

RELATIVE PERFORMANCE OF ZEBU CROSSES IN A DRY, TEMPERATE CLIMATE

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Systematic crossing of British breeds in commercial beef herds should enable producers to increase production per cow unit (Gregory et al., 1965; Cundiff et al., 1974). Evidence from the southern United States suggests that even higher production levels can be attained by crossing Zebu cattle, especially Brahmans, with European breeds (Kincaid, 1962; Koger, 1980); however, the potential for Zebu crosses in colder, dryer climates has not been established.

A long-term project to evaluate diverse breed types of cattle, including European and Zebu crosses, was initiated at the University of Nevada-Reno in 1973. Production traits of straightbreds and F₁ crosses are summarized in this report.

Materials and Methods

The study was conducted at the Main Station Field Laboratory, Reno, Nevada. The mean maximum temperature at this location (Lat. 39° 32' N, Long. 119° 49' W) in July is 32 C and the mean minimum temperature in January is -7.5 C. Mean annual precipitation is 180 mm. Elevation is 1341 m.

Foundation heifers obtained from 29 herds in eight states were assembled at the field laboratory in early 1974. Both registered and unregistered Herefords and Angus were utilized, along with registered Red Polls and Charolais-Cross heifers, which were mostly 3/4 or 7/8 Charolais. Hereford, Red Poll, Angus and Brahman bulls, selected on the basis of growth rate and structural soundness, were used as sires. A completely new battery of sires was utilized each yr (three bulls per sire breed for each of 4 yr; n=48 total). Hereford females were allotted at random each yr to Hereford, Red Poll, Angus or Brahman sires. Red Poll females were randomly assigned each yr to either Hereford or Red Poll bulls. All Angus females were mated to Brahman sires, and the Charolais-Crosses were bred to Angus sires.

Cows in the breeding herd were maintained on irrigated pastures. Supplemental hay was fed during the winter, as needed. The mating period, which began in November each yr, lasted 63 d. Heifers were approximately 20 mo of age at first exposure and averaged 2½ yr when their first calf was born.

All male calves were left intact. Bull calves had access to creep pellets during the last 2 mo of the preweaning phase. Calves of both sexes were weaned at an average age of 6 mo.

All heifer calves were retained for evaluation of maternal performance. They were exposed to Red Angus bulls at an average age of 19½ mo. Santa

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Gertrudis bulls sired each cow's second and third calf and Limousin bulls were used for the fourth calf.

Least-squares, fixed model procedures (Harvey, 1979) were used in the statistical analysis. Breed group, year and breed group x year interaction were included in the model for all traits. Sex and sex interactions were additional terms in the model for birth and weaning weights.

Results and Discussion

Straightbred and F₁ Calves. Results for the first increment of the study in which straightbred and F₁ cross calves were produced are shown in table 1. Breed group differences were important for calf birth weight (P<.01), weaning weight (P<.01) and production per cow (P<.05).

TABLE 1. LEAST-SQUARES MEANS FOR STRAIGHTBRED AND F₁ CALVES (INCREMENT I)^a

Calf group ^b	No. matings	Birth wt, kg	Calf weaned ^c	Weaning wt, kg	Production per cow ^d
		**		**	*
$\bar{\mu}$	755	35.6 \pm .1	.81 \pm .01	166 \pm 2	135 \pm 3
Hereford	80	34.6	.87	153	133
Red Poll	103	35.1	.80	175	140
Hereford x Red Poll	107	36.9	.74	184	139
Red Poll x Hereford	81	34.0	.85	151	129
Angus x Hereford	83	33.7	.86	158	135
Angus x Charolais	104	36.8	.82	183	154
Brahman x Hereford	80	38.4	.75	154	117
Brahman x Angus	117	35.4	.77	171	133

^aAdapted from Bailey and Moore (1980), Bailey (1981).

^bSire breed listed first.

^cNumber of calves weaned \div number of females exposed for breeding.

^dKg of calf weaned per female exposed for breeding.

*Breed type differences significant (P<.05).

**Breed type differences significant (P<.01).

The Brahman x Hereford calves were heaviest at birth in comparison to contemporaries in other breed groups, but they were below average in weaning weight, percentage of calves weaned and kg of calf per cow exposed for breeding. Poor fertility, late calving date and limited milking ability of dams appeared to be major causes of the below-average performance of Brahman x Hereford matings. Brahman x Angus crosses tended to be intermediate for most traits.

Straightbred and F₁ Dams. In the second increment of the project, maternal traits of females born during the first increment were evaluated. Increment II data are presented in table 2. Breed differences were significant for all four of the traits considered in this report.

TABLE 2. LEAST-SQUARES MEANS FOR STRAIGHTBRED AND F₁ DAMS (INCREMENT II)^a

Dam group ^b	No. matings	Birth wt, kg	Calf weaned	Weaning wt, kg	Production per cow
		**	*	**	**
$\bar{\mu}$	741	34.6 ± .2	.79 ± .01	218 ± 1	174 ± 3
Hereford	71	35.0	.69	210	145
Red Poll	97	35.6	.75	226	172
Hereford x Red Poll	87	36.8	.74	217	163
Red Poll x Hereford	90	36.6	.79	222	175
Angus x Hereford	100	34.1	.77	219	166
Angus x Charolais	99	35.9	.88	227	201
Brahman x Hereford	79	32.5	.89	215	193
Brahman x Angus	118	30.1	.81	212	175

^aSee table 1 footnotes for a description of traits.

