FACTORS AFFECTING VARIOUS MILK PRODUCTION TRAITS IN H.FRIESIAN CROSSBRED COWS

Muhammad Shafiq, M.Z. Chaudhry, Muhammad Rafiq & M.E. Babar
Livestock Production Research Institute, Bahadurnagar, Okara & University of Agriculture, Faisalabad

Over a 10 years period, data were collected on 374 H.Friesian x Sahiwal/Cholistani crossbred cows maintained at the Livestock Production Research Institute, Bahadurnagar (Okara). Overall first lactation milk yield, total and average milk yield for first three lactations and milk yield day^{-1} of age at second and fourth calvings averaged 2384.62 ± 46.16, 7044.33 ± 163.59, 2348.11 ± 54.53, 1.67 ± 0.03 and 3.19 ± 0.07 litres, respectively. The genetic group had a significant ($P<0.01$) effect on all these traits except milk yield day^{-1} of age at 4th calving. The effect of year and season of calving was non-significant for all traits. The correlation for first lactation milk yield with average milk yield for first three lactations, milk yield day^{-1} of age at 2nd and 4th calvings was 0.474, 0.888 and 0.510, respectively. The correlation for average milk yield day^{-1} of age at 4th calving and milk yield day^{-1} of age at 2nd calving with milk yield day^{-1} of age at 4th calving was 0.857 and 0.544, respectively. All correlation and regression coefficients of these traits were significant ($P<0.01$).

INTRODUCTION

Crossbreeding has been adopted for the last few decades in Pakistan to increase the milk production of non-descript indigenous cattle. The H.Friesian is a renowned dairy cattle breed of the world. The crossbreeding of local breeds with imported semen of H.Friesian is going on at the government farms as well as in the private sector. A research project at the Livestock Production Research Institute, Bahadurnagar (Okara) was initiated in 1974 to study the production and adaptability of H.Friesian crossbred cattle under the subtropical environmental conditions of Punjab.

In the past, dairy animals have been mainly selected on the basis of their milk yield without giving due attention to other traits. The estimate of total and average milk yield for first three lactations and milk yield day^{-1} of age at 2nd and 4th calvings would take into account various important economic traits related to the efficiency of milk production like age at first and third calvings and calving interval.

The data on 374 H.Friesian x Sahiwal/Cholistani crossbred cows for various milk production traits maintained during 1982-1991 at the Livestock Production Research Institute, Bahadurnagar (Okara), were used in the present study. The effect of some factors viz. year and season of calving and genetic group on various milk production traits was studied. The correlation and regression coefficients between some of these traits were also computed.

MATERIALS AND METHODS

Data on 300 H.Friesian x Sahiwal (HS) and 74 H.Friesian x Cholistani (HC) crossbred cows maintained at the Livestock Production Research Institute, Bahadurnagar

(Okara) from 1982 to 1991 were used in this study. All the crossbred cows were kept in loose housing system with adequate supply of green fodder and drinking water under the same managemental and environmental conditions. During the summer season, the animals were provided daily bath by sprinkling of water. The crossbred cows having less than 800 litres of milk lactation^{-1} were excluded from the study.

The data on first lactation milk yield, total and average milk yield for first three lactations and milk yield day^{-1} of age at 2nd and 4th calvings were analysed to estimate the effect of year and season of calving and genetic group of these traits. The data were analysed using the method of weighted square of mean (Bancroft, 1968). Significant differences between means were tested by Duncan's Multiple Range (DMR) test. For all analyses, SPSS PC+ computer software package version 3.0 was used. Each year was divided into three seasons (Butte and Deshpande, 1987) viz. summer (March to June), rainy season (July to October) and winter (November to February). The cows were divided into eight genetic groups as follows: 1 = F_1 HS, 2 = F_2 HS, 3 = F_3 HS, 4 = F_4 HS, 5 = F_1 HC, 6 1/2 (HS x HC), 7 = 3/4, 3/8, 5/8, 5/16 crossbred of HS/HC (pooled), and 8 = Miscellaneous crossbreds (all genetic groups were halfbred except 7th and 8th groups).

