Application of Nanotechnology for Some Cheese Preservation

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B.Sc. Agric. Sc. (Food Science and Technology), Fac. Agric.,

Fayoum Univ., 2015

THESIS

Submitted in Partial Fulfillment of Requirements for the Degree of Master of Science

In

Agricultural Microbiology

Agricultural Microbiology Department

Faculty of Agriculture

Fayoum University

2022

ABSTRACT

Nanotechnology is an alternative to chemicals preservatives, especially to provide natural protection without spoilage and extend the shelf life of foods. Nanochitosan and nanosodium alginate were prepared from chitosan and sodium alginate respectively.

Transmission electron microscopy (TEM) was used to limit the morphology of the nanochitosan and nanosodium alginate and their effects against some pathogens and spoiled microorganisms (bacteria and fungi) were examined as natural antimicrobial agents compared with chitosan and sodium alginate materials. Different concentrations of chitosan (10, 20, and 40 mg/ml) and sodium alginate (20, 40, and 80 mg/ml) were dissolved in 1.0, 1.5, and 2.0 % glacial acetic acid and their effect against some pathogenic microorganisms were tested, inhibition zone of chitosan against *Ps. aeroginosa*, and *B. cereus* were 12 mm in 2.0 % glacial acetic acid respectively, but there is no effect of chitosan on any tested fungal strains. Nano- chitosan showed maximum antibacterial activity at acetic 2.0 % which inhibition zone was 29 mm for *Staphylococcus aureus*. And showed maximum antifungal activity against *Aspergillus niger*, inhibition zone diameter recorded against *A. niger* was 12 mm at concentration 40 mg/ml.

Sodium alginate nanoparticles treated with 2% acetic acid showed a higher antimicrobial activity compared with 1% and 1.5% glacial acetic acid at 40 µ/ml inhibition zone was 38 for *Staph. aureus*, whereas there is no effect of sodium alginate and nanosodium alginate against fungal strains. Minimum inhibitory concentration and minimum lethal concentration of nanochitosan, and nanosodium alginate compared to potassium sorbet were investigated and results showed that MIC and MLC of nanochitosan were 40 µ/ml and 80 µ/ml for *Staph. aureus* and *Sal. enteritidis,* but MIC and MLC of nanosodium

alginate were 40 µ/ml and 80 µ/ml for *Staph. aureus* and 80 µ/ml and 160 µ/ml for *Salm. enteritidis*, compared with Potassium sorbet MIC and MLC which were 80 µ/ml and 160 µ/ml for *Staph. aureus* and *Salm. enteritidis*.

Nanochitosan and nanosodium alginate used as edible coating to improve the microbiological quality of Ras cheese and soft white cheese during ripening or Storage period. The highest decreasing percentage of total count, yeast, and fungi in Ras cheese coated with nanosodium alginate followed by nanochitosan and the mix of nanosodium alginate with nanochitosan through ripening period, and the highest decreasing percentage of total count, yeast, and fungi in soft white cheese coated with nanochitosan and the mix of nanosodium alginate with nanochitosan through ripening period.

Active substances with antimicrobial effect were extracted from thyme, cinnamon, moringa and orange peels using ethanol, methanol, chloroform, hexane, acetone and water. Five isolates were used to study the antimicrobial effect of these substances at concentrations of (2.5, 5, 10, 20 mg/ml); Listeria and Bacillus isolates were the most sensitive to these. *Cinnamon* extract was more effective on bacteria strains, followed by *orange peel*, *thyme* and *Moringa* extracts. A variety of antimicrobials were used in the market, such as (Rifampicin (15 µg/disk), Erythromycin (60 µg/disk), Cefepime (30 µg/disk), Ticarcillin (75 µg/disk), Gentamicin (10 µg/disk), Colistin Sulphate (10 µg/disk) and Vancomycin (5 µg/disk), as a comparison with the effect of these natural materials, they showed their resistance to some and sensitivity to others.

Key words: nanochitosan, nanosodium alginate, edible coating, antimicrobial and Ras cheese.