PRODUCTIVITY OF VARIOUS TWO-BREED CROSS COW GROUPS

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Story in Brief

Performance of various two-breed cross cow goups (Hereford X Angus, HA; Angus X Hereford, AH; Simmental X Angus, SA; Simmental X Hereford, SH; Brown Swiss X Angus, BA; Brown Swiss X Hereford, BH; Jersey X Angus, JA and Jersey X Hereford, JH) producing 1,721 three-breed cross calves over a seven year period was evaluated. Cows ranged in age from three to nine years and were mated to two sire breeds each year (Charolais and Brahman, two years; Charolais and Limousin, four years; Limousin and Gelbvieh, one year). Calves were born in the spring and weaned at an average age of 205 days. Compared to average birth weights of calves from HA and AH cows (81.3 lb), calves from S and B cross cows were averaged 5.5 lb heavier, and calves from J cross cows averaged 4.2 lb lighter. Frequency of calving difficulty for SA cows (21.7%) was greater than for AH, BH and J cross cows (averaged 10.1%). Weaning rate averaged 81.2% for J cross cows, 74.2% for HA, AH, SA and BA cows and 68.9% for SH and BH cows. Compared to the weaning weight of calves from HA and AH cows (averaged 472 lb), calves from S, B and J cross cows were 10, 12 and 7% heavier, respectively. Compared to the average weight of HA and AH cows (928 lb), S cross cows were 8% heavier, B cross cows were 4% heavier and J cross cows were 11% lighter. Jersey cross cows weaned the heaviest calves as a proportion of cow weight. Calf weaning weight per cow exposed to breeding, a measure of cow productivity, averaged 353 lb/cow for HA and AH cows. Compared to HA and AH, productivity was 7% greater for SH and BH cows, 13% greater for BA and JH cows and 17% greater for JA cows.

(Key Words: Crossbreeding, Cow productivity, Hereford, Angus, Simmental, Brown Swiss and Jersey.

Introduction

Crossbreeding has become increasingly accepted and recommended for commercial beef production. In addition to potential heterosis benefits from crossbreeding, the wide variety of cattle types currently available allows considerable flexibility in matching complementary breed types to local environmental resources and management systems. Thus, it is important to characterize breed types for an array of performance traits affecting economic merit.

The present study is a portion of a comprehensive research project designed to evaluate lifetime productivity of various two-breed cross cows when mated to bulls of a third breed. Efficient production of weaned calves is an important component contributing to the overall efficiency of producing retail beef. The objective of this study was to evaluate and compare cow productivity and calf performance to weaning of various two-breed cross cow groups.

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Materials and Methods

Data used in this study were collected from 1976 through 1982. Crossbred females were produced in 1973, 1974 and 1975 by Angus (A) and Hereford (H) cows mated to H, A, Simmental (S), Brown Swiss (B) and Jersey (J) bulls to produce eight two-breed cross groups (HA, AH, SA, SH, BA, BH, JA and JH). Two-breed cross heifers were mated to Shorthorn and Red Poll bulls to produce three-breed cross calves at two years of age (Belcher et al., 1978). Data used in the present study were collected from these cows as three- to nine-year-olds when mated to relatively larger sire breeds (Table 1).

Table 1. Mating design[a].

Year of calf birth	Cow age(s)	Sire breeds	No. sires[b]
1976	3	Charolais	4
		Brahman	3
1977	3, 4	Charolais	9(3)
		Brahman	3
1978	3, 4, 5	Charolais	8(4)
		Limousin	8
1979	4, 5, 6	Charolais	8(3)
		Limousin	8
1980	5, 6, 7	Charolais	8(4)
		Limousin	8
1981	6, 7, 8	Charolais	8(6)
		Limousin	8
1982	7, 8, 9	Limousin	7
		Gelbvieh	7

[a]Each crossbred cow group (Hereford x Angus, Angus x Hereford, Simmental x Angus, Simmental x Hereford, Brown Swiss x Angus, Brown Swiss x Hereford, Jersey x Angus and Jersey x Hereford) and calf sex (steer and heifer) was represented in each sire, cow age and year.

[b]Number in parentheses is the number of sires previously used.

Two sire breeds were used each year: Charolais and Brahman for two years, Charolais and Limousin for four years and Limousin and Gelbvieh for 1 year. The number of bulls of a given sire breed used in a given year ranged from three to nine. Some of the Charolais bulls were used more than one year. In a given year, each bull was mated to approximately the same number of cows, and bulls were randomly assigned to cows within each crossbred cow group X cow age subclass. Cows were bred predominantly by artificial insemination, however, some were bred by natural service in single sire breeding pastures.

