

Comparison of Forage-*vs* Grain-Fed Brangus Crossbred Steers

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Story in Brief

The effects of forage- *vs* grain-finishing systems on performance, carcass characteristics and soft tissue composition were examined in Brangus x Hereford-Angus crossbred steers. Steers (avg. 738 lb) were assigned to: 1) a conventional high concentrate (79 percent corn) finishing ration for 129 days; or 2) sorghum sudan and wheat pasture and/or bermudagrass for 202 days until slaughter. Performance, carcass traits and chemical composition of the soft tissue were determined. Average daily gain (ADG) was lower ($P<.01$) for group 2 (1.17 lb) than group 1 (2.68 lb) and slaughter weight slightly lower (1020 *vs* 1050 lb). Carcass traits, with the exception of maturity and rib eye area, were also lower ($P<.01$) for group 2 than for group 1. Differences in cold carcass weight were attributed to a higher dressing percent and more soft tissue (505.5 and 454.2 lb) in group 1 than in group 2. Carcass soft tissue was higher ($P<.01$) in crude protein, moisture and ash for forage-fed cattle than for group 1. Fat was 19.9 and 33.1 percent for the same groups, respectively.

Introduction

Alternate beef production systems have been examined as a result of concern for energy conservation, future world grain shortages and consumer demand for leaner meat. Utilization of forages as an alternative to the conventional feedlot system would satisfy these criteria but result in lighter weight cattle and require an increase of 2.6 cows to yield 1000 pounds of beef carcass (Ward *et al.*, 1977). However, this does not suggest that grazing systems should not be intensified in order to fatten cattle, thus reducing the number of days in the feedlot. Oklahoma has the potential for yielding acceptable gains from its high quality, cool season annual forage, wheat pasture.

Studies examining the feasibility of finishing cattle on wheat pasture have met with varying degrees of success (Wagner and Horn, 1976; Williams *et al.*, 1979). Since environmental factors play a decisive role in the success of grazing trials, an additional study was undertaken to further look at performance, carcass characteristics and composition of the soft tissue.

Materials and Methods

Brangus x Hereford-Angus crossbred steers (avg. 738 lb) were weaned and placed on pearl mellit prior to allotting to one of two treatments: 1) a high concentrate (79 percent corn) corn grain ration (Table 1) for 129 days; or 2) sorghum sudan and wheat pasture and/or bermudagrass until slaughter. Cattle in this treatment were grazed for

202 days. The steers were slaughtered at an average low choice slaughter grade (conventional grain-fed treatment) or at the end of the normal production system (forage-fed). Attempts were made to minimize age and weight differences at slaughter.

Carcasses were chilled for 48 hours or longer at $0 \pm 1^\circ\text{C}$ and evaluated for carcass measurements of dressing percentage, marbling, maturity, quality grade, rib eye area, average fat thickness (13th rib area), yield grade and kidney, heart and pelvic (KHP) fat. After dividing into retail cuts, carcasses (right side) were separated into soft tissue, bone and KHP fat. The soft tissue was thoroughly ground and mixed prior to taking a representative sample (40 lb) for chemical analysis. The sample was passed through a silent cutter to further mix and grind the soft tissue. Two samples (150 g) were randomly taken for proximate analysis. The samples were analyzed for crude protein N by Kjeldahl procedure (AOAC, 1970), moisture by weight loss after drying at 100°C for 24 hours, fat content by chloroform:methanol extraction (2:1 v/v) (Christie, 1973) and ash content by ashing at 500°C for 3 hours (AOAC, 1970).

Results and Discussion

Final weights of forage- and grain-fed steers were 1020 and 1051 lb for the forage- and grain-fed steers, respectively (Table 2). The forage-fed steers required an additional 73 days to attain their market weight. The average daily gain (ADG) for the forage- and grain-fed cattle (1.17 and 2.68) also reflected the additional time needed to attain the respectable slaughter weights. The ADG for the forage-fed group also did not indicate the true performance of these cattle. The majority of the gains (41 percent) for

Table 1. Composition of conventional grain ration.

Constituent	Percentage
Whole shellcorn	79.0
Soybean meal	4.0
Cottonseed hulls	5.0
Alfalfa meal (pelleted)	5.0
Molasses, cane	5.0
Calcium phosphate dibasic	0.4
Calcium carbonate	0.4
Salt (plain)	0.5
Urea	0.7
	100.0

Vitamin A (30,000 IU/g) supplement provided at 0.1% of the diet.

