

Thesis Title: Application of Persian acorn starch-zein layer-by-layer coating loaded with thymol Pickering emulsion for preservation of rainbow trout fillet

Author: Fatemeh Babaei Golujeh

Academic Year: 1403-1404 (2024-2025)

Thesis Number:

Abstract

Fish is a primary source of protein in the human diet. Fish meat is prone to microbial growth and physico-chemical changes due to its high-water content, free amino acids, and other non-nitrogenous compounds, making it highly perishable. To prevent spoilage and extend the shelf life of fish meat, edible coatings with antimicrobial and antioxidant compounds can be utilized. The objective of this study was to examine the impact of a layer-by-layer coating of Persian acorn starch-zein containing thymol Pickering emulsion on the microbial and chemical quality of rainbow trout fillets. First, the antibacterial properties of thymol against *Listeria monocytogenes* and *Salmonella* Typhimurium were examined using the MIC method, while its antioxidant activity was assessed through the ABTS and DPPH methods. Additionally, the zeta potential and particle size of the thymol Pickering emulsion were measured, and its antibacterial effect was evaluated using the growth inhibition zone test. The effect of single-layer and double-layer coatings containing free thymol or thymol Pickering emulsion on the microbial and chemical characteristics, as well as the color indices of rainbow trout fillets during 12 days of refrigerated storage, was studied. The results indicated that the MIC and MBC of thymol against both bacteria were determined to be 0.5 mg/ml. Growth inhibition zone tests demonstrated that the antibacterial activity of thymol Pickering emulsion was more potent than that of free thymol. The antioxidant activity of thymol increased with higher concentrations, and at a concentration of 2.5 mg/ml, it was able to scavenge approximately 91.5% of ABTS free radicals and 91.9% of DPPH free radicals. The average particle size of the thymol Pickering emulsion was reported to be 241 nm, with a zeta potential of -37.9 mV. The treatment involving a layer-by-layer coating of Persian acorn starch-zein with thymol Pickering emulsion yielded the best outcomes in microbial, chemical, and color assessments. Additionally, the single-layer coating of zein demonstrated superior effectiveness in extending the shelf life of fish fillets compared to the single-layer coating of Persian acorn starch. Based on the results obtained, it can be concluded that the two-layer coating of Persian acorn starch-zein with thymol Pickering emulsion significantly decreased the rate of microbial and chemical spoilage in rainbow trout fillets, thus presenting a promising and innovative approach to enhance the shelf life of these fillets.

Keywords: Layer-by-layer, Pickering emulsion, Persian acorn, Starch, Zein, Thymol, Rainbow trout.