calves tended to have less fat thickness over the rib than Angus x Hereford calves. This trend was not evident among individually-fed calves.

Group-fed calves which received the low preweaning milk level tended to produce carcasses with higher (1.5 percent) cutability. This trend was not evident among individually-fed calves.

Individually-fed calves which received the high preweaning milk level had higher marbling scores than those receiving the low milk level. A trend was not evident among group-fed calves.

Quality grade was not consistently influenced by preweaning milk level among calves of either breed combination.

Characteristics of Forage-Fed *vs* Grain-Fed Slaughter Cattle

Jim Williams, D. G. Wagner, L. E. Walters, J. J. Guenther, G. H. Horn and George Waller

Story in Brief

Thirty Brangus X Hereford-Angus crossbred steers (avg. 348.4 kg), approximately 13 months of age, were randomly assigned to three treatments: (1) 90 percent concentrate finishing ration for 161 days, (2) sorghum sudan and wheat pasture for 48 days, followed by the 90 percent concentrate finishing ration for 113 days, and (3) sorghum sudan and wheat pasture (190 days) until slaughter. Performance, carcass traits and chemical composition of the soft tissue were determined. Final slaughter weight and average daily gain (ADG) were lower for group 3 (928 and .83 lb) than for groups 1 (1075 and 1.96 lb) and 2 (1051 and 1.74 lb). Carcass traits, with the exception of percent of kidney, heart and pelvic fat (KHP), were similar for groups 1 and 2 and considerably higher than for group 3, except for rib eye area (REA). Animals in groups 1 and 2 graded 70 percent choice, 30 percent high good *vs* 60 percent standard, 40 percent good for those in group 3. Soft tissue in the carcass was significantly higher ($P<.05$) in crude protein, moisture and ash for group 3 *vs* group 1. Cattle in group 1 had approximately twice the fat content in the soft tissue compared to group 3.

Introduction

Present world grain shortages, likely increased future demands for grain for human consumption and potential change in the level of fat consumption in the human diet ultimately suggest a need for an alteration in beef production systems in the future. Recent trends in cattle feeding revealed that total grain use declined 50 percent between 1971 and 1974 with a concomitant 50 percent increase in the percentage of forages utilized in rations (Ward *et al.*, 1977). More recently, however, there has been some reversal in this sharp decline. Utilization of more forages in finishing rations for cattle will require additional tillable land for the production of high quality forages, since only high quality roughages will support adequate gains. Cool season annuals, such as wheat pasture, may offer great potential for producing forage-finished beef. Approximately 11.9 million acres of wheat pasture were available for grazing in Oklahoma and Texas in 1974.

Forage-finished beef yields smaller and leaner carcasses with less fat thickness, less internal fat and a lower dressing percentage than conventional grain-fed beef. Few studies have examined the detailed chemical composition of forage *vs* conventional grain-fed beef. The intent of this research was to examine the performance, carcass traits and chemical composition of cattle reared under widely different production systems.

Materials and Methods

Thirty Brangus X Hereford-Angus crossbred steers (avg. 768 lb), approximately 13 months of age, were allotted (10 per treatment) to one of three production systems: (1) a 90 percent conventional corn grain diet for 161 days;-(2) an intermediate group grazed on sorghum sudan and wheat pasture for 48 days, then fed on a 90 percent concentrate finishing ration for 113 days; or (3) a mixture of sorghum sudan and wheat pasture (190 days) until slaughter (no grain). The slaughter endpoint of the trial was the age at which the animals reached a low choice slaughter grade or at the end of the normal production system. An attempt was made to minimize age differences at slaughter.

After slaughtering, carcasses from all three groups (production systems) were chilled for 48 hr or longer at 0 ± 1 C. Carcasses were evaluated prior to processing for conventional carcass measurements of dressing percentage, marbling, maturity, quality grade, ribeye area and average fat thickness (13th rib area), kidney, heart and pelvic fat and yield grade.

The right side of the carcass from groups 1 and 3 were divided into retail cuts and separated into bone, soft tissue and KHP fat. The soft tissue was thoroughly ground in

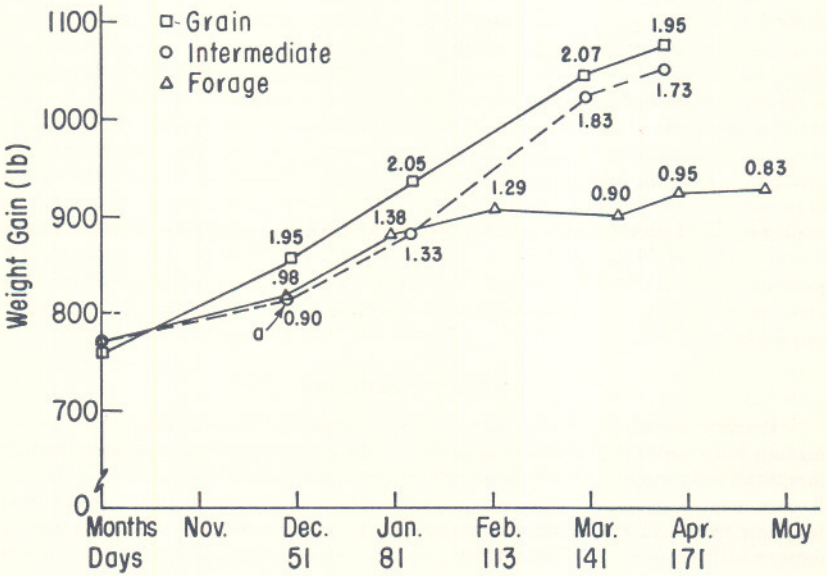

Figure 1. Growth curve for brangus crossbred steers on different production systems. The average daily gains appear on the respective growth curves.
[a]Signifies the end of the grazing period and the beginning of the feedlot phase for the intermediate group of cattle.

