Etege Menen Girls' Boarding School

Biology Department

Grade 10



Prepared by: Genene Teshome (2012)

Lesson Contents

4.3 Transports

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4. 3 Transports

The main transport ways in plans is

- Osmosis
- Diffusion
- Active transport

Osmosis makes plants rigid and firm by the movement of water into the cell

- Plants take up water through **root hair**
- **Root hair** increase surface area for osmosis to take place

- **Active transport** use plants to absorb mineral ion against concentration gradient

Transport System in plants

- Plants have two separate double transport system these are **phloem** and **xylem**

Phloem

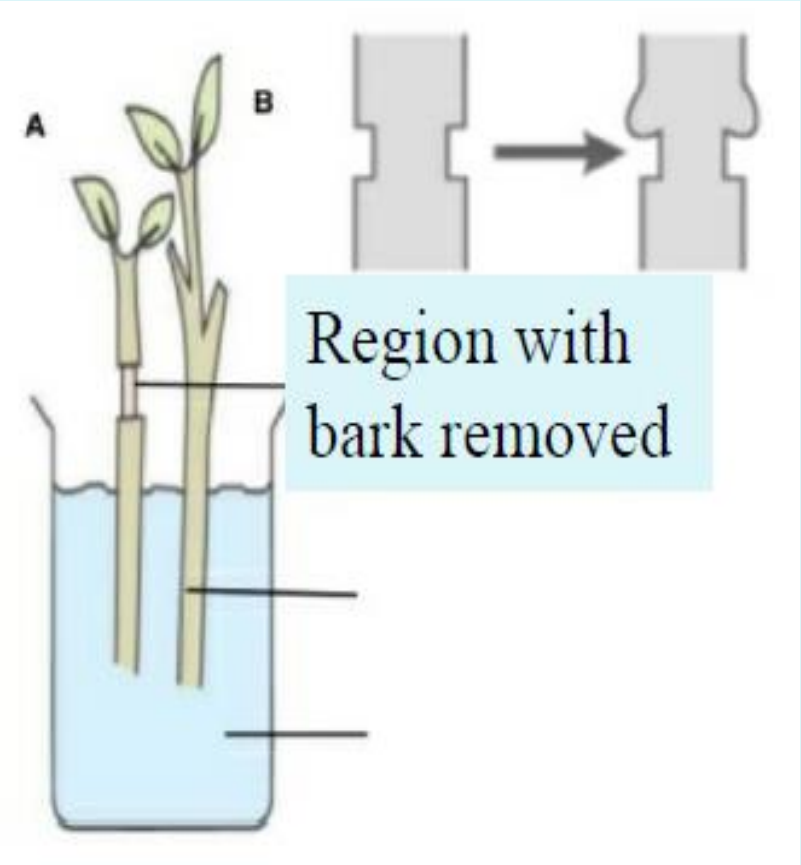
- Made up of **living tissue**
- **Transport organic** martial made by photosynthesis
- Use energy to move substance (active transport)
- Food substance move **both up and down** of the plant
- Phloem **cell are thin walled** and contain liquid reach food
- Phloem found in woody plant in the ring next to bark

Xylem

- Made up of **dead cell**
- **Transport water** and mineral ion
- No active transport take place
- Passive transport **no need of energy** from the plant
- Movement of water in xylem is due to **transpiration pull**
- Water and mineral **transport upward** of the plant

Ringing experiment

- To find out **whether, xylem** or **phloem** tissue are involved in transport of food material
- **Removing a ring from a woody** branch will result in the **removal of the Phloem tissue**
- **The swelling** above the ring where the phloem is removed will be **caused by an accumulation of sugars** in the region above the ring



