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Bacteria that Promotes Plant Growth: Mechanisms and Applications

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Abstract

The terrible outcome of increased environmental harm and population pressure around the world is that there may soon not be enough food being produced to feed everyone. Therefore, it is imperative that agricultural productivity rise dramatically over the next few decades. In order to achieve this, agricultural practises are changing in favour of a strategy that is more environmentally friendly and sustainable. This includes the expanding use of genetically modified organisms, such as bacteria and plants, in conventional agricultural methods. Here, several ways that bacteria encourage plant growth will be discussed and taken into account. Plant growth-promoting bacteria are anticipated to start taking the place of pesticides in agricultural, horticultural, forestry, and environmental cleaning methods in the not too distant future. Although there may not be a s ays conveye. m ж l ᴀ ƨ y ᵀ я te

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ere are currently around 7 billion people in the world and this number is expected to grow to around 8 billion around 2020. When considering both the expected increase in world population and the increasing environmental damage. As a outcome of increasing levels of industrialization, it is clear that in the next ten to twenty years, feeding the entire world population will be an uphill challenge, a problem that will only get worse as time goes on. ere is absolutely no time to waste;

possible to genetically engineer plants to x their own nitrogen. ese ideas seem a bit naive these days. Since nitrogen xation requires a large amount of energy in the form of ATP, it is advantageous if the bacterial carbon source is directed towards oxidative phosphorylation, which promotes ATP synthesis, rather than glycogen synthesis, leading to the storage process [9]. In one experiment, a strain of Rhizobium tropical was created by knocking out the glycogen synthesis gene. Treatment of bean plants with this modi ed bacteria outcome in a signi cant increase in the number of nodules formed and an increase in dry weight of the plants compared with treatment with the wild-type strain. is is one of the very few examples of scientists genetically engineering the nitrogen xation machinery of bacteria and achieving increased levels of nitrogen xation

Oxygen is both a Nitrogenase enzyme inhibitor and a negative regulator of nif gene expression; however, it is required for Rhizobium spp. bacterial respiration. In order to prevent oxygen from inhibiting nitrogen xation, and at the same time provide enough oxygen for the respiratory nodule bacteria, it can introduce bacterial hemoglobin, which binds to free oxygen. A er transfecting Rhizobium etli with Vitreoscilla sp. hemoglobin gene, at low dissolved oxygen levels, rhizobial cells had a respiration rate two to three times higher than that of the unconverted line. In the greenhouse, a er inoculation of R. etli containing hemoglobin in the legume plants, the legume plants had a nitrogenase activity 68% higher than that of the wild R. etli inoculated plants. Etli [10]. A mild, localized increase in plant ethylene levels is usually produced a er legume plants are infected with Rhizobium spp. Some strains of rhizobia are able to increase the number of nodules formed on the roots of host legume plants by limiting ethylene rise by synthesizing a small molecule called rhizobitoxin, which is chemically inhibited. activity of the enzyme ACC synthase, an enzyme that biosynthesizes ethylene. In addition, some strains of rhizobium produce the enzyme ACC deaminase that removes some of the ACC before it can be converted to ethylene.

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In addition, in cold and temperate climates, many plant fungal pathogens are most destructive when soil temperatures are low. In these environments, cold tolerant biocontrol PGPBs are likely to be more e ective in the eld than thermophilic biocontrol strains. Nearly twenty years ago, several researchers rst reported td itd.3(s8(29(s)8(-7.9(sp)-9(rb(r)a6(r legub)16( )19(a9(n2(s o)de