Faculty of Science

Department of Medical Technology

((General plant sciences))

1st stage

Lab (3)

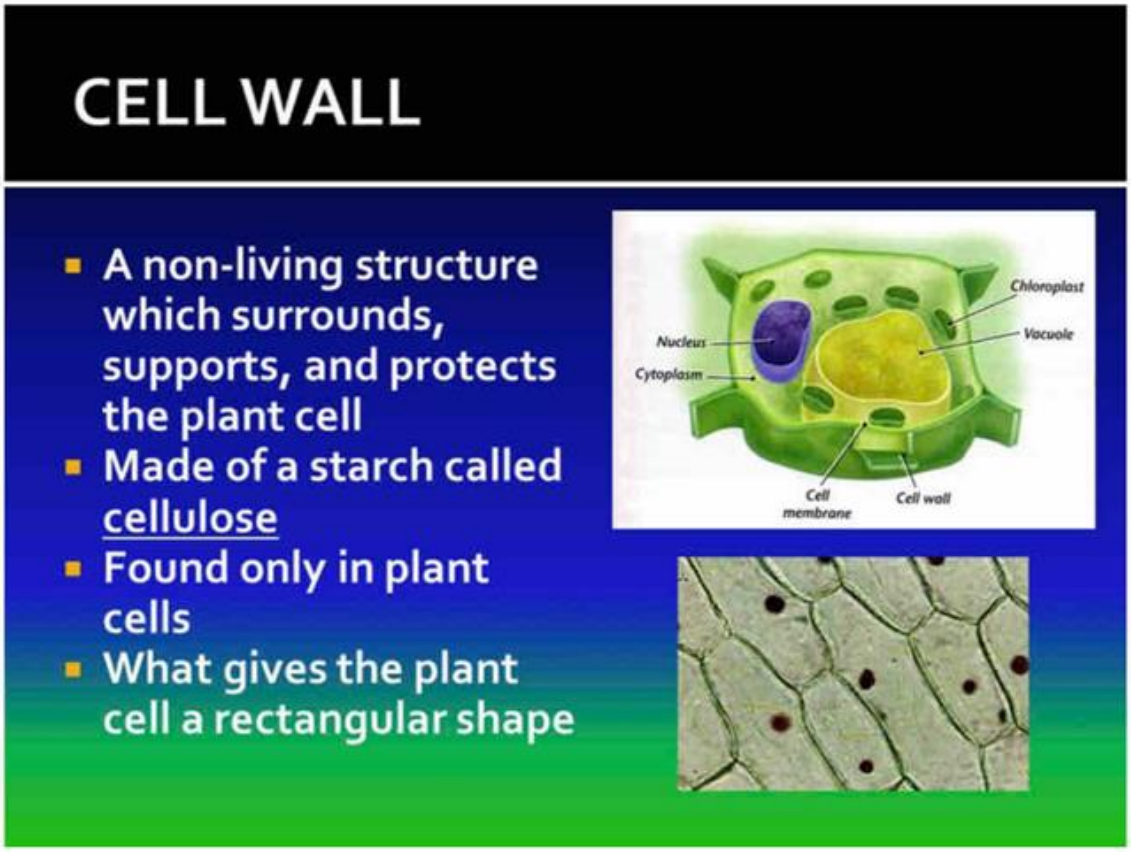
NON-LIVING CELLULAR COMPONENTS

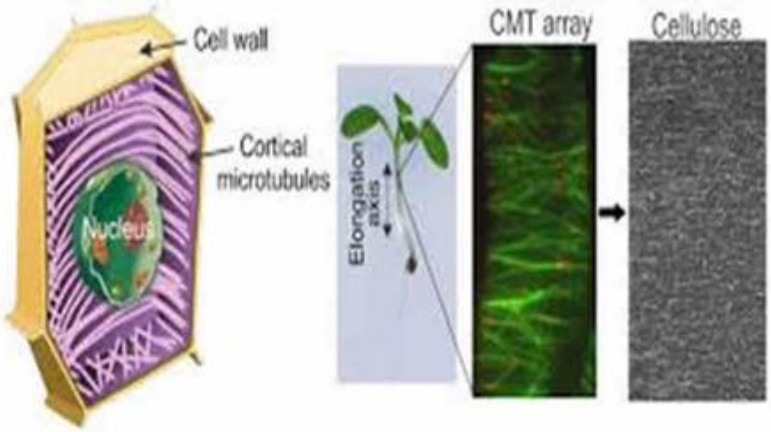
By

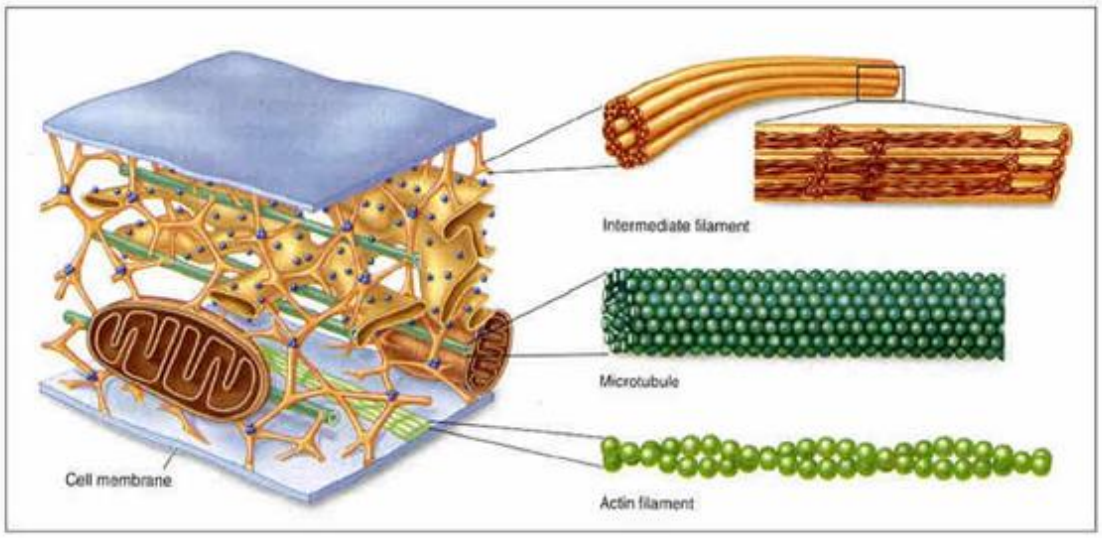
Mm. Ali Al-Awadi

Lab 3: Non-living cellular components (cytoplasmic inclusions)

1- Cell wall



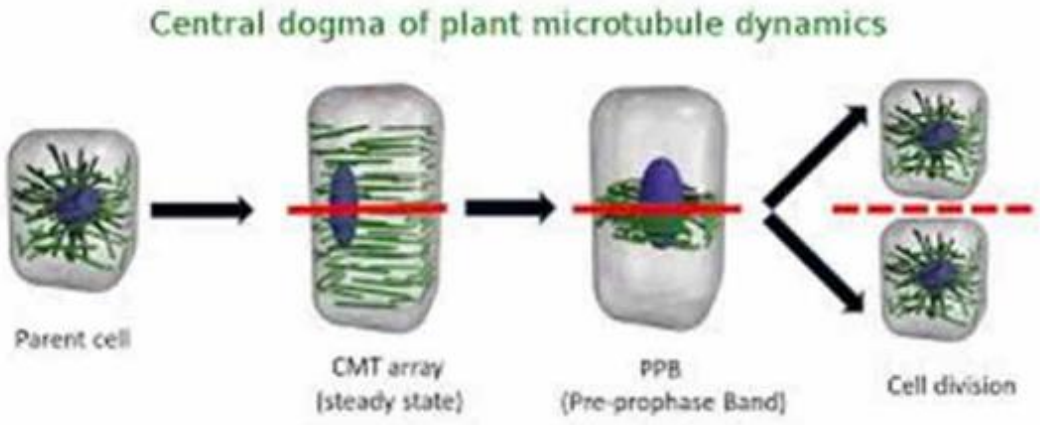




2- The non-living cell inclusions include **ergastic substances** and **cytoskeleton elements:**

1. **Ergastic substances**: These are non-living cell inclusions of cytoplasm like reserve food materials (**starch**, protein, and oils), secretory products (nectar, **pigments**, and enzymes), excretory products (alkaloids, resins, latex, and tannins) and **mineral crystals** (prismatic, cystoliths, raphides, druses).