Cows were managed on native tall grass and bermudagrass pastures at the Lake Carl Blackwell Research Range near Stillwater. Supplementary prairie hay and cottonseed meal were provided as needed in the winter months to meet protein requirements and to assist cows in maintaining condition adequate for rebreeding.

The breeding season started May 1 and lasted for approximately 75 days. Thus, calves were born mostly in February and March. Calves remained with their dams with no creep feeding until weaned in the fall at an average age of 205 days. Cows were closely observed during the calving season and each birth was assigned a calving score by the herdsman (1=no difficulty, 2=minor assistance without mechanical puller, 3=moderately difficult pull, 4=hard pull, 5=Caesarian birth and 6=abnormal presentation). Birth data for abnormally presented calves and twins were deleted prior to analysis. Calves receiving a calving difficulty score of 3, 4 or 5 were considered as being difficult births. At weaning, each calf was weighed and assigned a subjective condition score (1=very thin to 9=very fat) and conformation score (13=average choice). Cows were weighed prior to the start of the breeding season and at weaning.

Calving rate, percent live calves and weaning rate are all based on the number of cows exposed to breeding. Percent live calves was calculated based on the number of calves alive approximately 24 hours after birth. Crossbred cow group means for percent weaned were used as weighting factors for individual 205-day weights in calculating pounds of weaning weight per cow exposed to breeding. Cows were generally culled for failure to conceive two consecutive years or because of serious soundness or disposition problems. Crossbred cow group means for calving rate, percent live calves and weaning rate were calculated within years and then averaged over years.

Results and Discussion

Cow Reproductive Performance

Crossbred cow group means for reproductive traits are presented in Table 2. Calving rate averaged 88.3 % for J cross cows, 81.0 % for HA, AH, SA and BA cows and 73.7 % for SH and BH cows. Percentage of cows producing a live calf 24 hours after birth averaged 86.5 % for JA cows

Table 2. Cow reproductive performance.

Crossbred cow group[a]	% calves born[b]	% live calves[b]	% calves weaned[b]
HA	83.0	80.2	76.1
AH	81.0	76.6	73.2
SA	81.1	75.9	72.5
SH	73.8	69.3	67.9
BA	78.7	76.7	75.0
BH	73.6	71.1	69.8
JA	89.7	86.5	83.2
JH	86.8	81.6	79.2
Chi-square	40.0**	40.9**	30.9**

[a]H=Hereford, A=Angus, S=Simmental, B=Brown Swiss and J=Jersey.
[b]Based on number of cows exposed to breeding.
**P<.01.

80.9 % for HA and JH cows, 76.4 % for AH, SA and BA cows and 70.2 % for SH and BH cows. Percentage of cows producing a calf at weaning averaged 81.2 % for J cross cows, 74.2 % for HA, AH, SA and BA cows, and 68.9 % for SH and BH cows. Angus cross cows consistently produced a higher percentage of calves than Hereford cross cows. Excluding the HA and AH groups, calving rate and weaning rate, respectively, averaged 83.2 % and 76.9 % for Angus crosses and 78.1 and 72.3 % for Hereford crosses. The overall reproductive performance of these cows was somewhat lower than normal due to artificial insemination during a restricted breeding season under extensive range conditions.

Cow Weight and Calf Preweaning Traits

Cow weights, calf birth weights and calf weaning weights are presented by crossbred cow group and cow age in Table 3. The dam age X crossbred cow group subclass least squares means for cow weight indicate that J cross cows reached a higher proportion of their mature weight at an earlier age relative to the other cow bred types evaluated. Three-year-old cow weight as a percentage of mature weight averaged 87.8, 88.4, 88.1 and 94.4% for HA and AH, S, B and J cross cows, respectively. This helps explain the higher relative weights at birth and weaning of calves from J cross cows at younger ages. Weights of these cows at two years of age (Belcher et al., 1978) as a percentage of mature cow weight averaged 71.9, 72.7, 72.3 and 78.6 % for HA and AH reciprocal, S, B and J cross cows, respectively.

Birth weights of calves from J cross cows were heavier, relative to other crossbred dam groups, among three- and four-year-old dams than among mature dams. Compared to birthweight of calves from HA and AH cows, calves from S and B cross cows, respectively were 6 and 6% heavier for three-year-old cows, 66 and 11% heavier for four-year-old cows and 6 and 5% heavier for mature cows, whereas calves from J cross cows were 3, 4 and 9% lighter for three-year-old, four-year-old and mature cows, respectively.

