

Chapter 6: Chemical Coordination in Plants

1. Introduction:

Chemical coordination in plants involves the regulation of growth and responses to stimuli using specific plant hormones called **plant growth regulators (PGRs)**. These hormones help the plant adapt to changes in the environment and coordinate various physiological processes.

2. Plant Growth Regulators (PGRs):

Plant hormones are chemical substances that influence the growth, development, and responses to external stimuli. The major plant hormones include:

- Auxins:**
 - Effects:** Promote cell elongation, root formation, and apical dominance. Inhibit the growth of lateral buds.
 - Example:** Indole Acetic Acid (IAA).
 - Role:** Helps in phototropism and geotropism.
- Gibberellins:**
 - Effects:** Stimulate stem elongation, seed germination, and flowering.
 - Example:** Gibberellic acid (GA).
 - Role:** Overcome seed dormancy and induce bolting.
- Cytokinins:**
 - Effects:** Promote cell division and delay leaf senescence.
 - Example:** Zeatin and Kinetin.
 - Role:** Helps in the formation of new leaves, lateral bud growth, and nutrient mobilization.
- Abscisic Acid (ABA):**
 - Effects:** Induces dormancy, inhibits growth, and helps plants withstand stress.
 - Role:** Closes stomata during water stress and promotes leaf fall.
- Ethylene:**
 - Effects:** Stimulates fruit ripening, leaf abscission, and flower wilting.
 - Role:** Promotes root and shoot growth in some cases.

Classification of Plant Growth Regulators

Category	Growth Promoters	Growth Inhibitors
Examples	Auxins, Gibberellins, Cytokinins	Ethylene, Abscisic Acid
Functions	Promote growth, cell division, elongation, flowering, and fruit development	Inhibit growth, cause leaf fall, seed dormancy, and fruit ripening

3. Tropic Movements in Plants:

Tropic movements are directional movements in response to external stimuli. These movements help the plant orient itself favorably in its environment.

1. Phototropism (Light):

- **Definition:** Movement in response to light.
- **Example:** Bending of the plant stem towards the light.
- **Cause:** Unequal distribution of auxins on the shaded and illuminated sides.

2. Geotropism (Gravity):

- **Definition:** Movement in response to gravity.
- **Example:** Roots show positive geotropism (grow downward), while stems show negative geotropism (grow upward).

3. Hydrotropism (Water):

- **Definition:** Movement in response to water.
- **Example:** Roots grow towards the water source.

4. Thigmotropism (Touch):

- **Definition:** Movement in response to physical contact.
- **Example:** Tendrils of climbers coil around a support.

5. Chemotropism (Chemicals):

- **Definition:** Movement in response to a chemical stimulus.
- **Example:** Growth of the pollen tube towards the ovule during fertilization.

4. Key Points:

- Plant hormones regulate various physiological processes and responses.
 - Different hormones have distinct roles, from growth stimulation to stress management.
 - Tropic movements help plants adapt to environmental changes.
 - Tropisms ensure that roots and shoots grow in favorable directions.
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