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GLIMPSES ABOUT ROLE HORMONES IN PLANTS

Popular Article

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ABSTRACT

Hormones are vital to plant growth, and lacking them, plants would be mostly a mass of undifferentiated cells. The word 'hormone' is derived from a Greek term that means 'to excite.' These Plant hormones are also known as Phytohormones or Plant growth substances. The term 'Phytohormone' was coined by Thimann in 1948. Hormones helps to shape plant by affecting seed growth, time of flowering, sex of flowers, senescence of leaves, and fruits. They also affect the leaf formation, stem growth, fruit development and ripening, plant longevity, and even plant death. Hormones determine the formation of flowers, stems, leaves, shedding of leaves, and the development and ripening of fruit.

Introduction

Hormones are the signal molecules that coordinate the different parts of an organism produced within the plant and present in extremely low concentrations. This can regulate cellular processes in targeted cells locally, then moves to different other functional parts of the plant. These are by cells in one area of the plant - such as the leaves, stems or root - and then transported to a different area of the plant in order to produce a response.

Five major plant hormones have countless functions, and main responses they trigger:

Auxins

It is the first plant hormones discovered and have been studied extensively. Auxins are most commonly found in seed embryos, apical meristems and young leaves and root tips. Example: Indole Acetic Acid (IA). Auxins promotes stem elongation and inhibits lateral growth of buds. Auxin always goes towards the darker side of the plant, causing cells to grow larger than the corresponding cells on the lighter side and moves basipetally in the plant. This produces a curving of the plant stem tip toward the light, a plant movement known as phototropism.

Auxin plays an important role in maintaining Apical dominance and stimulating cell differentiation, stem elongation and regulating fruit development. Most plants have lateral (sometimes called axillary) buds located at nodes .

Buds are embryonic meristems maintained in a dormant state. Auxin maintains this dormancy. As long as sufficient auxin is produced by the apical meristem, the lateral buds remain dormant. This will cause the lateral buds to break

their dormancy and begin to grow. In effect, the plant becomes bushier. Even in fruits without auxins, fruits will often become too small. To overcome this spraying of artificial auxins is done on plants, like in apple, or pears - in order to increase the size of the fruits.

Cytokinins

A hormone which stimulate growth and have anti-aging effects and promotes cell division and influencing cell differentiation and aging of leaves. Because they're produced in roots, cytokinins must travel up through the plant's xylem in order to reach target areas, such as the stems and leaves. Cytokinins have several responsibilities, including working with auxins to stimulate growth and cell differentiation in both stems and roots. However, cytokinins need auxin to induce cell division. The ratio of cytokinins to auxin determines where cells will develop. If cytokinin levels increase, shoots form; if auxins increase, roots form. By themselves, cytokinins don't cause any new tissues to form. Cytokinins also specifically promote growth and development of chloroplasts, responsible for photosynthesis.

A unique role of cytokinins is to produce anti-aging effects on some plant parts. Cytokinins actually provide a younger, healthier look in plants. Florists commonly use cytokinins to make cut flowers look fresh for longer. By adding this hormone to cut flowers, florists are able to slow down the aging process, providing us with prettier flowers for longer.

Gibberellins

It is a hormones produced in meristems of stems and roots. This group of hormones is actually named after a fungus (*Gibberrela fuzikorai*). The fungus caused some rice plants to grow unbelievably tall - even to the point where the rice plants would fall over because the stem was too tall for the roots to support. The rate of cell division, flowering, increases the size of leaves and fruits, seed and bud dormancy, induction of growth at lower temperatures.

Gibberellin helps to stimulate stem cell elongation in plants. The fungus in the rice plants caused too much production of gibberellins and, therefore, too much stems growth. Some dwarf plant species don't produce enough gibberellins to make the stem elongate - causing the short stature. However, gibberellins can be added to plants in order to make them grow to normal heights. Gibberellins work with auxin to cause stem elongation and when fruit is developing. In fact, green seedless grapes are usually sprayed with gibberellins to make them bigger.

Seeds have the problem of not knowing when conditions right for germination. Luckily they do have lots of gibberellins, which are released after seeds take up water (perhaps after a heavy spring rain). After gibberellins are released, the outer layer of the endosperm releases digestive enzymes that break down nutrients in the endosperm and helps plant to grow.

Abscisic acid (ABA)

It is considered as "stress" hormone and one of the most important plant growth regulators. It inhibits the effects of other hormones to reduce growth during times of plant stress. It was discovered and researched under two different names before its chemical properties were fully known, it was called *dormin* and *abscicin II*. Once it was determined that the two compounds are the same, it was named abscisic acid. The name "abscisic acid" was given because it was found in high concentrations in newly abscissed or freshly fallen leaves.

ABA does some important things, even though it doesn't do what it's named for. ABA slows growth and is the main player in seed dormancy. In fact, seeds are so good at taking care of themselves they don't even start growing until conditions are right. The abscisic acid in a seed keeps it dormant. Certain things such as water,

light or even prolonged cold temperatures, cause the ABA to break down and cue germination of the seed.

ABA has another important role in plants: drought tolerance. When water gets scarce and leaves start wilting, ABA production is cranked up in the roots. ABA moves up to the leaves. As it accumulates in the leaves, ABA causes stomata to close, preventing more water loss. When water is plentiful again, the ABA breaks down and stomata reopen.

Ethylene

It is a plant hormone produced in fruits, flowers and aging leaves that promotes fruit ripening**.** It is particularly a interesting plant hormone because it exists as a gas. No other plant hormone is gaseous! There are a few other effects of ethylene, but these vary depending on the type of plant. Sometimes, ethylene will promote the growth and development of roots, leaves and flowers. However, in other species of plants, ethylene inhibits this growth. No matter the type of plant, ethylene is best known for promoting the ripening of fruit. Its effectiveness as a plant hormone is dependent on its rate of production versus its rate of escaping into the atmosphere. Ethylene is produced at a faster rate in rapidly growing and dividing cells, especially in darkness.

Ethylene affects fruit-ripening: Normally, when the seeds are mature, ethylene production increases and builds-up within the fruit, resulting in a climacteric event just before seed dispersal.

The nuclear protein Ethylene Insensitive2 (EIN2) is regulated by ethylene production, and, in turn, regulates other hormones including ABA and stress hormones.

Brassinosteroids

These are a class of polyhydroxysteroids, a group of plant growth regulators. Brassinolide was the first identified brassinosteroid and was isolated from extracts of rapeseed (*Brassica napus*) pollen in 1979. And thses Brassinosteroids have been recognized as a sixth class of plant hormones, which stimulate cell elongation and division, gravitropism, resistance to stress, and xylem differentiation. They inhibit root growth and leaf abscission.

Conclusion

Plant growth regulators are most commonly used by a horticulturist to regulate plant growth. In plant propagation, cuttings are dipped in a rooting hormone to stimulate root development. In greenhouse production, many potted flowering plants, may be treated with plant growth regulators to keep them short. Seedless grapes are treated with plant growth regulators to increase the size of the fruit. In special situations, turf may be treated to slow growth and mitigate the need for mowing. Because plant growth regulators are effective in parts per million or parts per billion, they have little application in home gardening also.

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