a meat grinder and then mixed in a mixer. A 40 pound sample was taken from the gound soft tissue for sampling purposes. The 40 pound sample was passed through a silent cutter to further mix and grind the soft tissue. Two samples (150 g) were taken at random from the soft tissue for proximate analysis. The samples were routinely analyzed for crude protein N by the Kjeldahl procedure (AOAC, 1970), moisture by the weight loss after drying at 100 C for 24 hr, fat content by ether extraction for 24 hr and ash content by ashing at 500 C for 3 hr (AOAC, 1970).

Results and Discussion

The performance of the three groups of cattle are shown in Figure 1. The average daily gains (ADG) for the conventional grain and intermediate fed cattle were 1.95 and 1.73 lb during the 161 days. During the 190 days, the steers grazing wheat pasture gained 160 lb (ADG .83 lb). The growth curves for the intermediate and forage fed cattle were similar up to mid-January (90 days) with the two groups attaining 41 percent and 75 percent, respectively, of their average slaughter weight. During January and February, excessive snowfall covered the wheat pasture, lowering performance of

Table 1. Composition of conventional grain ration.

Constituent	Percentage
Dry Rolled Corn	79.0
Soybean Meal	4.0
Cottonseed Hulls	5.0
Alfalfa Meal (Pelleted)	5.0
Molasses, Cane	5.0
Calcium Phosphate Dibasic	.4
Calcium Carbonate	.4
Salt (Plain)	.5
Urea	.7
	100.0%

Vitamin A (30,000 IU/g) supplement provided at .01% of the diet.

Table 2. Carcass data for brangus crossbred steers from various production systems.

Carcass Trait	Grain	Intermediate	Forage	SEM[e]
Hot Carcass wt, lb	675.9[a]	649.9[a]	504.7[b]	68.2
Dressing percentage	62.9[a]	61.8[a]	54.4[a]	
Maturity	14.1	14.0	13.8	.29
Marbling	14.8[a]	13.6[a]	9.0[b]	2.39
Quality Grade[d]	12.3[a]	12.1[a]	8.4[b]	1.01
Ribeye area, in^2	11.0[a]	10.5[ab]	9.6[b]	.87
Fat, in	.63[a]	.55[a]	.20[b]	.11
KHP %	3.9[a]	2.6[b]	1.6[c]	.65
YLDGRD	3.68[a]	3.36[a]	2.12[b]	.50

[abc]Means in a row with the same superscript letter differ ($P<.05$).
[d]12 = low choice, 9 = low good.
[e]Standard error of the mean.

Table 3. Proximate analysis of soft tissue from carcasses from the forage and grain-fed brangus crossbred steers.

Production System	Moisture	Dry Matter	Protein N	Fat	Ash
	%	%	%	%	%
Grain	49.80[a]	49.70[a]	14.95[a]	33.54[a]	.74[a]
Forage	64.43[b]	35.60[b]	18.75[b]	15.91[b]	.96[b]
SEM[c]	.68	.40	.10	.32	.006

[ab]Means in a column with different superscript letters differ (P<.05).
[c]Standard error of the mean.

the forage-fed group. During these months, the cattle were placed on sorghum stubble and provided with 2 lb cottonseed cake per day. During the last 30 days, the low ADG suggests that the grass-fed cattle had reached most of their growth potential and should have been slaughtered a month earlier. It appears that once forage-fed cattle of this type reach 900 to 930 lb, most of their potential for good gains on forage have been achieved.

Carcass data for the three groups are shown in Table 2. Carcass data for cattle in groups 1 and 2 was similar with the exception of percent KHP. The carcass parameters for the forage-fed steers were significantly lower (P<.05) than those of the other two groups with the exception of REA. The grain-fed and intermediate group graded 70 percent choice and 30 percent high good while the forage-fed steers graded 60 percent standard and 40 percent good. The carcass data and performance of cattle in group 3 compared less favorably to data from a previous year (Wagner and Horn, 1976) in which steers fed only wheat pasture gained 2.2 lb per day and carcasses graded 40 percent choice, 60 percent good.

Proximate analysis data for the soft tissue from cattle in groups 1 and 3 are shown in Table 3. The percent moisture, protein and ash were significantly higher (P<.05) in the soft tissue from forage-fed steer carcasses than from grain-fed steers. The percent fat and dry matter were significantly higher (P<.05) for the soft tissue from steers in group 1 than in group 3. The inverse relationship between percent fat and protein in the soft tissue of steers on the widely different production systems was expected. However, no explanation could be offered for the differences in ash content of soft tissue.

In conclusion, the differences in carcass characteristics and chemical composition of the soft tissue of steers on different production systems were greater than expected, reflecting the marginal wheat pasture conditions due to severe winter weather.

Literature Cited

A.O.A.C. Association of Official Analytical Chemists (14th Ed.), Washington, D.C.

Wagner, D. G. and F. Horn. 1976. Greater emphasis on forage in finishing programs. Ft. Reno Field Day Report.

Ward, G. M., P. L. Knox, B. W. Hobson. 1977. Beef production options and requirements for fossil fuel. Science 198:265.