

Growth performance to weaning was very similar for the calves from both sire breeds and the average 205-day weaning weight was 413.5 lb (unadjusted for age of dam and averaged over sexes). The only statistically significant differences between sire breeds were that the Shorthorn sired calves were .5 of a weaning conformation score and .4 of a condition score higher than the Red Poll sired calves. Thus, the Shorthorn sired calves appeared to have slightly more muscle as well as more fat at weaning.

Overall, the performance of three-breed cross calves sired by Red Poll and Shorthorn bulls were very similar, and the slight differences that were detected may simply reflect differences between particular bulls rather than real breed differences. Feedlot and carcass performance of the three-breed cross calves born in 1975 were reported in the 1977 Animal Science Research Report (Okla. Agr. Exp. Sta. Res. Report MP-101:80) and the performances were similar for both sire breeds.

Productivity of Two-Year Old Crossbred Cows Producing Three-Breed Cross Calves

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Story in Brief

Productivity was measured on 434 two-year old heifers of seven crossbred groups (Hereford x Angus, Simmental x Angus, Simmental x Hereford, Brown Swiss x Angus, Brown Swiss x Hereford, Jersey x Angus and Jersey x Hereford) mated to Red Poll and Shorthorn bulls. Percent calf crop weaned varied greatly among crossbred groups from Jersey cross and Brown Swiss x Angus cows averaging 88 percent to Simmental x Hereford cows at 53 percent. The heaviest calves at weaning were produced by Brown Swiss x Angus cows at 446 lb. Hereford x Angus cows weaned calves averaging 369 lb and the other crossbred dam groups were similar at 416 lb. Jersey cross and Brown Swiss x Angus cows were most productive in terms of pounds of calf weaned per cow exposed in the breeding herd by 102 lb (37 percent) above the Hereford x Angus crosses, followed by the Brown Swiss x Hereford and Simmental x Angus groups (30.5 lb or 11 percent above the Hereford x Angus crosses). Simmental x Hereford cows weaned 57 fewer lb of calf per heifer exposed (21

percent) than Hereford x Angus cows. Individual cow efficiency, measured by calf weaning weight divided by cow metabolic size, favored Jersey cross cows by 18.1 percent, Brown Swiss cross cows by 13.1 percent and Simmental cross cows by 5.2 percent over Hereford x Angus crosses.

Introduction

The growing urgency for more efficiency in beef cattle production has focused attention on crossbreeding. Research has demonstrated that crossbreeding systems can greatly increase percent calf crop weaned and calf weaning weights, thus resulting in increased productivity for the cow herd. Many studies have indicated that the pounds of calf weaned per cow exposed in the breeding herd will be increased 20 to 25 percent by a planned crossbreeding system.

Since over half of the increased productivity in a crossbreeding system results from using a crossbred cow, an extensive research program is presently underway at the Oklahoma Agricultural Experiment Station to compare the lifetime productivity of various two-breed cross cows mated to a bull of a third breed. The purpose of this study was to compare the productivity of the various two-breed cross heifer groups when managed to produce their first calf at two years of age.

Experimental Procedures

Angus and Hereford cows were mated to produce crossbred calves in 1973, 1974 and 1975 sired by Angus, Hereford, Simmental, Brown Swiss and Jersey bulls. Hereford x Angus and Angus x Hereford crosses were combined into a single group. Four different bulls of each breed were used each year. All heifer calves produced by these matings were kept in the herd for evaluation as cows. A total of 434 two-breed cross heifers entered the cow herd. A random half of the heifers in each crossbred group were mated to Red Poll bulls and the other half to Shorthorn bulls from April 15 to July 1 to produce their first calf at two years of age in the Spring of 1975, 1976 or 1977. A total of 334 three-breed cross calves were weaned (120 calves in 1975, 124 in 1976 and 90 in 1977). Three bulls from each sire breed were used in these matings each breeding season. Red Poll and Shorthorn bulls were used primarily as an attempt to avoid excessive calving problems associated with two-year old heifers.

