Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; SP1: 341-342

Somandeep Kaur
Assistant Professor, Department of Agriculture, Baba Farid College, Bathinda, Punjab, India

Ramandeep Kumar
Assistant Professor, Department of Agriculture, Baba Farid College, Bathinda, Punjab, India

Jagsir Singh
Block Technology Manager Department Agriculture and Farmers Welfare Punjab, Bathinda, Punjab, India

Correspondence
Somandeep Kaur
Assistant Professor, Department of Agriculture, Baba Farid College, Bathinda, India

(Special Issue- 1)
2nd International Conference
"Food Security, Nutrition and Sustainable Agriculture - Emerging Technologies"
(February 14-16, 2019)

Use of plant growth regulators in fruit crops

Somandeep Kaur, Ramandeep Kumar and Jagsir Singh

Abstract
The plant hormones are highly important agent in the integration of developmental activities in plants. Environmental factors often create inductive effects by changes in hormones in metabolism and distribution within the plant. Control of genetic expression has been demonstrated for the phytohormones at both transcriptional and translational levels. 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 very small amounts. Plant Growth regulators also known as bio-stimulants that modifies yield, quality and postharvest life the physiological processes in plant. The use of growth regulators has become an important component of agro-technical procedures for most of the fruit plants. In this review, we focus on the major functions of plant growth regulators in fruit production.

Keywords: Growth regulators, fruit crops

Introduction

Growth harmones are the substances synthesized in particular cells and are transferred to other cells where in extremely small quantities influence development process. Plant hormones affect gene expression and transcription levels, cellular division, and growth. They are naturally produced within plants, though very similar chemicals are produced by fungi and bacteria that can also affect plant growth. Synthetic plant hormones or PGRs are commonly used in a number of different techniques involving plant propagation from cuttings, grafting, micro propagation and tissue culture.

The concentration of hormones required for plant responses are very low (10^{-6} to 10^{-5} mol /L). Because of these low concentrations, it has been very difficult to study plant hormones, and only since the late 1970s have scientists been able to start piecing together their effects and relationships to plant physiology. The discovery of auxins, gibberellins and cytokinins led to commercial uses of products in these hormone categories that include improved shape of fruit, enhanced market value by reducing blemishes, optimise tree architecture and solve the serious problems in fruits. The naturally occurring hormone abscisic acid is showing potential for overcoming plant stress and also enhancing early fruit drop. 1-MCP, a competitive inhibitor of ethylene, has revolutionized storage of fruits and improving storage quality of fruit

II. Types of Growth Regulators

A. Auxin
B. Gibberellins.
C. Cytokinins
D. Abscisic Acid
E. Ethylene

A. Auxin

Auxins are compounds that influence cell enlargement, bud formation and root initiation. They also promote the production of other hormones and in conjunction with cytokinins, they control the growth of stems, roots, and fruits, and convert stems into flowers. Auxins were the first class of growth regulators discovered.

They affect cell elongation. Auxins act to inhibit the growth of buds lower down the stem and also to promote lateral and adventitious root development and growth. Auxins are toxic to plants in large concentrations; they are most toxic to dicots and less so to monocots. Synthetic auxin herbicides including 2,4-dichlorophenoxyacetic and 2,4,5-T have been developed and used for weed control. Auxins, especially Naphthalene acetic acid and Indole-3-butyric acid are also commonly applied to stimulate root growth when taking cuttings of plants. The most common auxin found in plants is indole-3-acetic acid. In majority of fruit plants fruit drop is controlled by spraying of NAA in different fruit crops in different concentration. It is applied after blossom fertilization. Application of NAA 10- 50 ppm in mango, citrus reduce fruit drop by preventing formation of abscission layer.

B. Gibberellins

Gibberellins include a large range of chemicals that are produced naturally within plants and by fungi. They were first discovered when Japanese researchers, including Eiichi Kurosawa, noticed a chemical produced by a fungus called *Gibberella fujikuroi* that produced abnormal growth in rice plants. It was later discovered that GAs are also produced by the plants themselves and they control multiple aspects of development across the life cycle. The synthesis of GA is strongly upregulated in seeds at germination and its presence is required for germination to occur. In seedlings and adults, GA strongly promote cell elongation. GAs also promote the transition between vegetative and reproductive growth and are also required for pollen function during fertilization. Application of 50- 100 ppm GA in grapes increases the berry size.

