

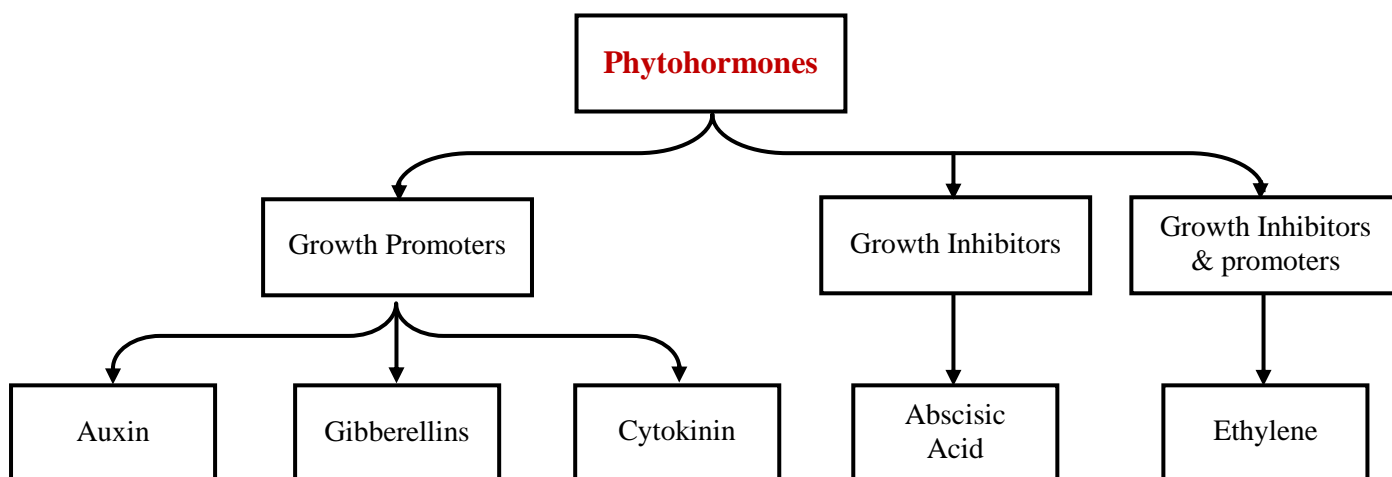
Phytohormones:

Phytohormones are chemical messengers that coordinate cellular activities of plants.

Plant hormones control all the growth and development activities like cell division, enlargement, flowering, seed formation, dormancy and abscission.

Based on their action, plant hormones are categorized into two categories:

1. Plant Growth Promoters
2. Plant Growth Inhibitors



Auxin Hormone

Auxin means “to grow”. They are widely used in agricultural and horticultural practices. They are found in growing apices (tops/tips) of roots and stems and then migrate to other parts to act.

- Natural: Indole-3-acetic acid (IAA), Indole butyric acid (IBA)
- Synthetic: 2,4-D (2,4-Dichlorophenoxyacetic acid), NAA (Naphthalene acetic acid)

Functions:

- Cell elongation of stems and roots
- Apical dominance, IAA in apical bud suppresses the growth of lateral buds
- Induces **parthenocarpy** i.e. development of fruit without fertilization e.g. in tomatoes
- Prevents premature fall of leaves, flowers, fruits
- Useful in stem cuttings and grafting where it initiates rooting
- Promotes flowering e.g. in pineapple

- 2,4-D is widely used as a herbicide to kill undesirable weeds of dicot plants without affecting monocot plants
- Helps in cell division and xylem differentiation

Q. Why is Auxin growth hormone?

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Gibberellins Hormone

There are more than 100 gibberellins (GA₁, GA₂, GA₃.....) that are known. They are acidic in nature. These are found in higher plants and fungi.

[GA₁ = Glutamic aciduria type-1]

Functions:

- Promotes **bolting**, i.e. sudden elongation of internodes just before flowering in rosette plants like cabbage, beet
- Delays **senescence** (the process of becoming old)
- Induces parthenocarpy
- Elongation of the stem and reverses dwarfism
- Induces maleness in certain plants like cannabis
- Induces the formation of hydrolytic enzymes such as lipase, amylase in the endosperm of germinating cereal grains and barley seeds
- Breaks seed dormancy

Cytokinins Hormone

Cytokinins play an important role in cytokinesis process (division of cytoplasm). Cytokinins are naturally synthesised in the plants where rapid cell division occurs e.g. root apices, shoot buds, young fruits, etc. Movement of cytokinins is basipetal and polar.

