INFLUENCE OF FINISHING SYSTEMS ON CARCASS TRAITS, NUTRITIONAL PROFILE, MEAT QUALITY, AND SENSORY ATTRIBUTES OF BISON BULLS

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I. INTRODUCTION

Studies comparing the effects of finishing systems on carcass traits, nutritional composition, and meat quality of bison are limited. Janssen *et al*. [1] evaluated the influence of grain and grass finishing systems on bison heifers and reported that grain-finishing resulted in increased hot carcass weight, backfat thickness, and marbling scores and produced steaks with more cholesterol and total fatty acids but a smaller percentage of polyunsaturated fatty acids. Steaks from grain-finished bison heifers were also more tender. While an increased proportion of the bison harvested in the United States are bulls, there is little research investigating the impact of finishing systems on bison bulls. We hypothesised that bison bulls finished in a grain system would have improved carcass characteristics and meat quality, but increased cholesterol compared to bison bulls finished in a grass system. The objective of this project was to evaluate the influence of finishing system (grain- vs. grass-finished) on carcass characteristics, nutrient profile, meat quality, and sensory characteristics of bison bulls.

II. MATERIALS AND METHODS

Bison bulls (n=196) were randomly assigned to either grain-finishing (n = 98, backgrounded on pasture and finished in a pen for 146 days with ad libitum access to prairie hay, alfalfa hay, and whole shell corn) or grass-finishing (n = 98, remained on pasture until slaughter). Bulls were slaughtered at approximately 30 months of age. Carcass measurements were collected at 24 hours postmortem. Hot carcass weight and kidney fat percentage were recorded. Objective color (*L*, a*, b**) of the ribeye was recorded with a colorimeter. Ribeye area, backfat thickness, marbling score, skeletal maturity, lean color, and external fat color were assessed by United States Department of Agriculture graders. Strip loins were collected from a subsample of 30 carcasses closest to the average hot carcass weight for each treatment. Ultimate pH was recorded and strip loins were fabricated into 2.54-cm steaks. Three steaks were designated for fatty acid composition, cholesterol content, and proximate composition. One steak was aged for 14 days for Warner-Bratzler shear force (WBSF) without freezing (fresh). Four additional steaks were assigned to a 4, 7, 14, or 21 day aging period, then frozen prior to WBSF analysis. Two steaks were aged for 14 days and frozen for trained and consumer sensory evaluation. Subjective carcass data including fat color, lean color, and skeletal maturity were analysed as binomial proportions using the GLIMMIX procedure of SAS with finishing treatment included as the fixed effect. Objective carcass data, fatty acid content, cholesterol, and proximate composition were analysed using the MIXED procedure of SAS, with finishing treatment as the fixed effect. Cook loss and WBSF samples subjected to different postmortem aging periods were analysed as repeated measures for effects of finishing treatment, aging day, storage treatment, and their interaction; peak temperature was included as a covariate. Trained and consumer sensory data were analysed using the MIXED procedure of SAS for the fixed effect of finishing treatment; panelist was included as a random effect. Carcass served as the experimental unit for carcass and meat quality analyses and individual panelist served as the experimental unit for sensory analysis. Means separation means was performed by LSD with a Tukey's adjustment and the significance was considered at ≤ 0.05.

III. RESULTS AND DISCUSSION

Grain-finished bulls had increased (P<0.0001) hot carcass weights, ribeye area, backfat thickness, kidney fat, and marbling scores than grass-finished bulls (Table 1). A greater proportion of grain-finished bulls were classified with moderately bright red lean color while an increased proportion of grass-finished bulls were classified with slightly bright red lean indicating grain-finishing results in a brighter colored lean tissue. The *a** value of the ribeye was increased (P<0.0001) in the grain-finished bulls. An increased (P<0.05) percentage of grass-finished bulls were classified with moderately yellow fat and he *L** and *b** values of the subcutaneous fat were increased (P<0.0001) for grass-finished bulls. Steaks from grain-finished bison bulls had a greater (P<0.0001) concentration of saturated (SFA), monounsaturated (MUFA), and polyunsaturated (PUFA) fatty acids. When calculated on a percentage basis of total fatty acids, SFA were similar (P>0.05) between finishing treatments, while PUFA were greater (P<0.0001) in grass-finished steaks and MUFA were greater (P<0.0001) in grain-finished steaks. Steaks from grain-finished bulls had increased (P<0.001) cholesterol, crude protein, crude fat, and ash content, while steaks from grass-finished bulls had increased (P<0.0001) moisture content. When comparing the influence of fresh and frozen storage it was determined that freezing steaks from bison bulls resulted in improved (P<0.0001) tenderness compared to fresh storage without impacting cook loss. Warner-Bratzler shear force was affected (P<0.05) by the interaction of finishing treatment with aging period. Steaks from grass-finished bulls were more (P<0.05) tender at 4 and 7 days of aging; however, by day 14 and 21 there was no difference between treatments. No effect of aging day or treatment by aging day interaction was observed for cook loss. Grass-finished bison steaks had increased (P<0.0001) aroma and flavor intensity compared to grain-finished bison steaks. No treatment difference was detected by trained panelists in toughness or juiciness intensity. No treatment difference was detected by consumer panelists in overall liking, texture liking, toughness intensity, juiciness intensity, or meat flavor intensity of bison steaks. Steaks from grain-finished bulls had higher consumer acceptability for aroma (P=0.05) and flavor (P<0.05) and steaks from grass-finished bulls were perceived to have more (P< 0.05) off-flavor.

Table 1. Least squares mean for effect of animal age on lean maturity of grain- or grass-finished bison bulls.

Variable	Grain-finished[1]	Grass-finished[1]	SEM[2]	P-value[3]
Hot carcass weight, kg	289	232	1.907	<0.0001
Ribeye area, cm^2	65.1	59.8	0.569	<0.0001
Backfat thickness, cm	0.91	0.25	0.020	<0.0001
Kidney fat, %	2.56	0.97	0.057	<0.0001
Marbling score[4]	185	105	4.357	<0.0001

[1]Treatments: GRAIN = bison bulls (n=98) backgrounded on grain and finished for 130 days with ad libitum access to grass hay, alfalfa, and a corn prior to slaughter. GRASS = bison bulls (n-98) remained on pasture until slaughter.
[2]Standard error of the mean
[3]Probability of difference among least square means
[4]Marbling score: 100=Practically Devoid^0, 200=Traces^0

IV. CONCLUSION

Grain-finished bison bulls produced heavier carcasses with improved carcass characteristics compared to grass-finished bulls. Finishing system also influenced nutrient content of bison steaks. Steaks from grass-finished bulls were more tender at early aging periods but by 14 days of aging trained and consumer panelists could not detect differences in tenderness between finishing treatments. These data indicate finishing systems can impact composition of bison carcasses, nutrient content of bison meat, and measures of meat quality.

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