Productivity Comparisons of Various Three-Year-Old Crossbred Cow Groups

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Story in Brief

Productivity was measured on 303 three-year-old crossbred cows of eight different two-breed crosses (Hereford-Angus, Angus-Hereford, Simmental-Angus, Simmental-Hereford, Brown Swiss-Angus, Brown Swiss-Hereford, Jersey-Angus and Jersey-Hereford) when mated to Brahman and Charolais bulls.

The percentage of cows exposed to breeding that weaned a calf ranged from 29.7 percent for Brown Swiss-Angus cows to 88.4 percent for Jersey-Hereford cows. The percentage of cows calving that required assistance in calving ranged from 11.4 percent for Jersey-Angus cows to 48.5 percent for Simmental-Angus Cows.

Calves from Simmental, Brown Swiss and Jersey crosses were from 10.0 to 14.6 percent heavier than calves from reciprocal Hereford-Angus cross cows. Jersey cross and Simmental cross cows produced 31.1 percent and 14.2 percent, respectively, more lb of calf weaned per cow exposed in the breeding herd than Hereford-Angus reciprocal cross cows. Brown Swiss-Angus and Brown Swiss-Hereford cows were 7.8 and 51.8 percent, respectively, less productive.

Using the ratio of calf weaning weight to cow metabolic weight as a measure of cow efficiency, Jersey cross, Brown Swiss cross and Simmental cross cows were 19.9, 10.8 and 5.4 percent more efficient, respectively, than Hereford-Angus reciprocal cross cows.

Introduction

Crossbreeding is increasingly being utilized to increase the efficiency of producing beef. Research studies have indicated that the lb of calf weaned per cow exposed in the breeding herd can be increased to 20 to 25 percent by planned crossbreeding systems. Since over half of the increased productivity from crossbreeding systems results from using crossbred cows, an extensive research program is presently underway at the Oklahoma Agricultural Experiment Station to compare lifetime productivity of various two-breed cross cows mated to bulls of a third breed. The purpose of this study was to compare productivity of various two-breed cross cow groups as three-year-olds.

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. Four different bulls of each breed were used each year. All heifer calves (a total of 434) produced by these matings were kept in the herd for evaluation. These crossbred heifers

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were mated to Red Poll and Shorthorn bulls to produce their first calf at two years of age in the spring of 1975, 1976 and 1977 (productivity as two-year-olds has been summarized in the 1978 Animal Science Research Report MP-103: 105-111).

The cows born in 1973 and 1974 were mated to Charolais and Brahman bulls for their second breeding season to produce calves as three-year-olds in the spring of 1976 and 1977. A different set of four Charolais and three Brahman bulls were used each year. The cows born in 1975 were mated to Charolais bulls only and thus were not included in this study.

All cattle were managed on native and bermuda grass pasture at the Lake Carl Blackwell Research Range. Cows were exposed to breeding from May 1 to July 15 each year; thus, calves were born mostly in February and March. Calves were weaned in the fall at an average age of 205 days.

All traits other than reproduction were analyzed by general least squares procedures. The production traits summarized for each crossbred cow group have been adjusted for all significant factors and two-factor interactions, as appropriate, based on preliminary analyses. For example, the 205-day average weaning weights were adjusted for sire breed, year, sex of calf and sire within sirebreed and year.

Results and Discussion

Table 1 presents the reproductive and calving performance of the three-year-old crossbred cows. Of the 303 cows exposed to breeding, 71.9 percent calved and 67.7 percent weaned a calf. As two-year-olds, 77 percent of the heifers exposed weaned a calf. This reduction in reproductive performance as three-year-olds demonstrates the difficulty that lactating two-year-old cows have rebreeding under range conditions. There was considerable variation in the percentage of cows exposed to breeding that weaned a calf ranging from 88.4 percent for Jersey-Hereford cows to 29.7 percent for Brown Swiss-Hereford cows with the other crossbred groups intermediate.