- Natural: Zeatin (corn kernels, coconut milk), isopentenyladenine
- Synthetic: Kinetin, benzyladenine, diphenylurea, thidiazuron

Functions:

- It promotes lateral and adventitious shoot growth and used to initiate shoot growth in culture
- Helps in overcoming apical dominance induced by auxins
- Stimulate the formation of chloroplast in leaves
- Promotes nutrient mobilization and delay leaf senescence

Q. Explain the role Cytokinins in cell division.

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Abscisic Acid Plant hormone

It is a growth-inhibiting hormone. It inhibits plant metabolism and regulates abscission and dormancy. It is also called “stress hormone” as it increases tolerance of plants.

Functions:

- Induces abscission of leaves and fruits
- Inhibits seed germination
- Induces senescence in leaves
- Accelerates dormancy in seeds that is useful for storage purpose
- Stimulates closure of stomata to prevent transpiration under water stress

Ethylene Plant Hormone

It acts as a growth promoter as well as an inhibitor. Occurs in gaseous form. It is synthesized in the ripening fruits and tissues undergoing senescence. It regulates many physiological processes and one of the most widely used hormones in agriculture.

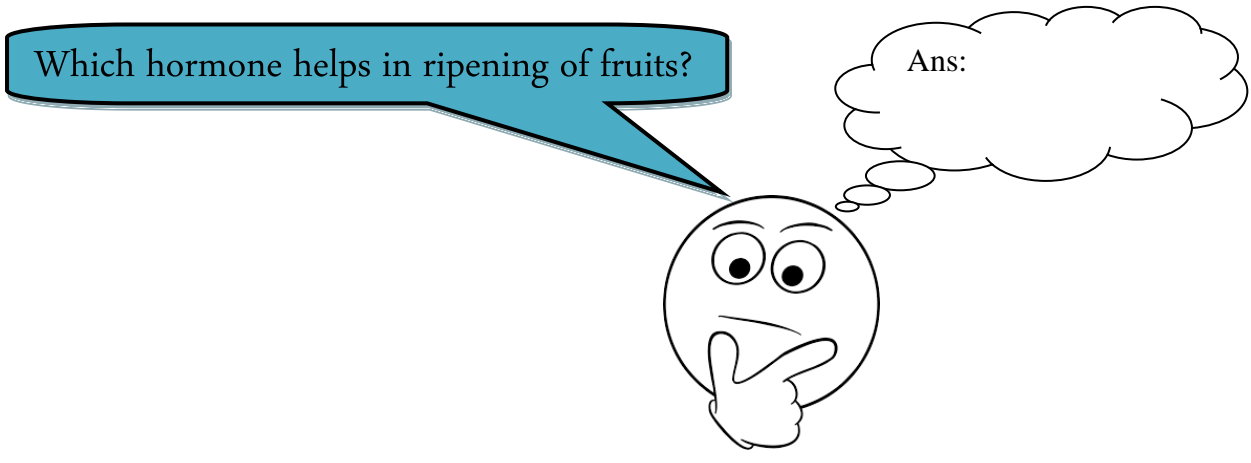
Functions:

- It hastens (hurry) the ripening of fruits
- Controls **epinasty** of leaves

[Increased growth on the upper surface of an organ or part, causing it to bend downward]

- Breaks seed and bud dormancy
- Stimulates rapid elongation of petioles and internodes
- Promotes senescence and abscission of leaves and flowers
- Induces root growth and root hair formation thereby increasing the absorption surface
- Stimulates femaleness in monoecious (unisexual plant) plants
- Apical hook formation in dicot seedlings

Other than the main 5 hormones, there are other hormones too that affect the plant's physiological processes, e.g. brassinosteroids, salicylates, jasmonates, strigolactones, etc.



Q. Explain the importance of growth inhibiting hormones.

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