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Edible Coating and Temperature Affect Meat Quality of Vacuum Packaged Lamb Meat

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Objectives

Packaging affects meat quality and durability because it can modify the environment around the product, creating conditions that delay deterioration reactions. During refrigerated storage of fresh meat, physical, chemical, microbiological and sensory changes may occur. Thus, to meet consumer needs, such as quality, convenience, and longer shelf life, it is necessary to extend the meat shelf life. An alternative is the use of edible coatings, which can be applied as primary packaging. This study aimed to evaluate the effect of chitosan and zein coatings on the meat quality of vacuum-packaged lamb meat stored for 57 d in two different temperatures.

Materials and Methods

Longissimus muscle (right and left sides) from male lambs with the same diet and genetic group obtained from five animals were cut onto 2.5cm thickness steaks, randomized equally and distributed into three treatments: control (no coating), coated with chitosan (1% w/v)/0.5% glycerol (w/v) solubilized in 1% lactic acid (v/v) and coated with zein (4% w/w)/0.5% pink pepper oil (w/w) solubilized in 70% ethanol. Samples were then vacuum packaged (permeability rate: 2000 $cm^3/m^2$24 h), stored for 57 d at two different temperatures (1°C and 5°C) and evaluated every 14 d by the following analyses: pH, instrumental color, water holding capacity (WHC), shear force, and TBARS- lipid oxidation. Lamb meat coated with zein or chitosan were submitted to a difference from the control test (the sample without any coating). Data were analyzed by ANOVA, and when a significant difference was found, SNK and Dunnet tests were applied for the quality analyses and sensory difference, respectively. For color analysis, $\Delta E = [(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2]1/2$ was also calculated.

Results

Coating, temperature and time showed significant differences ($p < 0.05$) for some of the studied variables except for WHC. A triple interaction was also found for all variables. At 1°C, ΔE from chitosan samples showed low values (ΔE = 1.95), meaning that color differences would not be noticed by time up to 29 d, although at 57 d values were 12.68. At the same temperature, zein containing samples when compared between 1 and 57 d, ΔE values varied from 5.51 to 11.42 where color changes were noticeable. At the end of 57 d, chitosan coated samples showed lower values of L* (lighter) and a* (less red) compared to zein coated and control samples. Generally, shear force values showed lower values by times, although chitosan showed higher values at 5°C. pH values varied from 5.09 to 5.48, temperature and coating did not affect this parameter, only time. For TBARS values, the highest value (0.238 mg MDA kg^{-1} sample) was found in the chitosan sample at 57 d at 5°C. Samples containing zein, for both temperatures, showed lower TBARS values if compared with chitosan. In this study, chitosan had a negative effect to lipid oxidation and shear force with higher values if compared to the others. In the difference from control test, lamb meat coated with zein was considered different with an average value = 4, which means moderate/great difference, ($p < 0.05$) from chitosan and control samples.

Conclusion

Zein was more effective for showing lower values of TBARS and for not affecting shear force if compared to chitosan and control samples and can be used as an alternative for edible coating.