

Biosynthesis of Nitrogen Nano-particles

*Mandira Barman¹, J.C. Tarafdar² and S.C. Datta¹

¹Division of Soil Science and Agricultural Chemistry, Indian Agricultural Research Institute, New Delhi-110012

²Central Arid Zone Research Institute, Jodhpur

E-mail: *mandira.ssaciari@gmail.com

Abstract—An investigation was undertaken to synthesize nitrogen (N) nano-particle biologically using bacterial enzymes. For this purpose several soil bacteria were isolated from the agricultural farm of Central Arid Zone Research Institute (CAZRI) located in Jodhpur, Rajasthan, India. A laboratory experiment was conducted to assess the compatibility of each bacterial isolate against varying concentration of different salts of N viz. ammonium sulphate, ammonium nitrate, ammonium chloride and potassium nitrate. Out of all bacterial isolates, three (bacteria-2, bacteria 4 and bacteria-7) showed positive growth in NH_4NO_3 salt solution and were selected and used for biosynthesis of N nano-particle. Results indicate that bacteria-2 and bacteria-7 were able to produce nano-particles in NH_4NO_3 salt solution. Whereas, bacteria-4 failed to produce nano-particles in NH_4NO_3 salt solution. Intensity distribution of bio-transformed salt solutions using extracellular enzymes of bacteria-2 in 1 mM of NH_4NO_3 salt solution after 24 hours of incubation indicate that particle size ranges between 1.8 and 99.4 nm and possess an average size of 42.9 nm. Bacteria-2 was able to produce 92.9% nano-particles from salt solution. The polydispersity index (PDI) was 0.065 shows high monodispersity of the particle in water which was used as solvent. Intensity distribution of bio-transformed salt solutions using extracellular enzymes of bacteria-7 in 1 mM of NH_4NO_3 salt solution only after 3 hours of incubation indicate that particle size ranges between 2.2 and 97.9 nm and possess an average size of 68.3 nm. Bacteria-7 was able to produce 70.6% nano-particles from salt solution. The polydispersity index (PDI) was 0.955 shows high monodispersity of the particle in water which was used as solvent.