

Nano-based slow releasing fertilizers for enhanced agricultural productivity

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Abstract

Nutrient losses from conventional fertilizers are one of the challenges being faced in the agricultural sector. Nano fertilizers are promising candidates for the fertilizer industry with a huge potential to improve nutrient retention for optimal growth. We report the synthesis and application of a slow releasing nanocomposite fertilizer with a high potential to sustain crop production. Nanotechnology is an emerging technology with a potential to improve agricultural yield by taking advantage of the salient features of nanostructured materials. Nano-encapsulated conventional fertilizers help in slow and sustained release of nutrients over an extended period of time. Comparative studies on the performance of the nanocomposite fertilizer and a conventional Compound D. Nitrogen, Phosphorus and Potassium (NPK) fertilizer were done. The nanocomposite fertilizer was characterized using Field Emission Scanning Electron Microscopy (FESEM) for surface studies and particle size analysis, Fourier Transform Infrared Spectroscopy (FTIR) for chemical composition studies, Powder X-ray Diffraction (P^oXRD) for structural analysis and Energy Dispersive Spectroscopy (EDAX/EDS) for elemental composition analysis, Brunauer-Emmett-Teller (BET) for surface analysis. The slow release fertilizer exhibited a superior performance over the bulk or conventional fertilizers for instance, phosphate leaching tests conducted for a period of 50 min showed a leached phosphate concentration of 0.002 mol/dm³ and 0.008 mol/dm³ respectively for the slow release nano fertilizer and conventional NPK fertilizer respectively. The research work has revealed the huge capability of nano-based slow releasing fertilizers in improving plant nutrient availability for enhanced growth. It was realized that nanotechnology can stimulate the generation of much more cost effective and smarter fertilizers for improved crop yield copyright information to be updated in production process.