Phenotype x herbage allowance interactions in reproduction of first calf heifers grazing semiarid rangeland

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Keywords: herbage allowance, growth curve, milk production, environmental interactions

Introduction Cattle are differentially adapted to nutritional environments. The most sensitive measure of adaptation is reproduction of first-calf heifers. We studied the role of maturation rate and milk production on reproductive performance of first-calf heifers allowed different levels of herbage in semiarid rangeland.

Materials and methods Data was collected over 4 y for 197 primiparous Brahman x Hereford F1 females grazing a semiarid Acacia savannah (Study 1, 29^0 lat. 99^0 52' long. 52 cm rain/y). Females were the residual from 345 heifers allotted at weaning each year to 4 pastures (1,950 to 6,100 ha) with 4 stocking rates (17 to 146 kg body weight [BW]/ha) to give a total of 16 herbage allowances (HA) over the four years (400 to 2,800 kg DM/100 kg BW). Calving (Jan.-Mar) was as 2- and then as 3-y olds. The HA was the mean of about 55 monthly hand clipped and visually estimated $0.5m^2$ quadrats/pasture. Maturation rate (k [-kg/d per d; this is the rate of decline in weight accretion and is negatively correlated with frame size] from $Wt=B+A\ loge^{-kt}$ of Brody, 1945) was computed (Beltran *et al*., 1992). First-lactation milk production (MP) was the mean of three estimates based on weighing calves before and after suckling. Distance traveled/d was estimated in Study 2 for 72 GPS-collared cows varying in frame size and allowed 1,200 ha pastures.

Results Figures 1 and 2 show the probability of a heifer being bred (PB = 1.28 -(log (-30.7149 + 0.0171771*HA + 398.689*k + 0.0143144*MP - 0.005403*HA*MP - 0.237244*HA*k -120.042*MP*k + 0.071795*HA*k*MP)-0.08)) (Chi Squares, P<.05). For the mean MP, earlier maturing females (EMF, k=0.080) had higher PB at low HA. At high HA, the reverse was true. For late maturing females (LMF, k=0.075), HA influenced PB more than for EMF. In Study 2, for frame sizes 4, 5, 6, 7 and 8 the distances traveled were 4,837, 5,255, 5,541, 5,531, and 5,227 m/d respectively, indicating an asymptote at 6. The frame size in Study 1 was

from 2 to 6. The data suggest that in Study 1 the LMF, with higher frame size, would have traveled further in search of feed. At high HA, the search was successful, resulting in increased PB. At low HA, the search was less successful, resulting in lower PB. In Figure 2, at the mean HA, MP influenced PB much more than k.

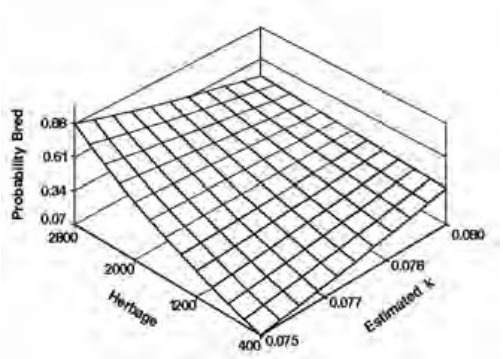

Figure 1 Effect of HA, kg DM/100 kg BW and estimated k, kg/kg/d on probability bred (milk=5 kg/d)

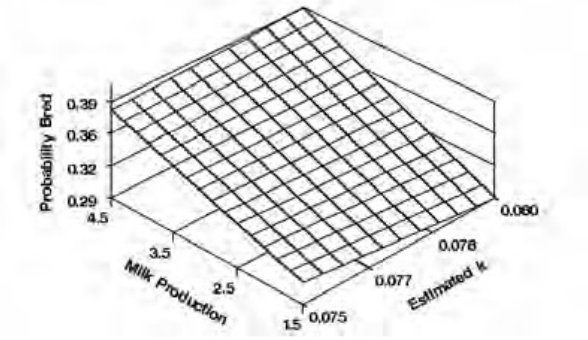

Figure 2 Effect of milk, kg/d and k kg/kg/d on probability bred (HA = 1600 kg DM/100 kg BW)

Conclusions The cow type that gives the best reproductive performance in semiarid rangeland depends on HA. Late maturing cows have ability to travel further from water and thus acquire more pasture at high HA. At limited HA, this is a detriment because LMF have larger working maintenance requirements and derive little extra feed. Adapted females gave more milk and had greater PB than less adapted females.

References

Brody, S. (1945). Bioenergetics and Growth. Reinhold Publishing Corp., New York.

Beltran, J.J.. W.T. Butts, Jr., T.A. Olson & M. Koger (1992) Growth patterns of two lines of Angus cattle selected using predicted growth parameters. *Journal of Animal Science*, 70, 734-741.