PRELIMINARY RESULTS OF INTER SE MATING OF
BROWN SWISS x ANGUS CATTLE AT THE BEEF RESEARCH UNIT

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SUMMARY

The reproductive and maternal performance of Brown Swiss (S) x Angus (A) F₂ (inter se) crossbred females was compared to that of contemporary S x A and reciprocal F₁ crossbred females. On a theoretical basis, one-half the heterosis produced in the F₁ cross should be lost as a result of such inter se mating. The F₂ actually achieved a 6% higher pregnancy rate than the F₁ females over the first four years of the study, the reverse of what would have been expected. Birth and weaning weights of calves from F₂ dams were 4.5 and 9.9 pounds, respectively, lighter than those from F₁ dams. While these differences were not statistically significant, they are of the magnitude that would have been expected on a theoretical basis. These results are somewhat encouraging as to the potential for this type of breeding program.

INTRODUCTION

An evaluation of the performance of F₂ crossbreds is of particular importance today in Florida due to the increased interest in and use of F₁ bulls such as Brahman x Angus or Brahman x Hereford bulls. The use of such bulls on cows with Brahman and British breeding results in essentially F₂ animals, the heifers of which are likely to be retained as replacements. Thus, it is important to determine the degree to which productivity declines, if at all, in F₂ animals. When the F₂ cross is produced, some (50%) of the heterozygosity that was present in the F₁ cross is expected to be lost. The performance of the F₂ animals, as a result, is expected to be reduced. The amount of the reduction will be determined by the degree to which the heterosis resulting from the original cross is controlled by heterozygosity. While the cross in this study was a Bos taurus x Bos taurus mating and thus the heterosis level produced was not as high as that from a Bos indicus (Zebu) x Bos taurus cross, the information gained from these animals should be useful in predicting the response with other types of crosses. We do expect that at least some heterosis will be lost from this type of mating system, the important question, however, is how much heterosis will be lost, as heterosis is also lost when rotational systems are used. Again, on a theoretical basis, we expect that the amount of heterosis lost depends on the number of breeds included in the original cross. If two breeds are used, each contributing half of the genes to the cross, then 50% of the F₁ heterosis is expected to be retained in the F₂ animal. This means that if heterosis yielded an increase of 50 pounds over the average of the purebreds used in the cross, that we would still have 25 pounds left when F₂ rather than F₁ animals are used. It should be re-emphasized here, that the heterosis produced by crosses of Zebu cattle with Bos taurus breeds will be greater than that of crosses among
Bos taurus breeds. Thus, a four breed cross with Zebu breed (25%) and three Bos taurus breeds (75%) will likely not produce and retain much more total heterosis than a two breed composite containing 50% Brahman. When four breeds (one Zebu and three Bos taurus) are utilized in the original cross, only 25% of the original heterosis is expected to be lost but a lower level of original heterosis will be produced. These heterosis retention values assume that no inbreeding is used in generating the F2 cross; in other words, the F1 bulls are unrelated to the F1 cows they are mated to other than being composed of the same breeds.

The heterosis that resulted from the cross of the Brown Swiss and the Angus breeds at the BRU increased the calf weaning weights of calves from F1 dams by 26.4 pounds over the average of the purebred calves from Angus and Brown Swiss dams. The calves from the F1 S x A and reciprocal dams included backcrosses to either the Brown Swiss or Angus breeds (3/4 S or 3/4 Angus) and F2 type calves. As a result these calves from which the heterosis for easing weight was obtained would themselves be exhibiting one-half of their potential for increased growth due to their individual heterosis, independent of the effect of the heterosis due to their dams. The effect of heterosis in the calf, however, was not important so this should not have a critical effect upon the results. The F1 dams also showed an advantage in pregnancy rate of 10 percentage units over the purebreds average.

OBJECTIVE

The objective of this study was to estimate the importance of heterosis loss for reproductive and maternal traits in Brown Swiss x Angus F2 crossbreds.

