Milk Production in Criollo, Guzerat and Reciprocal Cross Cows

A. Borrayo-Zepeda[*], G. Martínez-Velázquez[*], M. Montaño-Bermúdez[+], J.A. Palacios-Fránquez[*] and J.J. Bustamante-Guerrero[*]

Introduction

In beef production, survival and development of a calf are to a large degree dependent upon the maternal environment provided by its dam. A mayor component of this environment is the nutrition received through milk Cluter and Nielsen (1987). The objectives of this study were compare lactation trait from Criollo, Guzerat and F1 cows, to compare birth and weaning weight of their progeny, to estimate heterosis and direct and maternal genetic effects for all variables in the study, and to correlate milk production with weaning weight of calves

Material and methods

The study was carried out at Verdineño experimental station (INIFAP) in Nayarit, México. Records were collected from 2001 to 2003. Ninety two records were from Guzerat (G), 34 Criollo (C), 12 Guzerat x Criollo (GC) and 24 Criollo x Guzerat (CG) cows. Milk production was estimated in all years at an average 56, 84, 112, 140, 168 and 196 d postpartum by weight-suckle-weight techniques. To quantify lactation curve characteristics, individual animal observations were fitted to a nonlinear equation: $Y(n) = n/ae^{kn}$ by Jenkins and Ferrell (1984). Data analysis was carried out with the Mixed procedure of SAS considering repeated measurements. Estimates of the total yield for a 210-d lactation period (YT), time of peak lactation (PK), yield at time of peak lactation (PKYD), birth weight (BW) and weaning weight adjusted to 210 days of age (WW) were analyzed with a model that included the fixed effects of genotype of the cow, number of calving, season of breeding, year of breeding, calf sex, birth weight of the calf as a covariate (excepting BW). For all variables final models included interactions of two factors that were significant ($P<0.25$) in preliminary analyses. Contrasts were used to estimate individual heterosis (h^i), maternal heterosis (h^m) and differences between direct genetic effects (g^i) and maternal genetic effects (g^m).

Results and discussion

Results for the mayority of the variables are presented in table 1. The GC cows had higher yields ($P \leq 0.10$) from the C and G with 253 and 110 kg differences for YT. It was also

[*] S.E. "El Verdineño", INIFAP. Av. Insurgentes # 1050 Ote. Col. Menchaca, Tepic, Nayarit, México
[+] Centro Nacional de Investigación Disciplinaria en Fisiología y Mejoramiento Animal, INIFAP.

observed that CG showed different averages (P<0.05) from C females. Direct effects for YT were more important than maternal effects and favored the Guzerat. The h^i y g^i estimators influenced (P<0.05) in a favorable way upon YT, PK and PKYD. No significant differences were detected between g^m of Criollo and Guzerat in any of the variables (table 1). Brown et al. (1996) also found that crossbred cows present a higher YT than pure cows. GC, CG y G females showed different PK averages (P<0.05) from C females. The mention differences of 26, 15 and 12 % were for PK, to favor GC, CG and G from which the PKYD reached 75 ± 6, 78 ± 4 and 75 ± 3 days, respectively. The time in which the cows from this study reached the PK were higher than those reported by Jenkins and Ferrell in (1992). There weren't important differences detected (P>0.05) between the evaluated genotypes for PKYD. The higher average for BW corresponded to calves from G cows. Different (P<0.05) to calves from cows GC, CG and C in as much as 4 kg. Paschal et al. (1991) and Olson et al. (1991) have found higher values for this variable in calves from cows Bos indicus x Bos Taurus. The estimated h^m influenced in (P<0.01) BW calves. Calves from G, GC and CG cows showed similiar averages for WW and differents (P<0.05) to calves from C cows, with differences from 34, 37 and 32 kg respectively. The estimated h^m and g^i influenced (P<0.01) on the calve's WW. It was observed that in average the crossbred cows gave birth to calves that weighed 17±4 kg more to the WW than pure cows. Brown et al. (1999) also found that crossbred cows that weaned their calves after 205 days weighed 16.6±3 kg more than calves from pure cows. The estimated WW coefficient of regression in YT indicates that in every 4.88 ± 0.69 kgs more in lactated milk produces a kilogram of weaned calf for cow. That is to say that the one kilogram increment in WW is associated with the 4.88 kg increase in milk consumption. All the estimated correlations between YT and WW were significant (P < 0.05) with 0.44 values (considering cows G, C, GC and CG), 0.38 (considering cows GC and CG), 0.40 (considering G and C), 0.34 (considering cows G), 0.41 (considering cows C), 0.49 (considering cows GC), 0.25 (considering cows CG), similiar to the ones estimated by Mallinckrodt et al. (1993).

