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Plant Growth Promoting Rhizobacteria In Rice And Aerobic Rice

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Introduction

Present-day agriculture relies heavily on N fertilizers, which are developed using fossil fuel as the energy supply costing more than US$ 45 billion per year to produce. Manufacturing fertilizer for today's agriculture requires fossil fuel energy equal to about 100 million mg of oil per year. Oil is a non-renewable resource and its oxidized products pose hazards to human health and to the environment. Moreover, fossil fuel reserves are finite and therefore unsustainable in the long term. However, use of a renewable energy source such as solar power could substitute the utilization of fossil fuel and would be highly sustainable for the manufacture of chemical N fertilizer, though at the present juncture the exploitation of such energy source is considered as a far-fetched idea and may take several years to achieve this.

Nitrogen is the nutrient that most often limits rice production. Rice requires 1 kg of nitrogen to produce 15–20 kg of grain. In the tropics, lowland rice yields 2–3.5 Mg ha−1 using naturally available N derived from biological nitrogen fixation (BNF) by free-living and plant-associated diazotrophs and from mineralization of soil N. This system was sustainable for thousands of years when it supported approximately

Greater production of cereals brings forth higher production cost and pollutes the soil environment due to excessive use of chemical fertilizers. Therefore, crop scientists are exploring an alternative source namely biofertilizers which are cost effective and environment friendly.

In the biofertilizer technology, Rhizobium-legume is most common and widely used in different countries. Recently, it is also found that rhizobia can make an association with graminaceous plants such as rice, wheat, maize, barley millets and other cereals some time as endophytic without forming any nodule-like structure or causing any disease symptoms. Recent findings showed both more crop enhancing and biofertilizer attributes in cereal crops due to rhizobial inoculation. In addition, plant nutrients like P, K, Ca, Mg and even Fe accumulation were also observed. further research in this area will be able to develop a

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sustainable biofertilizer technology for greater and environment friendly cereal production system.

Plant growth promoting rhizobacteria

Rhizobium spp. are plant growth promoting rhizobacteria and some are endophytes which can produce phytohormones, siderophores, HCN, solubilize sparingly soluble organic and inorganic phosphates and can colonize in the roots of many non-legumes .With the use of high performance liquid chromatography or GC-MS, auxin synthesis by Rhizobium spp. has now been unequivocally demonstrated by researchers. Growth promotion of rice cultivars Giza-177, Sakha-102, L204 (Indica) and M202 (Japonica) were observed by the inoculation of Rhizobium.

The association increased plant growth at different growth stages such as enhanced seed germination, increased shoot length, leaf chlorophyll content, total dry matter, grain yield, N content and yield attributes. Rhizobium spp. are capable of synthesizing IAA in absence of tryptophan but the exogenous application of tryptophan increases IAA production several fold.

Increased rice root systems with a significantly greater absorptive surface area and extra cellular bioactive metabolites that can promote rice root development resulting in expansive root architecture were also observed by the application of Rhizobium. increased N uptake by rice plants inoculated with rhizobia.

Types Of Rhizobacteria Spp Used In Rice

Host plant	Rhizobia	Colonization
Rice	*Bradyrhizobium*	Rhizosphere
	Rhizobium leguminacerum bv trifolii	Roots
	R .vietnamiensis	Rhizosphere
	R . leguminacerum	Rhizosphere

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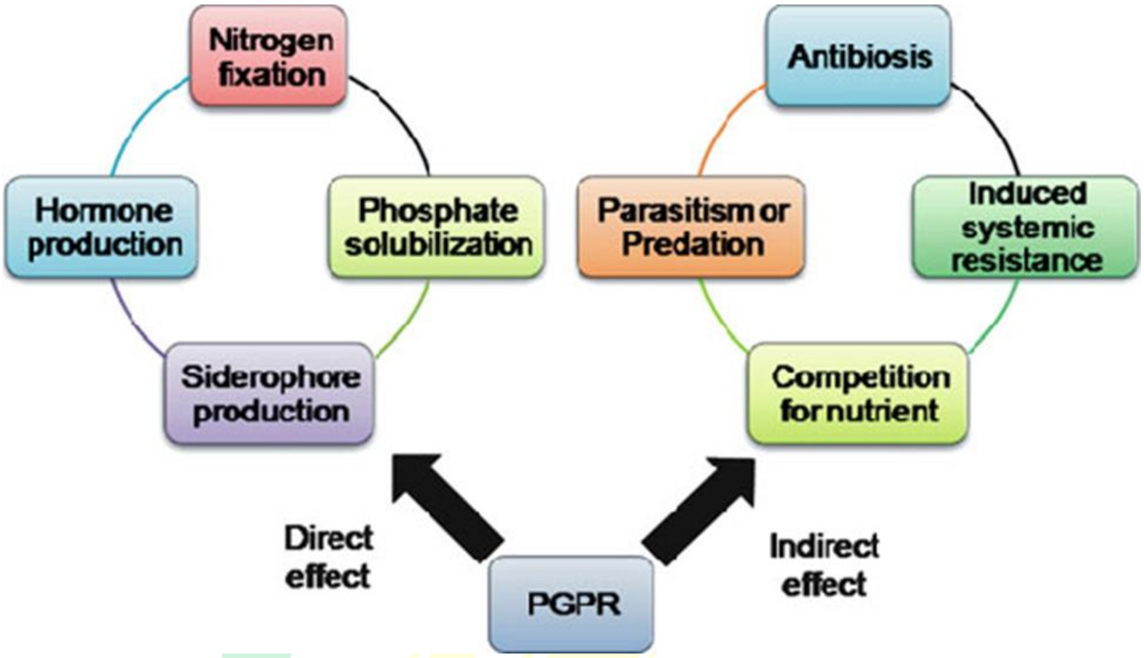
Advantages



Conclusion

The combined PGPR and rhizobia inocula reduced the plant dependence on chemical N-fertilizer through their synergistic BNF activities and contributed up to 22% of N_2 fixed from the atmosphere. This was achieved with a reduction in N-fertilizer application there by Faster seed germination Increased shoot height, leaf chlorophyll content, and dry weight Increased root length, number of roots, root surface area Increased plant dry matter Increased straw yield and N content number of panicles per hill and grains and spikelets per hill.