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Production of Grade Hereford, Beefmaster x Hereford, and Braford x Hereford Calves in South Florida [1]

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In any discussion of beef cattle production in a particular environment the matter of climatic adaptability is of prime consideration. Adaptation for beef cattle might be defined as the ability to reproduce, grow and thrive under local environmental conditions. Much has been written about the ability or inability of temperate zone breeds of cattle to adapt to hot, humid, subtropical environments. Most of the research on this subject has been summarized by Cunha et al. (2)1 and Koger et al. (4).

According to Bonsma (1), "the reason livestock procedures resort to a system of crossbreeding and afterwards, . . . to breed creation, is that the two main types of domestic livestock ... do not perform satisfactorily in all respects under unfavorable environmental conditions in which we want to maintain these cattle". The literature is void of work conducted where strains of temperate zone breeds of cattle have been developed for use in tropical or subtropical environments, however, it generally has been assumed that the Shorthorn of Australia and the Criollo of Latin America have undergone some adaptation to tropical conditions (5).

This bulletin describes the development of a herd of grade Hereford cattle maintained under subtropical conditions in south Florida for a period of more than 40 years and presents the results of an experiment comparing straightbred Hereford cattle of this strain with the first cross (F1) progeny of these cows sired by Beefmaster and Braford (breeds which were both developed from crossing *Bos taurus* and *Bos indicus* cattle) bulls.

MATERIALS AND METHODS

This study was conducted on the Brighton Reservation of the Seminole Tribe of Florida. The reservation is located between 27° and 27°10' N on the northwestern side of Lake Okeechobee. Average elevation is approximately 6.4 meters (21 feet), with an average rainfall of 1320 mm (52 inches) occurring mostly in June, July, August and September but with distribution throughout the year. The average maximum and minimum temperatures are approximately 29° and 16° C (85° and 60° F) with highs in the middle 90's F and lows in the middle 20's F. Humidity ranges from 55 to 100% with an average near 75%.

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Females used in this study were descendants of Herefords brought onto the reservation from Arizona (San Carlos Apache Reservation) in 1936 and 1938. These cattle underwent natural selection (survival of the fittest) for approximately 25 years. Though Brahman bulls were used for a time on some of the females during the beginning years, Hereford bulls were the predominant herd sires used. Many of the introduced Hereford bulls, however, were under considerable environmental stress and some failed to survive the rigors of the environment.

In 1964, a group of approximately 300 females was selected from a total of about 3500 to determine the feasibility of producing high quality range bulls for this particular environment. Selection was based on pregnancy status of the cows and phenotype of their nursing calves. The females were divided into six two-sire herds, which were managed on semi-improved pastures. Registered Hereford bulls were introduced at this time. During subsequent years, intensive selection for reproduction and production was practiced on the progeny of the foundation females with highly selected female progeny being returned to the cow herd and selected bull progeny going to the commercial range herd. Highly selected males were returned to the foundation herd for use as herd sires. By 1970 the entire bull battery consisted of bulls raised within the herd. In 1975 it appeared that the calves from the range herd contained too much British blood and a decision was made to infuse a low level of Brahman breeding into the herd. The Beefmaster and Braford breeds were chosen for this purpose rather than straight Brahman bulls. In 1976 the existing grade Hereford females were divided into three equal 2-sire herds to be mated, respectively, to Beefmaster, Braford or Hereford bulls.

The breeding season began March 1 and was 70 days in length. Calves were born in December and January, and weaned the first week of August at an average age of 237 days. Females were bred to calve first at three years of age and all females were palpated in September and culled the first time open. The cattle were maintained on Pangola grass (*Digitaria decumbens*) pastures and received 16% protein cane molasses as a supplement during the winter.

Data from the 1976 through 1980 calf crops were analyzed using the least squares technique described by Harvey (3). Data collected included pregnancy rate as determined by palpation, survival from birth to weaning and weaning weight, while unadjusted 205-day weight was calculated. Year, breed of sire, sex of calf, age of dam and breed x sex interaction were the variables used in the model (Table 1).

RESULTS AND DISCUSSION

Pregnancy rate . The effect of year was included in the analyses (Table 1) to increase precision and, as usual in this type of data, was highly significant ($P < .0l$). During previous years, conception rate for the herd had averaged near 90%. In this study, however, reproduction was more erratic with a high of 91% in 1977 and a low of 79% in 1979 (Table 2). It was concluded that either climatic conditions or management or a combination of the two was the probable cause.

The only other factor influencing pregnancy rate was that of age of dam ($P<.Ol$). As shown in Table 2, three-year-old cows nursing their first calves had a conception rate of 76% as compared 89, 87, and 87% for the first exposure females and the two older cow groups, respectively. This was due primarily to the management of the younger females entering the herd as two-year-olds. They were bred with the cow herd and were given no preferential treatment following their first parturition. This behavior is common in young females in Florida that are not given special attention.

Survival rate . This response trait showed only age of dam to have a significant effect ($P < .05$). The youngest cows (three-year-olds) lost a few more calves from birth to weaning. Observations would suggest that difficult birth was not a prime factor. Calves usually were born alive but did not survive.

