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Performance, Carcass, and Meat Traits of Different Cattle Types

M. E. Dikeman

Summary

Different crossbred (X) cattle types were evaluated for growth, feed efficiency, carcass and meat traits. Steers were studied from mating Angus (A), Hereford (H), Brahman (B), Sahiwal (S), Pinzgauer (P), and Tarentaise (T) sires to Angus and Hereford females.

Average daily gain (ADG) and feed efficiency were similar for all the crosses except that SX gained slower and required more feed per pound of gain. Brahman crosses tended to have higher, and PX tended to have lower dressing percentages than the other crosses. Quality grades ranged from low choice (HAX) to average good (BX and SX). HAX had higher fat trim percentages and lower retail product percentages than other crossbred types because they had more fat covering. All other crosses were similar in fat trim, retail product, and bone percentages. Taste panel flavor and juiciness scores did not differ between crosses. However, PX and HAX tended to be more tender than TX or BX, and considerably more tender than SX.

If all crossbred types had been slaughtered at the same percentage of body fat rather than at the same age, there would likely be no advantage of PX, TX, BX or SX over HAX in feedlot performance, carcass or meat traits.

Introduction

Two-year results from the U.S. Meat Animal Research Center's "cattle germ plasm program" are reported here. Kansas State University and the Standardization Branch, Food Safety and Quality Service, USDA, cooperated on carcass and meat aspects of the study.

Data on calving difficulty and preweaning performance resulting from matings in this study were obtained in addition to reproduction and maternal traits of the female progeny. That information is in Progress Report No. 5 from the "germ plasm evaluation program", Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, NE 68933.

Appreciation is expressed to Jean Riggs and Garland Lewis, Department of Housing, KSU, for use of the meat processing facilities in the Pittman building in conducting this research.

Experimental Procedure

Different crossbred (X) cattle types were produced by mating Angus (A), Hereford (H), Brahman (B), Sahiwal (S), Pinzgauer (P), and Tarentaise (T) sires to Angus and Hereford females. The two calf crops were born in March, April, and May of 1975 and 1976, castrated at birth and weaned when approximately 200 days old. All male calves were fed in a feedlot by sire breed groups to obtain growth and feed efficiency data. They were fed a corn silage-and-concentrate ration that approximated 80% TDN (total digestible nutrients) on a dry matter basis.

Approximately one-third of each crossbred type was slaughtered at each of three slaughter times. Steers born in 1975 were slaughtered after 192, 218, and 246 days on feed after a 40-day postweaning adjustment period. Steers born in 1976 were fed 180, 208, and 236 days after a 34-day postweaning adjustment period. All steers were slaughtered in a commercial slaughter plant. After a 48-hr chill, carcasses were evaluated for yield grade and quality grade. The right carcass side of an average of 45 steers per sire breed for each slaughter group (except for 34 Tarentaise-sired steers) were brought to Kansas State University for detailed cut-out and meat quality evaluations. The sides were fabricated into essentially boneless, closely trimmed retail cuts.

One rib steak was removed from each of the carcasses for Warner-Bratzler shear determinations of tenderness. Another rib steak was removed from six carcasses per crossbred group per slaughter time and evaluated for tenderness, flavor, and juiciness by a trained taste panel.

Results and Discussion

Feedlot average daily gain (ADG) was similar for all crossbred types except the SX which gained significantly slower (Table 18.1). Steers from H females had higher ADG than those from A females regardless of sire breed. Final weights of SX were the lightest of all crosses; BX the heaviest because they were heavier at weaning. Final weights were similar for HAX, PX and TX. Sahiwal crosses were less efficient in feed utilization than other crosses, and PX slightly more efficient than the other crosses. The remaining crosses were similar in feed efficiency.

Hot carcass weights were similar for all crossbred types except that SX were lighter (Table 18.2). Dressing percentages did not differ between HAX, TX, and SX; however, BX tended to dress highest and PX lowest. Quality grades ranged from low choice (HAX) to average good (BX and SX).

The range in yield grades for the different crosses was relatively narrow (3.2 to 3.8, Table 18.3), with no differences in rib eye areas but HAX had more fat cover which gave them a less desirable yield grade. TX had higher kidney knob percentages than the other crossbred types.

Hereford X Angus crosses had lower retail product and higher fat trim percentages than other crosses because they had more fat covering, with no advantage in muscle thickness (Table 18.4). All other crossbred types were similar in retail product, fat trim, and bone percentages. Taste panel flavor and juiciness scores did not differ statistically among crosses.