Similar to the pattern of the crossbred cow group X cow age interaction for birth weight, weaning weights of calves from J cross cows were higher relative to other crossbred cow groups when the cows were three and four years of age than when the cows were mature. Compared to weaning weights of calves from HA and AH cows, calves from S, B and J cross cows, respectively, were 9, 11 and 9% heavier for three-year-old cows, 12, 14 and 7% heavier for four-year-old cows and 10, 13 and 4% heavier for mature cows. For these same cows as two- year-olds, Belcher et al. (1978) reported calf weaning weights of 370, 419, 437 and 417 lb for calves from A X H reciprocal, S, B and J cross cows, respectively. Compared to calves from A x H reciprocal cross cows, calves from S, B and J cross cows were 13, 18 and 13% heavier, respectively. Crossbred cow group least squares means for cow weight, calf birth weight and calving difficulty are presented in Table 4. Averaged over all age groups, HA cows were 37 lb heavier than AH cows. Compared to the average weight of HA and AH cows (928 lb), S cross cows were 75 lb (8%) heavier, B cross cows were 33 lb (4%) heavier and J cross cows were 106 lb (11%) lighter.

Calves from HA cows were 4.4 lb heavier at birth than calves from AH cows. Compared to the average birth weight of calves from HA and AH cows (81.4 lb), calves from S and B cross cows averaged 5.5 lb heavier, and calves from J cross cows averaged 4.2 lb lighter.

Table 3. Least squares means for cow weight, calf birth and weaning weight by crossbred cow group and cow age.

Crossbred Cow group[a]	No. calves born	Cow wt, lb cow age group			Calf birth wt, lb cow age group			Calf weaning wt, lb cow age group		
		3	4	Mature	3	4	Mature	3	4	Mature
HA	210	895	941	999	81.1	83.8	85.8	459	470	478
AH	205	838	911	974	75.0	77.6	85.1	448	478	489
SA	242	939	1012	1053	81.8	86.0	89.7	500	527	534
SH	176	930	1019	1060	84.2	85.8	91.7	487	536	534
BA	189	895	950	1012	81.3	86.9	88.0	500	531	547
BH	171	902	979	1027	83.3	92.2	92.2	505	549	542
JA	272	798	822	836	73.6	78.0	76.3	494	509	498
JH	256	794	833	851	78.0	76.9	79.2	494	509	507
Overall	1721	873	933	977	79.8	83.3	86.0	485	514	516

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

Frequency of calving difficulty for SA cows (21.7%) was greater than for AH, BH and J cross cows (averaged 10.1%). The only other significant ($P<.05$) difference was between HA (17.4%) and JA (7.2%) cows. Crossbred cow group rankings for calving score were similar to those for percentage of calving difficulty.

Least squares means for average daily gain from birth to weaning, weaning weight and weaning scores are presented in Table 5. Calves from HA cows had the slowest rate of gain from birth to weaning (1.88 lb/day) and were exceeded by calves from AH cows (1.93 lb/day), SH and J cross

cows (averaged 2.07 lb/day), SA cows (2.13 lb/day) and B cross cows (averaged 2.17 lb/day). Weaning weights of calves from S, B and J cross cows exceeded those of calves from HA and AH cows (averaged 418 lb) by 46, 57 and 31 lb (10, 12 and 7 percent), respectively.

Calves were quite uniform at weaning with respect to condition scores (averaged 5.0). Weaning conformation scores ranged from 13.8 for calves from S cross cows to 13.0 for calves from J cross cows. Thus, calves from all crossbred cow groups had quite acceptable conformation.

Estimates of Cow Productivity

Least squares means for cow productivity traits are presented in Table 6. Ratios of calf weight to cow weight or to cow metabolic weight (cow weight$^{.75}$) have often been calculated in studies as estimators of cow efficiency. Based on the ratio of calf weaning weight to cow

Table 4. Least squares means for cow weight, calf birth weight and calving difficulty.

Crossbred cow group[a]	No. calves born	Cow weight		Calf birth weight		Calving difficulty	
		lb	% HA,AH	lb	% HA,AH	Score[b]	%[c]
HA	210	946^{e}	102.0	83.6^{f}	102.7	1.53^{de}	17.4^{de}
AH	205	908^{f}	98.0	79.2^{g}	97.3	1.36^{def}	10.2^{ef}
SA	242	1001^{d}	108.0	85.8^{ef}	105.4	1.58^{d}	21.7^{d}
SH	176	1003^{d}	108.2	87.3^{de}	107.3	1.45^{def}	13.9^{def}
BA	189	952^{e}	102.7	85.3^{ef}	104.9	1.40^{def}	15.7^{def}
BH	171	970^{e}	104.6	89.1^{d}	109.5	1.29^{ef}	9.5^{f}
JA	272	818^{g}	88.2	76.1^{h}	93.5	1.29^{f}	7.2^{ef}
JH	256	825^{g}	88.9	78.0^{gh}	95.9	1.39^{def}	13.4^{ef}
Overall	1712	928		80.9		1.41	13.6

[a] H=Hereford, A=Angus, S=Simmental, B=Brown Swiss and J=Jersey.
[b] 1=no difficulty, 2=little difficulty, 3=moderate difficulty, 4=major difficulty and 5=Caesarian.
[c] Percentage of calves with a calving score of 3, 4 or 5.
defgh Means in the same column not sharing a common superscript differ (P<.05).

