

Biology

CLASS NOTES FOR CBSE

Chapter 02. Control and coordination

01. Introduction

The changes in the environment to which the organisms respond and react are called stimuli. The living organisms show response to stimuli such as light, heat, cold, sound, smell, taste, touch, pressure, pain, water, and force of gravity, etc. The response of organisms to a stimulus is usually in the form of some movement of their body part. Both, plants and animals react (or respond) to various stimuli around them. The animals can react to stimuli in many different ways because they have a nervous system and an endocrine system and an endocrine system involving hormones. The plants, however, react to stimuli in a very limited way. This is because the plants do not have a nervous system like the animals have. The plants use only the hormones for producing reaction to external stimuli. The working together of the various organs of an organism in a systematic manner so as to produce a proper response to the stimulus, is called coordination.

02. Control and coordination in plants

The plants do not have a nervous system and sense organs like eyes, ears, or nose, etc., like the animals, but they can still sense things. The plants coordinate their behaviour against environmental changes by using hormones.

Plant hormones (or phytohormones)

These are four major types of plant hormones (or phytohormones) which are involved in the control and coordination in plants. These are :

- (a) Auxins,
 - (b) Gibberellins,
 - (c) Cytokinins, and
 - (d) Abscisic acid (ABA).
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- (i) Auxins are the plant hormones which promote cell enlargement and cell differentiation in plants. Auxins also promote fruit growth. Auxin hormone controls plant's response to light and gravity. In other words, auxin hormone is responsible for the phototropic and geotropic responses of plants. Auxin is made by cells at the tip of stems and roots. Auxin moves away from light, and towards gravity.
 - (ii) Gibberellins are plant hormones which promote cell enlargement and cell differentiation in the presence of auxins. Gibberellins help in breaking the dormancy in seeds and buds. They also promote growth in fruits. Gibberellin hormone is involved mainly in shoot extensions. Gibberellin stimulates elongation of shoots of various plants



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- (iii) Cytokinins are the plant hormones which promote cell division in plants. Cytokinins also help in breaking the dormancy of seeds and buds. They delay the ageing in leaves. Cytokinins promote the opening of stomata. They also promote fruit growth.
- (iv) Abscisic is a plant hormone which functions mainly as a growth inhibitor. Abscisic acid promotes the dormancy in seeds and buds (this is the opposite of breaking of dormancy). It also promotes the closing of stomata. Abscisic acid promotes the wilting and falling of leaves (which is called abscission). It also causes the detachment of flowers and fruits from the plants.

03. Plant movements

Movements of the plant part are usually caused by an unequal growth in its two regions by the action of plant hormones, under the influence of the stimulus. The plant movements made in response to external stimuli fall into two main categories : tropisms and nasties. Though all the tropisms are growth movements but nasties may be growth movements or growth-independent movements. In tropisms, the direction of stimulus determines the direction of stimulus.

Tropisms (or tropic movements)

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

- (i) If the growth (or movement) of a plant part is towards the stimulus, it is called positive tropism, and
- (ii) If the growth (or movement) of a plant part is away from the stimulus, then it is called negative tropism.

Response of plants to light : phototropism

Plants need sunlight, so the stems (or shoots) respond to sunlight by growing towards it. The plant stem responds to light and bends towards it due to the action of 'auxin hormone'

- (i) When sunlight comes from above, then the auxin hormone present in the tip of the stem spreads uniformly down the stem. Due to the equal presence of auxin, both the sides of the stem (A and B) grow equally rapidly. And the stem grows straight up.
- (ii) When the light falls only on the right side of the stem then the auxin hormone collects in the left side (shady side A) of the stem, away from light. This is because auxin hormone prefers to stay in shade.
- (iii) Now, more auxin hormone is present in the left side of stem but not its right side. Due to more auxin hormone, the left side (A) of stem grows faster than its right side (B) where there is no auxin. Since the left side of stem grows faster and becomes longer than its right side, therefore, the stem bends towards the right side.

The response of plants to gravity : geotropism

The response of plants to gravity is called geotropism. Geotropism is also known as gravitropism.