The correlation and regression coefficients of first lactation milk yield with average milk yield for first three lactations, milk yield day^{-1} of age at 2nd and 4th calvings, average milk yield for first three lactations with milk yield day^{-1} of age at 4th calving, and milk yield day^{-1} of age at 2nd calving with milk yield day^{-1} of age at 4th calving were also estimated.

RESULTS AND DISCUSSION

From 374 crossbred cows (H.Friesian x Sahiwal/Cholistani), overall first lactation milk yield, total and average yield for first three lactations, milk yield day^{-1} of age at 2nd and 4th calvings averaged 2384.70 ± 46.16, 7044.33 ± 163.59, 2348.11 ± 54.53, 1.67 ± 0.03 and 3.19 ± 0.07 litres, respectively (Table 1).

Effect of year and season of calving: The effect of year and season of calving for all the traits studied was non-significant (Table 2). However, the winter calvers produced more milk than cows calving in other seasons. The milk yield for first lactation was the best for cows calving in 1990, whereas total and average milk yield for first three lactations was the best in the cows calving in 1984. The milk yield day^{-1} of age at 2nd and 4th calvings was the highest in the cows calving during 1990 and 1987, respectively (Table 1).

The results of the present study are in line with the findings of Capriles *et al.* (1982), Perez-Beato and Granado (1982), Prasad and Pereir (1985) who reported that year and season of calving had non-significant effect on first lactation milk yield in crossbred cows. However, Al-Rawi and Said (1980) and Deshpande and Bonde (1982) reported significant effect of year and season on first lactation milk yield which were not in agreement with the results obtained in the present investigation.

The findings of the present study were in line with Shafiq (1987) who reported that effect of year and season of calving on milk yield day^{-1} of age at 2nd calving was non-significant. These findings were partially in agreement with those of Dhillon and Jain (1977), who stated that the month of calving had non- significant effect on milk yield day^{-1} of age at 2nd calving. Deshpande and Bonde (1983) reported that the milk yield

Table 1. Mean and standard error of different milk production traits in H.Friesian cows

