

EFECTO DE LA RAZA DE LAS CRIAS EN LA PRODUCTIVIDAD DE LAS VACAS

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INTRODUCTION

In most beef cattle crossbreeding studies that involve production of crossbred calves from straightbred cows, researchers have studied differences in performance of the different crossbred calf groups and differences between straightbred and crossbred calves. If there are important differences among groups of calves for traits such as weaning weight, then it is possible that some groups of calves stressed their dams to a greater degree than other groups of calves. It may be possible to detect increased stress on the cow by measuring cow traits such as weight, measures of body condition, milk production, reproduction and changes in weight and condition. The objective of this study was to compare traits of straightbred Hereford cows that produced Hereford, Angus - Hereford, 1/4 Simmental - 3/4 Hereford and 1/2 Simmental - 1/2 Hereford calves.

MATERIALS AND METHODS

The experiment was conducted at the Northern Agricultural Research Center near Havre, Montana, during the years 1976 to 1979. Contemporary straightbred Hereford cows were randomly bred to Hereford, Angus, Simmental x Hereford and Simmental sires by use of artificial insemination (AI) for 45 days. Each sire breed group was represented by 9 or 10 sires. Hereford and Angus sires were sampled from AI studs to represent an average group of bulls available to producers from AI studs. The Simmental purebred sires were selected from AI studs based on progeny performance. Progeny performance was assessed by using progeny test information from the American Simmental Association's National Sire Summary. Simmental sires were selected so that their average for growth traits was nearly equal to breed average. The Simmental-Hereford sires were all produced in one herd and were sons of the purebred Simmental sires. They were selected based on individual performance so that their average for growth traits was nearly equal to herd average.

Cows were 3 to 8 years old at calving but for purposes of statistical analyses they were grouped into three classes (3, 4 and 5+ years old). Cows were maintained on native range with sufficient supplemental feeding during the winter to maintain weight. Calves were not creep-fed and were weaned at an average age of 180 days.

Traits of the cow that were analyzed are listed in table 1. Precalving weight was taken on one day just prior the start of the calving season, normally about the middle of March. The prebreeding weight was taken just prior to the start of the 45-day breeding season during the first week of June. Weaning was during the first week of October. The ratios of weights and weight changes divided by height were all calculated by using height at withers at the time of weaning. The subjective condition score ranged from 1 to 9, with 9 representing the fattest cows. Milk production was measured twice during lactation by the weigh-suckle-weigh procedure, once at 30 to 50 days into lactation and again at 120 to 150 days into lactation.

Data were analyzed using the fixed model least-squares procedure (Harvey, 1975). Main effects included year, breed of calf, sex of calf and age of cow. All two-way interactions were tested in preliminary analyses and excluded from final analyses if they were non-significant. Days before calving (number of days between date of precalving weight and calving date) was included as a covariate for most traits.

After excluding all cows that had missing data (including conception date),

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TABLE 1. LIST OF COW TRAITS, MEANS AND STANDARD ERRORS

Trait	Mean \pm se
Precalving weight, kg	490 \pm 4.0
Prebreeding weight, kg	473 \pm 4.0
Weaning weight, kg	498 \pm 4.2
Weight change precalving to prebreeding, kg	-17.3 \pm 1.60
Weight change prebreeding to weaning, kg	24.7 \pm 1.77
Weight change precalving to weaning, kg	7.4 \pm 1.98
Precalving weight/height, kg/cm	3.98 \pm .0262
Prebreeding weight/height, kg/cm	3.84 \pm .0269
Weaning weight/height, kg/cm	4.04 \pm .0284
Wt. change precalving to prebreeding/ht., kg/cm	-.141 \pm .0130
Wt. change prebreeding to weaning/ht., kg/cm	.199 \pm .0143
Wt. change precalving to weaning/ht., kg/cm	.057 \pm .0160
Postcalving condition score	5.36 \pm .071
Weaning condition score	6.13 \pm .076
Change condition score postcalving to weaning	.77 \pm .085
Height at withers at weaning, cm	122.9 \pm .30
Interval from calving to conception, days	79.4 \pm 1.02
Early milk production, kg	10.0 \pm 1.10
Late milk production, kg	5.2 \pm 1.56

356 cows were available for analyses for all traits except milk production. Cows were sampled at random for milk production tests and 76 cows had complete data for milk production and all other traits.

