

Name:
Class: X

Subject: Biology
Date:

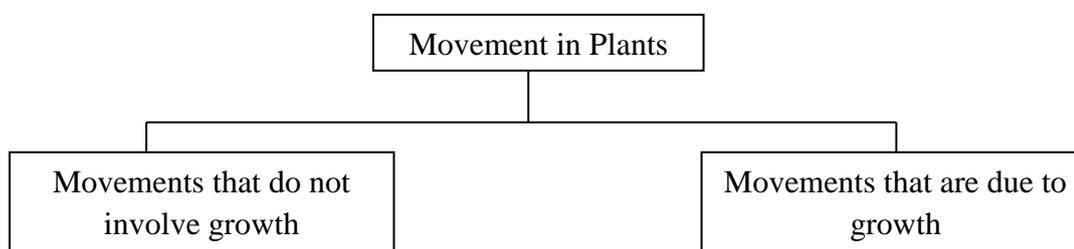
Plants have neither nervous system nor muscles like animals that bring about the movement in animals. It does not mean that plants do not show movements or they do not respond to stimuli. Plants also show movements & responses against stimuli.

For example:

1. When we touch the leaves of “Touch-me-not” (*Chhui-mui/Mimosa pudica*) they fold them and droop.
2. In growth of a seedling, the roots grow/move towards the soil while the stem moves towards the air above the soil. If prevented from growth, movement is not seen.

Thus, the plants show two different types of movements-

- i) **Movement dependent on growth** which is directional movement [Tropic Movements] as in seedling
- ii) **Movement independent of growth** [Nastic Movements] as in *Mimosa pudica*



1. Movement that does not involve growth or independent of growth - [NASTIC MOVEMENTS]

- **Immediate response to stimulus** – The movement that is independent of growth, responses immediately to stimulus. The plants do not have nervous and muscular system to bring about movement, but then also movement take place.
- The drooping/folding of the leaves (response) of the sensitive/touch-me-not plant is due to touch (external stimulus).

If we keenly observe the site of touch i.e. the leaves and the point of movement – it is the leaf base. The movement is at different point from the point of touch. Thus, the plants also use electro-chemical impulses to convey information but unlike animals there is no specialized tissue.

Plant cells change their shape by changing the amount of water in them. More water makes the cells to swell (turgid) and less water shrinks the cell (flaccid). Thus the movement in the sensitive plant is due to the stimulus given by finger (touch) and electric impulses that make change in the amount of water in cells and cells become flaccid. This causes the dropping/folding of the leaves. It is called as *thigmonastic* or *seismonastic* movement



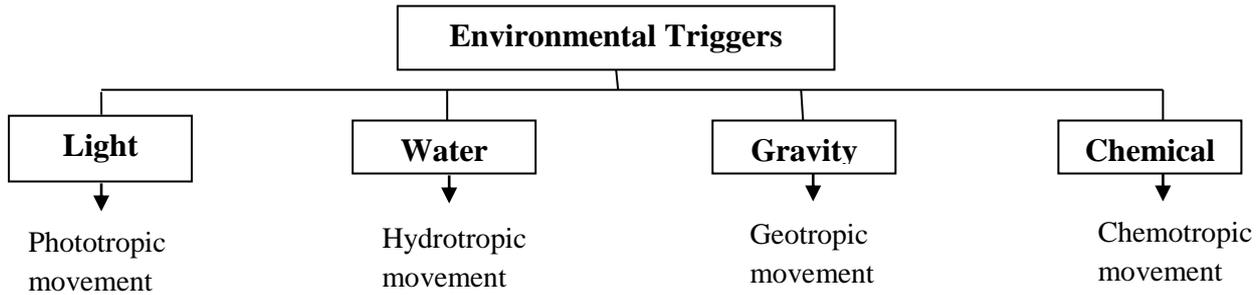
Note: The opening and closing of stomata in the leaves of plants is also due to change in the shape of guard cells. This change in shape is due to water quantity in the guard cells. When water is more, the guard cells bulge/swell up and open the stomata.

2. Movement due to growth or dependent on growth – [TROPIC MOVEMENTS]

The movements that are dependent on growth response slowly to stimuli in a particular direction i.e. are directional. On the basis of various stimuli, the growth related (tropic) movements are of following types-

- These are -

- a. Phototropic
- b. Geotropic
- c. Hydrotropic
- d. Chemotropic
- e. Thigmotropic movements



The movements caused due to these environmental triggers (stimuli) are directional. The movements may be towards the trigger (positive) or away from trigger source (negative). Such movements are called **tropical movements**.

Let us study how growth is related to movement.

