

Dr. Rachana Shalini
Department of Botany
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Plant Hormones Auxins: Distribution, Types and Physiological Effect

Plant growth substances or growth regulators are organic substances, other than nutrients, which in low concentration regulate growth, differentiation and development by promoting or inhibiting the same. Plant growth substances are also called phytohormones.

Technically a plant hormone is an organic compound synthesized in one part of a plant and translocated to another part, where in very low concentration, it causes a physiological response. The response in the target organ need not be promotive, because processes such as growth or differentiation are sometimes inhibited by hormones, especially abscisic acid.

Many plant physiologists use the term plant growth substances rather than plant hormone, for it can include both the native (endogenous) and the synthetic (exogenous) substances found to modify plant growth. Those substances elaborated by the plant are referred to as phytohormones whereas the others are called synthetic plant growth substances.

Five major kinds of endogenous plant growth substances are present in plants—auxins, gibberellins, cytokinins, abscisic acid, and ethylene. With the exception of abscisic acid and ethylene, which are represented by single molecules in plants, there are multiple forms of the endogenous plant growth substances.

Auxins:

The term auxin was first used by Frits Went in 1926, who discovered that some unidentified compound probably caused curvature of oat coleoptiles toward light. He demonstrated that a substance present in the tips could diffuse from them into a tiny block agar.

The activity of this auxin was detected by the curvature of the coleoptile caused by enhanced elongation on the side to which the agar block was applied. This Avena-curvature test, first developed by F. W. Went, is not only the first but to-date the best bioassay for auxin.

The test centres around two important aspects of auxin-action (a) the transport of auxin is strictly polar, diffusing from the morphological top to a morphological base (b) the degree of curvature is proportional to the amount of auxin.

Thimann (1948) defined an auxin as “an organic substance which promotes growth along the longitudinal axis when applied in low concentrations to shoots of plants freed as far as possible from their own inherent growth-promoting substances.”

Auxin Distribution in Plants:

Thimann (1934) working on etiolated seedlings of Avena found that the auxins occurred in their highest concentrations in the shoot tip; the root tips contained the least amounts. Thimann and Skoog found that in light-grown plants apical buds contained most auxin, young leaves contained lesser quantities and mature leaves, the lowest quantities. Auxin is synthesised in shoot apices, leaf primordia and developing seeds and it is now believed that the auxins-synthesis may take place in all parts of the plant.