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Biosynthesis of nanoparticles and its application in agriculture

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Abstract

Nanotechnology is the revolutionary technology where the particle size ranges between 1 and 100 nm at least in one dimension. Nanoparticles have better chemical reactivity, biological activity and catalytic behaviour which may be exploited for the benefit of mankind. Biosynthesized nanoparticles are more important in agricultural sciences due to their stability (> 90 days) as they are naturally encapsulated by mother protein. Thirtynine organisms identified in our laboratory which have the potential to synthesize of N, P, K, Mg, Fe, Zn, Ti, Au, Ag and Pt nanoparticles. In general, agricultural important nanoparticles are applied to the foliar mode at two weeks old plant. Aerosol spray, lower concentration < 5 ppm, particles of size < 20 nm and cube-shape may help more penetration both in plants and microorganisms. Nanoparticles enter into plants through cuticle, stomata, stigma, root tips, cortex, lateral root junction and wounding. It may enhance prevention of membrane damage and stress tolerance. Improvement in root length, root area, chlorophyll content, enzyme activities, and protein content was also noticed. In general, three times efficiency of nano-nutrient was observed after using biological nanoparticles. Nano-induced polysaccharide powder helps more moisture retention, C and microbial build up in arid and semi-arid areas. In general 15-50% improvement in crop yield, 8-100 times improvement in nutrient use efficiency was noticed with the application of biosynthesized nanoparticles to different crops. The early maturity was also noticed in vegetable due to nanoparticle application. Thus, nanotechnology can be an important part of the future agriculture and food industry.

Biography

J. C. Tarafdar did his M. Sc. & Ph. D. from Indian Agricultural Research Institute, New Delhi and Post Doctoral Research in Göttingen University, Germany. He is a DAAD, AvH, NAAS, ISSS, ISSRS and National Fellow. Dr. Tarafdar was published 286 research articles in reputed journals including 2 books and 28 book chapters. He has four patents and 39 potential organisms for nanoparticle production. Dr. Tarafdar received many awards most notable are Sukumar Basu Memorial Award, IMPHOS-FAI Award, Bharat Jyoti Award, Prof. S. K. Mukherjee Memorial Award, Prof. R. S. Murthy Memorial Award and Glory of India Gold Medal.