

Summary

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Title of thesis: **Preparation of Salep/*Zataria multiflora* essential oil nanoemulsion based antimicrobial film and its effects on *Salmonella* Typhimurium in chicken breast meat stored in refrigerator**

Summary: Controlling pathogens, including *Salmonella* in meat, is one of the most significant concerns for producers and consumers. The aim of this study was to prepare a *Zataria multiflora* essential oil nanoemulsion and use it in developing antimicrobial edible film based on Salep to control the growth and survival of *S. Typhimurium* in chicken breast meat. The essential oil nanoemulsion was prepared by the phase inversion method, its antimicrobial properties were evaluated, and the Salep antimicrobial film containing two concentrations of the nanoemulsion was produced by the casting method and the physical and mechanical properties as well as the antimicrobial properties of the films were investigated by laboratory and device tests. The size of nanoemulsion particles was found to be 65.6 nm. Antimicrobial properties of essential oil and nanoemulsion of essential oil were investigated by microbroth and diffusion method in agar against *Salmonella* Typhimurium bacteria. MIC and MBC values for essential oil were 8 and 32 µg/mL and for nanoemulsion were 16 and 32 µg/ mL. The growth inhibition zone diameter in the well diffusion method for essential oil and 5% nanoemulsion was 30.33 and 16.33 mm, respectively, and for the film containing 5×MIC and 10×MIC nanoemulsion, 22.51 and 29.33 mm were measured, respectively. The results of this study showed that the addition of nanoemulsion in the film increases the tensile strength of the Salep films. It was also shown that over time, the amount of loss of nanoemulsion in films with 10×MIC concentration was higher than 5×MIC. Scanning electron microscopic result showed that with increasing concentration of essential oil, the films had a more irregular appearance. The analysis of the size of the contact angle of the film with the water drop showed that the nanoemulsion had a negative effect on the contact angle and caused the films to become hydrophobic, and also adding the *Zataria multiflora* essential oil nanoemulsion to the film decreased the transparency of the films, increased the resistance to water vapor, and decreased the solubility of the film. in water and increasing its solubility in fat simulating environments. Finally, the effects of the antimicrobial properties of the Salep film containing double concentration of nanoemulsion on *salmonella* typhimurium in chicken breast meat during 16 days of storage at 7 °C showed that the bacterial population in the control sample on day zero was 5 log₁₀ CFU/g and by the end of the 16 th day, the control sample was about 2 log₁₀ CFU/g and the treatments containing 5×MIC and 10×MIC had 4 and 5 log₁₀ CFU/g respectively. The results of this research showed that the Salep film containing *Zataria multiflora* essential oil nanoemulsion can be used to control pathogens in chicken breast meat.

Keywords: Salep, active packaging, *Salmonella* Typhimurium, *Zataria multiflora* nanoemulsion essential oil, chicken meat.