All cattle were managed on native and bermuda grass pasture at the Lake Carl Blackwell Research Range. Calves were born in January, February and March of each year and remained with their dams on native grass until they were weaned at an average age of 205 days.

Results and Discussion

Table 1 presents the reproductive performance of the two-year old crossbred cows. Eighty-four percent of all the heifers exposed to breeding

calved, ranging from 58 percent for Simmental x Hereford to an average of 94 percent for Jersey x Hereford and Brown Swiss x Angus heifers.

Each calf was observed during birth and given a calving score. Percent calving difficulty is the percentage of births that were categorized as difficult births and required assistance from the herdsman. Based on the scoring system used, births scored 3 or higher were categorized as difficult births. A score of 2 is used for only minor assistance usually administered for the convenience of the herdsman rather than actually being required. The percent of heifers requiring assistance at calving varied from 48 percent for Simmental x Hereford to an average of 30.4 percent for Hereford x Angus, Simmental x Angus and Brown Swiss x Hereford to 20.3 percent for Brown Swiss x Angus and Jersey x Angus to 14.8 percent for Jersey x Hereford heifers. Overall, some assistance was provided for 26.1 percent of the calves and a total of 13 caesarian operations were performed.

Of the 434 heifers placed in the breeding pastures 79 percent produced a live calf, ranging from 91.5 percent for the Jersey x Hereford to 55.6 percent for the Simmental x Hereford. Overall, 77 percent of the 434 heifers exposed to breeding weaned a calf. There was considerable variation among crossbred groups in the percentage that weaned a calf. Jersey cross and Brown Swiss x Angus cows were similar and had the highest percentage weaned (averaged 88.2 percent) which was about 16 percent more than were weaned by Hereford x Angus, Simmental x Angus and Brown Swiss x Hereford cows (averaged 72.3 percent). Simmental x Hereford cows had the poorest reproductive performance and only 53.3 percent weaned calves.

A critical period in the reproductive management of young cows is the breeding season following the birth of the first calf at two years of age. Rebreding performance of those crossbred heifers that calved is presented in the last column of Table 1. Overall, 73.4 percent of the crossbred cows calving as two-year olds rebred. Rebreding performance ranged from 88.9 percent for Jersey crosses to 72.9 percent for Hereford x Angus and Simmental x Angus to 61.5 percent for Simmental x Hereford and 46.1 percent for Brown Swiss x Hereford cows.

Performance of the three-breed cross calves to weaning is presented in Table 2. Calves from Jersey cross cows had the lightest birthweights and averaged 59.3 lb which perhaps accounts for some of the easier calving experienced by the Jersey crosses. Calves from Jersey x Hereford cows were similar in birthweight to those from Hereford x Angus at 61.1 lb while the Simmental x Angus and Brown Swiss cross cows had the heaviest calves (averaged 67 lb). Simmental x Hereford cows, which experienced the most calving difficulty, had an average birthweight of 64.7 lb.

Simmental, Brown Swiss and Jersey cross cows were all expected to produce more milk than the Hereford x Angus crosses and thus wean heavier calves. The heaviest calves were produced by Brown Swiss x Angus cows at

Table 1. Reproductive performance of two-year old crossbred cows

Crossbred cow group ¹	No. of heifers exposed	Percent calving ²	Percent live calves born ²	Percent calving difficulty ³	Calving difficulty score ³	Percent calves weaned ²	Percent of cows calving rebred
HA	105	86.7	77.1	30.9	1.96 ^{bcd}	72.4	72.5
SA	69	81.2	72.4	34.0	2.02 ^{cd}	72.4	73.2
SH	45	57.8	55.6	48.0	2.28 ^d	53.3	61.5
BA	47	93.6	87.2	19.5	1.60 ^{ab}	85.1	68.2
BH	50	78.0	76.0	26.3	1.93 ^{ad}	72.0	46.1
JA	59	89.8	88.1	21.2	1.70 ^{ac}	88.1	84.9
JH	59	94.9	91.5	14.8	1.57 ^a	91.5	92.9
Overall	434	84.0	78.6	26.1	1.86	77.0	73.4

¹H=Hereford, A=Angus, S=Simmental, B=Brown Swiss and J=Jersey.

