PERFORMANCE OF 0, 1/4 AND 1/2 BRAHMAN CROSSBRED CALVES IN SPRING AND FALL CALVING SYSTEMS

R.C. Bolton[1], R.R. Frahm[2], J.W. Castree[3] and S.W. Coleman[4]

Story in Brief

Performance to weaning was evaluated on 499 spring-born and 423 fall-born calves of five different crossbred groups (Angus x Hereford, 1/4 Brahman:1/4 Hereford:1/2 Angus, 1/4 Brahman:1/4 Angus:1/2 Hereford, Brahman x Angus, Brahman x Hereford) over a three year period. Averaged over crossbred groups the 205-day weaning weight of spring-born calves was 43 lb heavier than the 240-day weight of fall-born calves.

Interactions between percent Brahman and season of birth were significant for all traits measured except birth weight. In the spring calving group, 1/4 and 1/2 Brahman calves were 20 and 40 lb heavier than 0 Brahman calves, respectively, while in the fall calving group the three levels of Brahman breeding had similar weaning weights. Hip height increased as the percent Brahman increased in both seasons. Averaged over both spring and fall, 1/4 and 1/2 Brahman calves were .7 and 2.1 in. taller, respectively, than 0 Brahman calves.

For growth traits through weaning, these data indicated a general advantage as proportion of Brahman breeding increased with the advantage being of greater magnitude for spring-born calves. Within each crossbred group spring-born calves out-performed fall-born calves.

(Key Words: Genotype-Environment Interaction, Brahman, Crossbreeding)

Introduction

Different genetic types of cattle have been used as a means of increasing production efficiency. However, the production environment also plays a major role in determining efficiency, and different types of cattle may perform best in different environments. This genotype-environment interaction is the basis for a study currently being conducted at the Oklahoma Agricultural Experiment Station. In order to determine possible interactions between genotypes (crossbred cow type) and environments (season of calving), this project was designed to use crossbred cows with different proportions of Brahman breeding managed under spring and fall calving systems. The performance of the crossbred calves produced in the initial phase of this long-term project was used to evaluate the effects of proportion of Brahman breeding by season of birth interactions on growth of crossbred calves up to weaning.

Materials and Methods

Angus and Hereford cows were randomly assigned to spring or fall calving groups and mated to Angus, Hereford, Brahman, Brahman x Angus and Brahman x Hereford bulls to produce calves that were 0 Brahman

---

[1]Graduate Assistant [2]Professor [3]Herdsman [4]Research Nutritionist, USDA-ARS

Table 1. Significance levels of factors in the analysis of variance.

Source	Trait					
	Birth	Preweaning	Weaning			
	Wt.	ADG	Wt.	Hip ht.	Conf.	Cond.
Genotype[a]:						
Crossbred Group (A)	**	**	**	**	**	**
Proportion Brahman (B)	**	*	**	**	**	**
Season of Calving (C):	NS	**	**	NS	NS	NS
Genotype x Environment[a]:						
AxC	*	**	**	*	**	**
BxC	NS	**	**	**	**	**

[a]Two separate analyses: one with genotype identified as 5 crossbred groups, the other with genotype identified as 3 levels of Brahman breeding (0, 1/4 and 1/2).
*Effect is significant at the .05 level of probability.
**Effect is significant at the .01 level of probability.
NS Effect is not significant (probability>.05)

(Angus x Hereford and Hereford x Angus), 1/4 Brahman (1/4 Brahman:1/4 Hereford:1/2 Angus and 1/4 Brahman:1/4 Angus:1/2 Hereford) and 1/2 Brahman (1/2 Brahman:1/2 Angus and 1/2 Brahman:1/2 Hereford). The same set of three bulls of each sire breed were used for spring and fall calving groups in the same year, with a different set of bulls used each year. During the three-year foundation period of the project, 499 and 423 calves were produced in the spring and fall calving seasons, respectively.

Spring calves were born from February through April, and fall calves were born from September through November. Birth weights were recorded within 24 hours of birth. Calves remained with their dams on native tallgrass and bermudagrass pastures at the Southwestern Livestock and Forage Research Station near El Reno, and neither group was creep fed. Spring- and fall-born calves were weaned at an average age of 205 and 240 days, respectively. Average weaning dates for the three years were September 25 and May 20 for spring and fall calves, respectively. Calf weights, hip heights, condition and conformation scores were determined at weaning.