The need of transport

1. To transport sugar made in leaves around the plant

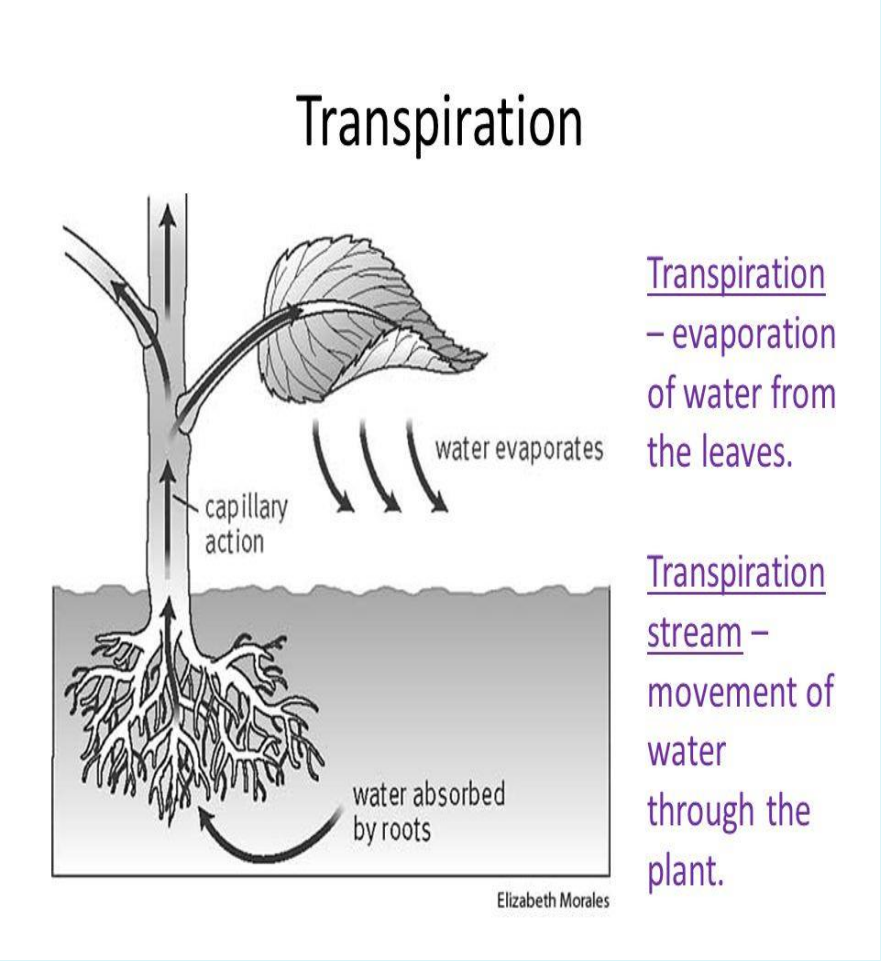
- Plant store glucose in the form of starch which is osmotically inert
- Plant **deposited starch** in root **tubers , stem, fruit** and **leaves**

2. To transport waters and mineral from root to leaves

- Mineral is needed to make protein and other molecule
- **Plant need water is for two reason**
  1) Maintain turgor pressure
  2) Raw material for photosynthesis

Moving water through xylem tissue

- **Transpiration stream;** a constant moving of water through xylem from root to leaves
- **Transpiration** evaporation of water from leaves through the stomata
- **Water enter** the root hair of the plant by **osmosis to xylem** tissue



The factor which move water up wards through xylem tissue

- **Root pressure** the pressure pushing water upwards
- **Adhesive force** the force of attraction between water molecule and xylem tube
- **Cohesive force** the strong attraction force between water molecules through xylem tube
- **Constant evaporation** of water from leaves the main pull which move water up from root
- **Capillarity of water:** refers to the rise water in a tube

