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Plant Growth Promoting Rhizobacteria Can Biofortify Zinc in Maize Grains

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Abstract

Zinc malnutrition is the global health problem that severely affects brain and physical health especially that of pregnant women and children. Scientists over the globe are working to improve micronutrient concentration in food through a number of approaches which include pharmaceutical, agronomic and breeding techniques. Zinc biofortification through zinc solubilising plant growth promoting rhizobacteria commonly called zinc solubilising bacteria (ZSB) is one of the novel biotechnological approaches that can biofortify cereal grains through increasing bioavailability and accessibility of nutrients. We isolated and screened a number of such strains which were promising to increase zinc bioavailability. These strains were tested to improve zinc concentration in maize grains in growth room and pot experiments. Finally, four most promising Zn solubilising *Bacillus* strains viz. *Bacillus* sp. ZM20, *Bacillus aryabhattai* ZM31, *Bacillus subtilis* ZM63, and *Bacillus aryabhattai* S10 were evaluated in field experiments to check their potential to biofortify zinc in maize grains in separate and co-inoculated combinations. These strains significantly improved plant growth, yield, and zinc concentration in grains in field experiments. More biofortified Zn and iron (Fe) concentration in grains were obtained due to co-inoculation combination with *B. aryabhattai* S10 and *B. subtilis* ZM63 strains that was significantly higher than control. These results suggested that Zn solubilising *Bacillus* strains have potential to be used as bio-inoculant that can contribute to growth and yield promotion as well as nutrient acquisition especially zinc in maize grains. It is recommended to use tested strains as potential bio-inoculants for Zn biofortification under the nutrient deficient alkaline soil conditions.

Keywords: *Bacillus* strains, biofortification, malnutrition, *Zea mays*, Zn solubilisation