DEVELOPMENT OF EDIBLE ANTIMICROBIAL PACKAGING MATERIALS INCREASING SHELF LIFE OF FOOD PRODUCTS

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1. Introduction

In addition to adequate and balanced nutrition in the protection of human health, the reliability of consumed foods is also great importance. When foods contact with the environment, they are undergoing many microbiological, physical and chemical changes such as moisture loss, aroma exchange, oxidation and contamination with microorganisms. So this changes reduce quality and shorten the shelf life. During cutting and processing of chicken meat, especially contamination on the surface causes deterioration of the meat starting from the surface and thus short shelf life. Though contamination of chicken meat surface is inevitable, growth of contaminant microorganisms can be inhibited and microorganisms can be killed. In recent years, increased risks of infection due to antibiotic-resistant microorganisms have forced the discovery of new and natural antibacterial materials. It is a new and advantageous approach to avoid environmental pollution caused by the use of food packaging and safety of food, prolongation of product shelf life by natural, edible, antibacterial biomolecules in packaging products. Alginate, a polysaccharide derived from brown seaweed, is often used as edible packaging material because of prevents moisture loss of the product and positively affects the aggravation of lipid oxidation. Nisin is an antimicrobial peptide whis is used in several foods for natural preservative

2. Method

In this project, it was aimed to obtain antimicrobial and edible packaging material by immobilizing nisin which is an antimicrobial peptide to alginate. In this context, immobilization of nisin to calcium alginate beads was carried out by adding nisin to the reaction medium containing sodium alginate and by dropping the calcium chloride solution using a blunt-ended syringe. And then optimization studies of immobilizing nisin in calcium alginate beads were done with 7 different parameters. Nisin immobilized calcium alginate beads characterized by ATR-FTIR Spectrum and SEM Analysis. Lastly, Determination of the antimicrobial activity of white meat product chicken which is coated by nisin immobilizing calcium alginate gel was performed.

Figure 1. Immobilization of Nisin in Calcium Alginate

3. Results

With the optimization studies carried out within the scope of the project, the amount of immobilized nisin before the optimization was 8,93 mg, while the value after optimization was 12,85 mg. So, the amount of immobilized nisin was increased by 43,9%. Immobilization was demonstrated by ATR-FTIR spectroscopy and surface morphologies of beads were determined by taking SEM images. Antimicrobial testing of nisin immobilized calcium alginate beads at optimal conditions showed that the developed product reduced the overall viable count by 90% and maintained the appearance of the first cut of the chicken even after 1 week.

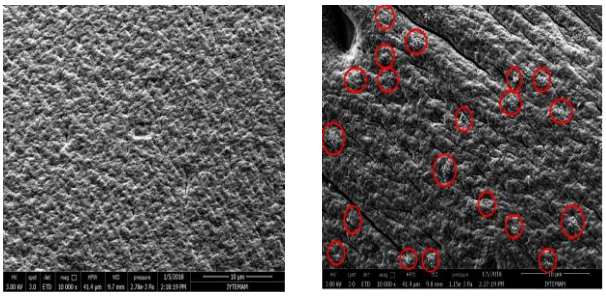

Figure 2. SEM Images of untreated and nisin immobilized calcium alginate bead

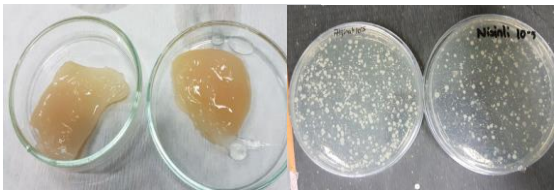

Figure 3. Total Live Count

4. Conclusion

As a result, a new edible packaging product has been developed that can be used to package different food products, which will increase shelf life due to its antimicrobial properties. Also, when the product is developed, alginate selected as the coating material is considered to be a threat to the ecological balance due to its easy disintegration in nature. In addition, developed new antimicrobial packaging material increases the potential of to be sold the product and ensures the consumer to reach a healthy product.

5. References

1. Appendini, P., Hotchkiss, J. H., (2002). Review of antimicrobial food packaging, Innovative Food Science & Emerging Technologies, 3(2): 113-126.

2. Chen, R., Cole, N., Wilcox, M., Park, J., Rasul, R., Carter, E. and Kumar, N. (2009). Synthesis, characterization and in vitro activity of a surface attached antimicrobial cationic peptide. Biofouling, 25; 517-524.