PROCEDURE

Brown Swiss x Angus F2 crossbred females (the progeny of S x A reciprocal F1 crossbred cows and heifers mated to S x A reciprocal F1 crossbred bulls) are being compared to contemporary Brown Swiss x Angus reciprocal F1 crossbred females. The F1 and F2 crossbred cow groups were composed of comparably aged animals from 2 to 5 years of age in 1983. All first exposure heifers each year were bred to Brown Swiss x Angus crossbred bulls to produce F2 or F3 crossbred calves. The calves from older cows were sired by Brown Swiss x Angus crossbred, Brahman and Romana Red bulls. The Romana Red is a primarily Zebu breed that was developed in the Dominican Republic originally as a draft animal. The breed composition of the Romana Red includes the Zebu breed, the Nellore, and Mysore type animals (also Zebu) as well as Bos taurus cattle of Spanish origin. The breed was developed by the Central Romana Corporation and a group was imported into Florida by the Gulf and Western Corporation. The imported cattle were later sold to the Bar G Bar Ranch which has provided the bulls used in this study. The Brahman bulls used in this project were obtained annually from the Brooksville Beef Cattle Research Station. In addition, limited numbers of calves were sired by Brahman bulls whose semen was obtained from a stud.
RESULTS AND DISCUSSION

Table 1 shows the results of the first four years of data collected on the F₁ versus F₂ comparison which represents from one to four calf crops of data on pregnancy rate, birth weight, age at weaning and weaning weight. The most interesting result is that the F₂ females actually surpassed both the reciprocal types of F₁ females in pregnancy rate. The pregnancy percentage of the F₂ females is over 6% higher (P < .05) than the average of the two F₁ types (94% versus approximately 88%). While an advantage in pregnancy rate of the F₂ over the F₁ generation females cannot be explained from a theoretical basis, at the least it can be observed that there was no dramatic decrease in pregnancy rate upon inter se mating of this type of F₁ crossbred. There were absolutely no differences in age of calf at weaning, a trait which is also related to reproductive ability.

<table>
<thead>
<tr>
<th>Type of cow</th>
<th>Pregnancy Rate (%)</th>
<th>Age at Weaning (days)</th>
<th>Birth Weight (lbs)</th>
<th>Actual Weaning Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A x S</td>
<td>92 ± 4</td>
<td>215 ± 4</td>
<td>82 ± 2</td>
<td>557 ± 12</td>
</tr>
<tr>
<td>S x A</td>
<td>84 ± 4</td>
<td>213 ± 5</td>
<td>77 ± 3</td>
<td>550 ± 19</td>
</tr>
<tr>
<td>F₂</td>
<td>94 ± 4</td>
<td>214 ± 3</td>
<td>76 ± 2</td>
<td>544 ± 12</td>
</tr>
</tbody>
</table>

A x S = Angus sire x Brown Swiss dam.
S x A = Brown Swiss sire x Angus dam.

A result more in line with theoretical expectations is being observed for birth and weaning weights as can also be observed in table 1. The calves from F₂ dams, all sire types combined, were lighter at birth (P < .05) than the calves of the A x S dams but essentially equal to those of the S x A dams. There does not appear to be any important reduction in birth weight of the calves from the F₂ dams but then none should have been expected since no heterosis was observed for this trait in the F₁ cross, either in F₁ calves from purebred dams or in F₂ and backcross calves from F₁ dams.

A reduction in weaning weight is seen in the calves from F₂ dams in comparison to those from F₁ dams. The calves from F₂ dams are about 10 pounds lighter than the average of those of the F₁ type dams. This difference is not statistically significant but it is comparable to that expected to be lost as a result of inter se mating (i.e., ten pounds is relatively close to one-half of the 26 pounds of original heterosis).
So what do these results suggest? These results to date support the theoretical expectations that a proportion of the heterosis observed in a particular cross will be lost upon inter se matings but that the loss may not be dramatic, seemingly about 50% of the heterosis achieved in the first cross. If such results can be extrapolated to Bos taurus x Bos indicus crosses (Zebu crosses), these results suggest that F1 Zebu cross bulls may be able to be bred to cows of similar composition without tremendous losses in productivity.