Journal of Animal and Veterinary Advances 7 (4): 485-488, 2008
ISSN: 1680-5593

Comparison of Crossbred Heifers Mated Naturally to Red Poll Bulls for Production and Growth Traits

[1]A.P. Márquez and [2]H. González-García
[1]Instituto de Ciencias Agrícolas, Universidad Autónoma de Baja California, Mexicali, México
[2]Programa de Medicina Veterinaria and Zootecnia, Universidad Autónoma de Ciudad Juárez, México

Abstract: Crossbred dams when mated at different ages and in different years by natural service to Red Poll (n = 415) were compared for calf birth weight BW, weaning weight WW, calving difficulty CD measured categorically and calving ease CE measured binomially and calf survival CS. Crossbred cows were from Angus, Hereford, Pinzgauer, Brahman, Sahiwal and Tarentaise crosses. The analytical model included: dam line (breed combination of dam) age of dam, sex and year as fixed effects, whereas julian birth day was a covariate. For analyses with back cross dams, covariates were included in the model for fractions of inheritance from each breed and fraction of complete heterosis of dams due to Bos taurus by Bos taurus, Bos taurus × Bos indicus, Bos indicus × Bos indicus crosses instead of breed combination of dam. Differences among crossbred dam groups were observed for birth and weaning weight and calving difficulty. Birth and weaning weights were less in female calves than bull calves. Crosses involving Brhaman and Sahiwal cows had least calving difficulty. Red Poll sired cows had more calving difficulty; but were heavier at birth and weaning weight. Heifer calves had less calving difficulty than bull calves. There were few differences among dam breeds for survival at weaning, at 3rd day or at birth.

Key words: Crossbred cows, birth weight, weaning weight, calving difficulty, survival

INTRODUCTION

In recent years, increased attention has been given to calving difficulty. One reason for this attention is the mating of breeds with large bulls to British breeds of cows (i.e., Angus, Hereford, Shorthorn). Increased calving problems also have been encountered within pure bred herds, because genetically large bulls are often mated to cows of only average size. Since, the pioneer research by, a large number of papers have appeared dealing with frequencies of calving difficulties and stillbirths. Stillbirth incidence and even incidence of calf mortality up to 1 month after calving are much higher when calving is difficult (Meijering, 1986; Laster *et al*., 1973). Birth weight is an effective correlated trait that can be used to reduce calving difficulty or birth weight will lead to lighter postnatal weight (Bennett and Gregory, 2001). Schemes for simultaneously changing or limiting change in calving difficulty, birth weight and postnatal weight have been proposed (Dickerson *et al*., 1974; MacNeil *et al*., 1998).

MATERIALS AND METHODS

This study used data that were part of a program to characterize a broad range of biological types of cattle as represented by breeds that differs widely in traits such as milk yield, growth rate, carcass composition and mature size (Gregory *et al*., 1991).

The cows used to initiate this phase of the experiment (Cycle III, phase 3) were originally produced by mating Hereford (H) and Angus (A) cows to produce F_1 crosses from Hereford (HA), Angus (AH), Pinzgauer (PH and PA), Brahman (BH and BA), Sahiwal (SH and SA) and Tarentaise (TH and TA) sires. These females produced 3-way cross progeny (Cycle III, phase 3) from matings to Red Poll sires to produce calves at 2 years of age.

The AI matings in (Cycle III, phase 4) provided progeny that were 0, 1/4, 1/2 and 3/4 Brahman and Sahiwal. These crossbred dams produced calves at 2 and 3 years of age from matings by natural service to Red Poll sires.

Corresponding Author: A.P. Márquez, Instituto de Ciencias Agrícolas, Universidad Autónoma de Baja California, Mexicali, México

Management: Cows were maintained on improved cool season (brome) or warm season pastures and feed (grass and alfalfa) or silage during the winter. Calving was in the Spring (March and April). At birth all calves were identified, weighed, dehorned (paste) and vaccinated against viral scours. Calves were weaned at approximately 200 day.

Data collection: The traits analyzed in this study were BW, WW (adjusted to 200 day of age), CD measured binomially and survival at weaning, at 3 day and at birth, respectively. Calving difficulty was subjectively evaluated categorically using descriptive scores (i.e., 1 = no difficulty, 2 = little difficulty by hand, 3 = little difficulty with jack, 4 = slight difficulty with a calf jack, 5 = moderate difficulty with calf jack, 6 = major difficulty with calf jack and 7 = Caesarean birth presentation.

