2014

Effect of Feeding Different Types of Byproducts and Concentrations Throughout a Beef Growing System on Ground Beef Color and Lipid Oxidation

Joe O. Buntyn
University of Nebraska–Lincoln

Brandy D. Cleveland
University of Nebraska–Lincoln

Amy L. Redfield Redfield
University of Nebraska–Lincoln

James C. MacDonald
University of Nebraska–Lincoln, jmacdonald2@unl.edu

Galen E. Erickson
University of Nebraska–Lincoln, gerickson4@unl.edu

See next page for additional authors

Effect of Feeding Different Types of Byproducts and Concentrations Throughout a Beef Growing System on Ground Beef Color and Lipid Oxidation

Joe O. Buntyn
Brandy D. Cleveland
Amy L. Redfield
Jim C. MacDonald
Galen E. Erickson
Tommi F. Jones
Ty B. Schmidt
Gary A. Sullivan[1]

Summary

The objective of this trial was to evaluate the effect of feeding different concentrations of wet distillers grains during winter backgrounding and either modified wet distillers grains or Sweet Bran® during the finishing phase on ground beef color and lipid oxidation. After a 14 day aging period, ground beef patties were made and placed in a simulated retail display for seven days. There were no overall differences in lipid oxidation between treatments but was a treatment by day interaction for discoloration. Ground beef from heifers finished with modified wet distillers grains discolored at a greater extent when compared to ground beef from heifers finished with Sweet Bran.

Introduction

Cattle fed distillers grain have an increase in polyunsaturated fatty acids, which may decrease oxidative stability (*2009 Nebraska Beef Cattle Report,* pp. 97-98). Higher levels of PUFA contribute to greater lipid oxidation, reduced retail shelf life, and off flavor development in fresh beef products (*2009 Nebraska Beef Cattle Report,* pp. -107-109 and 110-112*; 2011 Nebraska Beef Cattle Report,* pp. 96-99). Furthermore, the formation of metmyoglobin, the brown pigment state in meat, and lipid oxidation are related and can reduce the retail display life in fresh beef products. The objective of this project was to evaluate the effect of amount and types of byproducts fed during different production phases on the shelf life and rancidity in fresh ground beef patties.

Procedure

Sixty-four heifers were randomly assigned to dietary treatments in a 2 x 2 factorial design that included 2 or 5 lb/head/day DM basis supplementation of wet distillers grain during the winter backgrounding phase and either 40% Sweet Bran or MDGS during the finishing phase. During summer grazing, all cattle were supplemented with modified wet distillers grains at a rate of 0.6% of BW. At the conclusion of the finishing phase, cattle were harvested at a commercial abattoir. Forty-eight hours post-harvest, four clods were collected from USDA Choice carcasses from each of the dietary treatment group with similar fat content, vacuum packaged and wet aged for 14 days. On day 14, each clod was independently ground and 12, ¼ lb patties were formed (hand hamburger press).

Patties were placed on Styrofoam trays (two per tray), overwrapped with permeable oxygen wrap, and placed under simulated retail display for seven days. Objective color measurements were collected each day for seven days with a Minolta Chromameter CR-400 (Minolta Camera Company, Osaka, Japan) with an 8 mm diameter illumination area, illuminant D65 and 2° standard observer, L* (brightness), a* (redness) and b* (blue to yellow) values were recorded. Three readings were taken from each patty and averaged together for each individual tray; the same patties were used to evaluate objective color through the entire display period. Subjective color was also evaluated by a five-person panel of graduate students on days 0, 1, 2, 3, 5, and 6 using a score from 0% to 100% discoloration (%DIS) on a randomly selected predetermined package of patties. Also, during retail display, patties were removed from light and frozen at -20°F until thiobarbituric acid reactive substance (TBARS) were analyzed.

For TBARS, patties were removed from freezer storage and half a patty was cut into small pieces while partially frozen. The pieces were then flash frozen in liquid nitrogen and then powdered in a blender. Powdered samples were then analyzed using the TBARS standard protocol. Data were analyzed as a 2 x 2 factorial with repeated measures (day) utilizing the PROC GLIMMIX procedures of SAS (SAS Institute, Inc., Cary, N.C.).

