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Nano Fe Induced Bacterial Polysaccharide for Soil Aggregation and Moisture Retention under Arid Environment

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The moisture retention capacity in arid soils is very low due to low organic matter and less aggregate stability. As Fe is the structural component of polysaccharide, an attempt was made to develop nano-induced polysaccharide powder to overcome the problem in arid soils. Nanoparticles of iron were synthesized from the arid soil based fungus *Aspergillus flavus* TFR-7 (NCBI Accession No. JQ675294) and characterize by dynamic light scattering (DLS) technique for size distribution study on the basis of hydrodynamic diameter and further morphological validation was done by using the electron microscopy techniques such as TEM, HR-TEM and SEM. Elemental proportion and purity of bio-transformed product were analyzed through electron dispersive X-ray spectroscopy. It was found that all the 100% nanoparticles were in the range between 8 and 13 nm at least at one dimension and showing irregular shapes with high monodispersity in size. The biosynthesized iron nanoparticles were sprayed on bacteria *Bacillus subtilis* JCT-6 (NCBI GenBank Accession No. JQ675302), a unique polysaccharide producing microorganisms isolated and developed from the arid soils. The results showed 110% more exo-polysaccharide production over control. The nano- induced exo-polysaccharide was dried in powder form and characterize by electrophoresis and FTIR spectroscopy. The polysaccharide powder (1% w/v) were applied in soil resulted an enhancement of soil aggregation (62%) and moisture retention capacity (48%) within a month time. The result suggested that nano Fe-induced bacterial polysaccharide may help in reducing erodibility of arid soils, increasing soil moisture retention, and more rhizospheric microbial build-up beside the improvement in the soil organic matter content.