Factor affect in the rate of transpiration

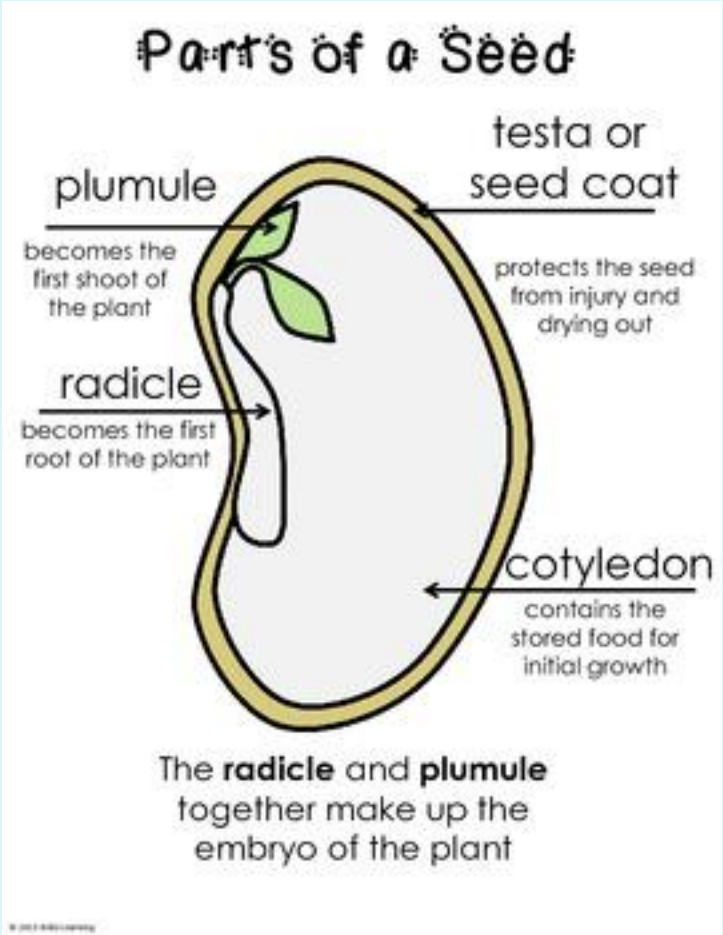
- The main factors which affect the rate of transpiration are
  - **Humidity** rate of transpiration **decrease in humid air**
  - **Light intensity** rate of transpiration very high during day time
  - **Temperature** transpiration **faster on warm sunny day** than **cold and dully day**
  - **Wind (air movement)** transpiration faster in **windy day** than **still day**
- **To sum up** transpiration is more rapid in **hot**, **dry** and **windy** than **humid, cold and dully day**

4.4 Response in plants

4.4.1 Germination of seed

❖ **The basic structure of seed**

1) **Endosperm** food storage tissue
2) **An embryo**
   - ➢ **Plumule** embryonic shoot
   - ➢ **Radicle** embryonic root
   - ➢ **Cotyledon** embryonic leaves
     - ✓ **Monocot** have one cotyledon
     - ✓ **Decoct** have two cotyledon
3) **Testa (seed coat)** protects the seed.
   - ❖ **Micropyle** A thin hole on the seed



Factor need for germination

- **Water** aid in **hydrolysis of stored** food into soluble materials
- **Temperature** (warmth) for optimum **enzyme activity**.
- **Oxygen(Air)** for **aerobic respiration** that produces energy for germination.

- **Enzymes in seed**
  - **Diastase** converts **starch** to **simple sugar**
  - **Lipase** hydrolysis **fat** into **fatty acid** and **glycerol**
  - **Proteolytic** hydrolysis **protein** into amino acid
- **Stage of development**
  - **Zygote → embryo → Seed lings**

