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RESEARCH PAPER

Changes of microbiome in response to supplements with silver nanoparticles in cotton rhizosphere

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Abstract

The current study focuses on analyzing the effects of supplements containing silver nanoparticles (AgNPs) on plant growth and rhizospheric bacterial communities. Specifically, the impact of AgNP supplements was assessed on both plant growth promoting traits and bacterial communities in the soil. To do this, a screening process was conducted to select bacteria capable of synthesizing AgNPs through extracellular biosynthesis. UV-Visible spectrophotometer, Fourier transform infrared, X-ray diffraction, scanning electron microscope, and field emission scanning electron microscopy all confirmed, produced AgNPs is in agglomerates form. The resulting AgNPs were introduced into soil along with various supplements and their effects were evaluated after 10 days using next generation sequencing (Illumina—16S rDNA V3–V4 region dependent) to analyze changes in bacterial communities. Seed germination, root-shoot biomass and chlorophyll content were used to assess the growth of the cotton plant, whereas the bacterial ability to promote growth was evaluated by measuring its culturable diversity including traits like phosphate solubilization and indole acetic acid production. The variance in Bray–Curtis β diversity among six selected combinations including control depends largely on the type of added supplements contributing to 95%–97% of it. Moreover, seed germination improves greatly between 63% and 100% at a concentration range of 1.4 to 2.8 mg/L with different types of supplements. Based on the results obtained through this study, it is evident that using AgNPs along with fructose could be an effective tool for promoting *Gossypium hirsutum* growth and enhancing plant growth traits like profiling rhizospheric bacteria. The results that have been obtained endorse the idea of boosting the growth of rhizospheric bacteria in a natural way when AgNPs are present. Using these supplements in fields that have been contaminated will lead to a better understanding of how ecological succession occurs among rhizospheric bacteria, and what effect it has on the growth of plants.

CONFLICT OF INTEREST STATEMENT