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Chemical And Biological Synthesis, Characterization and Control Release Pattern of Iron Nanoparticles (Fe Nps) Under Incubation Experiment in *Typic Haplustepts* and *Typic Ustifluvents* Soil

SATDEV ROKANA [1], NINTU MANDAL [1,*], MAHENDRA SINGH [1], AMIT KUMAR PRADHAN [1], MAINAK GHOSH [2], SOUVIK SADHU [1], SHRUTI KUMARI [1], RAKESH KUMAR [1]

[1] *Department of Soil Science and Agricultural Chemistry, Bihar Agricultural University, Sabour, Bhagalpur- 813210, India*
[2] *Department of Agronomy, Bihar Agricultural University, Sabour, Bhagalpur- 813210 India*

Abstract: *Deficiency of Fe is a widespread phenomenon globally. Conventional Fe fertilizer of $FeSO_4.7H_2O$ reported to have very low Fe use efficiency (1-5%). Hence, technological interventions need to be explored for increasing Fe use efficiency. Chemical and biological synthesized nano Fe nanoparticles were characterized by employing X-ray diffraction; Scanning Electron Microscopy, and Dynamic Light Scattering techniques. Fe (Chem) and Fe (Bio) were characterized in comparison with Fe-EDDHA and $FeSO_4.7H_2O$ in laboratory incubation experiment. DTPA extractable Fe, Mn, Zn and Cu were measured during incubation periods of 0 to 60 days in two soils namely Typic Haplustepts (Alluvial) and Typic Ustifluvents (Calcareous). Released pattern of Fe in two soils showed significantly higher under Fe-NPs (Bio.)> Fe (Chem.) > Fe-EDDHA followed by $FeSO_4.7H_2O$ at different incubation days i.e. 0, 15, 30, 45 and 60 days. DTPA extractable Fe released from Typic Halpustpts (37.56 mg kg^{-1}) and Typic Ustifluvents (36.05 mg kg^{-1}) were significantly higher under bacterial synthesized nanoscale Fe followed by chemically synthesised Fe nanoparticles at 60 days after incubation, respectively. As far as Fe availability and control-released pattern were concerned, biologically synthesized nano-Fe was far more efficient than chemical synthesized novel Fe-nanoparticles followed by Fe-EDDHA and conventional $FeSO_4.7H_2O$. Typic Haplustepts (Alluvial) soil released higher Fe followed by Typic Ustifluvents (Calcareous) soil during incubation periods. Therefore, biological and chemical synthesized nano-Fe function with better ease than conventional applied micronutrients.*

Keywords**:** Amending iron deficiency; DTPA-Fe; Dynamic Light Scattering; Iron deficiency; Scanning Electron Microgram; X-ray diffraction.