ABSTRACT

Title of thesis: **Effect of chitosan coating on chicken egg quality during shelf life**

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Egg is an important food source that provides essential nutrients while being widely available and relatively affordable. Its importance necessitates suitable approaches to better maintain egg quality and reduce economic losses. Various methods have been developed to either lower microbial loads on eggs or through approaches such as coating to maintain key quality parameters. Coating has gained increasing attention due to its biodegradable, non-toxic, and safe nature with specific properties that make it a suitable for extending egg shelf life. Among the main categories of coating materials, polysaccharides are notable for their excellent barrier properties, with chitosan being extensively studied for its effectiveness. It is not only eco-friendly but also cost-effective and has antimicrobial properties, making it a potential coating material.

This study investigates the effects of chitosan coatings at four concentrations (1.5%, 2.0%, 2.5%, and 3.0%) and 2.0% chitosan combined with sorbitol as a plasticizer at three concentrations (1.0%, 2.0%, and 3.0%) on extending egg shelf life. The coating was applied using the dipping method, and placed on metal net to air-dry. The applied coating provides a protective surface over the shell, sealing the pores, lowering gas exchange, reducing breakage, and maintaining egg quality better than uncoated control. Egg qualities were evaluated based on weight loss (WL), Haugh unit (HU), yolk index (YI), white index (WI), and air cell height (AC) during 4 weeks at 25 °C. Based on HU values, eggs coated with 1.5% chitosan extended freshness by one additional week, while those with higher concentrations or with sorbitol extended it by at least two weeks. All parameters followed a similar trend: higher concentrations of chitosan and sorbitol had better internal quality preservation. In the chitosan-only treatments, all concentrations except 1.5% showed improvement over the uncoated control. The 2.0%,

2.5%, and 3.0% coatings successfully maintained grade A egg quality after four weeks of storage. Furthermore, the addition of sorbitol as a plasticizer to 2.0% chitosan markedly enhanced the coating efficiency, showing better results than chitosan alone and retaining grade A quality until the end of the experiment. The 2.5% chitosan coating showed performance comparable to 3.0%, suggesting it as a more economical option for large-scale application. The incoporation of 3.0% among all sorbitol treatments provided the best preservation effects even though overall performance of different concentration of sorbitol had no significant difference.

Overall, this study highlights the effectiveness of chitosan-based coatings in extending egg shelf life by providing an efficient barrier to moisture and CO_2 transfer. Chitosan has attracted considerable attention due to its excellent oxygen barrier and antimicrobial properties. The combinations with other materials should be investigated to improve the properties of the coating layer. Research could explore the combination of chitosan with oils to enhance hydrophobicity and improve its moisture barrier properties. By combining with antimicrobial components, the coating could potentially prevent microbial growth and better maintain egg quality. Chitosan is cost-effective but the additional procedures and requirements associated with its application can increase production costs. Therefore, it is essential to find a balanced approach that maintains both egg safety and quality while remaining economically viable.