

Application of Chitosan Coating and Liquid Smoke as Antimicrobial Agent in Tuna Fish Pempek

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ABSTRACT

The goal of this study was to see the effect utilizing chitosan coating and liquid smoke had on pempek as an antibacterial. This study was carried out in an exploratory method, with differences in tuna pempek storage period, namely: control=0 days, A=1 day, B=2 days, C=5 days, D=7 days, and E=9 days. The results showed that the longer pempek tuna was stored using chitosan coating with the addition of 1% liquid smoke, the lower the total plate number was compared to without the addition of 1% liquid smoke. The storage time of pempek tuna without liquid smoke yielded results on chitosan coating, with water content ranging from 6.24 to 11.99% and protein content ranging from 3.68 to 11.8%. The Total Plate Count (TPC) test result was ranging from 5×10^{-4} to 13×10^{-4} colonies/g. With liquid smoke added, the water content increased to 4.56–10.48%, the protein content increased to 5.43–12.39, and the TPC test resulted in 2.7×10^{-4} – 7.3×10^{-4} colonies/g. According to SNI 7661.1:2013, a storage time of 3 days in the chitosan coating treatment with the addition of liquid is in the acceptable range.

Keywords: chitosan, coating, liquid smoke, pempek, tuna

INTRODUCTION

Pempek is a traditional Palembang dish from South Sumatra Province, Indonesia, with a chewy texture and sweet-spicy flavor. In enhancing the shelf life of pempek, antibacterial coatings need to be applied. The coating is a thin layer formed of consumable materials that act as a barrier to prevent moisture loss and slow down the respiration process (Li *et al.* 2023). Because of its unique chemical and biological features, chitosan is frequently employed as the coating due to the antibacterial, antifungal, and antioxidant properties.

In addition, liquid smoke can also be added as antimicrobial and food preservative, the concentration of usage is fairly low, and the application is simple and quick (Racioppo *et al.* 2023). The research objectives were to determine the storage time of tuna pempek with chitosan coating and liquid smoke as an antimicrobial.

METHODS

This study was conducted in the Laboratory of Agricultural Product Technology and the LLDIKTI X Padang laboratory. Tuna,

tapioca flour, wheat flour, water, salt, and garlic purchased from Pasar Raya Padang and distilled water, liquid smoke, and glycerol which are already in the laboratory were the primary materials utilized in this study. Chemical analysis materials included sulfuric acid, H_2SO_4 , HgO , K_2SO_4 , $NaOH$, and distillic acid.

Pempek is made with the following tools: a basin, a cutting board, a blender, and a burner. Analytical balance, magnetic stirrer 2 cm, stir bar, thermometer, and measuring cup (250, 500 ml) are the tools for creating edible coatings: (1) Water content analysis, namely: oven, pliers, porcelain cup, Erlenmeyer balance in analysis, (2) Protein analysis tools, including a Kjeldahl flask, distillation apparatus, burette, measurement pipette, Erlenmeyer tube, and fume hood, (3) Total Plate Count (TPC) test analysis, which includes the following items: test tubes, petri dish, volumetric pipettes, medium bottles, colony counts, autoclaves, and water heaters.

Measurement of differences in water content, protein content, and TPC was done by comparing the treatment of chitosan coating without liquid smoke as control to the treatment of chitosan coating with liquid smoke as antimicrobial as intervention. The samples were

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then stored for a total of 9 days, with observation performed at Day 0, 1, 3, 5, 7 and 9. The addition of 7.5 g of chitosan and 1% liquid was used during storage times in this study

RESULTS AND DISCUSSION

Water content

For nine days of storage, the significant difference in water content of tuna pempek without liquid smoke and with liquid smoke was detected in Day 9, as much as 6.24% in treatment without liquid smoke and 4.56% in treatment with addition of liquid smoke (Figure 1). This showed that the addition of liquid smoke to the treatment reduced the water content in fish pempek (Toynbe *et al.* 2016).

Protein content

For 9 days storage duration, the difference in protein content of tuna pempek without liquid smoke and with liquid smoke was detected in Day 9, namely 3.68% (without liquid smoke) (Figure 2). The protein content was 5.43% lower than 84. This is because liquid smoke can act as an antimicrobial agent, causing pempek to be well preserved for a longer period of time, resulting in a higher protein concentration compared to when it was without the addition of liquid smoke (Baehaki *et al.* 2019).

Total plate count

In TPC test, Figure 3 revealed that the storage time for tuna pempek without liquid smoke resulted in the lowest TPC value in

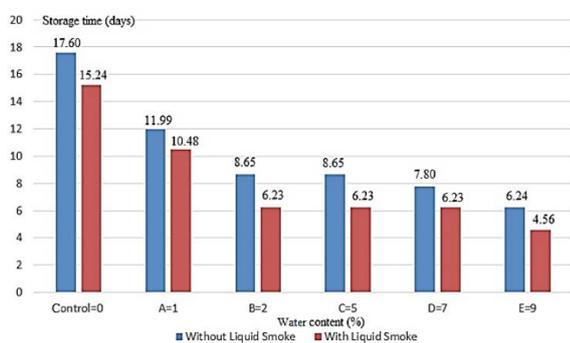


Figure 1. The average water content of tuna fish pempek with chitosan coating and liquid smoke at different storage times

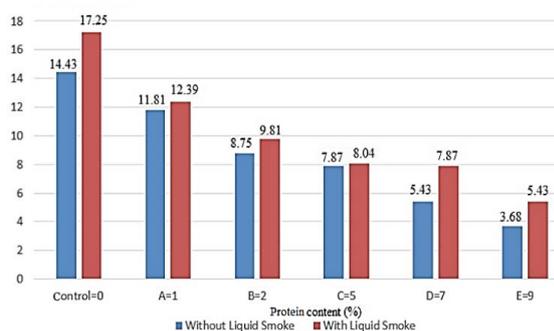


Figure 2. Average protein content of tuna pempek at different storage duration

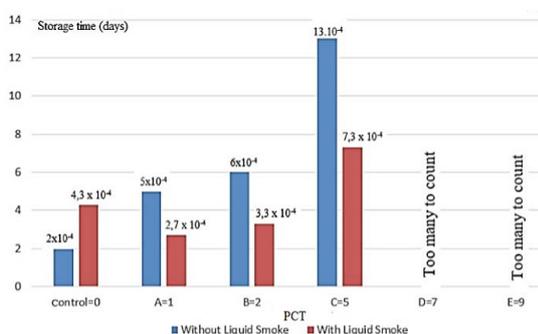


Figure 3. TPC for tuna fish pempek with chitosan coating and liquid smoke during storage

storage, namely 5x10⁴ colonies/g in Day 1 and 13x10⁴ colonies/g in Day 5. The bacteria could not be counted after seven days (treatment D) and nine days (treatment E). Based on the results of the study, the TPC storage time of tuna pempek with the addition of liquid smoke met the quality requirements for tuna pempek in Day 3 with 3.3 x 10⁴ colonies/g as regulated in the Indonesian National Standard (SNI 7661.1:2013) (Mustapa *et al.* 2017).

CONCLUSION

This study concludes that the storage time of three days for pempek sample coated with chitosan added with liquid smoke is in the acceptable range. There was an improvement in the shelf life of pempek by increasing the concentration of liquid smoke and chitosan coating in pempek.

DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflict of interest in the preparation of the manuscript.

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