(Table 18.5). However, PX and HX tended to be more tender than TX or BX, and considerably more tender than SX.

The only meaningful differences between crosses in this study probably were that SX have the least growth potential and Zebu-type cattle (S and B) tend to have less marbling and less tender meat. Most other differences can be attributed to differences in fatness at slaughter. If all crosses had been slaughtered at a constant percentage of body fat rather than at the same age, HAX probably would be at least equal to PX, TX, or BX in ADG, feed efficiency, quality grade, yield grade, retail product percentage, and meat palatability. That is, there appears to be no advantage of PX, TX, BX or SX over HAX in feedlot performance, carcass, or meat traits when all are managed as in this study.

Table 18.1. Postweaning average daily gains, final weights, and TDN efficiencies of different crossbred cattle types.

Breed of steer		No. steers ^a				Postweaning average daily gain				Final weight					Feed efficiency (TDN per lb gain) ^c			
Sire	Dam	S1	S2	S3	Total	S1	S2	S3	Avg	S1	S2	S3	Avg	Ratio	S1	S2	S3	Avg
Angus Hereford	Hereford	24	24	26	74	2.53	2.50	2.42	2.48	1011	1071	1119	1067	99.4				
	Angus	36	35	35	106	2.48	2.43	2.33	2.42	1030	1086	1128	1081	100.7				
	Average	60	59	61	180	2.51	2.46	2.38	2.45	1021	1079	1124	1074	100.0	5.93	6.13	6.37	6.14
Brahman	Hereford	17	17	18	52	2.56	2.50	2.48	2.51	1059	1113	1170	1114	103.7				
	Angus	34	34	33	101	2.40	2.36	2.41	2.39	1061	1125	1180	1122	104.5				
	Average	51	51	51	153	2.48	2.43	2.44	2.45	1060	1119	1175	1118	104.1	5.99	6.19	6.18	6.12
Sahiwal	Hereford	19	19	21	59	2.38	2.34	2.27	2.33	997	1045	1116	1053	98.0				
	Angus	32	32	31	95	2.22	2.13	2.11	2.15	984	1035	1084	1034	96.3				
	Average	51	51	52	154	2.30	2.24	2.19	2.24	991	1040	1100	1044	97.2	6.08	6.41	6.55	6.35
Pinzgauer	Hereford	22	23	23	68	2.65	2.54	2.51	2.57	1031	1090	1144	1088	101.3				
	Angus	36	36	36	108	2.48	2.42	2.30	2.40	1041	1096	1130	1089	101.4				
	Average	58	59	59	176	2.56	2.48	2.41	2.49	1036	1093	1137	1089	101.4	5.76	6.00	6.26	6.01
Tarentaise	Hereford	12	10	9	31	2.58	2.50	2.42	2.50	1042	1080	1141	1088	101.3				
	Angus	23	25	24	72	2.41	2.32	2.27	2.33	1043	1078	1137	1086	101.1				
	Average	35	35	33	103	2.50	2.41	2.35	2.42	1043	1079	1139	1087	101.2	5.86	6.18	6.37	6.14
Averages of all sires	Hereford	94	93	97	284	2.54	2.48	2.42	2.48	1028	1080	1138	1082	100.7				
	Angus	161	162	159	482	2.40	2.33	2.28	2.34	1032	1084	1132	1082	100.7				
	Average					2.47	2.40	2.35	2.41	1030	1082	1135	1082	100.7	5.92	6.18	6.35	6.15

^aS1, S2, and S3 represent slaughter groups 1, 2, and 3. Steers born in 1975 were slaughtered after 192, 218, and 246 days on feed after a 40-day postweaning adjustment period; 1976 steers were slaughtered after 180, 208, and 236 days on feed after a 34-day postweaning adjustment period.

^bRatio relative to 1074 lb average of Hereford-Angus reciprocal crosses.

^cTDN = Total digestible nutrients determined on a 100% dry matter basis.

Table 18.2. Hot carcass weights, dressing percentages, quality grades, and marbling scores of different crossbred types.