Table 5. Least squares means for calf average daily, gain, weaning weight and weaning scores.

Crossbred cow group[a]	No. calves weaned	Avg daily gain		Weaning weight		Weaning scores	
		lb/day	% HA,AH	lb	% HA,AH	Condition[b]	Conformation[c]
HA	198	1.88^{h}	98.8	470^{g}	99.8	5.0	13.2^{h}
AH	196	1.93^{g}	101.2	472^{g}	100.2	5.1	13.4^{g}
SA	221	2.13^{e}	112.0	520de	110.5	5.1	13.8^{d}
SH	165	2.09^{f}	109.8	516^{e}	109.6	5.1	13.8^{de}
BA	183	2.18^{d}	114.4	527de	111.9	5.0	13.6^{f}
BH	165	2.16^{de}	113.6	531^{d}	112.9	4.9	13.6^{ef}
JA	254	2.05^{f}	107.7	500^{f}	106.3	5.1	12.9^{i}
JH	242	2.07^{f}	108.6	503^{f}	106.8	5.1	13.0^{i}
Overall	1624	2.06		505		5.0	13.4

[a]H=Hereford, A=Angus, S=Simmental, B=Brown Swiss and J=Jersey.
[b]Condition score equivalents: 1=very thin to 5=moderate to 9=very fat.
[c]Conformation score equivalents: 12=low choice, 13=average choice and 14=high choice.
defghi Means in the same column not sharing a common superscript differ (P<.05).

weight, J crosses weaned the greatest percent of cow weight (61.9%), followed by B crosses (averaged 55.7%), AH and S crosses (averaged 52.4%) and HA (50.3%). Compared with the average of HA and AH cows, the calf weaning weight to cow weight ratios for S crosses were similar, and those for B and J crosses were 8 and 20% greater, respectively. The ratio of calf weaning weight to cow metabolic weight (cow weight$^{.75}$) favored S, B and J cross cows by 3.4, 9.3 and 14.7%, respectively.

A very useful measure of total herd productivity is the pounds of calf weaned per cow in the breeding herd. On this basis, HA cows were 2.5 percent more productive than AH cows. Compared to the average of the HA and AH reciprocal crosses (average 353 lb cow), SA and BH cows were 24 lb/cow (7 percent) more productive, BA and JH cows were 46 lb/cow (13 percent) more productive and JA cows were 60 lb/cow (17 percent) more productive. The SH cows were similar in productivity to HA and AH cows.

Table 6. Least squares means for measures of cow productivity.

Crossbred cow group[a]	No. Calves weaned	Calf weaning wt/cow wt		Calf weaning wt/cow wt$^{.75}$		Calf weaning wt per cow exposed	
		lb/lb	% HA,AH	lb/lb	% HA,AH	lb	% HA,AH
HA	198	.503^{e}	97.8	2.78^{f}	98.3	357^{e}	101.3
AH	196	.526^{d}	102.2	2.88^{e}	101.7	348^{f}	98.8
SA	221	.527^{d}	102.4	2.95^{de}	104.3	379^{d}	107.5
SH	165	.519^{d}	100.9	2.91^{de}	103.0	351^{ef}	99.4
BA	183	.559^{c}	108.6	3.09^{c}	109.5	399^{c}	113.1
BH	165	.554^{c}	107.7	3.07^{c}	108.6	373^{d}	105.6
JA	254	.620^{b}	120.5	3.29^{b}	116.4	412^{b}	116.9
JH	242	.617^{b}	119.9	3.29^{b}	116.4	397^{c}	112.5
Overall	1624	.553		3.03		377	

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

bcdef Means in the same column not sharing a common superscript differ (P<.05).

Conclusion

These data indicate that important differences exist in herd productivity among the various two-breed cross cow groups evaluated. For specific production objectives under various management systems practical by Oklahoma cattlemen, these data provide basic information useful in selecting specific crossbred cows and designing crossbreeding systems that will maximize production efficiency.

Literature Cited

Belcher, C. G., et al. 1978. Productivity of two-year-old crossbred cows producing three-breed cross calves. Okla. Agr. Exp. Sta. Res. Report MP-103:105.