Calving ease was also analyzed binomially with score 1 = ease (categorical, 1 and 2) and 0 = not so ease (categorical, 3 to 6). Survival was not analyzed for calves resulting from crossbred cows mated to Red Poll and Longhorn bulls because nearly, all calves survived to weaning. Analyses of this study included only records of calves conceived by natural service to unidentified bulls either as clean up-matings (Charolais) or for the full mating season (Red Poll, Simmental and Red Poll and Longhorn and Charolais bulls).

Separate analyses for each trait used Multiple Trait Derivative Free Restricted Maximum Likelihood (MTDFREML) program (Boldman *et al*., 1993). The analytical model included: dam line (breed combination of dam) age of dam, sex and year as fixed effects, whereas julian birth day was a covariate. For analyses with back cross dams, covariates were included in the model for fractions of inheritance from each breed and fraction of complete heterosis of dams due to Bos taurus by Bos taurus, Bos taurus × Bos indicus, Bos indicus × Bos indicus crosses instead of breed combination of dam. Variance components due to dam and residual effects were jointly estimated except for the matings of Red Poll bulls to crossbred cows that calved only once at 2 years of age. Standard errors were used to test significance of differences among crossbred dam groups and other effects.

RESULTS AND DISCUSSION

F_1 cross cows mated to Red Poll bulls (n = 415): Analyses of F_1 cross cows bred naturally to calve at 2 years of age to Red Poll bulls are summarized in Table 1. There were considerable differences in weights of calves born to cows of different dam groups. Crosses involving Pinzgauer and Tarentaise cows had the largest birth weights. The smallest birth weights cwere for calves of Sahiwal × Angus and Sahiwal × Hereford cows. Gregory *et al.* (1992) using same data also reported heaviest were from Pinzgauer sires. The same authors also reported smallest birth weights involved Sahiwal × Hereford and Sahiwal × Angus cows.

Table 1 also shows considerable differences among crossbred dam groups in weaning weights of calves. Weights of calves of Brahman × Angus and Brahman × Hereford dams were heavier than calves from dams of the other eight crosses. The smallest weaning weights involved Hereford × Angus and Angus × Hereford dams. In a crossbreeding program involving inheritance of Bos taurus × Bos indicus, the design of a mating system is very important due to a noticeable difference in the performance of reciprocal cross (Brahman bulls mated to Bos taurus cows vs. Bos taurus bulls on Brahman cows) calves for several economically traits (Thallman *et al*., 1993).

Calves from crosses involving Brahman and Sahiwal cows had the least calving difficulty. Crossbred Hereford × Angus, Pinzgauer × Hereford and Pinzgauer × Angus had the most calving difficulty. Significantly less calving difficulty was expressed in female than in bull calves.

Most differences among crossbred dams were not significant for survival at weaning, at 3 day and at birth, although calves Pinzgauer × Hereford, Hereford × Angus and Pinzgauer × Angus had the poorest survival. Survival rates at weaning, at 3 day and birth were slightly for bull than female calves. Gregory *et al.* (1991) reported large differences among breed groups in calving difficulty and survival independent of breed effects on birth weight.

Variance due to dams within dam breed: Table 2 lists phenotypic variances and fractions due to individual effects of dams within breed of dam groups. As shown, variation due to dam effects (0.47 and 0.48) was important for growth traits as birth and weaning weights, respectively. The phenotypic variance values (95 and 1652) for birth weight and weaning weight, corresponded to analyses of crossbred dams mated naturally to calve at 2 years of age, respectively.

Table 2 also shows that the phenotypic variance values (0.09, 0.03 and 0.07) for survival at weaning, at 3 day and survival at birth, corresponded to analyses of

Table 1: Solutions from analyses of records of calves of crossbred heifers mated naturally to unidentified red poll bulls to calve at 2 years of age

	Trait[a]						
Item	BW	WW	CD-C	CE	SWn	S-3d	S-Bth
Mean	72.9	430	2.14	1.69	0.89	0.91	0.93
Breed of dam							
H×A	1.9	-49	1.40	-.35	-.07	-0.03	-0.05
A×H	3.7	-39	0.38	-0.15	0.08	0.02	0.07
B×H	3.6	39	-6.4	0.18	0.04	0.03	0.03
B×A	2.2	44	-5.0	0.13	0.03	0.02	0.04
S×H	-4.0	12	-4.8	0.13	0.06	0.02	0.04
S×A	-7.0	1	-4.5	0.13	0.03	0.02	0.03
P×H	12.5	-1	1.23	-0.33	-0.11	-0.02	-0.07
P×A	8.3	-11	0.88	-0.22	-0.02	-0.03	-0.02
T×H	7.7	15	0.65	-0.19	-0.01	-0.04	-0.02
T×A	2.0	-6	0.61	-0.15	-0.08	-0.05	-0.10
SE[b]	±2.2	±10	±0.33	±0.10	±0.07	±0.04	±0.06
Sex							
Heifer	-3.2	-24	-5.9	0.16	0.01	0.02	0.02
SE[c]	±0.9683	±4.2784	± 0.1470	±0.0422	±0.0298	±0.0173	±0.0250
JBD	0.1120	0.0700	0.0070	-0.0030	0.0012	-0.0007	-0.0002
SE[d]	±0.0300	±10.300	±0.0040	±0.0010	±0.0009	±0.0005	±0.0009