RESULTS AND DISCUSSION

Table 1 shows the overall least-squares means and standard errors for each trait. Cows lost weight from precalving to prebreeding (a period of about 3 months) and gained weight from prebreeding to weaning (a period of about 4 months). Cows gained in condition score from postcalving to weaning. The estimate of milk production early in lactation was larger than late in lactation. These means for weights, condition scores and milk production were similar to those reported by Wyatt *et al.* (1977b) for Hereford range cows.

Mean squares from the least-squares analyses of variance are given in table 2 for selected traits. The traits presented in table 2 are those groups of traits where one or more of the traits in the group were significantly affected by breed of calf and the two estimates of milk production. Interactions were generally unimportant and were deleted from final analyses. No interaction involving breed of calf was significant for any trait. Year, age of cow and the year \times age of cow interaction were significant sources of variation for most traits.

Breed of calf had an important ($P < .05$) effect on cow weight change from precalving to weaning, cow weight change from precalving to weaning divided by cow height at withers at weaning and cow condition score at weaning (table 2). The effects of calf breed group on the cow traits are shown in table 3. Cows raising Hereford calves gained more weight from prebreeding to weaning and from precalving to weaning than cows raising 1/2 Simmental - 1/2 Hereford calves, and cows raising Angus - Hereford and 1/4 Simmental - 3/4 Hereford calves were intermediate. The same trend was observed for the weight changes divided by height at withers where cows raising straightbred calves gained more per unit of height than cows raising 1/2 Simmental - 1/2 Hereford calves. Calf breed group did not have a significant effect on cow condition score at postcalving, but at weaning the cows raising Hereford calves had higher condition scores than those raising 1/2 Simmental - 1/2 Hereford calves. For change in condition score from

TABLE 2. LEAST-SQUARES ANALYSES OF VARIANCE FOR SELECTED TRAITS OF COWS

Source of variation	df	Mean squares										
		Weight change (kg ²)			Weight change/height (kg/cm) ²			Condition score			Milk production (kg ²)	
		Precalving to prebreeding	Prebreeding to weaning	Precalving to weaning	Precalving to prebreeding	Prebreeding to weaning	Precalving to weaning	Postcalving	Weaning	Change post-calving to weaning	Early	Late
Year (Y)	3	4,550**	32,619**	28,347**	.3155**	2.1440**	1.7748**	5.864**	16.753**	41.063**	8.7	138.6**
Breed of calf	3	288	745	1,588*	.0209	.0479	.1039*	.231	2.253*	1.364	15.4	39.7
Sex of calf(S)	1	47	3	75	.0039	.0002	.0066	.790	.038	.482	1.3	133.1*
Age of cow(A)	2	2,136**	3,795**	11,350**	.1223**	.2682**	.7366**	4.917**	9.169**	1.767	7.1	28.2
Y X S	3	353	303	774	.0229	.0196	.0486	.193	2.106*	1.914	--	--
Y X A	4	1,779**	1,143*	4,638**	.115**	.0669	.2917**	.521	2.757**	4.046**	--	--
Regression on days before calving	1	98	45	275	.0070	.0027	.0174	23.948**	.025	25.512**	8.5	48.2
Regression o day of lactation	1	--	--	--	--	--	--	--	--	--	.2	61.2
Residual	388 ^a	360	442	549	.0236	.0289	.0357	.705	.809	1.026	13.7	27.3

^a Residual degrees of freedom for milk production were 64.

*P<.05.