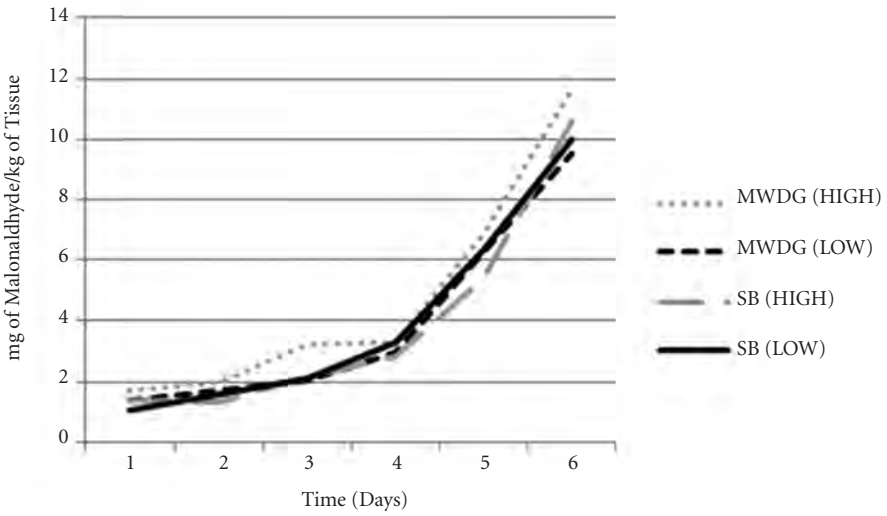
Results

There was a linear increase ($P < 0.001$) over time for TBARS concentrations, however, the main effects of WDGS during backgrounding or finishing diet did not impact ($P \geq 0.53$) TBARS concentration (Figure 1). There was a finishing diet by day interaction ($P < 0.001$) for percent discoloration (%DIS); patties from heifers fed MDGS on days 3, 5, and 6 were observed to have a greater ($P \leq 0.02$) %DIS when compared to patties from heifers fed SB (days 0, 1, 2, and 7 were similar; $P \geq 0.19$) (Figure 2). For objective color, a* and b*

(Continued on next page)

values linearly decreased ($P < 0.001$) over time regardless of treatment. The main effects of backgrounding and finishing diet did not have an impact ($P > 0.65$) on %DIS. Both finishing diet and day had an impact ($P \leq 0.03$) on L* values. Dietary effect was observed ($P = 0.03$) for L* measurements with patties from heifers finished with Sweet Bran having greater L* values compared to heifers finished with MWDG (53.01 vs. 51.73). The L* (lightness) values increased ($P < 0.001$) linearly as days of simulated retail display increased. Ground beef from heifers finished with MDGS discolored to a greater degree compared to ground beef from heifers finished with SB which would likely result in one extra day of acceptable retail shelf life of the product.

[1]Joe O. Buntyn, graduate student; Brandy D. Cleveland, graduate student; Amy L. Redfield, graduate student; Jim C. MacDonald, associate professor; Galen E. Erickson, professor; Tommi F. Jones, research technician; Ty B. Schmidt, assistant professor; Gary A. Sullivan, assistant professor, University of Nebraska–Lincoln Department of Animal Science, Lincoln, Neb.



Low and High indicate amount of supplementation, 2 or 5 lb/head/day, of WDGS during backgrounding. Finishing diet included either 40% MWDG or 40% Sweet Bran (SB).

Figure 1. Lipid oxidation (mg of Malonaldhyde/kg of tissue) over time based on cattle diets.

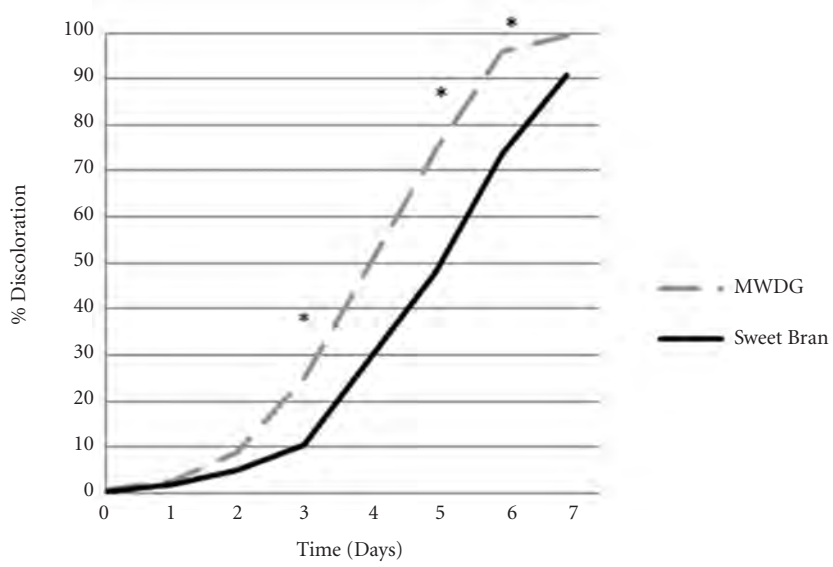


Figure 2. Percent discoloration of ground beef patties over time based on finishing diet.