²Based on the number of cows exposed in the breeding herd.

³Based on the number of cows calving. Calving difficulty scores: 1=no difficulty, 2=little difficulty, 3=moderate difficulty, 4=major difficulty and 5=caesarian or abnormal presentation. Percent calving difficulty is the percentage of births that required assistance from the herdsman (scores of 3 and higher).

a,b,c,d Means in the same column that do not share at least one superscript are significantly different at the .05 probability level.

Table 2. Performance to weaning of three-breed cross calves produced by two-breed cross cows

Crossbred cow group ¹	No. calves	Birth weight (lb)	Weaning ² conformation	Weaning ³ condition	Prewaning ADG (lb/day)	205-day weaning weight ⁴	
						lb	% HA
HA	78	61.5 ^b	12.5 ^a	4.9 ^a	1.50 ^a	369 ^a	100.0
SA	50	68.2 ^d	13.1 ^{bc}	5.3 ^b	1.73 ^b	423 ^c	114.6
SH	24	64.7 ^c	13.0 ^b	4.9 ^{ac}	1.68 ^b	406 ^b	110.0
BA	40	66.6 ^{cd}	13.4 ^c	5.3 ^b	1.85 ^c	446 ^d	120.9
BH	36	66.3 ^{cd}	13.2 ^{bc}	5.4 ^b	1.72 ^b	419 ^{bc}	113.6
JA	52	57.9 ^a	12.5 ^a	5.3 ^b	1.74 ^b	414 ^{bc}	112.2
JH	54	60.7 ^{ab}	12.3 ^a	5.2 ^{bc}	1.74 ^b	417 ^{bc}	113.0
Total or Overall Avg.	334	63.3	12.8	5.1	1.69	409	

¹H=Hereford, A=Angus, S=Simmental, B=Brown Swiss and J=Jersey.

²Conformation score equivalents: 12=low choice 13=average choice and 14=high choice.

³Condition score equivalents: range from 1=very thin to 5=average to 9=very fat.

⁴Weaning weights were adjusted only for the age of calf. Steer and heifer weaning weights were averaged. All dams were two years old at the time of calving.

a,b,c,d Means in the same column that do not share at least one superscript are significantly different at the .05 probability level.

446 lb (20.9 percent heavier than from Hereford x Angus). Jersey crosses, Brown Swiss x Hereford and Simmental crosses produced calves averaging 416 lb (12.7 percent heavier than from Hereford x Angus) with Hereford x Angus cows producing the lightest calves at 369 lb. Comparisons of calf preweaning average daily gain was similar to comparisons of calf weaning weight. Calves from Hereford x Angus cows had the slowest preweaning growth rate at 1.50 lb/day and calves from Brown Swiss x Angus cows were the fastest gainers at 1.85 lb/day. Calves from the other crossbred groups were similar in preweaning growth rate and averaged 1.72 lb/day.

Overall, these three-breed cross calves were very uniform in conformation. Calves from Hereford x Angus and Jersey cross cows averaged low choice in conformation while the others were average choice. They were also very uniform in condition with calves from Hereford x Angus and Simmental x Hereford cows slightly below average with a condition score of 4.9 and the other groups above average with a condition score of 5.3.

In Table 3, comparisons among crossbred groups in total productivity for the breeding herd were made by combining the percentage of cows exposed that weaned calves with the respective weaning weights to obtain the pounds of calf weaned per cow exposed in the breeding herd. Simmental x Hereford cows were 57 lb (20.8 percent) lower in productivity than Hereford x Angus. Jersey cross and Brown Swiss x Angus cows were 102 lb (37.1 percent) more productive than Hereford x Angus cows and Simmental x Angus and Brown Swiss x Hereford cows were 31 lb (11 percent) more productive.