2. **Cytoskeleton**: It is a complex network of interconnected **microfilaments** and **microtubules** of protein fibres present in cytoplasm. The microfilaments are composed of **actin** and microtubules are composed of **tubulins**. It helps **in mechanical support**, **cell motility**, **cell division** and **maintenance of the shape of the cell**.



A. Starch grain

Starch grains are small granules found in the leaves, roots, stems, fruits and seeds of plants. These grains serve as energy reserves for plants. People may consume starch grains for energy, as starch grains are carbohydrates. Common foods containing starch grains or starch grain compounds include wheat, barley, rice, oats, millet, corn, lentils, green peas, corn, **potatoes** and chick peas. **(Figure 3.1)**.

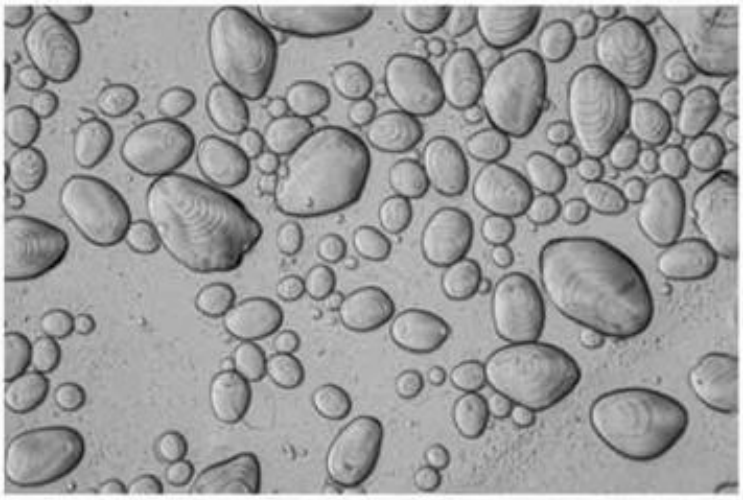
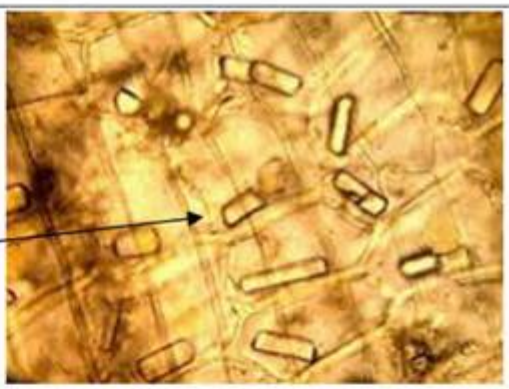
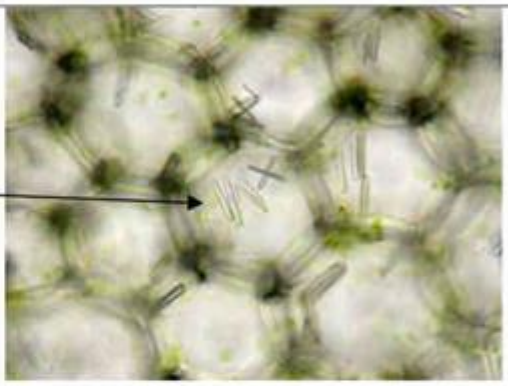
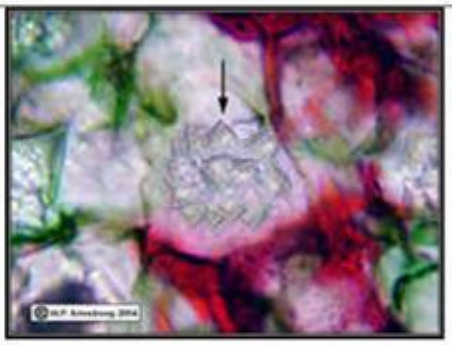
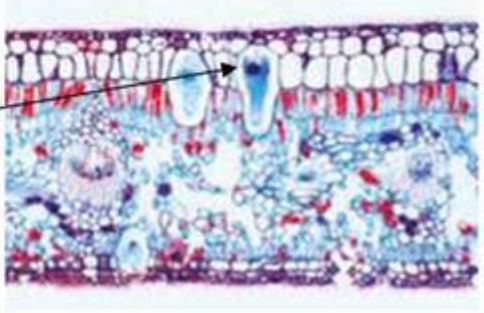


Figure 3.1: Starch grain in potato tissue.