The data were analyzed to determine the effect of crossbred group, percent Brahman, season of birth and crossbred group or percent Brahman by season of birth interactions.

Results and Discussion

In general, birth weight tended to increase with increased level of Brahman breeding (Figure 1). Even though the birthweight of spring versus fall calving reversed ranking between 1/4 and 1/2 Brahman calves, the differences were small and the interaction between season of birth and proportion of Brahman was not significant. Birth weight means for the various crossbred groups born in spring and fall are presented in

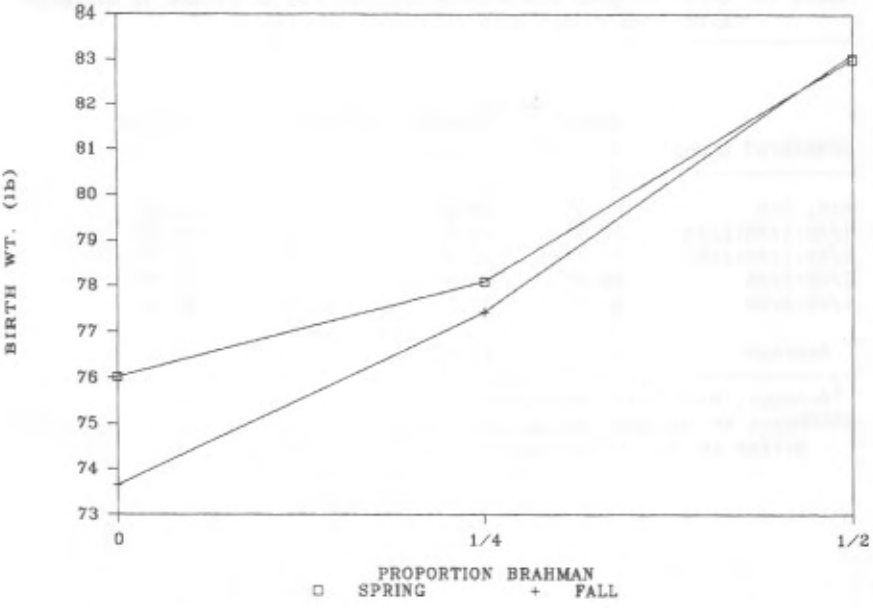

Figure 1. Birth weights of calves with different proportions of Brahman breeding.

Table 2. There was a significant interaction for birth weight between crossbred group and season of birth, with 1/4 Brahman calves that were 1/2 Angus weighing about the same as 1/4 Brahman:1/2 Herefords in the spring calving group but weighing 3.6 lb less in the fall calving group; Brahman x Angus calves weighed 6 lb less than Brahman x Hereford calves in the spring group, but there were no major differences between these two crossbred groups in the fall.

Genotype by environment interactions were significant ($P<.05$) for all five remaining traits studied, meaning that differences between crossbred groups or between levels of Brahman breeding vary depending upon whether the calves were born in spring or fall. Therefore, comparisons between calf breed groups will be compared separately for spring and fall calving groups. In general, interactions between breed of sire and breed of dam were not significant. Thus, it was appropriate to combine the performance of crossbred groups into levels of Brahman breeding (0, 1/4 or 1/2).

Average preweaning daily gain and weaning weight for 0, 1/4, and 1/2 Brahman calves are presented in Figures 2 and 3, respectively. Spring-born calves showed an increase both in daily gain and adjusted weaning weight as proportion of Brahman increased, with 1/4 and 1/2 Brahman calves gaining .07 and .15 lb more per day than 0 Brahman calves (1.74 lb/day) and weighing 20 and 40 lb more at weaning (0 Brahman=430 lb). Proportion of Brahman did not affect the average daily gain or weaning weight of fall-born calves. Spring-born calves outgained and outweighed fall-born calves of the same crossbred group and of the same proportion of Brahman. On the average, the 205-day weaning weight of

Table 2. Birth weights and weaning hip heights of calves in different crossbred groups born in spring and fall.