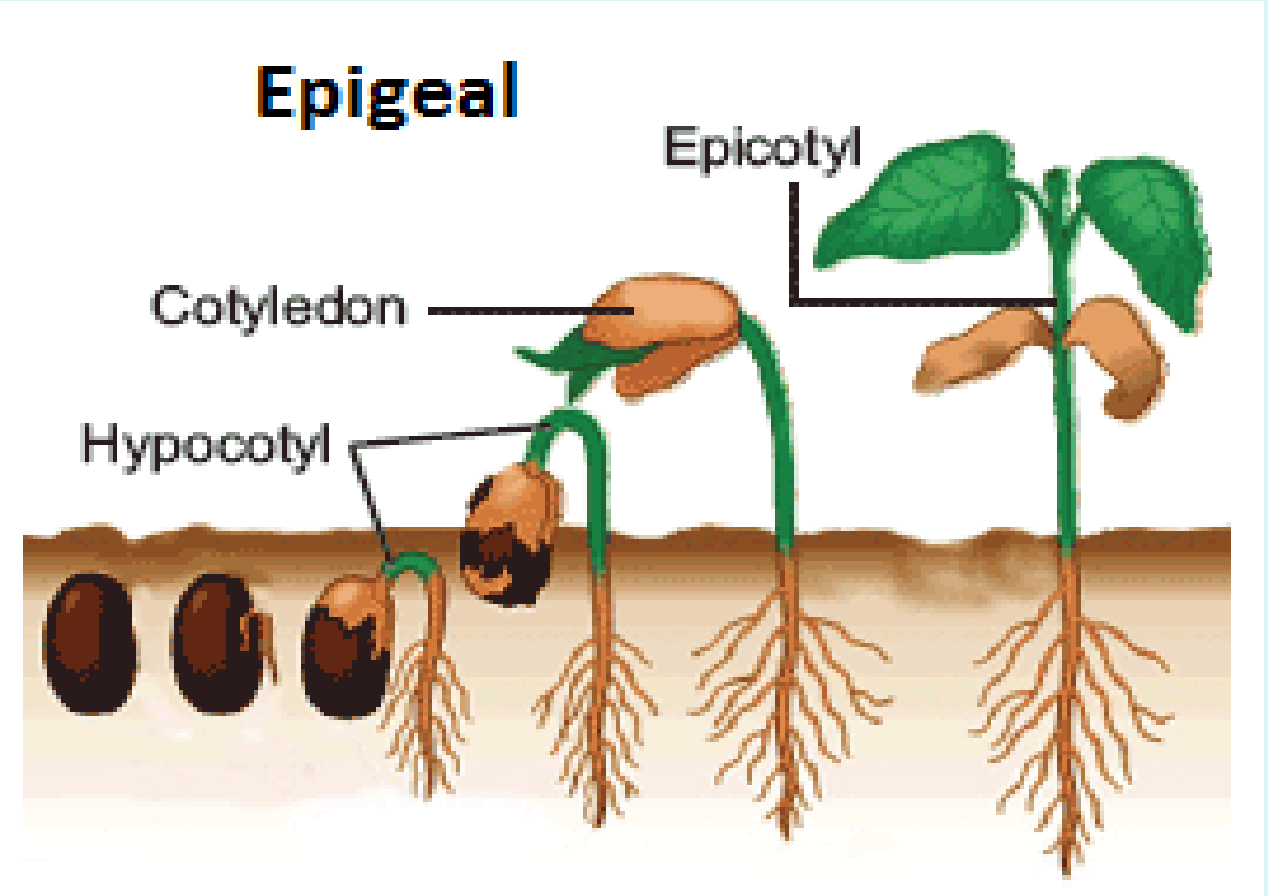
Type of germination

1. Epigeal germination

- Cotyledons are carried above the ground
- The elongation of **hypocotyls** bring the cotyledon above the ground
- E.g. **Most dicot plant castor oil seeds, ground nuts,** Cotton and **few monocots** onion , lilies

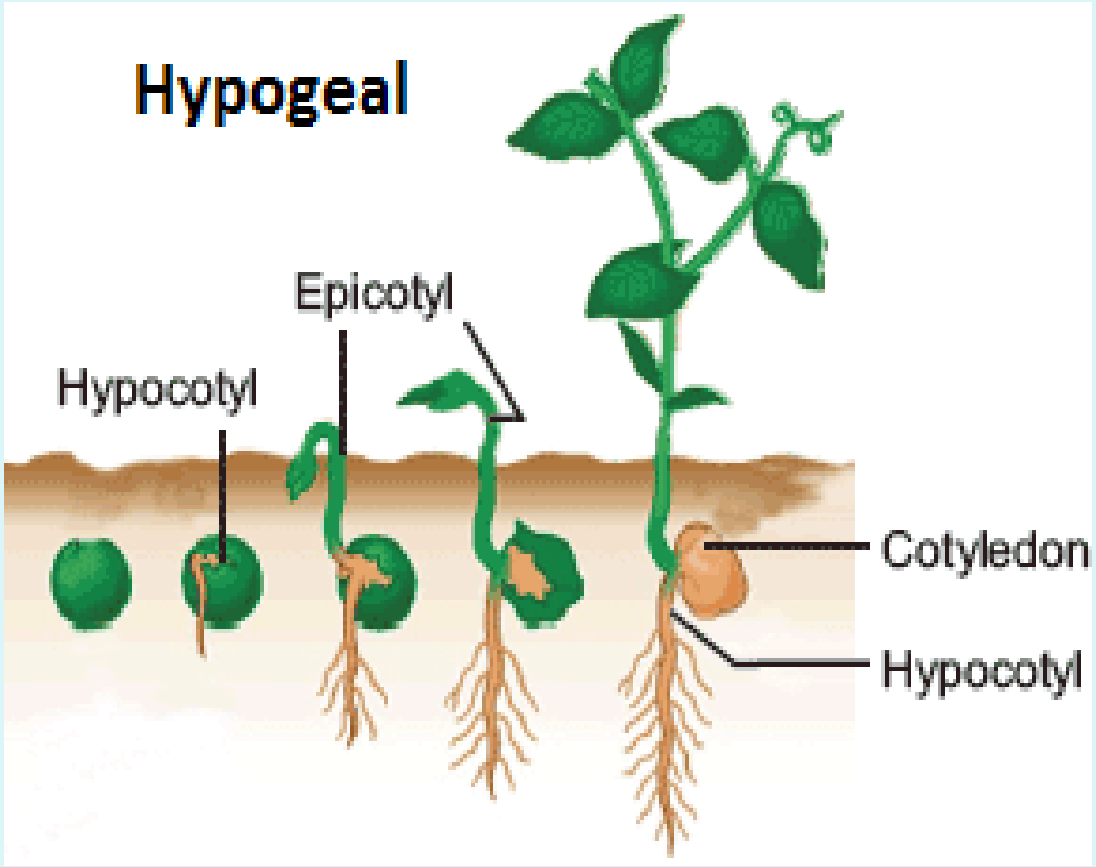
Epigeal germination….

