ISSN: 2157-7471
Journal of Plant Pathology & Microbiology

OPEN ACCESS Freely available online

Commentary

# Role of Microbes in Plant Growth

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## ABOUT THE STUDY

Plant growth and development include close coordination of spatial and temporal tissues of cell division, cell proliferation, and cell differentiation. Orchestration of these events requires the exchange of signaling molecules between roots and shoots. It can be affected by both biological and abiotic factors. The interaction of plants with their associated microorganisms has long been of interest as knowledge of these processes can lead to the development of new agricultural applications. Plants produce a variety of organic compounds, including sugars, organic acids, and vitamins. These compounds can be used as nutrients or signals by microbial populations. Problems related to the use of harmful fertilizers and pesticides have a significant negative impact on the environment and human health. There is growing interest in the use of beneficial microorganisms for the development of sustainable agricultural food systems. Successful microbial inoculation requires colonization of the root system, establishment of active interactions, and environmental competition with soil-dwelling natural microorganisms through lysocompetence properties.

Several microscopic and molecular methods-based approaches that rely on cultures have been developed to track biological vaccines on soil and plant surfaces over time. Culture-dependent methods are commonly used to estimate the persistence of biovaccines, but it is difficult to distinguish inoculated organisms from the native population based on morphological characteristics. Therefore, these methods should be used in a way that complements the culture-independent approach. Microbial interactions play an important role in the ecology and performance of plant communities. The microbial root community of plants is highly dependent on the genotype of the host. Several studies have shown that plant genotype has a small but significant effect on the composition of entophytic, rhizosphere, or phyllospheric microbial communities.

Plants are ubiquitous in the environment and are infected with microorganisms that colonize plant tissues both externally and internally. In soil, microorganisms promote the nitrogen cycle, releasing nutrients that are absorbed by the roots of plants. In soil, certain microorganisms can produce metabolites and colonize potential phytopathogens, reducing the pathogen's pathogenicity to plants. In colonizing plants, microorganisms can cause disease, leading to tissue damage and death. It is important to understand the various mechanisms used by microorganisms in the etiology or regulation of disease and is within the scope of this section.

The microorganisms can also colonize plant tissues without developing the disease. These microorganisms may be endophytes that inhabit the internal tissues of the plant, or they may be epiphytes that colonize only the surface of the plant. Non-pathogenic or symbiotic microorganisms in plant tissues interact with plants in unknown ways during development, affect plant growth, and are often more present in tissues than in the absence of microorganisms brings more growth. Microbes that internally colonize plants also frequently result in increased biotic and abiotic stress tolerance in host plants, again by uncertain mechanisms. There are indications that certain microbe`s shuttle nutrients between soils and plant roots, and the mechanisms by which this occurs are relevant to this section.

Diverse compounds released by different parts of the root system create an unique environment in the surrounding soil, which is known as the rhizosphere. Lowmolecular weight compounds represent the main portion of exudates and consist of sugars, amino acids, organic acids, phenolics, vitamins and various secondary metabolites. Highmolecular weight compounds consist of mucilage and proteins, while carbon dioxide, certain secondary metabolites, alcohols and aldehydes constitute volatiles.

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**Received:** 31-Dec-2022, Manuscript No. JPPM-22-594; **Editor assigned:** 04-Jan-2022, PreQC No. JPPM-22-594 (PQ); **Reviewed:** 18-Jan-2022, QC No. JPPM-22-594; **Revised:** 25-Jan-2022, Manuscript No. JPPM-22-594 (R); **Published:** 31-Jan-2022, DOI:10.35248/2157-7471.22.13.594
**Citation:** Pieterse D (2022) Role of Microbes in Plant Growth. J Plant Pathol Microbiol. 13:594.