COLOUR STABILITY OF GROUND ROUND BEEF PATTIES PRODUCED FROM CATTLE FED AN OMEGA-3 ENRICHED DIET

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I. INTRODUCTION

Numerous studies indicated beef colour was a top three consumer purchasing motivator [1,2]. Because consumers are increasingly becoming health conscious, beef producers are interested in increasing beef omega-3 content through custom-designed diets. Unfortunately, literature reported increasing ground beef omega-3 content caused detrimental effects on colour stability [3]. The study objective was to determine effects of a omega-3 enhanced finishing diet on beef ground round objective and subjective colour stability.

II. MATERIALS AND METHODS

Black-hided steers (*N* = 700) were weighed, stratified into 12 weight blocks, and allocated to 28 pens (*N* = 25 head/pen). Pens were randomly assigned to one of two treatments consisting of pens either fed a conventional feedlot finishing diet (CON; *n* = 14) or fed a conventional feedlot diet containing a 10% extruded proprietary flaxseed, wheat middlings, and *Nannochloropsis* algae blend (OMG; *n* = 14; greatOplus; NBO3 Technologies, Manhattan, KS). After 173 days on feed, one head per pen was randomly selected, transported, harvested, and fabricated at a commercial abattoir (Hertzog Meat Company, Butler, MO). Round subprimals were vacuum packaged, boxed, placed in cold storage, and shipped to the University of Georgia Meat Science and Technology Centre (Athens, GA). On day 21 *postmortem*, round muscles were coarse (13-mm plate) and fine ground (6-mm plate) targeting 10% fat (90:10). One-hundred-thirty (113 ± 2 g, 13-mm thick) patties were produced per carcass with 14 randomly allocated to simulated retail display or thiobarbituric acid reactive substances (TBARS) analysis. Objective and subjective colour analyses were collected every 12 hours for 84 hours and TBARS were measured every 24 hours. Objective and subjective colour data were analysed as a randomized complete block design with repeated measures using PROC Mixed of SAS. Treatment, Time, and their interaction served as fixed effects and Time served as the repeated measure with carcass as the subject and compound symmetry as the covariance structure. Data for TBARS were analysed as a completely randomized design with a 2 × 5 factorial arrangement with fixed effects as Treatment, Time, and their interaction. If an interaction occurred, data were reanalysed by time. Statistical significance was determined at $P \leq 0.05$.

III. RESULTS AND DISCUSSION

There were Time effects for all measurements consistent with ground beef discoloration ($P < 0.01$). There were no Treatment x Time interactions nor Treatment effects for *a**, chroma, worst point colour rating, overall colour rating, and percent discoloration rating ($P < 0.20$). A Treatment x Time interaction occurred for hue angle and percent surface metmyoglobin ($P < 0.05$; Table 1). From hour 0 to 60, CON and OMG patties did not differ in hue angle or percent surface metmyoglobin ($P > 0.21$), but CON patties had greater hue angle values and increased surface metmyoglobin percentages than OMG patties at 72 and 84 hours ($P < 0.01$). There was no Treatment x Time interaction ($P = 0.24$) for TBARS;

however, over the entire display period, CON patties had greater TBARS values than OMG patties ($P < 0.05$).

Table 1. Effects of feedlot dietary omega-3 regimen on percent surface metmyoglobin and thiobarbituric acid reactive substances (TBARS) through retail display (hours)

Item	Control	Omega-3	SEM[1]	P-value		
				Treatment	Time	Treatment × Time
Surface metmyoglobin, %			1.70	0.18	<0.01	0.05
0	27.4[a]	28.0[a]				
12	27.8[a]	28.3[a]				
24	29.8[a]	29.8[a]				
36	32.9[a]	32.0[a]				
48	38.8[a]	38.3[a]				
60	46.3[a]	44.2[a]				
72	55.6[a]	50.5[b]				
84	58.1[a]	51.1[b]				
Thiobarbituric acid reactive substances, mg/g			0.06	<0.01	0.01	0.24
0	0.50[x]	0.34[y]				
24	0.61[x]	0.38[y]				
48	0.64[x]	0.40[y]				
72	0.79[x]	0.41[y]				
96	0.79[x]	0.41[y]				

[1]SEM of the interaction is presented for both percent surface metmyoglobin and TBARS; [ab]Superscripts that are not the same within a Time differ ($P < 0.03$); [xy]Superscripts within a Treatment that are not the same differ ($P < 0.01$).

IV. CONCLUSION

While CON patties surface metmyoglobin percentage and TBARS values indicated less colour stability than OMG patties, panellists indicated differences were not visually apparent. Overall, the omega-3 enhanced feeding regimen did not negatively affect ground beef patty colour stability as other feeding regimens have shown in previous literature.

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