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Green Synthesis of Selenium Nanoparticles via Moringa Oleifera and its Antimicrobial Properties

Bongekile Ndwandwe[1], Soraya Malinga[1], Eugénie Kayitesi[2], Bhekisisa Dlamini[1]

[1]University of Johannesburg, Johannesburg, South Africa. [2]University of Pretoria, Pretoria, South Africa

Abstract

Consumers nowadays have higher expectations than ever before as they insist on a variety of food that is safe and more nutritious but with a longer shelf life. Therefore, the consumers' demand for safe and high-quality foods has motivated the scientific community and the food industry to find new strategies. These strategies aim at minimizing food contamination and increasing shelf life, but with slight effect on the organoleptic properties of food products. Nanotechnology application in food is one innovation that has been developed. Nanotechnology advances have led to the development of biodegradable and edible packaging materials. These packaging materials may include natural derived active agents such as nanoparticles that contribute minimally to food waste, environmental pollution and moreover, they may potentially augment food safety and consumer health. Therefore, the aim of this study was to synthesize selenium nanoparticles (SeNPs) using a green method for potential use in active food packaging.

SeNPs were synthesized via *Moringa oleifera* leaf extract using a solvothermal technique. The structural information as well as crystallinity of SeNPs were studied using X-ray diffraction (XRD). The size and shape of SeNPs were determined by the use of Transmission Electron Microscopy (TEM). Morphology and topographic structure of the nanoparticle surface were further studied by the Scanning Electron Microscopy with Energy Dispersive X-ray (SEM-EDX). To understand the elemental composition of the SeNPs EDX analysis was performed. Antimicrobial activity of the SeNPs was determined using the disk diffusion method.

The TEM studies revealed that the SeNPs had a uniform polygonal shape with an average size of 82.86nm ± 19.42nm. SEM-EDX confirmed the presence of Se at 1.37 KeV, 11.22 KeV and 12.49 KeV. SEM mapping showed uniform distribution of the nanoparticles. The nanoparticles exhibited antibacterial activity against *Escherichia coli*, *Salmonella typhimurium* as well as *Bacillus cereus* and this was attributed to the SeNPs size. The findings of this study demonstrate the potential application of SeNPs in the development of active food packaging with antimicrobial activity and improved shelf life of food.

Biography: Bongekile Ndwandwe

Bongekile Ndwandwe was born in the Kingdom of Eswatini. She graduated at the University of Swaziland in 2002 with a BSc degree in Biological Sciences and Chemistry. She then went on to obtain an Honors degree in Microbiology at the University of KwaZulu-Natal in 2007. After which she was employed as a laboratory technologist at a veterinary laboratory. In 2015, she graduated with Master's degree in Animal/Human/Ecosystem Health at the University of Pretoria. After graduation she worked as a research officer in a food science laboratory. While working, she developed passion for food safety and security

and as a result she decided to pursue her passion. Currently, she is a full-time student enrolled at the University of Johannesburg, Faculty of Science, Biotechnology and Food technology department, pursuing a D-Tech degree in Food technology. Her research work aims at developing a nanomaterial based active packaging.