From the Patron

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SMART FERTILIZERS

Chemical fertilizers have significant role in ensuring food security to the growing world population but, the low-average nutrient use efficiency of conventional chemical fertilizers to come up with feasible alternatives that have minimum environmental and human health hazards. Though solutions like controlled release fertilizers (CRF) and slow release fertilizers (SRF) are already in the market research efforts to develop more nutrient efficient fertilizers are still in progress throughout the world. Nano fertilizers are the latest entry to the list. Nano fertilizers are also known as SMART FERTILIZERS due to their smart delivery system of plant nutrients to specific targeted sites.

Unlike conventional chemical fertilizers, nano-fertilizers mostly available as encapsulated nano nutrient particles, nano nutrient particles coated with polymeric film or as emulsions. Requirement of these smart fertilizers in small doses to meet the nutrient requirement may make them attractive to the farmers as farmers need to invest a lot of time in fertilizer application during each crop season. Also, usability of nano fertilizers as *in vitro* (hydroponics and aeroponics) and *in vivo* (soil application and foliar spray applications) makes them ideal for small home gardens too. The small dimensioned nano nutrient particles enable interaction with larger surface areas of the plant and that in turn lead to better nutrient uptake by crop plants.

ICAR-Indian Institute of Soil Science has also been engaged with research in the field of nanotechnology in the past few years in order to develop environmental friendly nano-fertilizer materials as well as to study the nano-particle delivery mechanism and internalization in plant systems. The institute has developed a protocol for the preparation of nano particles from rock phosphate (RP) as well as from mineral ores containing potassium, zinc etc. Moreover, in order to supply the required quantity of Zinc to the plants a protocol was also developed for seed coating with nano ZnO powder.

Studies on application of smart fertilizers reported both positive and negative remarks on their ability to affect crop growth. Research associated with smart fertilizers is still a growing area as more efforts are required to unravel the impact of the technology to environment and human health.

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