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Use of Plant Growth Regulators in Horticultural Crops

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Abstract: -

Plant Growth Regulators (PGRs) are chemical substances that influence plant growth and development even when used in very small amounts. They play an important role in improving the productivity and quality of horticultural crops such as fruits, vegetables, flowers, and plantation crops. Plant growth regulators help in controlling plant height, inducing flowering, improving fruit set, increasing yield, and delaying senescence. These substances either promote or inhibit plant growth depending on their type and concentration. The major groups of plant growth regulators include auxins, gibberellins, cytokines, ethylene, and abscisic acid. In horticulture, PGRs are widely used to improve rooting in cuttings, regulate flowering time, increase fruit size, prevent fruit drop, and enhance shelf life. The proper use of plant growth regulators can significantly increase crop productivity and quality. However, their application should be carefully managed because excessive use may cause negative effects on plant growth. Therefore, understanding the role and application methods of plant growth regulators is essential for sustainable horticultural production.

Keywords: *Plant Growth Regulators, Horticulture Crops, Auxins, Gibberellins, Cytokines, Ethylene, Fruit Set, Flowering, Crop Yield etc.*

Introduction:

Horticulture is an important branch of agriculture that deals with the cultivation of fruits, vegetables, flowers, and ornamental plants. With the increasing demand for high-quality produce, farmers and researchers are continuously exploring new techniques to improve crop productivity and quality. One of the most effective tools used in modern

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horticulture is the application of plant growth regulators.

Plant Growth Regulators (PGRs) are organic compounds, other than nutrients, that modify or regulate physiological processes in plants. They influence plant growth and development at very low concentrations. These compounds may either occur naturally in plants or be synthesized artificially. Plant growth regulators control various plant processes such as seed germination, root development, flowering, fruit development, ripening, and leaf fall.

The use of plant growth regulators has become an important practice in horticultural crop production.

They help in overcoming problems such as poor fruit set, irregular flowering, excessive vegetative growth, and premature fruit drop. By regulating plant growth, these chemicals allow farmers to increase yield, improve quality, and manage crop production more efficiently.

In recent years, the application of plant growth regulators has gained significant importance due to their ability to enhance crop performance under different environmental conditions. They are widely used in fruits like mango, apple, banana, grapes, and citrus; vegetables like tomato and cucumber; and ornamental plants like roses and chrysanthemums. Thus, plant growth regulators play a vital role in modern horticultural practices.

Concept of Plant Growth Regulators

Plant growth regulators are chemical substances that influence plant growth and development by affecting physiological processes within the plant. They act as signaling molecules that regulate cell division, cell elongation, differentiation, and other metabolic activities

1. Growth Promoters

Growth promoters stimulate plant growth and development. They include:

Auxins:

Auxins are responsible for cell elongation and root formation. They are widely used in horticulture to promote rooting in plant cuttings and prevent premature fruit drop. Indole-3-acetic acid (IAA) and Indole-3-butyric acid (IBA) are common examples.

Gibberellins:

Gibberellins promote stem elongation, seed germination, and flowering. They are used in horticultural crops to increase fruit size and improve fruit quality. Gibberellic acid (GA_3) is commonly used in grapes to increase berry size.

Cytokinins:

Cytokinins promote cell division and delay aging in plants. They help in improving shoot growth and increasing the shelf life of horticultural produce.

2. Growth Inhibitors

Growth inhibitors slow down or regulate plant growth.

Ethylene:

Ethylene is a gaseous plant hormone that plays a key role in fruit ripening and leaf fall. It is widely used in horticulture for artificial ripening of fruits such as bananas and tomatoes.

Abscisic Acid (ABA):

Abscisic acid acts as a growth inhibitor and helps plants respond to environmental stress. It also plays an important role in seed dormancy.

Uses of Plant Growth Regulators in Horticultural Crops

1. Root Development

Plant growth regulators such as auxins are widely used to promote root formation in plant cuttings. Auxins like IBA and NAA stimulate the development of adventitious roots, which helps in successful plant propagation.

2. Regulation of Flowering

Plant growth regulators help control flowering time in many horticultural crops. For example, gibberellins can induce flowering in certain plants, while other regulators can delay flowering to match market demand.

3. Fruit Set Improvement

Poor fruit set is a major problem in many fruit crops. Plant growth regulators help improve fruit set by stimulating the development of flowers and fruits. Auxins and gibberellins are often used for this purpose.

4. Prevention of Fruit Drop

Premature fruit drop reduces crop yield significantly. Plant growth regulators such as NAA are used in crops like mango and citrus to prevent fruit drop and increase fruit retention.

5. Increase in Fruit Size

Gibberellins are commonly used in grapes to increase berry size and improve the appearance of fruits. This increases the market value of the produce.

6. Improvement of Fruit Quality

Plant growth regulators improve fruit color, taste, texture, and nutritional value. They help in producing high-quality fruits and vegetables suitable for market demand.

7. Breaking Seed Dormancy

Some seeds remain dormant and do not germinate even under favorable conditions. Plant growth regulators such as gibberellins help break seed dormancy and promote germination.

8. Delaying Senescence

Cytokinins delay the aging process in plants by maintaining chlorophyll content in leaves. This helps extend the shelf life of horticultural produce and ornamental plants.

9. Ripening of Fruits

Ethylene is used for artificial ripening of fruits such as bananas, tomatoes, and mangoes. Controlled ripening helps maintain uniform quality and reduces post-harvest losses.

10. Control of Plant Height

Some growth regulators are used to control excessive plant growth. This is especially useful in ornamental plants and greenhouse crops.

Conclusion

Plant growth regulators play an important role in modern horticultural crop production. They help regulate plant growth, improve fruit quality, increase yield, and enhance the overall productivity of horticultural crops. These substances influence various physiological processes such as root formation, flowering.

Reference

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