- **Epicotyls** the region above the cotyledons which gives rise to young leaves
- **Hypocotyls** the stem likes area below cotyledon which gives rise to embryonic root



2. Hypogeal germinations

- **Cotyledon** below the ground
- The **elongation of epicotyls** leaving the cotyledon below the ground
- E.g. **most monocots maize, wheat, sorghum, millet** and **few dicot** kidney been, broad been



4.4.2 Plant hormone and growth

- The main hormone involve in plant growth
  - **Auxin**
  - **Ethylene**
  - **Gibberellin acid**
  - **Absicisic acid**
  - **Cytokines**

Auxin (IAA)

- Involve in general plant growth
- Stimulates the elongation of new plant cell **(apical dominance)**
- **Slows down the growth of side shoots**
- Stimulates the **growth of root on cuttings**
- Plays a significant **role in tropism**

Gibberellins

- Stimulates **growth of plants stem**
- Makes dwarf plants **grow in normal size**
- Helps **seed to break their dormant period start germinations**
- Stimulates the production of enzymes food stored in seed.

Cytokinins

- **Stimulate cell division in plants**
- The balance between Auxin and cytokinins very important in plant growth
- Promote **lateral bud development**
- Inhibit leaf falling

Abscisic acid (ABA)

- Inhibit growth
- Play a major role in leaf fall
- **Involve in seed dormancy**
- Involved in geotropism

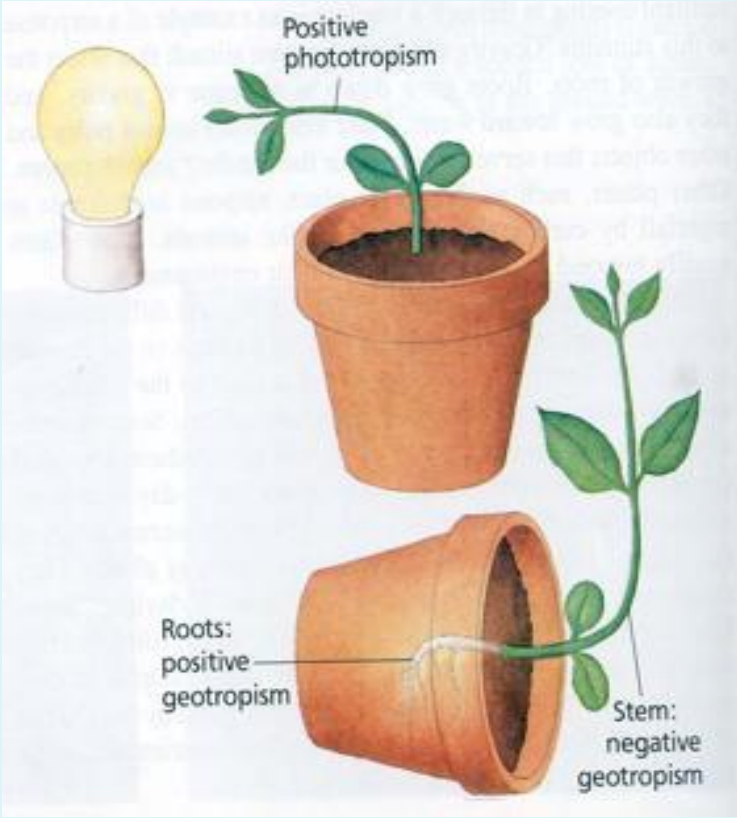
Ethylene

- Gas at room temperature
- Promote of **fruit ripen**
- Causes **fruits and leaves to fall** from plants

