GAU Res. J. 1994. 19 (2) : 140-142

Genotype x Environment Interaction in the Performance Traits of Holstein Friesian x Sahiwal Crossbreds*

K. R. Tajane and A. P. Vyas

Livestock Research Station, Gujarat Agricultural University, Navsari 396 450

Scientific information on the existence of genotype x environment (G x E) interaction would be of great importance especially for selecting the crossbreds. The present attempt was, therefore, made to know the relative importance of various G x E interactions in Holstein-Friesian (HF) x Sahiwal crossbreds.

Data on 1711, 1352 and 726 HF x Sahiwal crossbreds of three military dairy farms (Bangalore, Pimpri and Secunderabad), born during 1975 to 1983 pertain to economic traits viz. birth weight (BW), age and body weight at first calving (AFC, BFC), first and second lactation traits viz. length (FLL. SLL), yield (FLY, SLY), peak yield (FLPY, SLPY), dry period (FDP, SDP) and calving interval (FCI, SCI), respectively. Assuming multifactor linear model, analysis of variance was done to detect the significance of G x E interactions. The relative contribution of each interaction was to the total variation in the performance traits was calculated as R^2 per cent (Table 1). The genetic variant was breed of sire (B), while environmental variants were farm, period, season, age and body weight at calving.

Perusal of the contributions of various nongenetic effects to the total variation in all performance traints revealed the farm as major effect (R^2% =0.02 to 19.83), followed by body weight (R^2% = 0.02 to 19.83), calving (R^2% = 0.15 to 3.47) and season (R^2% = 0.01) to with period (R^2% = 0.15 to 3.47) and season (R^2% = 0.01 to 5.59) were comparatively less important, in most of the traits. Similar results were obtained for same traits of these crossbreds even when some more data were added to the present and analysed separately for each breed of sire (Tajane *et al.*, 1988, Tajane and Rai, 1989a and 1989b).

Among the various G x E interactions, B x F was found to be the most important contributing around 1.80 to 6.10 per cent ($P < 0.01$) to the total variability in lactation yields (FLY, FLPY, SLY and SLPY). It also significantly influenced the variability in AFC, SIL and SDP (Table 1), while it was almost absent in remaining traits. Ganpule *et al.* (1984) also reported significant sire x location interaction for AFC, ELY and body weights at different ages. However, the contribution of this interaction reported by them (0.00 to 3.00%) was comparatively less.

* Based on the data from Ph. D. thesis of the author.

TABLE 1

Relative contributions (R^2) of various nongenetic effects and their interactions with breed of sire (B) to the total variation in performance traits of HF x Sahiwal crossbreds.

Sources	d.f	BW	AFC	BFC	FLL	FLY	FLPY	FDP	FCI	SLL	SLY	SLPY	SDP	SCI
B	1	0.01	0.32**	0.07	6.49**	3.11**	6.22**	1.56**	1.09**	0.01	1.00**	0.03	1.06**	0.33*
Farm F	2	0.02	3.29**	0.37**	1.35**	15.76**	9.08**	19.83**	0.69**	0.21	13.47**	8.99**	1.65**	1.81**
Period P	1	0.15	3.47**	0.59**	0.42**	0.86**	1.14**	0.06	1.77**	1.04**	0.56**	0.15	0.30	0.82*
Season S	2	0.02	1.31**	0.01	0.74**	0.20**	0.16	0.87**	0.80**	0.20	5.59**	0.48**	0.71	0.82*
Age A	5	—	—	—	0.52**	0.19	0.48*	0.47	0.46	1.36**	1.97**	1.08**	0.59	0.24**
Body wt. Bw	4	—	—	—	0.43*	7.39**	11.50**	1.37	1.54**	0.25	4.99**	8.34**	0.34	0.22
B x F	2	0.05	1.05**	0.23	0.00	1.80**	3.63**	0.00	0.20	0.48**	2.75**	6.10**	1.15**	0.47
B x P	1	0.13	0.00	0.40	0.23	2.24**	2.93**	1.82**	1.20**	0.03	3.69**	6.14**	1.00**	0.62*
B x S	2	0.02	0.00	0.00	0.00	0.00	0.20*	0.12	0.33	0.00	0.00	1.16**	0.00	0.00
B x A	5	—	—	—	0.00	0.31	0.00	0.16	0.24	0.00	0.00	0.00	1.23**	0.00
B x Bw	4	—	—	—	0.07	6.41**	4.08**	0.00	0.00	0.38	4.85**	6.71**	0.29	0.19
Error	—	99.60	90.56	98.33	89.75	61.73	60.58	73.74	91.68	96.04	61.13	60.82	91.68	93.48
Error d.f		1757	1757	1757	1320	1320	1320	913	913	695	695	695	566	566

* ($P < 0.05$), ** ($P < 0.01$). Negative contributions were assumed zero.

The another important interaction was found to be B x BW (R^2% = 4.08 to 6.71) for lactation yields (FLY, FLPY, SLY and SLPY). Contrarily it was (R^2% = 0.00 to 0.38) for negligible for lactation length (FLL, SLL) and reproduction traits. The interaction between B x A (R^2% = 0.00 to 0.31) was also for little importance for almost all traits except for SDP (R^2% = 1.23).

Similarly, B x S interaction was also non significant for most of the traits (R^2% = 0.00 to 0.33) except for FLPY and SLPY (R^2% = 0.20 and 1.16, respectively). Thus, these findings were in close accordance with those reported by Mao and Burnside 1969) for FLY. In contrast to their findings of nonsignificant sire x Y-S interaction, the present study revealed a significant B x P interaction for yield and reproduction traits during first and second lactations (Table 1). Around 0.62 to 6.14 per cent variation in these traits was attributable to B x P interaction. However, it was nonsignificant for BW, AFC, BFC, FLL and SLL (R^2% = 0.00 to 0.40).

In general, B x F, B x Bw and B x P interactions appeared to be of more importance for affecting significantly the variation in yield and reproduction traits of first and second lactation traits. Hence, the selection programme in crossbred population must consider the existence of interactions. The other interactions (B x S and B x A) could be ignored for dairy traits in HF x Sahiwal crossbreds.

(Received on 29th Oct., 1993)

REFERENCES

Ganpule, S. P., Chaudhary R. P.and Tomar, S. P. S. 1984. Sire x location interaction in Friesian x Sahiwal crossbreds under Indian tropical conditions. *Indian Journal of Dairy Science*, **37** : 1-4.

Mao, I. L. and Burnside, E. B. 1969. Sire by herd environment interaction for milk production. *Journal of Dairy Science*, **52** : 1055-1062.

Tajane, K. R., Rai A. V. and Nagaraja, C. S. 1988. Relative contribution of various factors affecting second lactation traits in Holstein-Friesian x Sahiwal crossbreds. *Indian Journal of Animal Sciences* : : 1221-1222.

Tajane, K. R. and Rai, A. V. 1989a. Relative importance of various factors affecting milk production traits in Holstein-Friesian x Sahiwal crossbreds. *Indian Journal of Dairy Science*, **42** : 87-89.

Tajane, K. R. and Rai, A. V. 1989b. Relative importance of various factors affecting body weights in Holstein-Friesian x Sahiwal crosses. *Indian Veterinary Journal*. **66** : 614-617.