

Importance of Plant Growth Hormones

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EDITORIAL

Plants need hormones at some particular time during the plant growth and specifically at some locations. Plant hormones (phytohormones) are not nutrients, but they are the organic chemicals synthesized within the plant and at times added synthetically to enhance the plant productivity. Plant growth regulators function as chemical messengers for intercellular communication. Currently five groups of plant hormones have been recognized which are: auxins, gibberellins, cytokinins, Abscisic Acid (ABA) and ethylene. These growth hormones are categorized according to their chemical structure; however they are utilized to produce similar physiological responses in the plant.

Importance of plant hormones

Plant hormones control all aspects of plant growth and development such as embryogenesis, organ size regulation, defense against pathogen, stress tolerance and reproductive development.

In order for plants to respond to the environment, their cells must be able to communicate with other cells. Sometimes, even under favourable condition, some seeds may not germinate. Under such circumstances, plant hormones can be utilized to provide external strength to the plant, paving way to provide the plant better germinating conditions.

Auxins: Auxins stimulate cell elongation and influence other developmental responses, such as root initiation, vascular differentiation, the development of auxiliary buds, flowers and fruits. Auxins are synthesized in the stem and root apices and transported through the plant axis.

IAA: Several other indole derivatives, which are the precursors to IAA are said to express auxin activity, probably by converting to IAA in the tissue. Auxins in plant tissue culture are used to induce callus from explants, and cause root and shoot morphogenesis. Auxins are most effective when combined with cytokinins.

Cytokinins: Cytokinins play crucial role in stimulating the cell division and induce shoot bud formation in tissue culture. They usually act as antagonists to auxins. Cytokinins are N⁶ substituted derivatives of the nitrogenous purine base adenine. Cytokinins mostly used in tissue culture are zeatin, adenine, 6-(g,g-dimethylallylamino) purine (2 iP) and kinetin. Cytokinins often inhibit embryogenesis and root induction.

Gibberellins: The major part of gibberellins in plants is to cause stem elongation and flowering. They are prominently involved in mobilization of endosperm during early embryo growth and seed germination. There exist over 80 different gibberellin compounds in plants but only gibberellic acid (GA3) and GA4+7 are often used in plant tissue culture. In tissue culture, gibberellins are useful to induce organogenesis, especially adventitious root formation.

Abscisic Acid: Abscisic Acid (ABA) in plants involves terpenoid which primarily helps in regulating seed germination, inducing storage protein synthesis and modulating water stress. In plant tissue culture, it is used to help in somatic embryogenesis, particularly during maturation and germination.

Ethylene: Ethylene is a gaseous hydrocarbon which is not required for normal vegetative growth. However, it can have a significant impact on development of root and shoots. Usually, ethylene is not used in plant tissue culture. Since this is a gas, it can diffuse through the plant's tissue, outside the plant, and travel through the air to affect a totally different plant. This is how, ripening of brown banana right next to a bunch of green bananas, and turning to yellow colour can be observed much faster.

Plant hormones are very important to overcome dormancy or growth under stress condition. Cell growth can be enhanced by the use of plant hormones leading to the production of high quality trees and fruits.

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