Crossbred group[1]	Season of Birth			
	Spring		Fall	
	Birth Wt. (lb)	Weaning Ht. (in)	Birth Wt. (lb)	Weaning Ht. (in.)
H:A, A:H	75.5[a]	39.9[a]	74.0[a]	40.4[a]
1/4B:1/4H:1/2A	79.0[b]	41.5[c]	75.7[a]	41.3[b]
1/4B:1/4A:1/2H	77.3[a,b]	40.9[b]	79.3[b]	40.7[a]
1/2B:1/2A	80.0[b]	43.0[d]	82.1[b,c]	42.5[d]
1/2B:1/2H	86.0[c]	42.7[d]	84.0[c]	41.9[c]
Average	79.6	41.6	79.0	41.4

[1]A=Angus, B=Brahman, H=Hereford

[abcd]Means in the same column not sharing at least one common superscript differ at the .05 probability level.

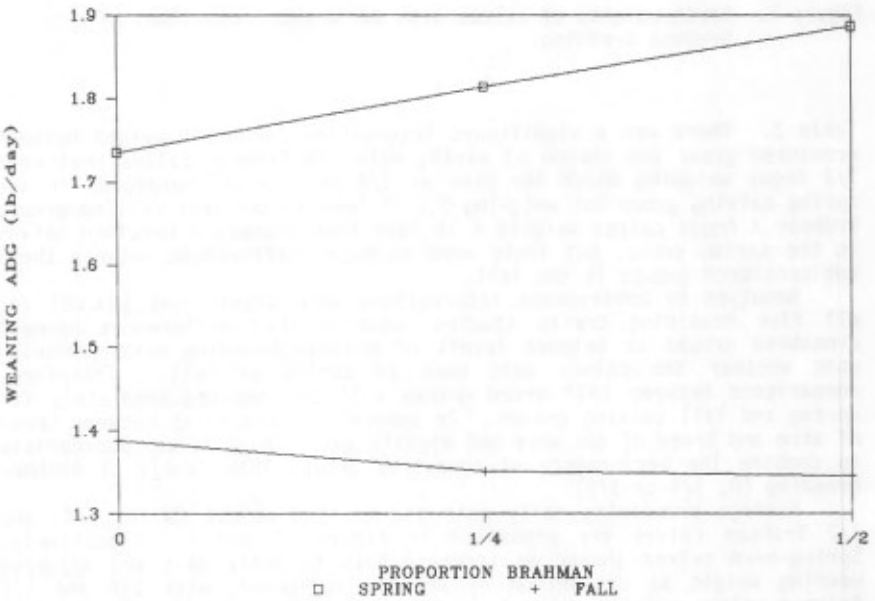

Figure 2. Preweaning daily gains of calves with different proportions of Brahman breeding.

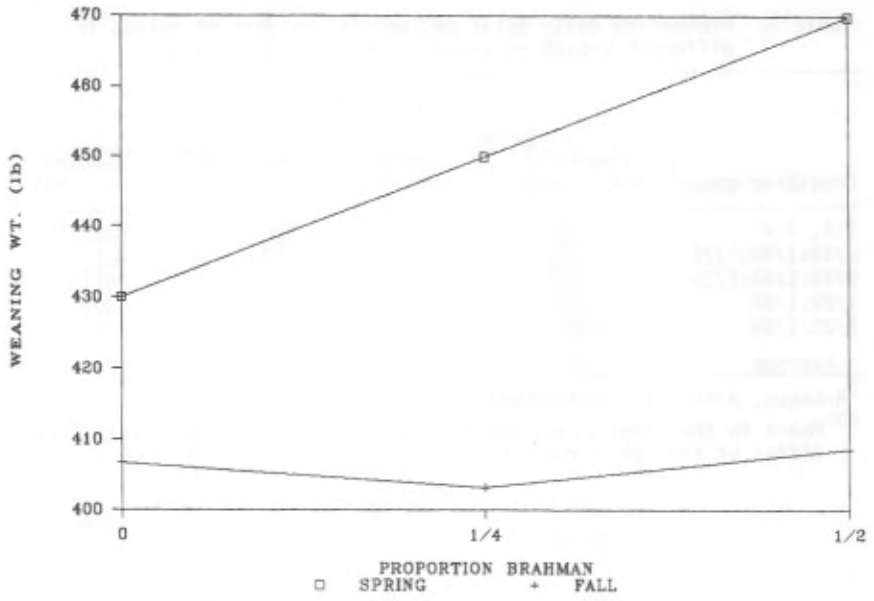

Figure 3. Adjusted weaning weights of calves with different proportions of Brahman breeding.