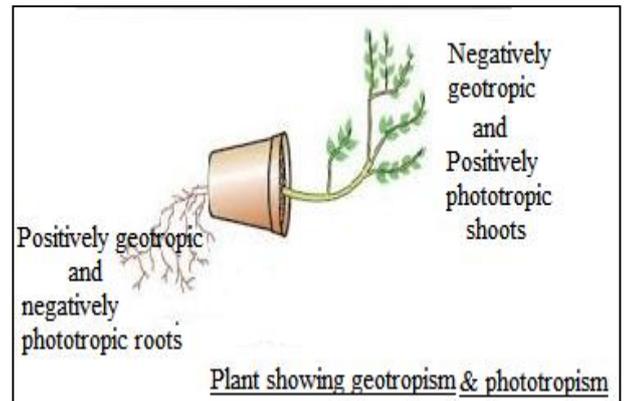
Tendrils: It is a green wire-like structure produced in some plants like pea, gourds, cucumbers, etc. It is a climbing organ that helps the weak stemmed plants to stand or climb with the help of a support. The tendrils coil around the support and make the plant to stand erect.

Tendrils are sensitive to touch (thigmotropic). As soon as they touch an object they coil around it. The part of tendril in contact with object does not grow as rapidly as the other part which is away from the object. This causes the tendrils to circle/coil around the object & clings to the object.

Because the growth is directional it appears that the plant is moving.

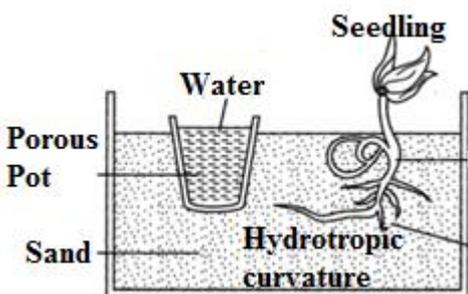
1. Phototropic movement: Movement of plants/ shoots in response to light towards it is called **phototropic movement** (Positive). Roots move away from light (Negative phototropic movement).

2. Geotropic movement: Movement of plants/or its part – shoots away from earth and roots towards the earth in response to the earth/soil/gravity is **geotropic movement** or **geotropism**. (Negative and positive respectively)



Similarly the directional movement due to water is

hydrotropism and chemicals are chemotropism, e.g. growth of pollen tubes towards the ovules in a flower is chemotropism.



Responses to environmental triggers (stimulus) may be very slow (growth related movements) or slow (movement of sunflower in response to day/night) or fast (movement or drooping of the leaves in sensitive plants).

Limitations of electrical impulse & need of chemical messengers–

First – They reach only those cells which are connected by nervous tissue, not each & every cell of the body.

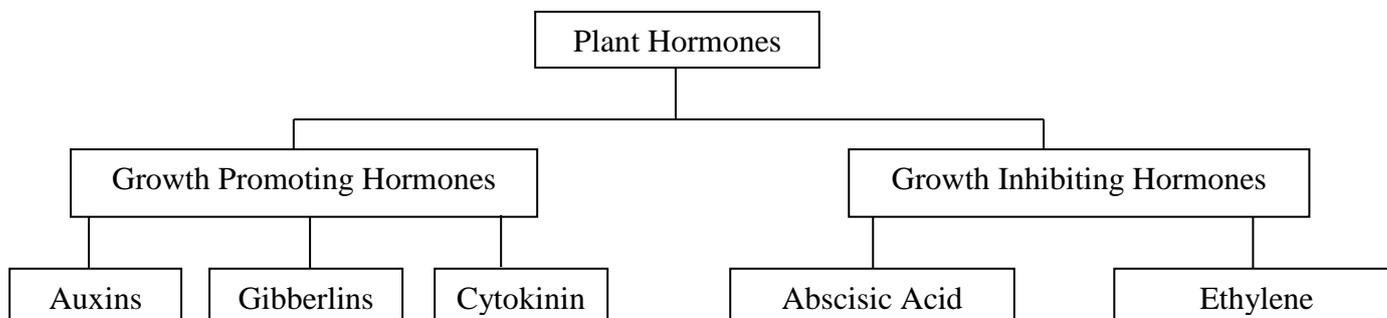
Second – Once electrical impulse is generated & transmitted in a cell; the cell needs some time to reset before it generates other new impulse.

Thus cells cannot continuously create & transmit electric impulses. They use another means – the chemical communication.

Significance of chemical messengers – The hormones

- a. The chemicals/hormones diffuse all around the original cells, even identified by specific receptors on other cell surface and transmit it.
- b. The chemical impulse although slow transmitted but potentially reach all the cells of body steadily and persistently.

HORMONES IN PLANTS: They help to co-ordinate growth, development and responses to the environment. They are synthesized at places away from where they act & simply diffuse to the area of action.



<u>Plant Hormone / Phytohormone</u>	<u>Function / Role</u>
1. Auxin	Cell elongation, help in growth of stem
2. Gibberlin	Cell elongation, help in growth of stem
3. Cytokinin (More in conc. in areas of rapid cell division)	Cell division, growth of fruits and seeds.
4. Absciscic Acid	Is inhibitor, checks growth, wilting of leaves.