**P<.01.

TABLE 3. MEANS FOR TRAITS OF COWS FOR EACH CALF BREED GROUP

Calf breed group	No.	Weight change (kg)			Weight change/height (kg/cm)			Condition score			Milk production (kg) ^c	
		Precalving to prebreeding	Prebreeding to weaning	Precalving to weaning	Precalving to prebreeding	Prebreeding to weaning	Precalving to weaning	Postcalving	Weaning	Change post-calving to weaning	Early	Late
Hereford	83	-16.5±2.58	29.0±2.85 ^a	12.5±3.18 ^a	-.135±.0208	.234±.0230 ^a	.098±.0257 ^a	5.34±.114	6.26±.122 ^a	.92±.138	10.4±1.49	3.1±2.11
Angus - Hereford	100	-16.5±2.30	23.2±2.55 ^{ab}	6.7±2.84 ^{ab}	-.134±.0186	.187±.0206 ^{ab}	.053±.0229 ^{ab}	5.37±.102	6.10±.109 ^{ab}	.73±.123	7.8±1.18	6.3±1.66
1/4 Simmental - 3/4 Hereford	88	-16.1±2.51	24.6±2.78 ^{ab}	8.5±3.10 ^{ab}	-.131±.0203	.198±.0225 ^{ab}	.065±.0250 ^{ab}	5.42±.111	6.25±.119 ^a	.83±.134	10.9±1.41	6.0±2.04
1/2 Simmental - 1/2 Hereford	85	-20.1±2.58	22.0±2.86 ^b	1.9±3.19 ^b	-.165±.0209	.179±.0231 ^b	.012±.0257 ^b	5.29±.114	5.91±.122	.62±.138	10.5±1.64	5.5±2.31

^{a, b} Means within column with different superscripts are significantly different ($P < .05$).

^c Numbers of animals for milk production were 26, 12, 25 and 13, respectively, for Hereford, Angus-Hereford, 1/4 Simmental-3/4 Hereford and 1/2 Simmental-1/2 Hereford.

postcalving to weaning, the difference between cows raising Hereford calves and those raising 1/2 Simmental - 1/2 Hereford approached significance ($P=.07$). Although not significant, cows raising straightbred calves tended to produce less milk during late lactation than those raising crossbred calves. This was in agreement with Reynolds *et al.* (1978) where cows raising crossbred calves produced 0 to 26% more milk than those raising straightbred calves. Cartwright and Carpenter (1961) reported that crossbred calves suckled more frequently than straightbred calves. However, Wyatt *et al.* (1977a) concluded that "it appears that the potential growth rate of calves had little effect on milk intake." All of the present results showed that the crossbred calves in this study stressed their dams more than the straightbred calves.

SUMMARY

Straightbred Hereford cows were randomly bred to Hereford, Angus, Simmental x Hereford and Simmental sires. Each sire breed group was represented by 9 or 10 sires. These matings produced approximately 100 calves in each sire breed group over 4 years. The objective of this study was to determine the effect of calf breed on characteristics of the cow such as milk production, reproduction, measures of condition, weight and changes in condition and weight during lactation. All of the cows were contemporary straightbred Herefords that were raised and managed under similar environmental conditions. Hence, any detection of an important effect of calf breed on cow productivity should be a reflection of different levels of stress imposed on the cow by the different calf breed groups. Calf breed group had significant effects on cow weight change from precalving to weaning, cow condition at weaning and change in weight from precalving to weaning/height at weaning. Cows that raised crossbred calves had lower condition scores at weaning, smaller gains in weight change per unit of height and gained less weight from precalving to weaning. The trend in cow milk production, although not significant, was for cows that raised crossbred calves to give more milk.

RESUMEN

Vacas Hereford fueron empadradas en forma randomizada con toros de las razas Hereford, Angus, Simmental x Hereford, y Simmental puros. Cada grupo de razas de machos estuvo representado por 9 - 10 toros. Estos empadres produjeron aproximadamente 100 crías en cada grupo de razas de los machos sobre 4 años. El objetivo de este estudio fue determinar el efecto de la raza de la cría sobre las características de la vaca, como producción de leche, reproducción, medidas de la condición, peso y cambios en condición, y pesos durante la lactación. Todas las vacas fueron contemporáneas, Herefords que fueron criada y manejadas bajo condiciones similares de medio ambiente. Así, cualquier detección de efectos importantes de la raza de la cría sobre la productividad de la vaca sería reflejo de diferentes niveles de stress impuesto sobre la vaca por los diferentes grupos de razas de las crías. El grupo de raza de cría tuvo efectos significantes en el cambio del peso de la vaca desde el parto hasta el destete, condición de la vaca al destete y cambios en la condición desde el parto hasta el destete. Las vacas que criaron crías cruzadas tuvieron un grado de condición menor al destete, ganacias de condición menores del parto al destete y ganaron menos peso del parto al destete. La línea de producción de leche en las vacas, aunque no significativa, fue para vacas que criaron crías cruzadas una mayor producción de leche.

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