the spring-born calves was 43 lb heavier than the 240-day weaning weight of the fall-born calves.

Preweaning daily gains and weaning weights of calves in different crossbred groups born in spring and fall are presented in Table 3. Among 1/4 and 1/2 Brahman calves born in the spring, those calves that were 1/2 Angus outgained those that were 1/2 Hereford by .10 and .14 lb/day, respectively, and weighed 27 and 35 lb more at weaning; in the fall group, they gained .09 and .13 lb/day more and were 20 and 38 lb heavier at weaning.

In the spring calving group, age-adjusted hip height increased as percent of Brahman increased (Figure 4), with 1/4 and 1/2 Brahman calves being 0.99 and 2.58 in. taller than 0 Brahman calves (40.25 in.). In the fall-born group, hip heights of 0 and 1/4 Brahman calves were similar while 1/2 Brahman calves were 1.48 and 1.12 in taller than 0 and 1/4 Brahman calves, respectively. Hip heights of 0 and 1/4 Brahman calves were similar when compared across calving seasons, while 1/2 Brahman calves were .74 in taller in the spring calving group than in the fall calving group. Hip heights for the various crossbred groups are presented in Table 2. Hip heights of 1/4 Brahman:1/2 Angus calves were .62 in. greater than for 1/4 Brahman:1/2 Hereford calves (40.92 in.) in the spring group, but there were no large differences between Brahman x Angus and Brahman x Hereford calves. In the fall group, 1/2 Angus calves in both 1/4 and 1/2 Brahman groups were taller than 1/2 Hereford calves (.58 and .55 in., respectively).

Table 3. Preweaning daily gains and weaning weights of calves in different crossbred groups born in spring and fall.

Crossbred group[1]	Season of Birth			
	Spring		Fall	
	Preweaning ADG (lb/day)	Weaning Wt. (lb)	Preweaning ADG (lb/day)	Weaning Wt. (lb)
H:A, A:H	1.75^{a}	434^{a}	1.42^{b}	$420^{b,c}$
1/4B:1/4H:1/2A	1.86^{b}	460^{b}	1.40^{b}	411^{b}
1/4B:1/4A:1/2H	1.76^{a}	433^{a}	1.31^{a}	391^{a}
1/2B:1/2A	1.96^{c}	483^{c}	1.43^{b}	430^{c}
1/2B:1/2H	$1.82^{a,b}$	$448^{a,b}$	1.30^{a}	391^{a}
Average	1.83	452	1.37	409

[1] A=Angus, B=Brahman, H=Hereford

[abc] Means in the same column not sharing at least one common superscript differ at the .05 probability level.

