

# EFFECTS OF ROSEMARY AND GREEN TEA ANTIOXIDANTS ON GROUND BEEF PATTIES IN TRADITIONAL AND MODIFIED ATMOSPHERE PACKAGING

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## I. OBJECTIVES

Consumers purchase ground beef more than any other beef product in the US, with 88% of consumers preferring traditional foam trays with overwrap (polyvinyl chloride [PVC]); however, PVC has a very limited shelf life. Utilizing gases like carbon monoxide (CO) and antioxidants like rosemary and green tea have been shown to extend shelf life. The objective of this study was to understand the effects of rosemary and green tea in ground beef in PVC and modified atmosphere packaging (MAP).

## II. MATERIALS AND METHODS

Four treatments were used in this study: control, 2,500 ppm rosemary, 300 ppm green tea, and 2,500 ppm rosemary + 300 ppm green tea. Patties from each treatment ( $n = 42$ ) were randomly packaged into one of 3 types: PVC, MAP, or master packages (MP), MAP and MP flushed with 0.4% CO, 69.6% N<sub>2</sub>, and 30% CO<sub>2</sub>. Patties in PVC and MAP were put directly into simulated retail display for 7 d; MP were put in dark storage for 7 d, then removed and put in display cases for 7 d. Subjective and objective color were measured utilizing a spectrophotometer, lipid oxidation and trained sensory panel measurements were measured. A 3 × 4 factorial design was used to evaluate 3 packaging types and 4 treatment types. The MIXED procedure of SAS version 9.4 (SAS Institute Inc., Cary, NC) was utilized, and when there was a significant F-test ( $P < 0.05$ ), least-squares means were separated using a pairwise  $t$  test with the PDIFF option.

## III. RESULTS

As expected, patties in MAP had significantly ( $P < 0.05$ ) lower lipid oxidation values and were significantly higher ( $P < 0.05$ ) in all color values than patties in PVC after display. In MAP, green tea significantly ( $P < 0.05$ ) improved  $a^*$  and chroma values on day 6 of retail display and had lower surface discoloration scores from day 3 to 6 compared to the rosemary + green tea treatment. In MP patties, green tea statistically ( $P < 0.05$ ) improved  $L^*$  values, display color, and surface discoloration scores compared to the combination treatment. However, green tea did not significantly ( $P > 0.05$ ) improve values when compared to rosemary for these parameters. Trained taste panelists could not detect a difference between control and green tea patties ( $P > 0.05$ ) for the green-hay attribute; however, rosemary was highly detectable in the green-hay attribute.

## IV. CONCLUSION

In conclusion, utilizing MAP and MP can improve shelf life duration of ground beef due to the formation of carboxymyoglobin. Green tea improved subjective color measurements and  $L^*$  values; however, other objective measurements were not improved with either green tea or rosemary. Sensory panelists were unable to detect green tea, which can be utilized in the future for label-friendly antioxidant replacements.

Keywords: antioxidants, beef, meat color, packaging