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Within-breed comparisons have shown that intact males grow faster and yield a higher percentage of lean, edible beef than steers (Klosterman et al., 1954; Bailey et al., 1966a). The meat from bulls 13 to 14 mo of age or less appears to be acceptable in palatability (Bailey et al., 1966b; Field, 1971; Winer et al., 1981), although it is slightly less tender than steer beef. This report is a summary of a long-term project that is designed to characterize growth and compositional characteristics of *Bos taurus* and *Bos indicus* x *Bos taurus* crossbred bulls.

## Materials and Methods

Calves born at the Main Station Field Laboratory, Reno during the fall in 1975 through 1978 were used in the first increment of the study. Breed types represented were straightbred Hereford, straightbred Red Poll, Hereford x Red Poll reciprocals, Angus x Hereford, Angus x Charolais (mostly 3/4 or 7/8 Charolais), Brahman x Hereford and Brahman x Angus. Increment II calves were the progeny of females produced in Increment I. They were sired by Red Angus, Santa Gertrudis, or Limousin bulls. Progeny evaluated in Increment II were born in the spring from 1978 through 1980. Bailey and Moore (1980) and Bailey (1981) have given an account of herd management practices.

The bulls received creep feed for approximately 55 d prior to weaning. Each yr the entire calf crop was weaned on the same day at an average age of 6 mo. Immediately after weaning a complete feed mixture containing about 62% total digestible nutrients was offered ad libitum. Each bullock was slaughtered at about 400 d of age. A shrunk (water but no feed) weight was recorded just before slaughter. Percentage of fat in the carcass was an estimate based on specific gravity of the right side of the carcass (Garrett and Hinman, 1969). Cutability was determined by standard procedures (Murphey et al., 1960; Schoonover et al., 1967). A Warner-Bratzler device was utilized to measure shear force of aged rib steaks (Winer et al., 1981).

The basic model for the statistical analyses included breed group and year effects and the interaction of these two factors. Fixed model, least-squares methods (Harvey, 1979) were employed. Additional analyses were run in which length of time in the feedlot ( $\bar{X}=223$ ,  $SD=17$  d for Increment I;  $\bar{X}=220$ ,  $SD=13$  d for Increment II) was a covariate, along with other terms.

## Results and Discussion

Straightbred and F<sub>1</sub> Bulls. Important ( $P<.01$ ) breed group differences were observed in live weight just prior to slaughter, estimated percentage of fat in the carcass, cutability and yield of edible product per day of age (table 1).

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TABLE 1. GROWTH AND COMPOSITIONAL CHARACTERS OF STRAIGHTBRED AND F<sub>1</sub> CROSS BULLS (INCREMENT I)

Bull group <sup>a</sup>	No. bulls	400-d wt, kg	Carcass fat, %	Cutability, % <sup>b</sup>	Edible cuts/d, kg <sup>c</sup>	Shear force, kg <sup>d</sup>
		**	**	**	**	
$\bar{\mu}$	298	481 ± 2	24.1 ± .2	51.6 ± .1	.385 ± .002	8.47 ± .10
Hereford	34	458	23.1	51.8	.363	8.54
Red Poll	41	479	23.7	51.8	.380	7.98
Hereford x Red Poll	40	503	24.8	51.3	.400	8.69
Red Poll x Hereford	32	464	23.4	51.7	.371	8.30
Angus x Hereford	30	470	24.5	51.8	.378	8.02
Angus x Charolais	45	508	20.6	53.0	.426	8.42
Brahman x Hereford	31	472	25.3	51.5	.378	9.12
Brahman x Angus	45	496	27.6	50.2	.388	8.70

<sup>a</sup>Sire breed listed first.

<sup>b</sup>Percentage of boneless, closely-trimmed retail cuts from round, loin, rib, chuck

<sup>c</sup>Cutability x carcass weight/age at slaughter.

<sup>d</sup>Measured on 2.54-cm core of aged rib steak. Winer et al. (1981).

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

F<sub>1</sub> Angus x Charolais bulls grew more rapidly to 400 d of age, produced the leanest carcasses with the highest cutability, and yielded the greatest amount of closely-trimmed retail cuts per d of age in relation to other groups. F<sub>1</sub> Brahman x Angus bulls were fatter than contemporaries, but they had the lowest cutability percentage and were only average in yield of edible tissue per d. Other groups tended to be intermediate. Comparison of these results with those from adjunct analyses in which length of time in the feedlot was included as a continuous, independent variable, along with other terms, showed that relative merit of breed groups was similar with or without adjustment for number of d on feed.

Comparison of Progeny from Straightbred and Crossbred Dams. Least-squares means for Increment II in which bulls were raised by straightbred or crossbred dams are reported in table 2. As in the first increment, variation among breed types was significant for all traits except shear force of rib steaks.

