

### **Abstract for General Public**

Nanotechnology has been playing a crucial role in 21<sup>st</sup> century in solving various problems in the field of agriculture, electronics and medicine. The broad range of applications shown by nanomaterials is due to the large surface area of the particles because of their small size (<100 nm in one dimension). The unique physico-chemical properties of nanoparticles, different from the bulk material, have attracted the attention of several workers to harness the multiple functionalities of nanoparticles. Rapidly growing world population simultaneously harmonized with increase in the agricultural production to meet the future food demands. Given the limited additional arable lands and scarce water resources in the world and effective management of fertilizers is required to achieve the massive increase in agricultural production. Application of innovative nanotechnology in agriculture is regarded as one of the promising approaches. Investigation of the nanomaterial approaches in agriculture is required, if global food production and demands are to be met in an environmentally and economically sustainable manner.

The use of conventional chemical fertilizers at high rates and for a long period in the agricultural sector has caused serious issues; like loss of soil fertility, decreasing organic content of soil etc. In the present study an attempt is made to enhance the agricultural production using modern nanotechnology with micro irrigation systems. Here calcium carbonate coated nanomaterials of oxides of micronutrients, will be encapsulated in casein with biocatalyst like proteases are proposed as nanocomposite or nanofertilizers. The encapsulation technique is used to grasp the nutrient inside the carrier with polymer and steadily release nutrient to crop. Enabling nutrient carriage to the rhizosphere region and minimize nutrient loss and further improving the efficiency of applied Nano fertilizer

**1st stage:** Synthesis of individual nanomaterials of macronutrients and micronutrient elements -zinc oxide, copper oxide, magnesium oxide, and iron oxide, using fungus, which is extracellular process and an eco-friendly approach.

**2nd stage:** The synthesized nanomaterials will be encapsulated in casein micelle with proteases. Aggregation of these materials will be coated with calcium carbonate nanoscale shell.

**3rd stage:** Pot studies using maize, wheat or beet root by randomized complete block design to compare the effect of proposed nanofertilizer and conventional fertiliser regime.

Current agrochemicals are already expensive. It has been suggested that nanoagrochemicals may be superior to conventional products and great expectations are placed in the applications of nanotechnologies in the sector. Reducing the use of agrochemicals significantly to mitigate environmental contamination. This study will provide an efficient fertilizer delivery system to increase agricultural production. Experiments carried out to synthesize calcium carbonate nano complexes with entrapped casein with micronutrients as fertilizer will provide a knowledge base to improve this strategy further. Deliverable of this work includes an efficient and cost effective nano fertilizer which is expected to reduce pollution due to conventional fertilizations systems. This strategy can be developed further to produce nano complexes with the nutrients as per demand of the agricultural sector.