Conclusion

The differences in cow's milk production shows the advantage from the Guzerat cattle to the Criollo, and another great advantage from crossbred and pure females. The maternal heterosis influenced the calve's weight favorably when weaned. The previous mentioned shows the higher productivity related between crossbred and pure cows until weaned. This suggests that GC cows could be the ones with higher potential to improve the productivity through weaning in subhumid tropical regions. The differences between the estimated correlations for crossbred cows indicates a higher association (double) between the milk production from GC cows and the weight when their calves are weaned compared to the CG association and their calves. From this, the decision to use Guzerat x Criollo or Criollo x Guzerat cows for calve's production when weaned in Nayarit should include the recommendation of the different strategic management for each of the genotypes.

Table 1: Least squares means and standard errors for lactation trait and calf weight, individual heterosis, maternal heterosis and differences of direct and maternal genetic effects.

	Lactation trait			Calf weight	
	Yield				
	210-d Total, kg	At peak latation, kg	Time of peak lactation, d	Birth, kg	Weaning, kg
G	949 ± 27[a]	6.5 ± 0.1[a]	75 ± 3[a]	32 ± 0.3[a]	179 ± 2[a]
GC	1059 ± 54[b]	7.3 ± 0.3[b]	75 ± 6[a]	28 ± 0.7[b]	182 ± 5[a]
CG	990 ± 42[ab]	6.7 ± 0.3[ab]	78 ± 4[a]	29 ± 0.5[b]	177 ± 4[a]
C	805 ± 34[c]	5.8 ± 0.2[c]	71 ± 4[a]	28 ± 0.4[b]	145 ± 3[b]
h^i	147 ± 44*	3.4 ± 5.0[ns]	0.9 ± 0.3**		
h^m				-1.3 ± 0.5**	17 ± 4**
g^i	212 ± 72*	2.3 ± 8.0[ns]	1.2 ± 0.5*	2.9 ± 1**	40 ± 7**
g^m	-69 ± 58[ns]	2.4 ± 6.0[ns]	-0.5 ± 0.4[ns]	0.6 ± 0.8[ns]	-5 ± 5[ns]

[a,b,c] Different letter superscripts in the same column indicate significant difference ($P<0.05$) for PK, PKYD, BW and WW and ($P\leq0.10$) for YT.
*($P<0.05$), **($P<0.01$), [ns]($P>0.05$)

References

Brown, M.A., Brown, H.A., Jackson, W.G. et al. (1996). *J. Anim. Sci*., 74:2058-2066.
Brown, M.A., Phillips, W.A., Brown, H.A. et al. (1999). *J. Anim. Sci.*, 77:25-31.
Clutter, A.C. and Nielsen, M.K. (1987). *J. Anim. Sci.*, 64:1313-1322.
Jenkins, T.G. and Ferrell, C.L. (1984). *Anim. Prod.*, 39:479-484.
Jenkins, T.G. and Ferrell, C.L. (1992). *J. Anim. Sci.*, 70:1652-1660.
Mallinckrodt, C.H., Bourdon, R.M., Golden, B.L. et al. (1993). *J. Anim. Sci.*, 71:355-362.
Olson, T.A., Euclides, K., Cundiff, L.V. et al. (1991). *J. Anim. Sci.*, 69:104-114.
Paschal, J.C., Sanders, J.O. and Kerr, J.L. (1991). *J. Anim. Sci.*, 69:2395-2402.