Progeny of F<sub>1</sub> Angus x Charolais mothers produced more edible product per than other breed categories. Male progeny of F<sub>1</sub> Brahman cross dams were below average in growth rate and yield of edible tissue. Inclusion of number of d in the feedlot as a covariate in the model had little effect on relative merit of breed groups.

#### Discussion

Literature reports on breed type differences in bull traits are limited. Fredeen et al. (1972) found that breed of sire effects on growth and carcass performance of hybrid bulls were generally nonsignificant except for growth rate in the feedlot. British-breed crosses had thicker rib fat than Charolais

TABLE 2. GROWTH AND COMPOSITIONAL CHARACTERS OF BULL PROGENY RAISED BY STRAIGHTBRED AND F<sub>1</sub> DAMS (INCREMENT II)<sup>a</sup>

Dam group <sup>b</sup>	No. bulls	400-d wt, kg	Carcass fat, %	Cutability, %	Edible cuts/d, kg <sup>c</sup>	Shear force, kg
		**	*	*	**	
$\mu$	162	482 + 4	25.6 + .3	50.8 + .1	.382 + .003	7.82 + .13
Hereford	8	494	28.1	49.3	.382	7.90
Red Poll	19	478	25.7	51.0	.374	7.84
Hereford x Red Poll	16	489	26.8	50.4	.384	8.25
Red Poll x Hereford	17	488	26.1	50.8	.385	7.47
Angus x Hereford	21	490	25.2	51.2	.396	7.71
Angus x Charolais	30	500	23.1	51.8	.410	7.67
Brahman x Hereford	18	462	23.6	51.4	.363	7.86
Brahman x Angus	33	452	26.5	50.9	.358	7.85

<sup>a</sup>See table 1 footnotes for a description of traits.

<sup>b</sup>Dam's sire breed listed first.

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

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

crosses. Total deboned-defatted lean yield of the carcass was least for the British breed crosses. Data on 360-d weight from a recent experiment involving British and Brahman crosses (Long et al., 1979) appear to be consistent with Nevada results. Relative merit of Hereford, Angus x Hereford, Angus x Brahman and Brahman x Hereford reciprocals in carcass side closely trimmed lean at 12 mo of age (Jenkins et al., 1981) was similar to rank for estimated edible cuts/d in the present analysis.

#### Summary

Breed combinations studied were straightbred Hereford and Red Poll, Hereford x Red Poll reciprocals, Angus x Hereford, Angus x Charolais, Brahman x Hereford and Brahman x Angus. Immediately after weaning at 180 d intact males (n=460) received a complete feed mixture containing approximately 62% TDN. Each animal was slaughtered at 400 d of age. Variation among breed groups was significant (P<.01) for most growth and compositional characters. F<sub>1</sub> Angus x Charolais bulls grew more rapidly, were leaner and yielded more edible tissue per d of age than contemporaries. F<sub>1</sub> Brahman x Angus males were fatter compared to other groups but were average in estimated product yield/d. Herefords excelled in feed efficiency but ranked lowest for yield of edible tissue per d. Male progeny raised by F<sub>1</sub> Angus x Charolais dams produced more edible product/d than any other group. Progeny of F<sub>1</sub> Brahman cross dams were below average in growth rate and edible product/d of age. Generally, breed type differences in meat palatability traits were negligible.

#### R E S U M E N

Las combinaciones raciales estudiadas fueron fundamentalmente Hereford y Red Poll, Hereford x Red Poll y recíprocamente, Angus x Hereford, Angus x Charolés, Brahman x Hereford y Brahman x Angus. Inme-

diatamente después del destete hasta los 180 días, los machos (en número de 460), recibieron una mezcla alimenticia completa conteniendo aproximadamente 62% de TDN. Cada animal se sacrificó a los 400 días de edad. La variación de los grupos raciales fué significativa ( $P < .01$ ) para muchos caracteres de crecimiento y de composición. Los toros  $F_1$  Angus x Charolés crecieron más rápidamente, fueron más magros y produjeron más cantidad de tejido comestible por día de edad que sus contemporáneos. Los machos  $F_1$  Brahma x Angus fueron más grasos en comparación con otros grupos, pero produjeron un estimado rendimiento diario. Los Hereford fueron excelentes en eficiencia alimentaria, pero con menor producción de tejido comestible por día. La prole masculina nacida de ~~este~~  $F_1$  Angus x Charolés produjo mayor cantidad de carne comestible que ningún otro grupo. La prole de hembras cruzadas  $F_1$  Brahman tuvo menor crecimiento medio ~~que~~ y menor producción de carne comestible por día de edad. Generalmente, las diferencias entre los tipos raciales en la ~~palatabilidad~~ <sup>palatabilidad</sup> de la carne, fueron desprecia-

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