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Research Report

INFLUENCE OF VITAMIN E, DURALOX® , AND HERBALOX® ON LEAN COLOR AND RETAIL CASE- LIFE OF GROUND BEEF

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Authors:

**A.E. Down, J.B.
Morgan, K.E.
Nanke and H.G.
Dolezal**

Story in Brief

Beef trimmings from cattle fed diets supplemented with 0 (Control) and 500 IU vitamin E/head/day were used to prepare the ground beef. The ground beef from the Control group was divided into three portions. One served as control, a second was supplemented with .25% Duralox® and the third was supplemented with .2% Herbalox® . Products were packaged using oxygen permeable film and placed in a commercial display case at 36°F for 6 d. Subjective measures of color were taken twice daily. Lipid oxidation (TBARS) was measured on 0, 2, and 4 d for each treatment group. Packages representing control treatment displayed increased TBARS values for the overall display period compared with control + Duralox® , control + Herbalox® and vitamin E treatments. Ground beef packages from vitamin E, control + Duralox® and control + Herbalox® treatments maintained their lean color longer than the control. This was especially noticed following 3 d of display. Treatment groups vitamin E, control + Duralox® and control + Herbalox® exhibited an increase in lean color acceptability of 1.21, 0.81 and 0.65 d, respectively when compared with the control. The same treatment groups had improved overall case-life by 0.94, 0.51 and 0.44 d, respectively, compared with control. This trial suggests that both supplementation of cattle diets with vitamin E and addition of natural antioxidants can be beneficial in maintaining lipid stability and prolonging the case-life of ground beef packages.

Key Words: Case-life, Antioxidants, Duralox® , Herbalox® , Vitamin E, Ground Beef

Introduction

Today's fast track consumers *expect* to purchase products that are high quality and nutritional value. In recent years, the quest to improve "quality" has become the underlying theme of retailers and restaurateurs in the United States beef industry. Any product that deviates from the consumer's perception of quality generally results in a "bad" experience for the customer. The service that the beef industry is responsible for providing to the American consumer is its product. This makes it essential to provide beef consumers with a high quality product that meets their expectations every time they purchase beef.

This study was conducted to determine if natural (Herbalox® and Duralox®

) and synthetic (vitamin E) antioxidants are effective in stabilizing red meat color and prolonging the case-life of ground beef products in simulated retail conditions.

Materials and Methods

Meat Samples. Beef trimmings (approximately 85% lean) from cattle on feed without (Control) and with 500 IU of vitamin E/head/day were obtained from a commercial fabrication facility. Alpha tocopherol acetate was the form of vitamin E used. Trimmings from both groups of cattle were ground and prepared in batches weighing approximately 60 lb. They were initially coarse ground using a 0.37 in plate. Natural antioxidants Duralox® (a rosemary based antioxidant) and Herbalox® (rosemary plus citric acid) were added to separate portions of the trimmings from control cattle following the initial grind at 0.25% and 0.20% of the total meat weight, respectively, and allowed to mix for 10 min in the mixing bin. All 4 samples were then ground through a 0.13 in plate. During the final grind, ground beef packages were assembled (approximately 1 lb) by placing a foam tray lined with a Dry-loc pad⁵ beneath the grinder head and evenly distributing the meat onto the tray in order to reduce further handling. Following traying, ground beef packages were overwrapped with oxygen permeable film. Each treatment group was packaged separately and 25 packages comprised each group. On d 0, 2, and 4 of retail display, duplicate samples were taken from each treatment and frozen to -4°F for further analyses of thiobarbituric acid reactive substance (TBARS).

Retail Case-life Display. Samples were placed in a commercial display case and evaluated daily for six days. Conditions of display and observations were as described previously (Down et al., 1999).

Statistical Analysis. The Least Squares Means option of the General Linear Model Procedure of SAS (1995) was used to compare means for the overall treatment effect as well as each treatment by day combination. Acceptability ranges of objective and subjective ratings for lean color and overall acceptability were calculated using regression equations to determine the number of days required to reach a score of 4.5 (unacceptable) or less. The frequency procedure of the SAS program was performed to determine how many packages reached 4.5 or less per treatment per day in order to decide how many packages were considered unacceptable per day.

Results and Discussion

Lipid Oxidation. Levels of TBARS were used to determine the amount of lipid oxidation at 0, 2 and 4 d of display. Least squares means indicated that the control group had significantly greater ($P < .05$) TBARS values across all days while the vitamin E, control + Duralox® and control + Herbalox®

treatments were not significantly different from each other (Table 1).