Breed of steer		Hot carcass wt, lb				Dressing percentage ^a				U.S.D.A. quality grade ^b				Marbling score ^c			
Sire	Dam	S1	S2	S3	Avg	S1	S2	S3	Avg	S1	S2	S3	Avg	S1	S2	S3	Avg
Angus Hereford	Hereford	603	643	686	644	59.8	60.4	61.5	60.6	11.4	12.3	12.7	12.2	10.0	12.2	13.5	11.9
	Angus	623	664	703	663	60.3	61.0	62.1	61.1	11.7	12.3	12.1	12.0	10.3	12.1	11.6	11.4
	Average	613	653	694	654	60.0	60.7	61.8	60.9	11.6	12.3	12.4	12.1	10.2	12.1	12.6	11.6
Brahman	Hereford	615	653	700	656	60.3	61.3	61.6	61.0	10.5	9.8	11.0	10.4	9.2	7.8	9.5	8.8
	Angus	638	685	720	681	61.6	62.6	62.5	62.2	10.6	11.1	11.3	11.0	8.8	9.7	10.1	9.5
	Average	627	669	710	668	60.9	62.0	62.0	61.6	10.5	10.4	11.1	10.7	9.0	8.8	9.8	9.2
Sahiwal	Hereford	569	609	656	612	59.9	60.8	61.7	60.8	10.3	10.2	11.0	10.5	8.5	8.4	9.4	8.8
	Angus	580	619	646	615	60.8	61.9	61.2	61.3	10.4	11.8	11.8	11.4	8.8	11.2	11.1	10.4
	Average	575	614	651	613	60.3	61.3	61.5	61.0	10.3	11.0	11.4	10.9	8.6	9.8	10.3	9.6
Pinzgauer	Hereford	590	638	669	632	57.8	59.5	59.7	59.0	10.7	11.4	11.2	11.1	8.9	10.9	9.9	9.9
	Angus	620	657	695	657	59.4	59.9	61.2	60.2	11.8	11.9	12.6	12.1	10.8	11.5	12.7	11.7
	Average	605	648	682	645	58.6	59.7	60.5	59.6	11.2	11.7	11.9	11.6	9.8	11.2	11.3	10.8
Tarentaise	Hereford	602	639	677	639	59.8	60.8	60.7	60.4	10.5	11.3	11.0	10.9	8.9	9.6	10.4	9.6
	Angus	624	658	691	658	60.7	61.5	61.6	61.3	10.9	11.4	12.1	11.4	9.5	10.0	11.5	10.3
	Average	613	649	684	649	60.2	61.2	61.1	60.8	10.7	11.3	11.5	11.2	9.2	9.8	10.9	10.0
Average of all sires	Hereford	596	636	678	637	59.5	60.6	61.0	60.4	10.7	11.0	11.4	11.0	11.1	9.8	10.5	9.8
	Angus	617	657	691	655	60.5	61.4	61.7	61.2	11.1	11.7	12.0	11.6	11.6	10.9	11.4	10.6
	Average	606	646	684	646	60.0	61.0	61.4	60.8	10.9	11.3	11.7	11.3	9.4	10.3	11.0	10.2

^aDressing percentage equals hot carcass weight divided by final weight on feed and water (without shrink).

^bU.S.D.A. quality grade as revised in 1976. 10 = average good, 11 = high good, 12 = low choice, 13 = average choice, etc.

^cMarbling Score: 9 = slight+, 10 = small-, ..., 21 = slightly abundant+.

Table 18.3. Yield grades, rib eye areas, fat thicknesses, and estimated kidney, pelvic, and heart fat percentages of different crossbred types.