[a]BW = Birth Weight (lb), WW = Weaning Weight (lb), CD-C = Calving Difficulty measured Categorically, CE = Calving Ease measured binomially, SW = Survival at weaning, S-3d = Survival at 3-d, S-Bth = Survival at birth, [b]H = Hereford, A = Angus, B = Brahman, S = Sahiwal, P = Pinzgauer, T = Tarentaise; average standard error of difference between crossbred dam groups and Sahiwal by Angus cows. [c]Bulls minus heifers; standard error of the difference between bull and heifer calves. [d]Julian birth day; standard error of regression coefficient

Table 2: Phenotypic variances and fractions of variance due to individual effects of dams within crossbred groups mated naturally to Red Poll bulls

Sire of breed	Age of dam year	BW	WW	CD-C	CE	S-Wn	S-3d	S-Bth
Fraction of variance due to dam effects								
Red poll	2	0.47	0.48	0.26	0.10	C	C	C
Phenotypic variances								
Red poll	2	95	1652	2.13	0.17	0.09	0.03	0.07

[a]BW = Birth Weight (lb), WW = Weaning Weight (lb), CD-C = Calving Difficulty Categorical, CE = Calving Ease binomial, S-Wn = Survival at weaning, S-3d = Survival at 3d, S-Bth = Survival at birth; [b]Estimates were not obtained because mean survival was nearly 100%

crossbred dams mated naturally to Red Poll bulls to calve at 2 years of age, respectively. There was not much variation among dams for survival probably because of uniformly high survival rates. Because nearly, all animals survived, survival was not analyzed.

IMPLICATIONS

There were significant differences among breed groups for most traits studied. Generally, breed groups characterized by higher birth weight and more calving difficulty were also heavier at weaning. Calving difficulty is an important reason for involuntary culling and has a negative effect on herd amortization costs. Producers must consider birth weight and calving difficulty as important traits in their breeding programs.

REFERENCES

Bennett, G.L. and K.E. Gregory, 1996. Genetic (co) variances among birth weight, 200-day weight and pre weaning grain in composites and parental breeds of beef cattle. J. Anim. Sci., 74: 259826-2611.

Boldman, K.G., L.A. Kriese, L.D. Van Vleck and S.D. Kachman, 1993. A manual for use of MTDFREML. A set of programs to obtain estimates of variances and covariances. (Draft). ARS, USDA.

Dickerson, G.E., N. Kunzi, L.V. Cundiff, R.M. Koch, V.H. Arthaud and K.E. Gregory, 1974. Selection criteria for efficient beef Production. J. Anim. Sci., 39: 364.

Gregory, K.E., L.V. Cundiff and R.M. Koch, 1991. Breed effects and heterosis in advanced generations of composite populations for birth weight, birth date, dystocia and survival as traits of dam in beef cattle. J. Anim. Sci., 69: 3574.

Gregory, K.E., L.V. Cundiff and R.M. Koch, 1992. Composite breeds to use heterosis and breed differences to improve efficiency of beef production. U.S.D.A. Agricultural Research Service Publication. Roman L. Hruska. U.S. Meat Animal Research Center, A.R.U.S.D.A., Clay Center, Nebraska 68933.

Laster, D.B., H.A. Glimp, L.V. Cundiff and K.E. Gregory, 1973. Factors affecting dystocia and the effects of dystocia on subsecuent reproduction in beef cattle. J. Anim. Sci., 36: 695.

MacNeil, M.D., J.J. Urick and W.M. Snelling, 1998. Comparison of selection by independent culling levels for bellow average birth weight and high yearling weight in line 1 Hereford cattle. J. Anim. Sci., 76: 458-467.

Meijering, A., 1986. Dystocia in dairy cattle breeding. Thesis Research Institute for Animal Production Schoonoord.

Meijering, A., 1986. Sire evaluation for calving traits by Best Linear Unbiased Prediction and non linear methodology. Research Institute for Animal Production. Schoonoord, Netherlands.

Thallman, R.M., J.O. Sanders and J.F. Taylor, 1993. Non-Mendelian genetic effects in reciprocal cross Brahman × Simmental F1 calves produced by embryo transfer. Progress Report No. 5053. Beef Cattle Research in Texas. Texas A and M University.