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Effect of Natural Antioxidant Concentration on Lipid Oxidation of Ready-to-Eat Ground Beef Links from Cattle Fed Distillers Grains in Different Phases of Production

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Introduction

Lipid oxidation occurs most commonly in phospholipids and polyunsaturated fatty acids that will readily undergo free-radical chain reactions resulting in deterioration of the lipid. Lipid oxidation reduces shelf life and decreases overall desirability of the product by increasing the evidence of “warmed over” or “rancid” flavors. The use of plant extracts, such as rosemary or green tea, is becoming increasingly popular in meat processing as a natural antioxidant to increase shelf life of cooked meat products. This becomes particularly beneficial for companies seeking to clean up labels or use “natural” labeling claims for their product. Therefore, the objective of this study was to evaluate the effectiveness of natural rosemary and green tea extract in cooked beef from cattle fed distillers grains.

Procedure

Cattle were randomly assigned to a dietary treatment in a 2 x 2 factorial that included 2 or 5 lb/head/day (DM basis) of wet distillers grains during the winter backgrounding phase and either Sweet Bran® or modified wet distillers grains during the finishing phase (40% dietary inclusion, DM basis). All cattle were supplemented with modified wet distillers grains at a rate of 0.6% of BW during the summer months. A total of 16 USDA Choice clods from four carcasses from each dietary treatment group were collected. Each clod was independently ground and divided into three 5 lb batches. All treatments contained 0.75% salt, 0.25% phosphate and either 0, 0.13% or 0.20% rosemary plus green tea extract (FORTIUM RGT12 Plus Dry Natural Plant Extract; Kemin, Des Moines, Iowa). Beef and non-meat ingredients were mixed for one minute and the mixture was stuffed into skinless

Summary

Shelf life of cooked ground beef links with no, low, or high concentrations of a blend of natural plant extract antioxidant were compared to evaluate lipid oxidation over time. When no antioxidants were added, samples stored nine days or beyond were more oxidized than the samples with the addition of an antioxidant. No differences in lipid oxidation were observed between 0.13% and 0.20% antioxidant concentrations during similar days of refrigerated storage days. Therefore, the addition of natural antioxidants were effective at reducing oxidative rancidity, regardless the concentration of antioxidant.

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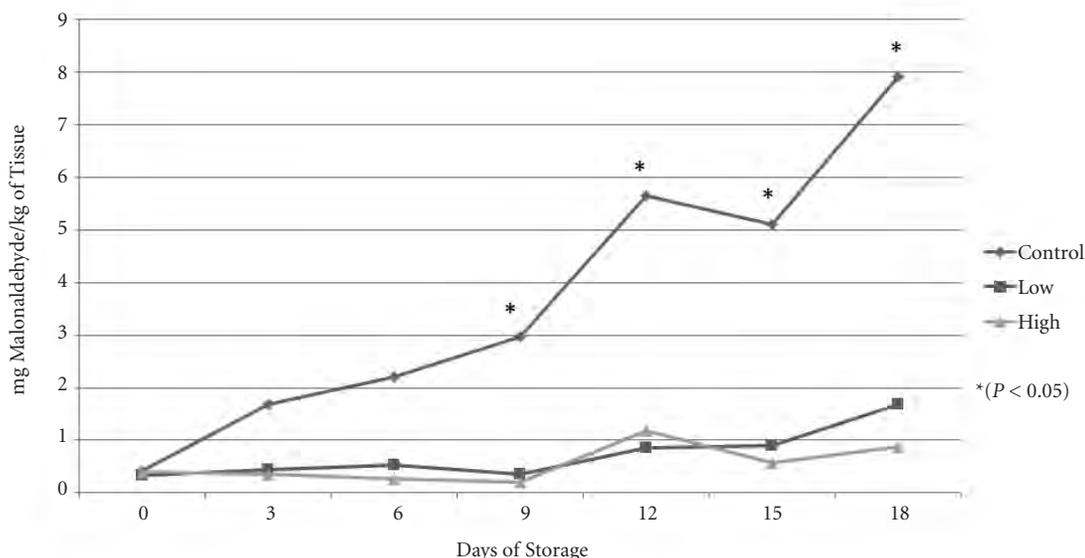


Figure 1. Effect of adding no, low, or high concentrations (0%, 0.13%, 0.2%) natural plant extract on the lipid oxidation (mg of malonaldehyde/ kg or product) in ready-to-eat beef links.

links using a piston stuffer. Links were placed in individual foil trays for each clod and cooked in a smokehouse to an internal temperature of 160°F. Links were placed in zip-top bags with the presence of oxygen and placed in dark refrigerated storage. Lipid oxidation was evaluated on days 0, 3, 6, 9, 12, 15, and 18 using the thiobarbituric acid reactive substances (TBARS) analysis. Data were analyzed as a 2 X 2 factorial with repeated measures (day) using the PROC GLIMMIX procedure of SAS (SAS Institute, Inc., Cary, N.C.).

Results

An antioxidant concentration × day interaction ($P < 0.05$) was observed (Figure 1), whereas no significant dietary treatment interactions or main effects were observed. A study was done viewing the same

dietary treatments independent from antioxidant treatment, where cattle fed higher levels of modified wet distillers grains during backgrounding had greater oxidative rancidity with extended storage and beef links from cattle finished with wet distillers grains oxidized more rapidly than those finished on Sweet Bran (2014 *Nebraska Beef Cattle Report*, pp. 107-108). The lack of dietary effects ($P > 0.16$) in this study is likely due to the effectiveness of antioxidants masking the effects of diet on lipid oxidation.

On days 6, 9, 12, 15, and 18 of storage, cooked links with no added antioxidants were more oxidized ($P > 0.05$) than all treatments with either concentration of antioxidant on any day. On day 3 for the control, there was a trend for increased oxidation when compared to high levels of antioxidant ($P = 0.10$). The

threshold for when lipid oxidation becomes evident to consumers is 1 mg of melonaldehyde/kg of product. The control surpassed this threshold on day 3, whereas samples with any level of added antioxidant did not surpass it until day 18. There were no ($P > 0.05$) differences in lipid oxidation between samples with 0.13 or 0.20% added antioxidants on any day of evaluation. These findings suggest that the addition of rosemary and green tea extract can suppress lipid oxidation in cooked beef products.

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