Breed of steer		U.S.D.A. yield grade				Ribeye area, sq. in.				Fat thickness, in.				Est. kidney, pelvic and heart fat, %			
Sire	Dam	S1	S2	S3	Avg	S1	S2	S3	Avg	S1	S2	S3	Avg	S1	S2	S3	Avg
Angus Hereford	Hereford	3.2	3.7	4.0	3.6	10.8	10.7	11.0	10.8	.52	.60	.68	.60	3.0	3.4	3.4	3.3
	Angus	3.6	3.9	4.2	3.9	10.6	10.8	11.0	10.8	.65	.68	.74	.69	2.8	3.3	3.5	3.2
	Average	3.4	3.8	4.1	3.8	10.7	10.8	11.0	10.8	.58	.64	.71	.65	2.9	3.3	3.4	3.2
Brahman	Hereford	3.2	3.3	3.8	3.4	10.5	10.9	10.8	10.7	.43	.49	.57	.50	3.1	3.1	3.7	3.3
	Angus	3.5	3.9	3.9	3.8	10.8	11.2	11.4	11.1	.52	.64	.63	.60	3.6	3.9	4.1	3.9
	Average	3.3	3.6	3.9	3.6	10.6	11.0	11.1	10.9	.48	.56	.60	.55	3.3	3.5	3.9	3.6
Sahiwal	Hereford	3.1	3.2	3.6	3.3	10.2	10.5	10.9	10.5	.45	.47	.54	.49	2.8	2.8	3.6	3.1
	Angus	3.3	3.6	3.6	3.5	10.5	10.9	11.2	10.9	.52	.61	.62	.58	3.4	3.5	3.7	3.5
	Average	3.2	3.4	3.6	3.4	10.4	10.7	11.0	10.7	.48	.54	.58	.53	3.1	3.1	3.6	3.3
Pinzgauer	Hereford	2.7	3.0	3.2	3.0	10.9	11.1	11.4	11.2	.33	.42	.48	.41	3.1	3.1	3.4	3.2
	Angus	3.1	3.4	3.7	3.4	11.1	11.5	11.7	11.5	.46	.51	.61	.52	3.4	3.9	4.2	3.9
	Average	2.9	3.2	3.5	3.2	11.0	11.3	11.6	11.3	.40	.47	.54	.47	3.3	3.5	3.8	3.5
Tarentaise	Hereford	2.9	2.8	3.7	3.1	10.7	11.3	11.1	11.0	.36	.33	.52	.40	3.4	3.4	4.1	3.6
	Angus	3.2	3.5	3.7	3.5	10.9	11.4	11.4	11.2	.41	.51	.52	.48	3.9	4.4	4.7	4.3
	Average	3.0	3.1	3.7	3.3	10.8	11.3	11.3	11.1	.38	.42	.52	.44	3.7	3.9	4.4	4.0
Average of all sires	Hereford	3.0	3.2	3.6	3.3	10.6	10.9	11.0	10.8	.42	.46	.56	.48	3.1	3.2	3.6	3.3
	Angus	3.3	3.6	3.8	3.6	10.8	11.2	11.3	11.1	.51	.59	.62	.57	3.4	3.8	4.0	3.7
	Average	3.2	3.4	3.7	3.4	10.7	11.0	11.2	11.0	.46	.53	.59	.53	3.3	3.5	3.8	3.5

Table 18.4. Carcass percentages of retail product, fat trim, and bone of different crossbred types.^a

Breed of steer		Retail product, % ^b				Fat trim, %				Bone, %			
Sire	Dam	S1	S2	S3	Avg	S1	S2	S3	Avg	S1	S2	S3	Avg
Angus Hereford	Hereford	69.2	66.4	63.5	66.3	18.3	21.6	24.8	21.6	12.5	12.0	11.7	12.1
	Angus	67.3	65.0	62.8	65.0	20.6	23.3	25.8	23.2	12.1	11.7	11.4	11.8
	Average	68.3	65.7	63.1	65.7	19.4	22.5	25.3	22.4	12.3	11.9	11.6	11.9
Brahman	Hereford	70.5	69.3	66.3	68.7	16.0	17.8	21.1	18.3	13.5	12.9	12.6	13.0
	Angus	69.4	67.2	65.3	67.3	18.1	21.0	22.8	20.6	12.5	11.8	11.8	12.0
	Average	70.0	68.2	65.8	68.0	17.0	19.4	22.0	19.5	13.0	12.4	12.2	12.5
Sahiwal	Hereford	70.9	69.4	66.3	68.9	15.9	17.5	21.3	18.2	13.2	13.1	12.4	12.9
	Angus	69.4	67.6	65.3	67.4	18.2	20.8	23.1	20.7	12.4	11.6	11.6	11.9
	Average	70.1	68.5	65.8	68.1	17.1	19.2	22.2	19.5	12.8	12.4	12.0	12.4
Pinzgauer	Hereford	70.9	69.1	66.8	68.9	15.3	17.5	20.1	17.6	13.7	13.5	13.1	13.4
	Angus	69.3	67.6	64.5	67.1	17.7	19.6	23.6	20.3	13.0	12.9	12.0	12.6
	Average	70.1	68.3	65.6	68.0	16.5	18.5	21.8	19.0	13.4	13.2	12.5	13.0
Tarentaise	Hereford	70.1	69.4	66.1	68.5	16.7	17.2	22.0	18.6	13.1	13.4	11.9	12.8
	Angus	70.2	67.3	65.1	67.5	17.5	20.7	23.2	20.5	12.4	12.0	11.7	12.0
	Average	70.2	68.3	65.6	68.0	17.1	19.0	22.6	19.6	12.7	12.7	11.8	12.4
Average of all sires	Hereford	70.3	68.7	65.8	68.3	16.5	18.3	21.9	18.9	13.2	13.0	12.3	12.8
	Angus	69.1	66.9	64.6	66.9	18.4	21.2	23.7	21.1	12.5	12.0	11.7	12.1
	Average	69.7	67.8	65.2	67.6	17.4	19.7	22.8	20.0	12.9	12.5	12.0	12.5

^aDetailed carcass cutout data obtained on an average of 45 steers per sire breed by slaughter group subclass for all sire breeds except Tarentaise (average of 34 were included in each slaughter group).

