University of Zabol
Graduate School
Faculty of Agriculture
Department of Horticultural Sciences and landscape

The Thesis Submitted for the Degree of Master of Science
(In the field of Horticultural Sciences)

Title

Encapsulation of savory essential oil by electrospinning: characterization, study of antimicrobial effects and impact on post-harvest banana life

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Abstract:

Savory medicinal plant has many compounds with antioxidant properties. These compounds prevent various diseases and increase the overall health of the body. This study was performed to fabricate zein nanofibers using savory essential oil and to investigate its antimicrobial properties and properties on Staphylococcus aureus and Escherichia coli and its effect on the postharvest life of banana fruit in vitro. For this purpose, first the savory essential oil was extracted and a solution of zein and acetic acid was prepared and then nanofibers were produced by electrospinning the solutions. After the production of nanofibers, the properties of nanofibers were investigated using scanning electron microscopy tests, Fourier transform infrared spectroscopy, measurement of porosity and specific surfaces and X-ray diffraction analysis. Then the efficiency of the amount of loaded essential oil, antimicrobial activity of nanofibers and the effect of nanofibers on the postharvest life of banana fruit were determined. The results of SEM test showed that the produced nanofibers are uniform and homogeneous and do not have any beads. In the X-ray diffraction test, the resulting nanofibers were amorphous and the fibers containing the essential oil did not have any additional peaks, which indicates the compatibility between the essential oil and the zein polymer. The results of BET test showed that with increasing the essential oil, the average diameter of nanofibers increases and the decreasing trend observed in high concentrations of essential oil can be attributed to the agglomeration of essential oil in these concentrations. Nanofibers containing savory essential oil had inhibitory properties on both Staphylococcus and Escherichia coli. The Diameter of zone of Inhibition of Escherichia coli in different concentrations of savory essential oil was larger than that of Staphylococcus aureus and nanofibers containing savory essential oil were more effective in inhibiting Escherichia coli. Because banana is an climateric fruit. The use of nanofibers containing essential oils stimulated the production of ethylene and Increased fruit ripening, but in tangerine, which is a non-climatric fruit, it caused longer shelf life and fruit quality.

Key words*:* Savory essential oil, Enecapsulation, Medicinal plants, Nano fibers.