B. Crystals

Calcium oxalate is a common biomineral in plants, occurring as crystals of various shapes. It can be found in any tissue or organ in plants and is often formed in the vacuoles of specialized cells called crystal idioblasts. Recent work indicates that calcium oxalate formation is generally a mechanism for **regulating bulk-free calcium levels in tissues and organs**. However, various other functions might have evolved secondarily. A function in physical protection **against grazing animals** is implicated by the size, shape and placement of crystals in some tissues and organs.

Different types of crystals can be found in plant cells, for exmaples:

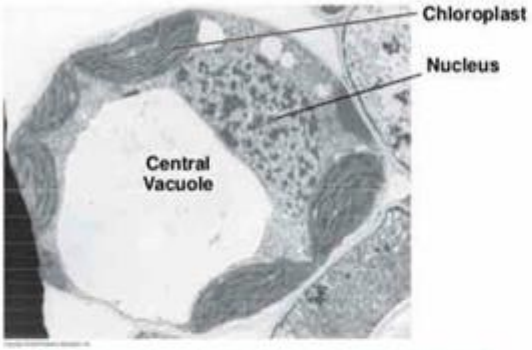
Crystals	Define	Shape
Prismatic	rod-like or cubic crystals in onion scales	
Raphides	needle-like crystal found in *Mirabilis stem C.S*	
- Druses	like a glistening diamond in *Tilia* stem C.S.	
Cystolith	consist of stalk and body in *Ficus* leaf C.S.	

C. Vacuole

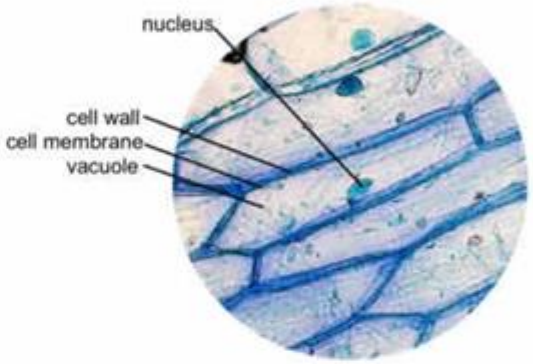
Is a membrane-enclosed fluid filled sac found in the cells of plants including fungi. Vacuoles can be large organelles occupying between 30 - 90% of a cell by volume.

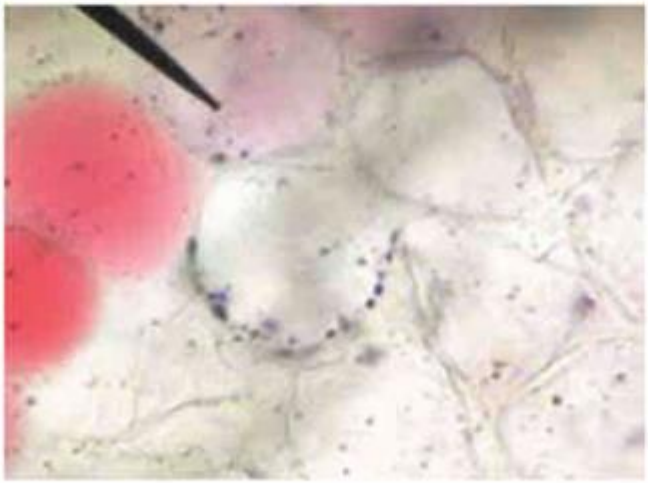
Vacuoles appear to have three main functions, they:

1. Contribute to the rigidity of the plant using water to develop hydrostatic pressure.
2. Store nutrient and non-nutrient chemicals.
3. Break-down complex molecules including material may be harmful for the cell.
4. Play a major role in autophagy, endocytosis and exocytosis.



Central vacuole in a plant cell





Carefully focus to distinguish the colourless vacuoles near the margion.

If you search far from the toothed margin, you can see red colour vacuoles because they contain **anthocyanin** in their cell sap.