Each calf was assigned a calving difficulty score by the herdsman. 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. Simmental-Angus cows experienced the most calving difficulty (48.5 percent difficult births and average calving score of 2.5) and the others were not significantly different from each other and ranged from Simmental-Hereford (31.6 percent difficult births and average calving score of 1.9) to Jersey-Angus (11.4 percent difficult births and average calving socre of 1.5).

Of the 218 cows that calved, 27.1 percent required assistance which is more calving difficulty than most commercial producers could tolerate. These data would suggest that the use of bulls from the larger, more muscular breeds (Charolais and Brahman in this study) should be delayed until the cows are more mature.

The last column of Table 1 is the percentage of cows that calved as three-year-olds that conceived during the following breeding season. Differences in rebreeding performance were not significant and ranged from 75 percent for the Jersey-Hereford cows to 46.2 percent for Brown Swiss-Hereford cows.

The average rebreeding performance of 62.8 percent is disappointingly low. Part of this low rebreeding performance is perhaps due to the fact that one-half of the cows in each crossbred group were bred by artificial insemination. However, it probably also indicates an inadequate level of nutrition. These cows received 2 lb of 41 percent protein cottonseed cake daily from November 1 to calving. After calving, they received 5 lb daily of a 20 percent protein range cube that contained 60 percent milo. Supplementation was increased to 7 lb daily for 30 days prior to the start of breeding season. Apparently additional feed supplementation would be required to achieve a higher level of reproduction from lactating three-year-old cows.

Table 1. Reproductive performance of three-year-old cows.

Crossbred cow group[1]	No. cows exposed	Cows[2] calving %	Live calves[2] born %	Calving difficulty[3,4] %	Calving difficulty[3,4] score	Calves[2] weaned %	Cows[3] rebred %
HA	35	74.3[a]	65.7[ab]	30.8[a]	1.71[b]	65.7[ab]	57.7[a]
AH	41	75.6[a]	73.2[a]	25.8[a]	1.89[b]	73.2[a]	54.8[a]
SA	45	73.3[a]	73.3[a]	48.5[a]	2.50[a]	73.3[a]	63.6[a]
SH	27	70.4[ab]	70.4[ab]	31.6[a]	1.90[ab]	70.4[ab]	47.4[a]
BA	33	63.6[ab]	57.6[ab]	23.8[a]	1.69[b]	57.6[ab]	57.1[a]
BH	37	35.1[b]	29.7[b]	23.1[a]	1.46[b]	29.7[b]	46.2[a]
JA	42	83.3[a]	76.2[a]	11.4[a]	1.52[b]	76.2[a]	48.6[a]
JH	43	93.0[a]	88.4[a]	22.5[a]	1.65[b]	88.4[a]	75.0[a]
Total or average	303	71.9	67.7	27.1	1.79	67.7	62.8

[1] H=Hereford, A=Angus, S=Simmental, B=Brown Swiss and J=Jersey.
[2] Based on number of cows exposed to breeding.
[3] Based on number of cows calving.
[4] Calving difficulty scores: 1 = no difficulty, 2 = little difficulty, 3 = moderate difficulty, 4 = major difficulty and 5 = caesarian. Percent calving difficulty are those receiving a score of 3, 4, or 5.
[a,b]Means in a column that do not share at least one common superscript are significantly different at the .05 probability level.

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

Crossbred cow group[1]	No. calves	Birthweight lbs	Weaning conformation[2]	Weaning condition[3]	Preweaning ADG (lbs/day)	205-day weaning wt[4] lbs	205-day weaning wt[4] % HA,
HA	23	78.1^{ab}	13.2^{c}	4.9^{a}	1.67^{b}	421^{b}	101.3
AH	30	72.3^{cd}	13.2^{c}	4.9^{a}	1.65^{b}	410^{b}	98.7
SA	32	77.7^{abc}	13.8^{a}	5.0^{a}	1.94^{a}	474^{a}	114.1
SH	19	79.1^{ab}	13.7^{ab}	5.0^{a}	1.84^{a}	457^{a}	110.0
BA	19	76.6^{abc}	13.4^{abc}	5.0^{a}	1.91^{a}	463^{a}	111.4
BH	11	81.7^{a}	13.5^{abc}	5.0^{a}	1.93^{a}	476^{a}	114.6
JA	32	69.7^{d}	13.1^{c}	4.9^{a}	1.93^{a}	465^{a}	111.9
JH	38	73.8^{bcd}	13.2^{c}	5.0^{a}	1.88^{a}	460^{a}	110.7
Total or average	204	76.1	13.4	5.0	1.84	453	