Weaning weight . This trait was influenced by year, sex of calf and age of dam ($P < .01$) and breed of sire ($P < .05$). As in much other data of this kind, year and age of dam would be expected to have a significant effect. Most research shows that young first calf cows do not perform as well as older cows up to 10 years of age and most data is adjusted for age differences. However, in this study the young

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(three-year-old) cows were equally as productive as cows in the four-year-old and five-to nine-year old age groups with average calf weanings weights of 219.9 kg (485 pounds), 220.4 kg (486 pounds) and 220.9 kg (487 pounds), respectively (Table 2). Calves weaned from ten-year-old and older cows were significantly lower (P < .0l) at 207.7 kg (458 pounds) than those from younger females. Numbers were small in this group due to the practice of culling cows over ten years of age. One possible explanation for the above average performance of the young cows is probably due to selection on their dam's production record.

The most surprising result was the rather small difference between breed of sire groups with 220.4 kg (486 pounds), 216.4 kg (477 pounds) and 214.5 kg (473 pounds) for calves sired by Beefmaster, Hereford and Braford bulls, respectively. More surprising was the observation that adapted grade Hereford calves were comparable to those of the two Brahman-derivative sire breeds.

Breed-of-sire differences for estimated 205-day weight were more significant than those for actual weaning weight (P <.05 vs. P < .0 1) as shown in Table 2. This was due to the Beefmaster sired calves averaging five and three days younger in age, respectively, at weaning than the Braford and Hereford sired calves.

SUMMARY AND CONCLUSIONS

The performance of straightbred grade Hereford calves was compared to that of offspring from comparable dams mated to Beefmaster and Braford sires. Breed of sire significantly affected (P < .05) actual weaning weight and 205-day weight (P < .0l). The five-year average, however, showed a difference in weaning weight of only 5.9 kg (13 pounds) between the heaviest (Beefmaster) and lightest (Braford) groups.

Age of dam had a more significant effect on performance traits studied (pregnancy, P < .01; survival, P < .05; weaning weight, P < .0l; and 205-day weight, P < .0l) than did breed of sire. Three-year-olds nursing their first calves were lower in conception than younger and older cows, showed a lower survival rate than calves from older cows. Cows ten years old and older failed to wean as heavy calves as did younger cows.

These data indicate that temperate zone breeds, which have become adapted to subtropical conditions through natural selection and a period of intense artificial selection, can be made to perform competitively with breeds adapted to subtropical environments. However, this would involve a long time adjustment. If this particular group of females had not been well adapted it is possible that more observable difference would have been noted in performance.

This bulletin contains only data obtained on performance of Hereford dams and their straightbred and crossbred progeny. It appeared that heterosis levels for weaning weights, obtained from mating Beefmaster and Braford bulls to these females, were very low (1.8% and -0.08% for Beefmaster- and Braford-sired calves, respectively). Most research data has shown that higher heterosis levels are obtained when cattle of Zebu *(Bos indicus*) and British (*Bos taurus*) breeding are intermated than when matings are made between breeds of British breeding (4). The same source presented data indicating that certain levels of Zebu breeding were essential for adaptation to tropic and subtropic environments. In this study the theoretical amount of Zebu breeding contributed from the Beef master and Braford bulls to their progeny was 25% and 18.75%, respectively. As upgrading continues with the Beefmaster (47-50% Zebu) and Braford (37.5% Zebu) it is highly probable that after three or four generations more pronounced differences will appear.

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Table 1.

Table 1. Probability values from analyses of variance for performance traits.

Source	df	Pregnancy rate	Survival rate	Weaning weight	205-day weight
Years	4	**	NS	**	**
Breed of sire	2	NS	NS	*	**
Sex of calf	1	--	--	**	**
Age of dam	3	**	*	**	**
Breed x sex	2	--	--	NS	NS
df for remainder		1457	1065	1019	1019

** = P<.Ol* = P<.05
NS = nonsignificant.

Table 2.

Table 2. Least squares means for performance traits.

Effect	N	Pregnancy rate(%)	N	Survival[a] rate(%)	N	Weaning weight(kg)[b]	205-day weight(kg)
Breed of sire							
Beefmaster	429	84.3	313	95.5	298	220.4	197.3
Braford	439	84.8	329	96.9	319	214.5	191.1
Hereford	599	85.4	433	95.4	415	216.4	190.5
Age of dam							
3 years	306	89.0	249	92.6	230	220.0	192.8
4 years	264	76.0	190	96.9	183	220.4	196.9
5-9 years	695	87.4	523	97.5	510	220.9	197.3
10 years and older	202	87.0	113	96.6	109	207.7	183.3
Years							
1976	317	84.2	212	98.4	208	207.7	194.1
1977	302	91.0	252	93.2	235	210.0	179.6
1978	308	90.0	235	95.3	225	200.5	177.8
1979	290	79.0	184	96.1	178	233.2	203.7
1980	250	80.4	192	96.5	186	234.1	208.7

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Table 2.

Mean or total	1467	84.8	1075	95.9	1032	217.3	192.8

[a]Differences between numbers for pregnancy and survival were due both to open cows being excluded from the latter and to culling low producing and unsound cows that were pregnant.[b]1 kg = 2.205 pounds.

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