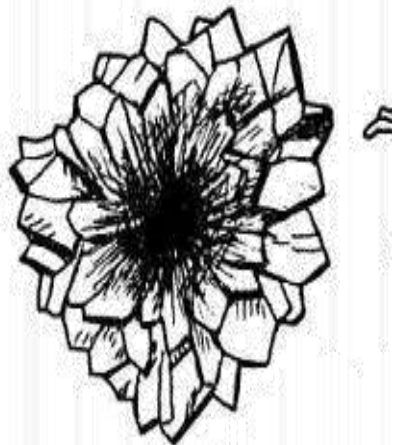
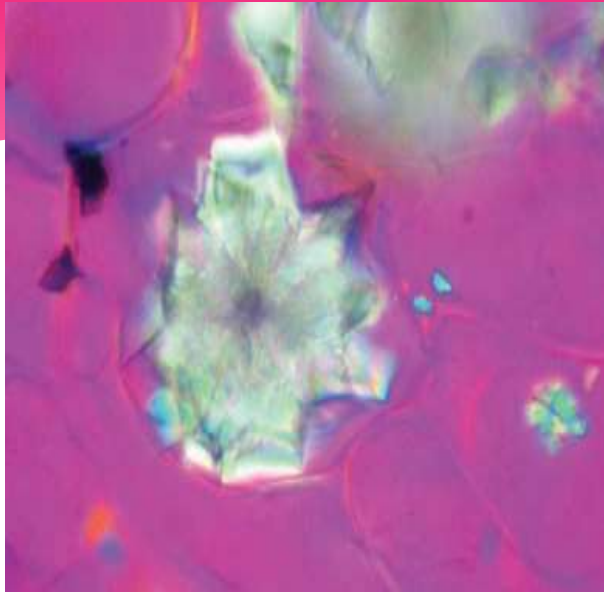
# b- Calcium oxalate raphides

Ca-OX as single elongated needle crystal = (Styloids).  
Or group of elongated needle crystals = (raphides)



Ca-OX raphides in Squill leaves

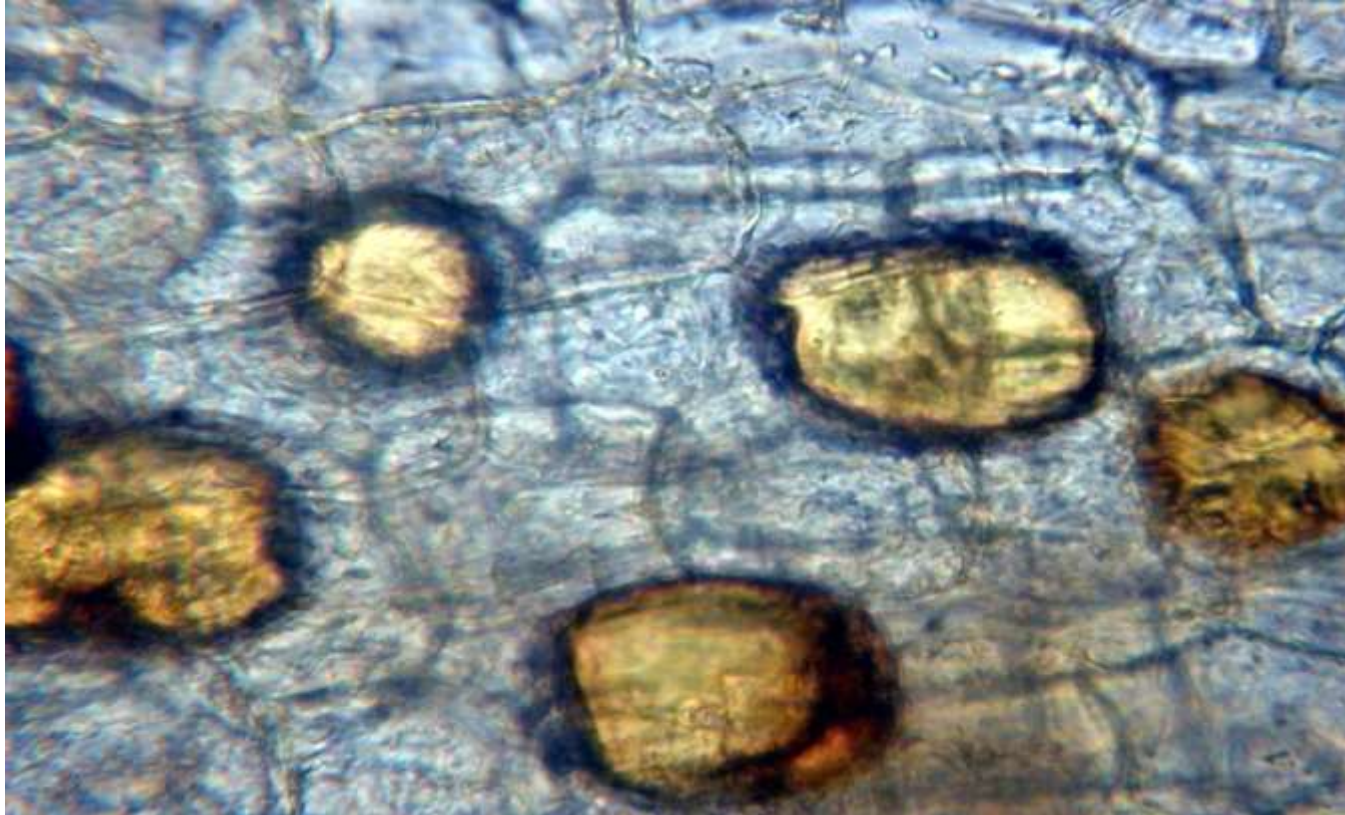
# c- Calcium oxalate Cluster



Ca.Ox Clusters in Rhubarb roots and rhizomes

# III) Other secretory products

## (Volatile oil cells)



Chemical test: **Red** color with sudan III

A decorative banner at the top of the slide, consisting of a solid pink rectangular area above a wavy, layered pink shape that tapers towards the bottom.

That's all for today ....

**Thanks**