[1] H=Hereford, A=Angus, S=Simmental, B=Brown Swiss and J=Jersey.
[2] Conformation score: 13 = average choice and 14 = high choice.
[3] condition score: 1 = very thin to 5 = average to 9 =very fat.
[4] Weaning weights were not adjusted for age of dam since all cows were four years old.
[a,b,c,d] Means in a column that do not share at least one common superscript are significantly different at the .05 probability level.

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

Crossbred cow group[1]	Pounds of calf weaned per cow exposed					
	As two-year-olds		As three-year-olds		Average	
	lbs	% HA, AH	lbs	% HA, AH	lbs	% HA, AH
HA	260	94.9	277	96.0	269	95.7
AH	288	100.5	300	104.0	294	104.6
SA	307	112.0	337	116.8	322	114.6
SH	220	80.3	322	111.6	271	96.4
BA	381	139.1	266	92.2	324	115.3
BH	305	111.3	142	49.2	224	79.7
JA	367	133.9	354	122.7	361	128.5
JH	382	139.4	407	141.1	395	140.6
Average	314		301		307	

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

Performance of the three-breed cross calves sired by Brahman and Charolais bulls is presented in Table 2. The lightest calves at birth were from Jersey cross and Angus-Hereford cows (averaged 71.9 lb) and the other crossbred groups produced heavier calves ranging from 76.6 lb for Brown Swiss-Angus to 81.7 for Brown Swiss-Hereford cows.

Higher levels of lactation achieved by Simmental, Brown Swiss and Jersey cross cows resulted in more rapid calf growth rate from birth to weaning. Calves from the Hereford-Angus reciprocal crosses averaged 1.66 lb/day from birth to weaning, whereas, calves from all other crosses averaged 1.91 lb/day.

The higher preweaning gain of calves from Simmental, Brown Swiss and Jersey cross cows resulted in 205-day weaning weights that were not significantly different and averaged 466 lb which was 50 lb or 12.1 percent heavier than calves from the Hereford-Angus reciprocal cross cows. At weaning, the calves were very similar in condition score and all were acceptable in conformation (average chioce) with calves from Simmental and Brown Swiss crosses exhibiting slightly more muscling.

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 pounds of calf weaned per cow exposed in the breeding herd (Table 3). The first two columns present productivity of these crossbred groups as two-year-olds (previously reported and discussed in the 1978 Animal Science Research Report MP-103:105-111). The middle two columns represent productivity as three-year-olds and the last two columns summarizes productivity for the first two years of production.

Brown Swiss-Angus cows, which were 39.1 percent more productive than reciprocal Hereford-Angus cows as two-year-olds, were 11 lb per cow exposed or 7.8 percent less productive as three-year-olds. Although Brown Swiss-Hereford cows produced the heaviest calves at weaning, their low calf crop weaned percentage of 29.7 percent resulted in production as three-year-olds 146 lb (50.8 percent) below the reciprocal Hereford-Angus cows.

As compared to the reciprocal Hereford-Angus cows, Simmental cross cows were 41 lb (14.2 percent) and the Jersey cross cow 92 lb (31.9 percent) more productive per cow exposed to breeding. The favorable productivity of the Simmental-Hereford cows

Table 4. Crossbred cow weights and measures of cow efficiency.