Particulars	1st lactation milk yield		Total MY for 1st three lactations		Average MY for 1st three lactations		MY/day of age at 2nd calving		MY/day of age at 4th calving	
	No.	Mean ± SE	No.	Mean ± SE	No.	Mean ± SE	No.	Mean ± SE	No.	Mean ± SE
Overall	374	2384.70 ± 46.16	142	7044.33 ± 163.59	142	2348.11 ± 54.53	374	1.67 ± 0.03	116	3.19 ± 0.07
Year										
1982	12	2286.75 ± 182.52	7	6654.71 ±293.28	7	2218.29 ± 97.26	12	1.65 ± 0.14	6	3.17 ± 0.04
1983	33	2244.30 ± 105.92	25	7440.40 ± 341.41	25	2480.13 ± 104.80	33	1.50 ± 0.08	22	3.25 ± 0.15
1984	46	2144.22 ± 108.89	32	7466.22 ± 325.37	32	2488.78 ± 108.46	46	1.45 ± 0.09	28	3.21 ± 0.13
1985	29	2375.17 ± 196.25	14	6795.21 ± 682.26	14	2265.07 ± 227.42	29	1.64 ± 0.13	12	3.16 ± 0.25
1986	68	2184.50 ± 108.36	38	6625.89 ± 386.55	38	2208.96 ± 128.85	68	1.52 ± 0.09	29	3.04 ± 0.17
1987	28	2456.50 ± 183.93	10	7302.60 ± 633.46	10	2434.20 ± 211.15	28	1.84 ± 0.16	9	3.52 ± 0.30
1988	49	2532.92 ± 128.18	10	7160.00 ± 307.81	10	2386.67 ± 102.60	49	1.71 ± 0.09	6	3.10 ± 0.23
1989	33	2676.42 ± 150.04	6	6200.33 ± 416.46	6	2066.78 ± 138.82	33	1.88 ± 0.10	4	3.17 ± 0.18
1990	57	2680.12 ± 129.18	-	-	-	-	57	1.89 ± 0.09	-	-
1991	19	2120.95 ± 201.98	-	-	-	-	19	1.64 ± 0.18	-	-
Season										
Summer	127	2288.80 ± 76.57	45	6832.36 ± 281.10	45	2277.45 ± 93.70	127	1.57 ± 0.06	34	3.12 ± 0.11
Rainy	88	2371.70 ± 96.93	34	6886.03 ± 216.58	34	2295.34 ± 72.19	88	1.64 ± 0.07	30	3.04 ± 0.09
Winter	159	2468.45 ± 72.15	63	7281.17 ± 286.38	63	2427.06 ± 95.46	159	1.76 ± 0.05	52	3.32 ± 0.13
Genetic groups										
1	52	2121.12 a ± 86.39	42	7909.60 b ± 286.32	42	2636.53 b ± 95.41	52	1.38 a ± 0.06	40	3.33 ± 0.11
2	116	2144.77 a ± 72.82	57	6467.81 a ± 221.43	57	2155.94 a ± 73.81	116	1.47 a ± 0.05	45	2.95 ± 0.10
3	82	2885.04 c ± 103.03	14	7272.50 ab ± 522.83	14	2424.17 ab ± 174.28	82	1.98 bc ± 0.06	6	3.51 ± 0.26
4	16	3052.00 c ± 155.79	-	-	-	-	16	2.17 c ± 0.09	-	-
5	33	2677.00 bc ± 178.15	17	6945.12 ab ± 651.93	17	2315.04 ab ± 217.31	33	2.14 bc ± 0.15	16	3.34 ± 0.28
6	15	2781.27 bc ± 222.50	-	-	-	-	15	1.99 bc ± 0.16	-	-
7	10	2187.40 ab ± 264.61	-	-	-	-	10	1.54 ab ± 0.21	-	-
8	50	1908.30 a ± 101.51	12	6628.75 ab ± 383.91	12	2209.58 a ± 127.97	50	1.35 a ± 0.09	9	3.20 ± 0.16

Note: 1. M Y = Milk yield in litres.
2. The means shared by the same letters in the same column are statistically non-significant.

day^{-1} of age at 2nd calving was significantly affected by year and season of calving which was not in line with the present findings.

Effect of genetic group: The effect of genetic group was significant ($P<0.01$) for all traits except milk yield day^{-1} of age at 4th calving.

Table 2. Analysis of variance of different milk production traits in H.Friesian crossbred cows

Traits	Source of variation	df	Mean squares	F-ratio	Probability
First lactation milk yield					
	Year	7	492326.029	1.030	0.415
	Season	2	113684.889	0.238	0.789
	Genetic group	4	2144648.524	4.485	0.002
	Residual	101	478147.369	-	-
Total milk yield for first 3 lactations					
	Year	7	1970731.421	0.560	0.786
	Season	2	2513774.909	0.715	0.492
	Genetic group	4	11880627.254	3.378	0.012
	Residual	101	3516786.391	-	-
Average milk yield for first 3 lactations					
	Year	7	213889.26	0.559	0.788
	Season	2	266037.76	0.095	0.501
	Genetic group	4	1252521.81	3.272	0.014
	Residual	101	382772.94	-	-
Milk yield per day of age at 2nd calving					
	Year	7	0.270	0.935	0.400
	Season	2	0.292	1.011	0.367
	Genetic group	4	1.786	6.186	0.000
	Residual	101	0.289	-	-
Milk yield per day of age at 4th calving					
	Year	7	0.337	0.575	0.775
	Season	2	0.797	1.362	0.261
	Genetic group	4	1.056	1.804	0.134
	Residual	101	0.585	-	-

The F_4 HS halfbred were the best milk producers (3052.00 ± 155.79 litres) for first lactation milk yield, while the F_1 HS were the top milk producers for total and average milk yield for first three lactations (Table 1). The present findings are in agreement with the studies of Jadhav *et al.* (1991) who found that genetic groups influenced first lactation milk yield and the halfbred performed better than all other grades.

halfbreds, respectively (Table 1). The results of the present study are in line with Deshpande and Bonde (1983) who found significant effect of genetic groups on milk yield day^{-1} of age at 2nd calving; they also reported highest milk yield day^{-1} of age at 2nd calving in halfbreds.

