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Commentary

Role of Plant Hormones in the Plant Growth and Crop Yield

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DESCRIPTION

Plant growth and development as well as interactions with microorganisms like endophytic fungus depend heavily on Phytohormones. *Piriformospora indica*, an endophytic root-colonizing fungus, boosts the resilience of colonized plants to diseases, insects, and abiotic stress while fostering plant growth and performance. Phytohormones are essential for both interplant and systemic signal transmission. *P. indica* stimulates growth, blooming period, differentiation, and local and systemic immune responses through interfering with the production and signaling of plant hormones. In reaction to the bacteria, plants modify the hormone levels in their roots to limit colonization and fungal growth. The knowledge that is currently known about the functions of Phytohormones in advantageous root-microbe interactions raises new concerns about how *P. indica* modifies the metabolism of plant hormones to enhance the advantages for both parties in the symbiosis.

Generally speaking, plant hormones may be divided into two divisions based on their physiology. Plant growth-promoting processes such cell division, cell elongation, seed and fruit development, and pattern of differentiation are all carried out by Phytohormones, which belong to class one. The second class of hormones, on the other hand, is crucial in how plants react to biotic and abiotic stressors. Other hormones that are important to plants include strigolactones, brassinosteroids, salicylic acid, jasmonates, and others. Plant hormones make great candidates to improve plant development and/or mediate abiotic and biotic challenges in agriculture due to their biochemical signaling network and their crosstalk capability. Finally, investigating plant hormones and their uses is one of the future directions of plant hormone study.

Under both ideal and stressful conditions, Phytohormones (PHs) are essential for controlling a number of physiological and biochemical processes that control plant development and productivity. Because they activate signaling pathways, the interplay of various PHs is essential for plant survival in stressful situations. The precise tuning of physiological processes in plant architecture by hormonal cross regulation enables plants to develop under less-than-ideal growth circumstances. The function of PHs such abscisic acid, salicylic acid, ethylene, and jasmonates in the plant responses to environmental stressors has recently come to light in a number of research. Under both normal and stressful circumstances, the role of cytokinins, gibberellins, auxin, and relatively new PHs such strigolactones and brassinosteroids in plant growth and development has been demonstrated.

The first plant melatonin receptor was recently discovered, which paved the way for this regulating molecule to be recognized as a novel plant hormone. However, this chapter has been expanded to include polyamines, which are not PHs. Numerous microorganisms create and emit hormones that aid plants in absorbing nutrients including N, P, and Fe. Such bacteria can be used exogenously to assist plants in repairing nutritional deficiencies caused by abiotic stressors. This chapter concentrated on the most recent advancements in our understanding of PHs and their roles in anticipatory, signaling, cross-talk, and response mechanism activation during abiotic stressors. We suggest using hormones and microbes as viable strategies for managing crop stress in light of the function that hormones play and the capacity of bacteria to produce hormones.

Since then, numerous scientific developments have been made to enhance photosynthesis, such as the genetic engineering of the C4 pathway into C3 rice (*Oryza sativa*), a method that has already shown some promise in the overexpression of transcription factors in the Cytokinin (CK) signaling network that affect chloroplast volume. The strategy has several drawbacks, such as a higher ATP consumption and the need for future changes in the vasculature to support this increased energy requirement, which can be aided by better understanding how Phytohormones affect the control of photosynthesis. Improving photosynthetic rates in C3 plants and switching plants from C3 to C4 photosynthesis to boost yields, which can solve future concerns of global food security, require knowledge of the hormonal influence on photosynthesis and its management. This can also help with a better comprehension of source-sink interactions and whole-plant responses to stress, two

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current hot subjects in the use of agro-biotechnology in the agro-food industry.

Fruiting bodies have developed in angiosperms to promote in seed development and subsequent dispersion. All plant species produce a variety of fruit, from dry to fleshy varieties. According to evolutionary research, species that generate dry fruit are the progenitors of species that produce soft fruit, which explains why the two varieties of fruit have a lot of the same embryonic processes. A high-level regulatory network of transcription factors governing fruit growth has been discovered in Arabidopsis, the model plant for dry fruits. Similar to this, research on the tomato, a model for fleshy fruits has revealed fresh information about the networks that regulate ripening. Strong parallels in the molecular circuits regulating development and maturity between dry and fleshy fruits, as well as among various fleshy fruits, suggest that regulatory networks are preserved over a broad range of angiosperm fruit.