4.4.3 Tropic response (tropism)

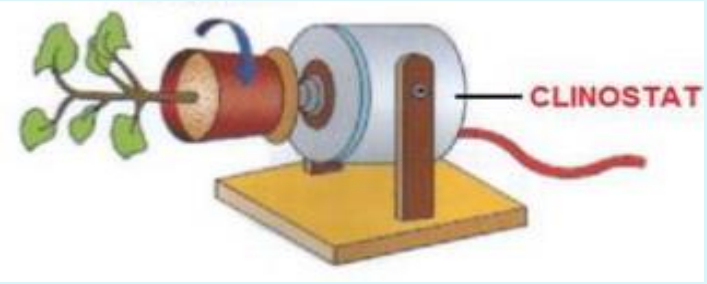
- The directional growth movements to stimuli
  - **Positive tropism** growth toward stimuli
  - **Negative tropism** growth away from the stimuli
- **Phototropism**
  - The directional growth movements in response to light
  - **Shoot** positive phototropism
  - **Root** negative geotropism

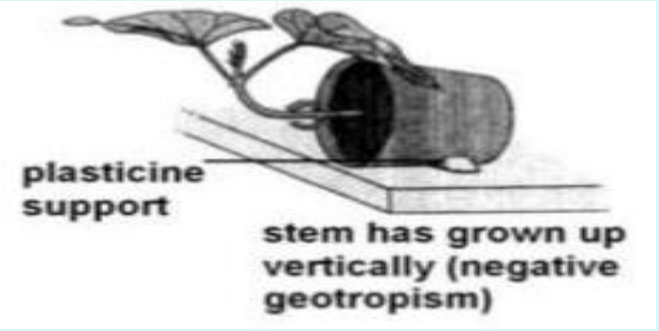
- **Hydrotropism**
  - Growth response to water stimuli
  - **Root** positive hydrotropism
  - **Shoot** negative hydrotropism
- **Geotropism**
  - Growth response to gravity
  - **Shoot** negative geotropism
  - **Root** positive geotropism



Investigating the response of seedlings to gravity

- The response of seedling to gravity can be investigated using piece of apparatus known **klinostat.**
- **Plant response to unilateral stimuli**
- Klinostat **cancel the** effect of **unilateral stimuli (gravity) by rotating the disk**
- Seedling horizontally fixed to klinostat both shoot and root continue to grow straight





Nastic response

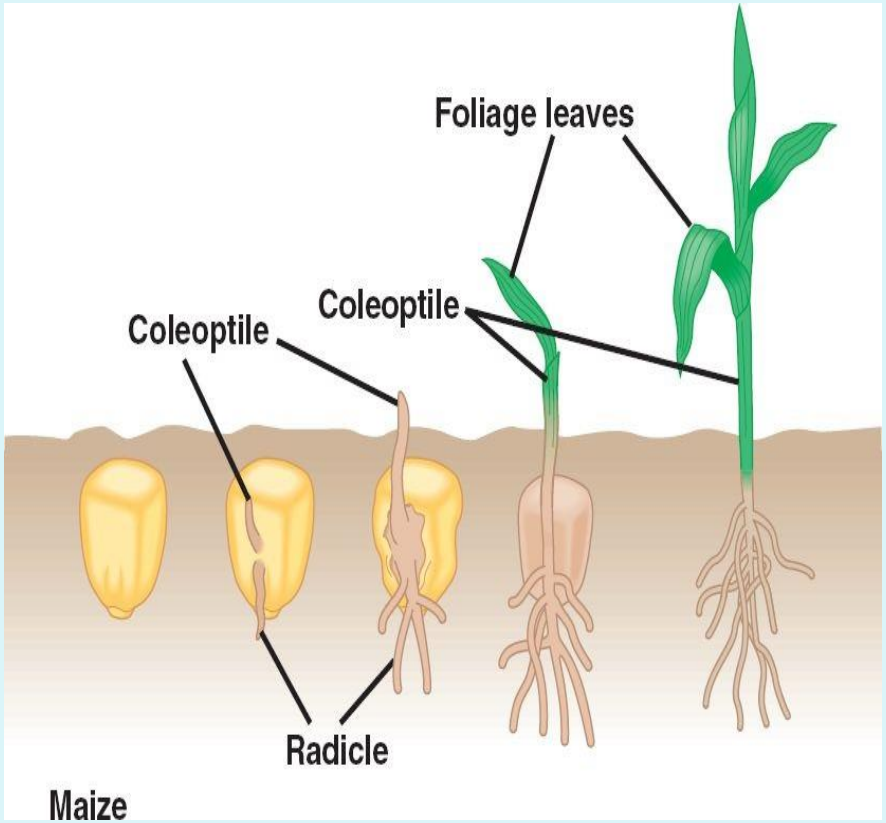
- Non directional response to stimuli



Nastic response	Tropic response
Non directional response	Directional response
Independent of stimulus position	Depend on the direction of stimulus
E.g. opening and closing of stomata	E.g. phototropism, Hydrotropism

