

2018 Reciprocal Meat Conference – Meat and Poultry Processing, Ingredient Technology and Packaging

Meat and Muscle Biology™



Effects of Inclusion of Tannic Acid on Color, Lipid Stability, and Sensory Attributes of Ground Beef Patties

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Keywords: antioxidants, ground beef, lipid oxidation, sensory evaluation, tannic acid
Meat and Muscle Biology 2(2):52

doi:10.221751/rmc2018.045

Objectives

Oxidation negatively affects meat quality leading to changes in sensory and nutritional properties. Inclusion of antioxidants in ground beef improves lipid stability and extends case life. In this study, we examined the effects of tannic acid as a novel antioxidant source on lipid oxidation, color stability, and sensory attributes of ground beef patties.

Materials and Methods

A beef trim 80% lean composite from 4 different carcasses aged for 14 d was acquired from Wolfpack Meats, the University of Nevada, Reno (UNR) USDA harvest and processing facility. Trim was transferred to the UNR Meat Quality laboratory, ground, and divided in 4 batches. Each batch was treated with 0 (Control), 0.5, 1, or 1.5% of a burgundy food-grade tannic acid powder. Ground beef portions weighing 120 g were formed into 11.5 cm diameter/1.5 cm thickness patties ($n = 5$ per treatment). Patties used for sensory analysis were vacuum-packaged and held at -80°C until testing. Prior to sensory analysis, patties were thawed for 24 h at 4°C and cooked on an electric grill to an internal temperature of 71°C . Pie-shaped pieces were obtained from each sample and served to a 7-member sensory panel. Each panelist evaluated tenderness, chewiness, juiciness, off-flavor, and overall desirability using an unstructured linear 10 cm scale (0 = extremely tough, chewy, dry, mild, and undesirable to 10 = extremely tender, soft, juicy, intense, and desirable). For color and lipid stability (TBA values), patties were placed in polystyrene trays, overwrapped with an oxygen permeable PVC film, and stored at 4°C . Samples were displayed for 6 d under fluo-

rescent lights with intensity of approximately 1,300 lux. Objective color (L^* , a^* , b^*) measurements were taken daily by using a Minolta CR-400 and lipid oxidation was evaluated on d 0, 3, and 6. Data were analyzed as a CRD with repeated measures using PROC GLIMMIX of SAS (SAS Inst. Inc., Cary, NC). Fixed effects included tannic acid treatment (TA) and day of display.

Results

Significant interactions between fixed effects of tannic acid treatment and day of display were observed for a^* , b^* , and Chroma values. For all 3 variables, values decreased as display time increased. Control samples were redder from d 1 to 4 when compared to treated samples. Regarding yellowness, samples treated with 1.5% of TA showed the highest b^* values from d 1 to d 6, whereas minimal differences between control and 0.5% TA samples were observed during display time. Chroma values were higher on samples treated with 1.5% of TA on d 5 and 6 when compared to control and 0.5% samples. At the end of display (d 6). All TA treatments similarly improved lipid stability when compared to control samples. However, inclusion levels above 0.5% led to detrimental effects on sensory attributes.

Conclusion

Inclusion of 0.5% of tannic acid is effective to improve lipid stability without compromising objective color parameters and sensory attributes of ground beef. Levels above 0.5% decrease redness and scores of sensory attributes, possibly due to the burgundy color and the astringent flavor of the powder.