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Exploring the Role of Probiotics as Biostimulants and Biofortifiers in Seed Germination: A Research Overview

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Introduction

The use of probiotics as biostimulants and biofortifiers in seed germination has gained significant attention in recent years, driven by the increasing need for sustainable agricultural practices and the desire to improve crop yields. Traditionally, probiotics are associated with human health, particularly in promoting gut health. However, emerging research suggests that certain beneficial microorganisms can play a similar role in plants, enhancing growth, improving seed germination, and increasing nutrient content. This article explores the potential of probiotics as biostimulants and biofortifiers in seed germination, highlighting their mechanisms of action, benefits, and potential challenges. Probiotics are live microorganisms that confer health benefits to the host when administered in adequate amounts. In the context of agriculture, probiotics are microorganisms, primarily bacteria and fungi, that can promote plant health and growth. These beneficial microorganisms can colonize plant roots, improving plant resilience and overall productivity. Probiotics are often referred to as biostimulants when they enhance plant growth and development, and as biofortifiers when they improve the nutritional content of plants. Biostimulants are substances or microorganisms that, when applied to plants, stimulate natural growth processes and enhance plant health [1-3].

Description

Biofortifiers, on the other hand, are specific microorganisms or compounds that increase the nutrient content of crops, such as essential vitamins, minerals, and amino acids. Both biostimulants and biofortifiers are critical in modern agriculture as they offer sustainable alternatives to traditional chemical fertilizers and pesticides. Seed germination is a critical stage in the life cycle of a plant, influencing crop yield and overall plant health. During germination, seeds absorb water, swell, and begin to grow into seedlings. However, this process can be affected by various factors, including soil quality, temperature, moisture, and the presence of pathogens. Certain probiotic microorganisms have been shown to enhance the uptake and assimilation of nutrients from the soil. For example, some species of Bacillus and Pseudomonas can solubilize phosphate in the soil, making it more available to plants. Additionally, probiotics can help in the synthesis of certain vitamins and amino acids, such as folate and tryptophan, which are essential for plant growth and development [4,5].

Conclusion

Probiotics hold great potential as biostimulants and biofortifiers in seed germination, offering sustainable solutions to improve crop growth, enhance seedling vigor, and increase the nutritional content of crops. Through their ability to produce plant growth regulators, enhance nutrient uptake, suppress diseases, and improve water retention, probiotics contribute to healthier and more resilient crops. As research in this field continues to advance, probiotics may play a critical role in shaping the future of agriculture, helping to meet the growing global demand for food while promoting sustainability and environmental responsibility.

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Conflict of Interest

None.

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