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In vitro antimicrobial properties of carboxymethyl cellulose spray coated copper-montmorillonite nanocomposites

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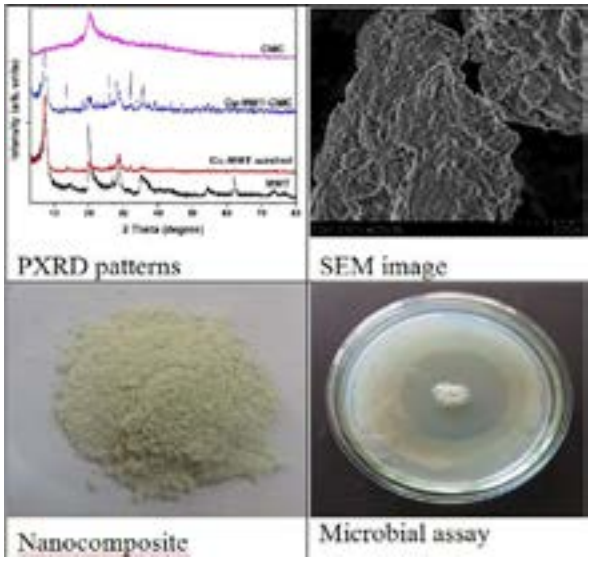
Cu^{2+} is one of the major active ingredients which is widely being used in many agricultural biocides due to its relative effectiveness in terms of reduction of inoculum level and lower production cost. However, Cu is known as a heavy metal that pollutes ecosystems and thereby leading to bioaccumulation. Nanotechnological approaches permit controlled release of active ingredients to retain on the target surface for an extended time and further requires low loading. *Erwinia carotovora* is a soil borne bacterium that causes soft rot in many cash crops including potato. At present in Sri Lanka, the disease is found to be prevailing in the fields in which the cut tubers are being used as planting material, though not encouraged. In this study, Cu-montmorillonite (Cu-MMT) nano composites were prepared and spray coated with carboxymethyl cellulose (CMC) at three levels of viscosity (2.5, 5 & 7.5 g/L) as antimicrobial formulations and then characterized using powder X-ray diffraction (PXRD), scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). Furthermore, all three nano composites were tested using different weights for their *in-vitro* antibacterial properties. Accordingly, the PXRD patterns showed a basal value of 1.23 nm which has increased compared to the Na-MMT original nano composites used (1.19 nm). SEM images showed that the plate like layered structure is continues to be remaining and FTIR spectra further confirmed the bonding interaction between Cu-MMT and CMC. Nanocomposites coated with CMC with different viscosities were tested using different weights exerted antibacterial activity on *E. carotovora* at a cell concentration of 2x106 colony forming units /mL, and the level of inhibition was increased with the weight used. When Cu^{2+} ions are intercalated into MMT interlayer space, it enhances slow releasing nature of Cu^{2+} while improving the textural properties while the CMC coating further triggers their slow releasing activity. The outcome of the present study is to be further experimented towards applying as seed/tuber treatments where the problem prevails.



Biography

Ryan Rienzie is a young researcher and academician in the field of Plant Pathology and Pesticide Technology. His research focuses on Nanotechnology applications on plant disease control and management.

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