## CONTROL AND CO-ORDINATION MOVEMENTS AND HORMONES IN PLANTS

# PLANT MOVEMENTS & PLANT HORMONES

#### PLANT MOVEMENT:

The movements in plants are not as apparent as in case of animals. Plants generally show movements at a very slow rate. The higher plants are fixed to the substratum by means of roots. They cannot move from one place to another. They, therefore show movement of their organs only.

#### CLASSIFICATION OF PLANT MOVEMENTS:

Plant movements are broadly classified into two types:



#### (i) Tropisms (Tropic movement):

A growth movement of a plant part in response to an external stimulus in which the direction of stimulus determines the direction of response is called tropism. Thus, tropism is a directional movement of the part of a plant caused by its growth.

- If the growth (or movement) of a plant is towards the stimulus, it is called Positive Tropism.
- If the growth (or movement) of a plant part is away from the stimulus, then it is called Negative Tropism.

STIMULUS	TYPE OF TROPISM
Light	Phototropism
Gravity	Geotropism
Chemical	Chemotropism
Water	Hydrotropism
Touch	Thigmotropism

(I) Phototropism: The response of a plant to light is called phototropism. If the plant part moves towards light, it is called positive phototropism. The stem (or shoot) of a growing plant bends towards light, so the stem (or shoot) of a plant shows positive phototropism.





Diagrams to show the response of a plant to light (or phototropism).

(II) Geotropism: Response of a plant to gravity is called Geotropism. If the plant part moves in the direction of gravity, it called Positive Geotropism. The roots of a plant move downwards in the direction of gravity, so the roots of a plant show positive geotropism.



Experiment to show the response of a plant to gravity (geotropism).

The stem (or shoot) of a plant moves upwards against the direction of gravity, so the stem (or shoot) of a plant shows Negative Geotropism.

(III) Chemotropism is due to the chemical stimulus e.g. growth of pollen tube. The response of a plant to chemical stimulus is called chemotropism. If the plant part shows movement (or growth) towards the chemical, it is called Positive Chemotropism. The pollen tube grows towards the sugary substance (chemical) secreted by the ripen stigma of carpel in the flower.



Diagram to show the response of a plant part 'pollen' to chemical secreted by stigma (or chemotropism).

(IV) Hydrotropism: The response of a plant part to water is called Hydrotropism. If the plant part moves towards water, it is called Positive Hydrotropism. The roots of a plant always go towards water, so roots are Positively Hydrotropic.

#### (ii) Nasties / Nastic movements:

The movement of a plant part in response to an external stimulus in which the direction of response is not determined by the direction of stimulus is called nastic movement.

- > The folding up of the leaves of a sensitive plant (Mimosa pudica) on touching.
- The opening up of the petals of dandelion flowers in morning in bright light and closing in the evening when the light fades.
- The closing of the petals of moonflower in the morning in bright light and opening at dark when the light fades.

# (I) Thigmonasty : The non-directional movement of a plant part in response to the touch of an object is called Thigmonasty. The sensitive plant has pad-like swellings called 'pulvini' at the base of each leaf. The folding up of the leaves of a sensitive plant on touching is due to the sudden loss of water from padlike swellings called 'pulvini' present at the base of all leaves of the sensitive plant which make the pulvini lose their firmness causing the leaves to drop and fall. Leaves of 'touch-menot' plant (Mimosa pudica) drops rapidly when touched. It is due to turgidity of cells at the base.

Here touch response is diffused affecting the entire leaf. The vascular strand of leaf divides the leaf into upper stable and lower sensitive part. In normal condition both parts remain turgid and thus, leaf remains erect. After touching the leaf, stimulus reaches the leaf. The upper half remains unaffected but cells of the lower half loose water and become flaccid. Thus, leaf drops down due to loss of turgor pressure. After sometime when stimulus diminishes, cells again become turgid and the leaf returns back to its normal position. Plant movement occur due to change in turgor pressure due to efflux and influx of k+ ions.





(II) Photonasty: The non-directional movement of a plant part (usually petals of flowers) in response to light is called photonasty. The opening and closing of flowers in response to light (or photonasty) are growth independent movements.

#### (b) Plant hormones:

A phytohormone can be defined as a chemical substance which is produced naturally in plants and is capable of translocation and regulating one or more physiological processes.

- Different plant hormones help to coordinate growth development and responses to the environment. They are synthesised at places away from where they act and simply diffuse to the area of action.
- > First plant hormone, discovered by Went was auxin.

#### Main phytohormones are –

- (i) Auxins
- (ii) Gibberellins
- (iii) Cytokinins
- (iv) Abscisic acid
- (v) Ethylene
- (i) Auxins
- When growing plants detect light, a hormone called auxin, synthesised at shoot tip, helps the cells to grow longer.
- When light is coming from one side of the plant, auxin diffuses towards the shady side of the shoot.
- This concentration of auxin stimulates the cells to grow longer on the side of the shoot which is away from light. Thus, the plant appears to bend towards light. The first discovered plant hormone was identified as Indole Acetic Acid (I.A.A.).

#### ✤ Functions of Auxins

- Promote cell division and elongation
- Cause apical dominance (terminal or apical bud inhibits the development of lateral buds)
- Used in parthenocarpy (production of seedless fruits without pollination and fertilization).

> Help in root initiation in cutting or in callus differentiation.