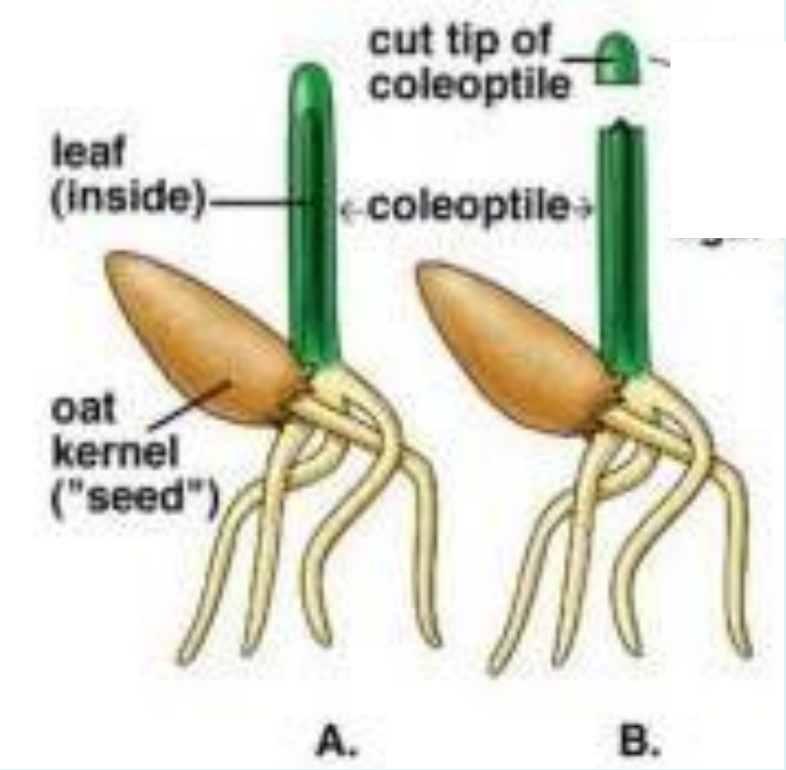
Investigating role of hormone in plant growth

- Maize grain germinate to produce a straight shoot called **coleoptiles**
- **Coleoptiles** widely used in experiment to investigate **the role of hormone in plant growth**



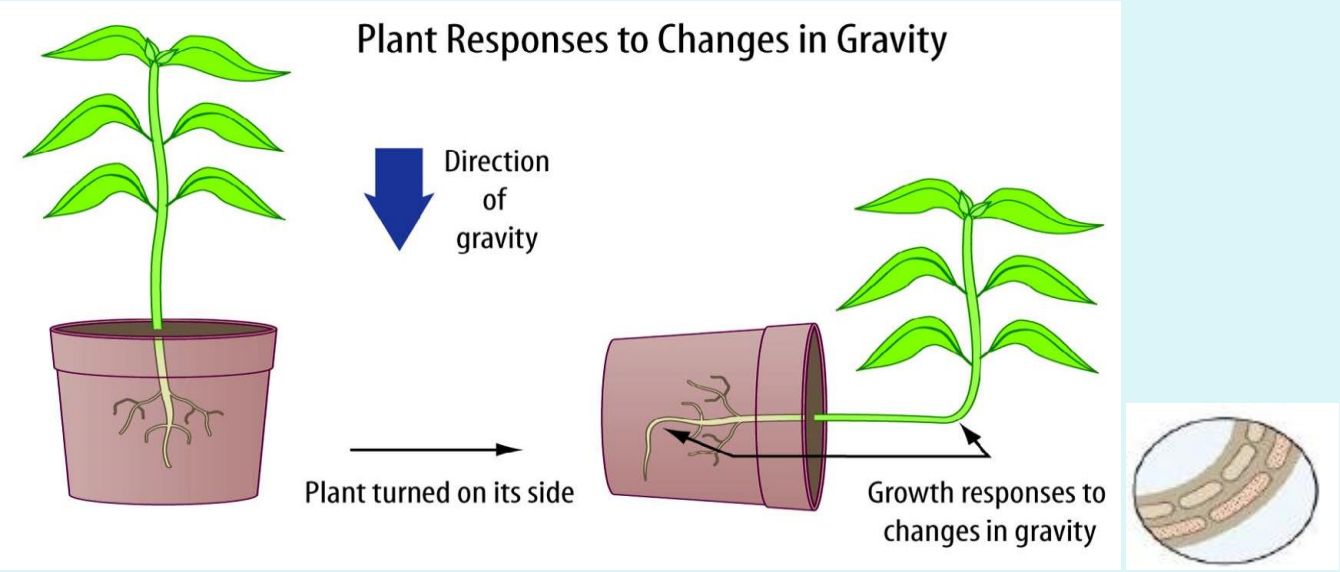
When the tip of coleoptiles are removed (decapitated)