^bRetail product, % = Actual yield of boneless, closely trimmed beef from the carcass.

Table 18.5. Warner-Bratzler shear values and taste panel scores of rib steaks from different crossbred types.

Breed of steer		W-B shear, lb. ^a				T.P. tenderness ^b				T.P. flavor ^b				T.P. juiciness ^b			
Sire	Dam	S1	S2	S3	Avg	S1	S2	S3	Avg	S1	S2	S3	Avg	S1	S2	S3	Avg
Angus Hereford	Hereford	7.2	7.4	6.5	7.0	7.4	7.3	7.6	7.4	7.2	7.3	7.3	7.3	7.3	7.3	7.5	7.4
	Angus	7.4	7.9	6.9	7.4	7.2	7.1	7.5	7.2	7.1	7.0	7.0	7.0	7.1	7.1	7.1	7.1
	Average	7.3	7.7	6.7	7.2	7.3	7.2	7.5	7.3	7.1	7.1	7.1	7.1	7.2	7.2	7.3	7.2
Brahman	Hereford	9.4	8.8	7.3	8.5	5.9	6.1	6.6	6.2	6.9	6.9	7.2	7.0	6.4	6.8	6.9	6.7
	Angus	9.4	8.6	7.5	8.5	6.5	6.4	7.0	6.6	7.0	7.0	7.0	7.0	7.0	7.1	6.8	7.0
	Average	9.4	8.7	7.4	8.5	6.2	6.3	6.8	6.4	6.9	7.0	7.1	7.0	6.7	7.0	6.8	6.8
Sahiwal	Hereford	9.9	10.1	8.3	9.4	5.6	4.9	6.1	5.5	6.8	6.8	6.9	6.9	6.8	6.8	6.9	6.8
	Angus	9.9	9.4	8.1	9.1	6.1	5.9	6.3	6.1	7.0	6.9	6.9	6.9	6.9	6.9	7.0	6.9
	Average	9.9	9.8	8.2	9.3	5.8	5.4	6.2	5.8	6.9	6.9	6.9	6.9	6.9	6.8	7.0	6.9
Pinzgauer	Hereford	8.4	7.3	7.0	7.6	7.0	7.0	7.4	7.1	7.2	7.3	7.3	7.2	7.2	7.1	7.3	7.2
	Angus	7.9	7.0	6.5	7.1	6.5	7.2	7.6	7.1	6.9	7.2	7.2	7.1	6.8	7.1	7.4	7.1
	Average	8.1	7.2	6.7	7.3	6.8	7.1	7.5	7.1	7.1	7.2	7.3	7.2	7.0	7.1	7.3	7.1
Tarentaise	Hereford	8.9	7.4	7.6	8.0	6.2	6.7	6.9	6.6	6.9	7.0	7.3	7.1	6.9	6.9	7.0	6.9
	Angus	9.4	8.2	7.0	8.2	6.2	6.9	7.2	6.7	7.1	7.3	7.1	7.2	6.9	7.0	7.1	7.0
	Average	9.1	7.8	7.3	8.1	6.2	6.8	7.0	6.7	7.0	7.2	7.2	7.1	6.9	7.0	7.0	7.0
Average of all sires	Hereford	8.7	8.2	7.3	8.1	6.4	6.4	6.9	6.6	7.0	7.1	7.2	7.1	6.9	7.0	7.1	7.0
	Angus	8.8	8.2	7.2	8.1	6.5	6.7	7.1	6.8	7.0	7.0	7.0	7.0	6.9	7.1	7.1	7.0
	Average	8.8	8.2	7.2	8.1	6.5	6.5	7.0	6.7	7.0	7.1	7.1	7.1	6.9	7.0	7.1	7.0

^aWarner-Bratzler shear is a measure of the pounds of force required to shear one-half inch cores of steaks cooked at 350°F to 150°F internal temperature and cooled for 30 minutes at room temperature. Warner-Bratzler shear was measured on the same steers from which detailed carcass cutout data were obtained.

^bTaste panel scores are based on a 9-point scale, with higher scores indicating more flavor, juiciness, or tenderness. Traits taste panel members evaluated were measured on steaks from an average of 6 steers per sire-dam breed group per slaughter date per year.