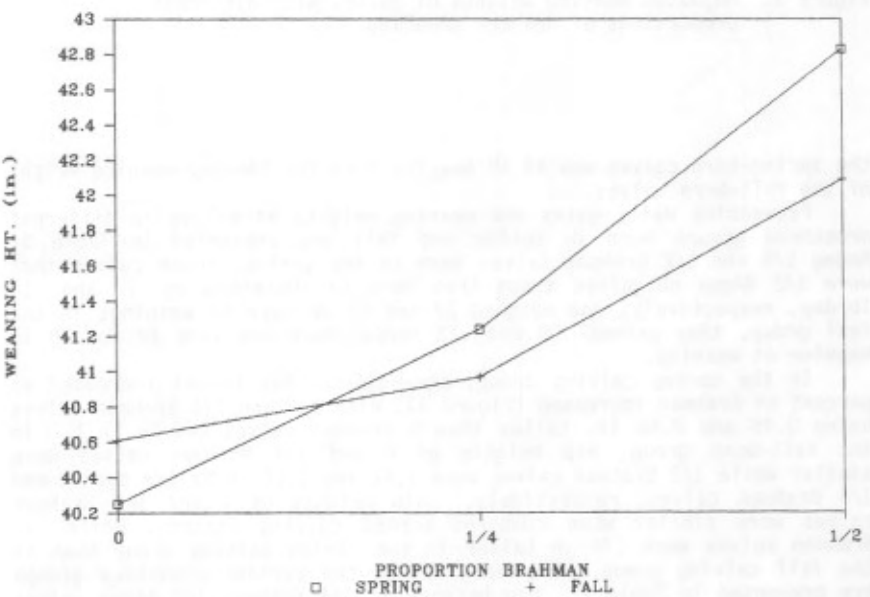

Figure 4. Weaning hip heights of calves with different proportions of Brahman breeding.

Conformation scores for 0, 1/4 and 1/2 Brahman calves (Figure 5) were similar in the spring calving group, while in the fall calving group conformation scores of 1/4 and 1/2 Brahman calves were .3 and .6 units lower than those of 0 Brahman calves (13.1). Comparisons of the same percent Brahman groups showed that 0 Brahman calves had lower scores in the spring calving group than in the fall calving group, there was no difference between spring and fall groups for 1/4 Brahman calves, and 1/2 Brahman calves born in the spring had higher conformation scores than 1/2 Brahman calves born in the fall.

Condition scores of spring-born calves were similar for all three levels of Brahman breeding. For fall-born calves, condition scores decreased with increased proportion of Brahman breeding, with 0 Brahman calves scoring .3 and .6 units higher than 1/4 and 1/2 Brahman calves, respectively (Figure 6). Comparing spring versus fall calving seasons, 0 Brahman calves had scores .2 units lower in the spring system than in the fall, 1/4 Brahman calves had similar scores, and 1/2 Brahman calves had scores .2 units higher in the spring calving group than in the fall group.

Conformation and condition scores of calves in different crossbred groups born in spring and fall are presented in Table 4. Conformation scores of 1/4 and 1/2 Brahman calves that were 1/2 Hereford were .3 and .4 units lower than their 1/2 Angus counterparts in both spring and fall calving groups and, in the spring group, were similar to scores for 0 Brahman calves. Condition scores of spring-born calves did not vary

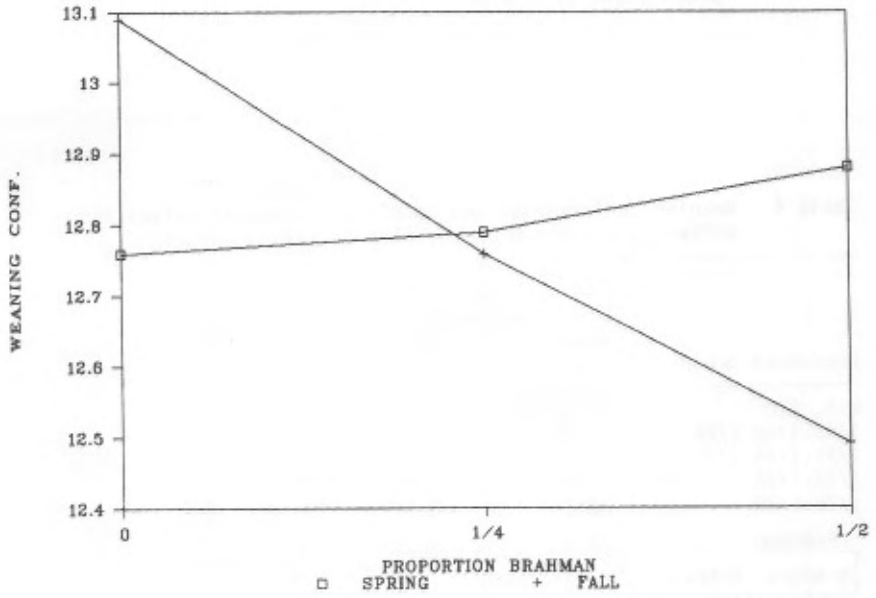

Figure 5. Weaning conformation scores of calves with different proportions of Brahman breeding.