- The coleoptiles don't grow since the source of IAA is removed
- **Failure of decapitated seed to grow suggest** that **auxin probably produce in the tip**



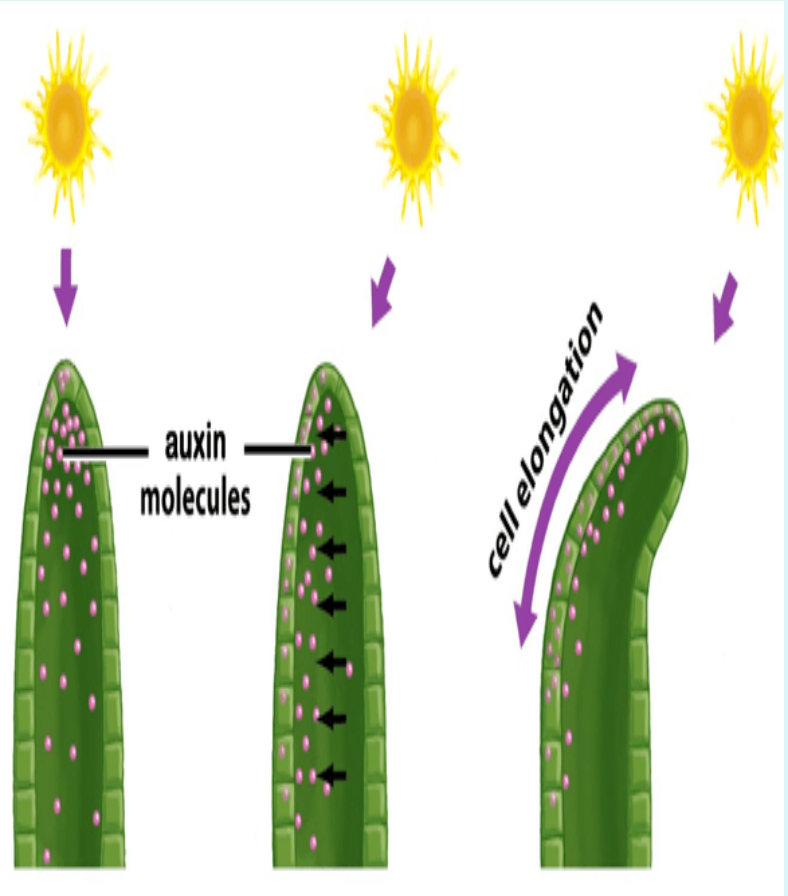
When the plant placed horizontally

- Due to **force of gravity auxin accumulate to the lower side**
- Auxin promote shoot growth and the shoot growth upward
- Auxin inhibit cell growth in lower cell layer and the root growth downward



When the shoot is lit from one side only

- **Light** involved the **distribution of Auxin in shoot**
- Auxin diffuse toward the dark side of the shoot
- The dark side grow faster than illuminated
- Growth is **directly proportional to auxin**
- The shaded side grows faster than illuminated side so, the shot bend toward light



Summary of the lesson

1) Explain the main transport system in plant?
2) What is the need of transport in plants?
3) What are the factors which move water upward in xylem vessels?
4) What are the factor affect the rate of transpiration?
5) What are the factor needed for germination?
6) Explain the type of germination
7) Explain the role of plant hormones?
8) Explain tropic and nastic response?