Larger cows require more feed during the year for body maintenance and thus need to produce larger calves in order to be competitive with small cows in efficiency of production. Cow efficiency data are presented in Table 4. The heaviest cows were Simmental x Angus at 801 lb (12 percent heavier than the Hereford x Angus). Brown Swiss cross and Simmental x Hereford cows averaged 26 lb (4 percent) heavier than Hereford x Angus cows and Jersey crosses were 55 lb (8 percent) lighter. One measure of cow efficiency is the ratio of calf weaning weight to cow weight. Larger values are indicative of more efficient cows. On this basis, Jersey cross cows were most efficient, weaning

Table 3. Weaning weight production per crossbred cow in the breeding herd

Crossbred cow group ¹	Pounds of calf weaned per cow exposed	
	lb	%HA
HA	274	100.0
SA	307	112.0
SH	217	79.2
BA	380	138.7
BH	302	110.2
JA	365	133.2
JH	382	139.4

¹H=Hereford, A=Angus, S=Simmental, B=Brown Swiss and J=Jersey

Table 4. Average crossbred cow weights and measures of cow efficiency

Crossbred cow group ¹	No. of cows	Average cow weight ²		Calf Wn. Wt. ÷ Cow Wt.		Calf Wn. Wt. ÷ Cow Metabolic Wt.	
		lb	%HA	Ratio	%HA	Ratio	%HA
HA	105	716	100.0	.527 ^a	100.0	2.71 ^a	100.0
SA	69	801	111.9	.537 ^a	101.9	2.84 ^b	104.8
SH	45	746	104.2	.549 ^a	104.2	2.86 ^b	105.5
BA	47	750	104.7	.600 ^b	113.9	3.12 ^{cd}	115.1
BH	50	729	101.8	.582 ^b	110.4	3.01 ^c	111.1
JA	59	661	92.2	.638 ^c	121.1	3.22 ^d	118.8
JH	59	662	92.4	.627 ^c	119.0	3.18 ^d	117.3

¹H=Hereford, A=Angus, S=Simmental, B=Brown Swiss and J=Jersey.

²Average of spring weight after calving and prior to breeding and the fall weight after weaning.

a,b,c,d Means in the same column that do not share at least one superscript are significantly different at the .05 probability level.

calves at 63 percent of their body weight which was 20 percent more efficient than Hereford x Angus crosses. Brown Swiss crosses were 12 percent more efficient than Hereford x Angus cows and Simmental crosses were only slightly more efficient (3.5 percent) than Hereford x Angus cows.

Nutritional requirements to maintain a cow of a particular size is dependent upon the metabolic body size of the animal which can be estimated as the animal's weight taken to the 0.75 power. Since differences in feed requirements between crossbred groups should be estimated with greater precision when based on metabolic cow size, the ratio of calf weight to cow metabolic weight was also considered. On this basis, as compared to Hereford x Angus cows, Jersey cross and Brown Swiss x Angus cows were 17.1 percent more efficient, Brown Swiss x Hereford were 11.1 percent more efficient and Simmental crosses were 5.2 percent more efficient.

These data suggest some relatively large differences in two-year old cow productivity among the various crossbred groups. Some of these may be, at least in part, due to differences in rate of physiological development and maturity. Thus, the relative comparisons in productivity and production efficiency may change as the cows mature.

A Comparison of Profitability of Two-Year-Old Crossbred Cows

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Story in Brief

Profitability of raising a calf of various two-year-old two-breed cross cows was compared. Data on two-year-old two-breed cross cows that have been described in the preceding paper in this report and information from other sources were used to simulate the production systems of these two-breed cross cows.

Dry matter requirements or nutritional requirements for each type of cow were determined from recommended requirements based on milk production, weight, stage of pregnancy, and stage of lactation of the cow. An average of the market prices of beef for the last five years and current costs of feed were used to provide an economical comparison of systems using two-breed cross cows.