Table 2. Performance of forage - vs grain-fed Brangus crossbred steers.

	Grain	Forage
No. of animals	10	10
Initial wt, lb	705	771
Final wt, lb	1051	1020
No. of days	129	202
ADG, lb	2.68	1.17

the cattle occurred on wheat pasture during the month of April, in which the cattle showed an ADG of 3.48 and gained 101 lb. Some of this performance was obviously due to compensatory gain since the cattle had attained only 28 percent of their gain up to this period. Excessive snowcover on the wheat pasture was partly responsible for this and required supplementation of the cattle with alfalfa hay *ad libitum* during January and February.

Carcass data for the two groups are shown in Table 3. All carcass characteristics, with the exception of maturity and rib eye area, were lower ($P < .01$) for the forage-fed group than the grain-fed group. The grain-fed steers graded 60 percent choice, 40 percent good, while the forage-fed group graded 10 percent choice, 60 percent good and 30 percent standard. The carcass parameters for the forage-fed steers were more favorable than in a previous study (Williams *et al.*, 1979), reflecting annual variations in performance of cattle on wheat pasture. Present and previous data suggest that supplementation of some grain or high quality forage hay during January and February may be necessary in order to finish cattle on wheat pasture, particularly during years of weather stress.

Carcass composition of grain- and forage-fed steers are shown in Table 4. Differences in cold carcass weight between the two groups were mainly attributed to the 11.3 percent greater amount of soft tissue in carcasses of the grain-fed group. Proximate analysis data revealed that a significantly higher percentage of fat in the soft tissue was responsible for most of the difference in soft tissue between cattle raised via the two diverse production systems.

As previously reported (Williams *et al.*, 1979), percent crude protein, moisture and ash were higher ($P < .01$) in the soft tissue of forage-fed than grain-fed steers. The greater percentage of lean in the soft tissue of forage-fed cattle likely accounts for the higher percent crude protein and ash. It has been reported that nutritional regime will not alter carcass chemical composition as long as cattle are fed to constant final slaughter weight (Marchello and Hale, 1974). However, our studies do not support this view and suggest that forage- vs grain-feeding of cattle to similar final weights did materially alter carcass chemical composition. Unlike live weight, carcass weights of the two groups were significantly different.

Table 3. Carcass characteristics of forage- vs grain-fed Brangus crossbred steers.

Carcass Trait	Grain	Forage	SEM ^d
Cold carcass wt, lb	617.1 ^a	551.2 ^b	3.87
Dressing percentage	58.9 ^a	53.8 ^b	.56
Maturity	13.9	14.2	.12
Marbling	14.6 ^a	10.4 ^b	.86
Quality grade ^c	11.8 ^a	9.5 ^b	.42
Rib eye area, in ²	11.5	10.4	.51
Fat, in	.58 ^a	.30 ^b	.05
KHP%	3.6 ^a	2.5 ^b	.15
YLDGRD	3.4 ^a	2.6 ^b	.23

^{ab}Means in the same row with different superscripts differ at $P < .01$.

^c12= low choice, 9= low good.

^dStandard error of the mean.

Table 4. Carcass composition of forage- vs grain-fed Brangus crossbred steers.

Parameter	Grain	Forage	SEM ^e
Cold carcass wt, lb	617.1 ^a	551.2 ^b	3.87
Soft tissue wt, lb	505.3 ^a	454.2 ^b	4.29
Bone wt, lb	78.0 ^c	82.7 ^d	1.04
Chemical composition of soft tissue, %			
Crude protein	15.1 ^a	18.0 ^b	.53
Fat	33.1 ^a	19.9 ^b	
Moisture	51.1 ^a	61.2 ^b	1.67
Ash	.72 ^a	.88 ^b	.06

^{ab}Means in the same row with different superscripts differ at $P < .01$

^{cd}Means in the same row with different superscripts differ at $P < .05$.

^eStandard error of the mean.

In conclusion, forage-feeding *vs* grain-feeding resulted in significant differences in carcass characteristics and soft tissue composition of Brangus crossbred steers, even though final live weights were similar. These and previous results suggest that supplementation of cattle on wheat pasture would be necessary in order for cattle to finish with an acceptable quality grade in a reasonable period of time.

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