

PGRs and Their Working Manner

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Summary

The plant hormones or regulators are the organic chemical compounds, which modify or regulate physiological processes in an appreciable measure in the plant when used in small concentration. In other words, plant growth regulators are organic substances (other than nutrients), which in small amount promote, inhibit or otherwise modify any physiological process in plants. Thus the use of plant growth regulators has resulted in some outstanding achievements in several fruit crops with respect to growth, yield and quality.

Introduction

Phytohormones are organic substances produced naturally in higher plants, controlling growth or other physiological functions at a site remote from its place of production and active in minute amounts. But, plant growth regulators includes naturally occurring phytohormones, their chemical analogs, hormone releasing agents, hormone sensitivity altering agents and hormone synthesis inhibitors (Hajam et al., 2017). Thimmann (1948) proposed the term Phytohormone as these hormones are synthesized in plants. Plant growth regulators include auxins, gibberellins, cytokinins, ethylene, growth retardants and growth inhibitors.

“Hormone” is Greek word derived from “hormao”, which means to stimulate. Auxin was the first hormone to be discovered in plants and at one time considered to be only naturally occurring plant growth hormone. Plant growth regulators considered as a new generation of agrichemicals when added in small amounts, modify the growth of plants usually by stimulating or modifying one part of the natural growth regulatory system, thereby the yield is affected as well.

Class of Plant Growth Regulators

Auxins	IAA, NAA, IBA, IPA, 2-4D, 4-CPA, 2,4,5-T
Gibberellins	GA ₃ (most commonly occurring)
Cytokinins	Kinetin, Zeatin, Benzyladenine
Ethylene	Ethereal
Abscissic acid	Dormins, Phaseic Acid
Phenolic substances	Coumarin
Flowering hormones	Florigen, Anthesin, Vernalin
Natural substances	Vitamins, Phytochrome
Synthetic substances	Synthetic Auxins, Synthetic Cytokinins
Growth inhibitors	AMO-1618, Phosphon-D, Cycocoeil, B-999

Plant growth regulators and their associated functions

Plant Growth Regulators	Associated functions
Auxins	Promote stem elongation, stimulates cell elongation, inhibit growth of lateral buds (maintains apical dominance), promote root initiation, control fruits drops,
Gibberellins (GAs)	Regulate various <u>developmental processes</u> , including stem elongation, <u>germination</u> , <u>flowering</u> , <u>flower development</u> . GAs are one of the longest-known classes of plant hormone.
Cytokinins (CK)	Promote <u>cell division</u> , or <u>cytokinesis</u> , in plant roots and shoots. They are involved primarily in <u>cell growth</u> and <u>differentiation</u> .
Ethylene	Regulating the <u>ripening of fruit</u> , the opening of <u>flowers</u> , the <u>abscission</u> (or shedding) of <u>leaves</u> .
Abscissic acid	Acts as plant stress hormone, seed and bud dormancy, the control of organ size and stomata closure. It is especially important for plants in the response to <u>environmental stresses</u> .

Commercial Utility of PGRs in Fruit crops

Auxins

Optimum concentration and combination of IBA and NAA on rooting potential. The treatment of IBA (7500 ppm) gave maximum rooting percentage (96.67%). Application of

2,4-D spray (20 ppm) at or shortly after bloom effectively thins the number of mandarin fruits without affecting total yield. Effect of NAA on fruit set and fruit retention percentage of mango was found as positive effect.

Gibberellic Acid

The promotive effect of GA₃ on seed germination is due to role of GA₃ in activating alpha amylase enzyme which converts starch into simple carbohydrate and liberate chemical energy which is used in the activation of embryo.

Cytokinins

The promoting effect of Cytokinin on fruit set and fruit retention is achieved by reducing abscissic acid content. It also affects the rate of somaclonal variation indirectly by increasing multiplication rate and inducing adventitious shoot proliferation

Ethylene

Increasing the higher accumulation of metabolites and a quick conversion of starch into soluble sugars during the fruit development in response to growth regulators due to effect of different concentrations of ethrel (2-chloroethyl phosphonic acid) also shown on ripening and colour development of the fruits.

Abscissic Acid

ABA treatment enhanced anthocyanin accumulation under high night temperatures to almost the same level as under low night temperatures. Mechanism for the increase of anthocyanin accumulation in grape skin by ABA treatment seems to involve the induction of VvmybA1, a putative regulatory gene of anthocyanin biosynthesis.

Conclusion

Plant growth regulators considered as a new generation of agrichemicals when added in small amounts, modify the growth of plants or regulate physiological processes in an appreciable measure in the plant when used in small concentration.