C. Cytokinins

Cytokinins are a group of chemicals that influence cell division and shoot formation. They were called kinins in the past when the first cytokinins were isolated from yeast cells. They also help delay senescence of tissues are responsible for mediating auxin transport throughout the plant and affect internodal length and leaf growth. Cytokinins and auxins often work together and the ratios of these two groups of plant hormones affect most major growth periods during a plant's lifetime. Cytokinins counter the apical dominance induced by auxins. They in conjunction with ethylene promote abscission of leaves, flower parts, and fruits. It is used to induce development of shoot and roots along with auxin, depending on the ratio.

D. Abscisic Acid

Abscisic acid is one of the most important plant growth regulators. It was discovered and researched under two different names before its chemical properties were fully known, it was called *dormin* and *abscicin II*. The name "abscisic acid" was given because it was found in high concentrations in newly abscissed or freshly fallen leaves. This class of PGR is composed of one chemical compound normally produced in the leaves of plants, originating from chloroplasts, especially when plants are under stress. In general, it acts as an inhibitory chemical compound that affects bud growth, and seed and bud dormancy. It mediates changes within the apical meristem, causing bud dormancy and the alteration of the last set of leaves into protective bud covers. In other plants, as ABA levels decrease, growth then commences as gibberellin levels increase. Abscisic acid's effects are degraded within plant tissues during cold temperatures or by its removal by water washing in out of the tissues, releasing the seeds and buds from dormancy. ABA plays a role in closing the stomata. Soon after plants are water-stressed and the roots are deficient in water, a signal moves up to the leaves, causing the formation of ABA precursors there, which then move to the roots. Abscisic acid mostly acts as an antagonist to Gibberellic acid. It is also known as the stress hormone as it helps by increasing the tolerance of plants to different kinds of stress.

E. Ethylene

Ethylene is a gas that forms through the breakdown of methionine, which is in all cells. Ethylene has very limited solubility in water and does not accumulate within the cell but diffuses out of the cell and escapes out of the plant. Ethylene is produced at a faster rate in rapidly growing and dividing cells, especially in darkness. The resulting thicker stem can exert more pressure against the object impeding its path to the surface. If the shoot does not reach the surface and the ethylene stimulus becomes prolonged, it affects the stem's natural geotropic response, which is to grow upright, allowing it to grow around an object. Synthesis of ethylene is inhibited by carbon dioxide and requires oxygen. Ethylene affects fruit-ripening: Normally, when the seeds are mature, ethylene production increases and builds-up within the fruit, resulting in a climacteric.

References

1. Osborne DJ, McManus MT. Hormones, signals and target cells in plant development. Cambridge University Press, 2005, 158. ISBN 978-0-521-33076-3.
2. Classification of auxin related compounds based on similarity of their interaction fields: Extension to a new set of compounds Tomic, S.1,2, Gabdoulline, R.R.1, Kojic-Prodic, B.2 and Wade, R.C.11 European Molecular Biology Laboratory, 69012 Heidelberg, Germany 2Institute Rudjer Boskovic, HR-10000 Zagreb, Croatia
3. Grennan AK. Gibberellin metabolism enzymes in rice. Plant Physiology. 2006; 141(2):524-6. doi:10.1104/pp.104.900192. PMC 1475483 PMID 16760495.
4. Tsai FY, Lin CC, Kao CH. A comparative study of the effects of abscisic acid and methyl jasmonate on seedling growth of rice. Plant Growth Regulation. 1997; 21(1):37-42. doi:10.1023/A:1005761804191.
5. Sipes DL, Einset JW. Cytokinin stimulation of abscission in lemon pistil explants. J Plant Growth Regul. 1983; 2(1-3):73-80. doi:10.1007/BF02042235.
6. Jump up, Feurtado JA, Ambrose SJ, Cutler AJ, Ross AR, Abrams SR *et al*. Dormancy termination of western white pine (Pinus monticola Dougl. Ex D. Don) seeds is associated with changes in abscisic acid metabolism. Planta. 2004; 218 (4):630-9. doi:10.1007/s00425-003-1139-8. PMID 14663585.