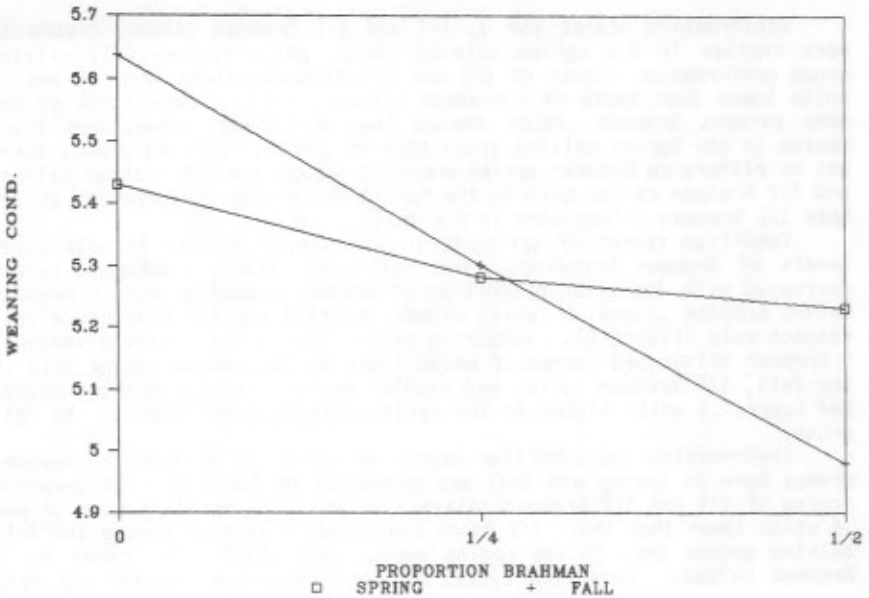

Figure 6. Weaning condition scores of calves with different proportions of Brahman breeding.

Table 4. Weaning conformation and condition scores of calves in different crossbred groups born in spring and fall.

	Season of Birth			
	Spring		Fall	
Crossbred group[1]	Weaning Conf.[2]	Weaning Cond.[3]	Weaning Conf.	Weaning Cond.
H:A, A:H	12.8^{a,b}	5.55^{b}	13.2^{d}	6.02^{c}
1/4B:1/4H:1/2A	13.0^{b,c}	5.41^{a,b}	12.9^{c}	5.29^{b}
1/4B:1/4A:1/2H	12.7^{a}	5.21^{a}	12.6^{a,b}	5.27^{b}
1/2B:1/2A	13.1^{c}	5.24^{a}	12.7^{b,c}	5.15^{b}
1/2B:1/2H	12.7^{a}	5.24^{a}	12.3^{a}	4.85^{a}
Average	12.8	5.33	12.7	5.32

[1]A=Angus, B=Brahman, H=Hereford
[2]Conformation: 12=low choice, 13=average choice.
[3]Condition: 1=thin to 9=fat with 5=average choice.
^{abcd}Means in the same column not sharing at least one common superscript differ at the .05 probability level.

within 1/4 and 1/2 Brahman groups. In the fall calving group, there was no difference in condition score within 1/4 Brahman calves, while Brahman X Angus calves scored .3 units higher than did Brahman x Hereford calves (4.85).

In summary, these data indicated that traits through weaning were improved as level of Brahman breeding increased, with a greater improvement of Brahman crossbred calves over 0 Brahman calves evident in the spring calving group. Spring-born calves of all crossbred groups have an advantage over fall-born calves. Since interactions between level of Brahman breeding and season of birth exist, the use of different crossbred types should be carefully evaluated for the type of management system.

Some differences were observed between crossbred calves with the same proportion of Brahman breeding (1/4 Brahman:1/4 Hereford:1/2 Angus versus 1/4 Brahman:1/4 Angus:1/2 Hereford and Brahman X Angus versus Brahman x Hereford), with calves out of Angus dams showing an advantage in some traits. This may in part be explained by the fact that preweaning traits reflect not only the genetic merit of the calf but also the maternal ability of the dam.