Crossbred cow group[1]	No. cows	Average cow weight[2]		Calf wn. wt. ÷ cow wt.		Calf wn. wt. ÷ cow metabolic wt.	
		lbs	% HA, AH	Ratio	% HA, AH	Ratio	% HA, AH
HA	23	839^{ab}	104.4	.516^{d}	97.9	2.75^{c}	98.7
AH	30	768^{cd}	95.6	.538^{cd}	102.1	2.83^{c}	101.3
SA	32	878^{a}	109.3	.546^{bcd}	103.6	2.97^{bc}	106.3
SH	19	859^{ab}	106.9	.540^{bcd}	102.5	2.92^{bc}	104.5
BA	19	817^{bc}	101.7	.579^{b}	109.9	3.09^{b}	110.6
BH	11	838^{ab}	104.3	.578^{bc}	109.7	3.10^{b}	110.9
JA	32	739^{d}	92.0	.644^{a}	122.2	3.34^{a}	119.5
JH	38	718^{d}	89.4	.651^{a}	123.5	3.36^{a}	120.2
Total or average	204	807		.574		3.046	

[1] H=Hereford, A=Angus, S=Simmental, B=Brown Swiss and J=Jersey.
[2] Average of spring weight after calving and prior to breeding and the fall weight after weaning.
[a,b,c,d]Means in a column that do not share at least one common superscript are significantly different at the .05 probability level.

as three-year-olds was probably because of the fact that as two-year-olds only 53.3 percent of them weaned a calf. Thus, nearly half of the Simmental-Hereford cows exposed to breeding for three-year-old production had not previously produced a calf and were in a very favorable physiological condition for reproduction.

Over the first two years of production, Brown Swiss-Hereford and Simmental-Hereford cows were 20.3 percent and 3.6 percent, respectively, less productive per cow exposed to breeding than Hereford-Angus reciprocal crosses. Conversely, Simmental-Angus, Brown Swiss-Angus, Jersey-Angus and Jersey-Hereford cows were 14.6 percent, 15.3 percent, 28.5 percent and 40.6 percent, respectively, more productive than the reciprocal Hereford-Angus crosses.

Larger cows require more feed for body maintenance and thus, need to wean larger calves in order to be competitive with smaller cows in efficiency of production. Table 4 presents average cow weights and some measures of cow efficiency for those cows weaning calves in each crossbred cow group. Cow weight is the average of the weight obtained in April after calving and before breeding season and the fall weight obtained on the day calves were weaned. Average cow weight over all crossbred groups was 807 lb which is 84 lb heavier than these cows were as two-year-olds. Jersey cross cows were 9.3 percent lighter than Hereford-Angus reciprocal cross cows, whereas the other crossbred cow groups ranged form 1.7 percent (Brown Swiss-Angus) to 9.3 percent (Simmental-Angus) heavier. There is no apparent reason for the rather large difference of 71 lb between Hereford-Angus and Angus-Hereford cows.

One measure of cow efficiency is the ratio of calf weaning weight to cow weight. Larger ratios are indicative of more efficient cows. On this basis, Jersey cross cows were most efficient weaning calves that weighed 64.7 percent of the cow's weight. Brown Swiss and Simmental cross cows were intermediate in efficiency, weaning calves that weighed 56.1 percent of the cow's weight; Hereford-Angus reciprocal cross cows were least efficient, weaning calves that weighed 52.7 percent of the cow's weight.

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 among crossbred cow groups should be estimated with more precision when based on metabolic cow size, the ratio of calf weaning weight to cow metabolic body weight was calculated as a second measure of cow efficiency. On this basis, Jersey cross cows were most efficient (19.9 percent more efficient than Hereford-Angus reciprocal cross cows) and the Brown Swiss and Simmental cross cows were intermediate in efficiency (8.1 percent more efficient than Hereford-Angus reciprocal cross cows). These comparisons of cow efficiency were very similar to that obtained for these crossbred cow groups as two-year-olds.

These data suggest some relatively large differences in three-year-old cow productivity among the various crossbred cow groups. Comparisons in productivity at any one age should be considered with some caution and final judgement should be reserved until productivity can be averaged over several years through maturity.