Subjective Color Analysis. Mean panelist lean color ratings suggest that the vitamin E, control + Duralox® and control + Herbalox® treatments maintained a more desirable ($P < .05$) lean color than did their control counterparts with the vitamin E packages being the most desirable (Table 2). Days to reach a lean color score of 4.5 in treatment groups vitamin E, control + Duralox® and control + Herbalox® were greater by 1.21, 0.81 and 0.65 d, respectively, when compared with their control counterparts (Figure 1). Visual assessment of fat color indicated that the control treatment received significantly lower ($P < .05$) ratings for the entire display period than did packages representing the vitamin E, control + Duralox® and control + Herbalox® treatments (Table 2). The vitamin E treatment was also more desirable ($P < .05$) than both the control + Duralox® and control + Herbalox® treatments during the same time period (Table 2). Percent discoloration scores indicated that the control treatment was significantly lower ($P < .05$) than the remaining three treatments while the vitamin E group was again higher ($P < .05$) than the control + Duralox® and control + Herbalox® groups (Table 2). Overall appearance scores dictate that the vitamin E treatment was more acceptable ($P < .05$) than the control, control + Duralox® and control + Herbalox® packages (Table 2). Overall appearance scores show that vitamin E, control + Duralox® and control + Herbalox® treatments extended the case-life of ground beef chubs by 0.94, 0.51 and 0.44 d, respectively, when compared with the control group (Figure 2). In fact, at d 2 of display 76% of control packages had reached an overall acceptability score of 4.5 while only 8, 28 and 36% of vitamin E, control + Duralox® and control + Herbalox® packages were at the same level, respectively.

Literature Cited

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Table 1. Comparison of TBARS values for each treatment group across all display days.

Treatment	Mean TBA value	SEM
Control	1.18 ^a	.18
Vitamin E	.27 ^b	.18
Control + Duralox®	.18 ^b	.18
Control + Herbalox®	.16 ^b	.18

^{a,b}Numbers within the same column with differing superscripts are significantly different ($P < .05$).

Table 2. Comparison subjective color measurements for each treatment group across all display days.

Attribute	Treatment				SEM
	Control	Vitamin E	Control + Duralox	Control + Herbalox	
Lean color	4.47 ^a	5.68 ^b	5.24 ^c	5.11 ^d	.03
Fat color	4.47 ^a	5.68 ^b	5.24 ^c	5.11 ^c	.12
Percent Discoloration	4.65 ^a	5.50 ^b	5.15 ^c	5.00 ^d	.29
Overall appearance	4.29 ^a	5.22 ^b	4.87 ^c	4.78 ^d	.03

^{a,b,c,d}Numbers with differing superscripts within the same row are significantly different ($P < .05$).

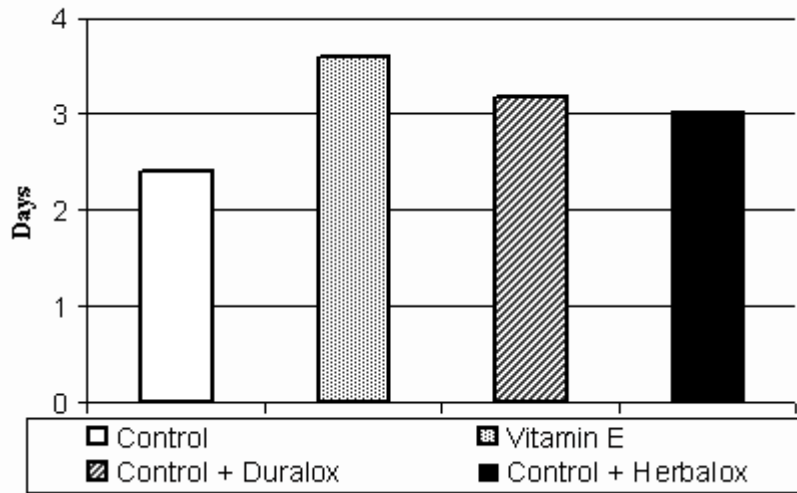


Figure 1. Comparison of the number of days required for each treatment group to reach a lean color score of 4.5.

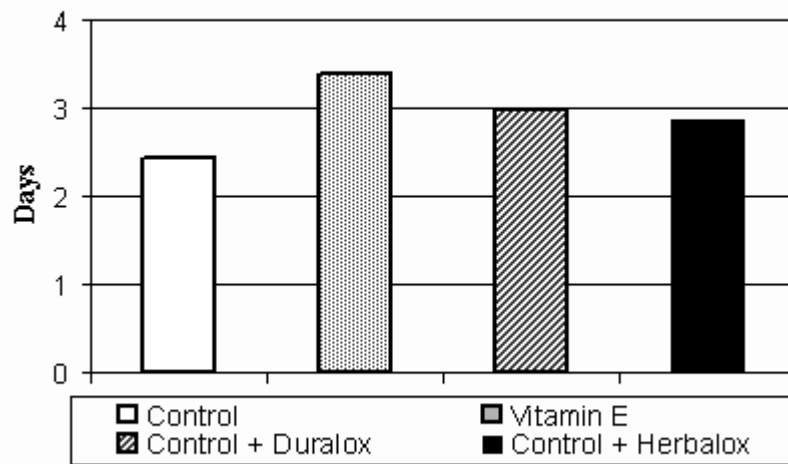


Figure 2. Comparison of the number of days required for each treatment group to reach an overall appearance score of 4.5.