

## Multi-perspective CuO@Cnanocomposites : synthesis using drumstick peel as carbon source and its optimization using response surface methodology

T. V. Surendra<sup>a,b</sup>, Selvaraj Mohana Roopan<sup>a</sup>, D. Devipriya<sup>a</sup>, Md Maksudur Rahman Khan<sup>c</sup>, Reda Hassanien<sup>d</sup>

<sup>a</sup> Chemistry of Heterocycles & Natural Product Research Laboratory, Department of Chemistry, School of Advanced Sciences, Vellore Institute of Technology, Vellore 632 014, Tamilnadu, India

<sup>b</sup> Department of Chemistry, School of Advanced Sciences, Kalasalingam Academy of Research and Education, Krishanan Kovil 626 126, Tamilnadu, India

<sup>c</sup> Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia

<sup>d</sup> Department of Chemistry, Faculty of Science, New Valley University, El-Kharja, 72511, Egypt

### ABSTRACT

Recent finding on the *Moringa oleifera* (*M. oleifera*) species evidenced the significant pharmacological activities which comply with the claims made in the folk medicine. However there is no conclusive pharmacognostic, nutritional value, phytochemical investigations on the dry peel of *M. oleifera* till date. The current work discuss on the nutritional value, minerals, vitamins content, amino acids, bioactive compounds and quantitative phytochemical analysis of *M. oleifera* dry vegetable peel. The result obtained from the above study confirms the presence of carbohydrates, protein, and fat as  $7.15 \pm 0.15$  mg/100 g,  $2.5 \pm 0.85$  mg/100 g and  $0.2 \pm 0.08$  mg/100 g respectively. The dry peel powder of *M. oleifera* showed high content of potassium with  $12.48 \pm 0.85$  and promising amount of vitamins, amino acids and bioactive compound composition. From the preliminary phytochemical analysis, it was found that the dry vegetable peel contains high content total glycosides, flavonoids and phenolic contents. The preparations of CuO@C nanocomposites were optimized using RSM (Response surface methodology). The synthesized CuO@C nanocomposites were analyzed using various characterization techniques and size and shape of CuO@C nanocomposites determined as 20 nm with cubic shape. The synthesized CuO@C nanocomposites are showed nontoxic on the human erythrocytes and act as a good antibacterial agent on gram negative bacterial strain.

### KEYWORDS

Composites; CuO@C; Nano-engineered materials; Natural carbon; RSM

## **ACKNOWLEDGEMENTS**

We thankful to the VIT to provide the research facility. We thankful to the Prof. G. Madhumitha for her support to utilize microwave under DST funding (No. [SB/FT/CS 113/2013](#)). Also, Dr. S. M. Roopan thankful to DBT (no. [BT/PR6891/GBT/27/491/2012](#)) for providing chemicals to carry out this research work.