^bDam's sire breed listed first.

*Breed type differences significant (P<.05).

**Breed type differences significant (P<.01).

Progeny of F₁ Brahman cross cows had the smallest birth weights compared to other breed groups. Despite the fact that only 48% of the Brahman x Hereford females and 74% of the Brahman x Angus had reached puberty at the start of their first mating season ($\bar{\mu}$ for all groups=81%), the Brahman-sired cows were average or higher for percentage of calves weaned and kg of calf weaned per female exposed for breeding.

Discussion

Evidence of higher birth weights for Brahman-sired calves than for straightbreds and crosses of *Bos taurus* breeds has been reported previously (Kincaid, 1962; Gregory et al., 1979). In the Nevada project, F₁ Brahman x Hereford calves were significantly heavier at birth than those from Hereford dams that were mated to Hereford, Red Poll or Angus bulls.

Cundiff (1970) noted that the effect of heterosis on percentage of calf crop weaned in F₁ Brahman x British calves is small. Contrary to Increment I results, Peacock et al. (1977) found that the weaning rate for Brahman sires in a Florida experiment exceeded that for Angus by 5.8%. At the U.S. Meat Animal Research Center in Nebraska, 3.8% more (P<.01) Angus and Hereford cross calves than Brahman-sired calves survived to weaning (Gregory et al., 1979). The number of generation 1 calves weaned in relation to the number of dams exposed to breeding was slightly higher for straightbred matings than for Brahman x Hereford matings in a Canadian study (Peters and Slen, 1967). Lack of agreement between experiments could result from genotype x environment interaction.

Actual weaning weights of Brahman x Hereford calves were not outstanding compared to weights of calves in other groups that were raised by Hereford mothers (table 1). When comparisons are made on an age-equivalent basis, however, Brahman x Herefords are superior. Data from the southern United States

(Kincaid, 1962; Koger et al., 1975), midwestern United States (Gregory et al., 1979) and Canada have consistently shown that F_1 Brahman x British calves grow more rapidly during the preweaning stage than British-sired progeny.

During Increment II, the Brahman cross cows, particularly the Brahman x Herefords, were competitive with other groups in fertility and mothering ability (table 2). Cundiff (1970) and Franke (1980) have presented evidence of substantive hybrid vigor in production traits of Brahman cross cows. Results from Canada (Peters and Slen, 1976) showed that Brahman cross dams were superior to Herefords in kg of calf weaned per cow bred. Preliminary data from studies at the U.S. Meat Animal Research Center in Nebraska also show an advantage for F_1 Brahman cross dams (Cundiff et al., 1981). Thus the Zebu cross female may have considerable production potential in temperate zones, as well as in the subtropics.

Summary

Data for this report (N=1496 matings) were derived from a long-term project that is designed to evaluate complete, life-cycle performance of diverse breed types in the Western United States. The mean maximum temperature at the experiment station (Lat. $39^{\circ} 32' N$, Long. $119^{\circ} 49' W$) in July is $32^{\circ} C$ and the mean minimum temperature in January is $-7.5^{\circ} C$. Mean annual precipitation is 180 mm. Elevation is 1341 m. Breed types under study are Brahman x Hereford (BH), Brahman x Angus (BA), Angus x Hereford (AH), Angus x Charolais (AC), straightbred Hereford (HH), straightbred Red Poll (RR), and Hereford x Red Poll reciprocals (HR, RH). Performance of F_1 Brahman cross calves was mediocre in relation to contemporaries. F_1 Brahman cross females lagged in rate of sexual development but generally were comparable or superior to other breed types in productivity. Means for kilograms of calf weaned per female exposed for breeding for BH, BA, AH, AC, HH, RR, HR and RH dams in the $2\frac{1}{2}$ - to $5\frac{1}{2}$ -yr age range were 193, 175, 166, 201, 145, 172, 163 and 175, respectively.

R E S U M E N

Los datos de este trabajo (1.496 montas) derivaron de un proyecto a largo término diseñado para valorar los rendimientos completos en el ciclo vital de diversos tipos raciales en el Occidente de los Estados Unidos. La temperatura media máxima de la Estación Experimental (Latitud $39^{\circ} 32' N$, Long. $119^{\circ} 49' W$) en Julio fue de $32^{\circ} C$ y la temperatura mínima media en enero fue de $-7,5^{\circ} C$. La precipitación media anual fue de 180 mm. La altitud era de 1.341 m. Los tipos raciales estudiados fueron Brahma x Hereford (BH), Brahma x Angus (BA), Angus x Hereford (AH), Angus x Charolais (AC), Hereford pura (HH), Red Poll pura (RR) y Hereford x Red Poll y recíprocamente (HR, RH). Los rendimientos de los terneros de cruce F_1 Brahma fueron mediocres en relación con sus contemporáneos. Las hembras cruzadas F_1 Brahma fueron inferiores en tipo de desarrollo sexual, pero generalmente comparables o superiores a los demás tipos raciales

de productividad . Las medias por kilo de ternero destetado por hembra expuestos por raza para BH, BA, AH, AC, HH, RR, y RH a los 2,5 a 5,5 años de edad, fueron de 193, 175, 166, 201, 145, 172, 163 y 175.

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