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Effects of Antioxidants on Lipid Stability, Color Parameters, and Aerobic Plate Count of Beef Patties from Steers Fed Distillers Grains

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Objectives

Beef from steers fed distillers grains plus solubles (DGS) is more susceptible to lipid oxidation due to higher deposition of polyunsaturated fatty acids in the lean. Inclusion of antioxidants in ground beef is an efficient strategy to improve lipid stability. In this study, we tested the hypothesis that a novel composition of citrus extracts combined with buffered vinegar leads to improved color stability, lower lipid oxidation, and lower microbial loads of ground beef from steers fed distillers grains, when compared to other antioxidants commonly used by the industry.

Materials and Methods

A total of 24 crossbred steers were randomly assigned to 1 of 3 dietary treatments including CORN, Dry DGS (DDGS), and Modified DGS (MDGS; 8 steers per treatment). Distillers grains diets were formulated with inclusion levels of 40% DM basis. After slaughter, shoulder clods were collected and transferred under refrigeration to the University of Nevada, Reno Meat Quality Laboratory. After 7 d of aging, the M. latissimus dorsi, M. tensor fasciae antibrachii, and approximately 7.6 cm of the caudal part of the M. Triceps brachii were excised from each clod and ground. Ground samples from individual clods were divided into 4 batches that were subsequently treated with 0.3% of ROSEMARY, 0.25% of ACEROLA, and 0.6% of CITRIC (plus buffered vinegar) extracts. A CONTROL batch was formulated without any ingredient. Patties of 11.5 cm diameter were formed and displayed for 6 d. Instrumental color (L*, a*, b*) was recorded daily using a CR-400 Minolta® chroma meter whereas lipid oxidation (TBA), and aerobic plate count (APC) were evaluated on d 0, 3, and 6. The data were analyzed using GLIMMIX procedure of SAS (SAS Inst. Inc., Cary NC) whereas animal (dietary treatment) was considered the main plot and antioxidant treatment the sub plot. Color and TBA data were analyzed as repeated measures.

Results

For all instrumental color parameters, interactions between dietary treatment and day of display, and antioxidant treatment and day of display were observed ($P < 0.01$). Patties from steers fed DGS were darker than CONTROL samples on d 1 (48.77^b, 50.18^b, and 51.86^a, for DDGS, WDGS, and CORN, respectively), whereas redness (a*) was greater on DGS patties on d 6 (13.20^a, 14.67^a, and 11.39^b, for DDGS, WDGS, and CORN, respectively). Patties treated with ROSEMARY were significantly lighter than all other treatments on d 6 (53.14a, 50.34b, 50.98b, and 51.14b, for ROSEMARY, ACEROLA, CITRIC, and CONTROL respectively), whereas CITRIC samples were the reddest on d 5 and 6 of display. ACEROLA and CITRIC treatments led to similar lipid stability during display, whereas CITRIC samples showed less oxidation on d 6 when compared to CONTROL and ROSEMARY (0.21c, 0.29bc, 0.41b, and 0.90a, for CITRIC, ACEROLA, ROSEMARY, and CONTROL, respectively). Treatment CITRIC inhibited APC growth by 2 log when compared to all other treatments (3.73b, 5.34a, 5.44a, and 5.42a, for CITRIC, ACEROLA, ROSEMARY, and CONTROL, respectively).

Conclusion

The inclusion of CITRIC in ground beef improved redness of patties, whereas patties treated ROSEMARY were lighter. ACEROLA and CITRIC extracts provided better lipid stability to ground beef whereas CITRIC was the only ingredient that inhibited bacterial growth, possibly due to its combination with buffered vinegar.