Correlation and regression coefficients: The correlation and prediction equations of regression for various milk production traits in

Table 3. Correlation and regression among various milk production traits in H.Friesian crossbred cows

Traits	Number	Correlation	Prediction equation $Y = \alpha + \beta X$	
First lactation milk yield with average milk yield for first three lactations	114	0.474**	1277.661	0.44413**
First lactation milk yield with milk yield per day of age at 2nd calving	374	0.888**	0.106	0.00065**
First lactation milk yield with milk yield per day of age at 4th calving	116	0.510**	1.946	0.00052**
Average milk yield for first three lactations with milk yield per day of age at 4th calving	118	0.857**	0.694	0.00103**
Milk yield per day of age at 2nd calving with milk yield per day of age at 4th calving	118	0.544**	2.051	0.67498**

** = Significant ($P<0.01$); Y = Estimated value of affected trait; X = Given value of affected trait.

The milk yield day^{-1} of age at 2nd and 4th calvings was maximum in F_4 HS

crossbred cows were developed (Table 3). All the correlation and regression coeffi-

cients were significant ($P<0.01$). The maximum correlation (0.474) was found between first lactation milk yield and average milk yield for first three lactations. The highest magnitude of correlation value was 0.888 for first lactation milk yield with milk yield day^{-1} of age at 2nd calving. It indicates that the efficiency of prediction will be maximum if it is based on these traits of milk production.

The prediction equations in Table 3 show that 0.444, 0.00065 and 0.00052 litre increase in average milk yield for first three lactations, milk yield day^{-1} of age at 2nd and 4th calvings is expected due to litre^{-1} increase in first lactation milk yield. With each litre increase of average milk yield for first three lactations and milk yield day^{-1} of age at 2nd calving, the milk yield day^{-1} of age at 4th calving is expected to increase by 0.00103 and 0.675 litre, respectively.

REFERENCES

Al-Rawi, A.A. and S.I. Said. 1980. Some genetic and non-genetic factors associated with milk yield of Friesian, indigenous and their crosses in Iraq, Mesopotemia. J. Agri. 5: 21-31. (Anim. Breed. Abstr. 50: 6016; 1982).

Bancroft, T.A. 1968. Topics in Intermediate Statistical Methods. Vol. 1. The Iowa State Univ. Press, Ames, Iowa, USA.

Butte, S.V. and K.S. Deshpande. 1987. A note on production efficiency traits in Friesian x Sahiwal crossbreds. Indian J. Dairy Sci. 40 (1): 144-146.

Capriles, M., L. De Vaccaro, L. Paredes, M. Paz, N. Blanco and M. Munoz. 1982. Productivity of crossbred dairy cows at the San Nicolas station taking year and season into account. Anim. Breed. Abstr. 52: 2364; 1984.

Deshpande, K.S. and H.S. Bonde. 1982. Note on first lactation milk yield in Friesian x Sahiwal crossbreds. Indian J. Anim. Sci. 52: 1082-1084.

Deshpande, K.S. and H.S. Bonde. 1983. Genetic aspect of milk yield per day of age at 2nd calving in Friesian x Sahiwal crossbreds. Indian J. Anim. Sci. 53: 189-191.

Dhillon, J.S. and A.K. Jain. 1977. Comparison of Sahiwal and different grades of Holstein-Friesian x Sahiwal crossbreds for efficiency of milk production. Indian J. Dairy Sci. 30: 214-217.

Jadhav, K.L., V.N. Tripathi, V.K. Taneja and M.M. Kale. 1991. Performance of various Holstein x Sahiwal grades for first lactation reproduction and production traits. Indian J. Dairy Sci. 14: 209-219.

Perez-Beato, O. and A. Granado. 1982. Some factors affecting the phenotypic variation in milk yield in crossbred Holstein-Friesian x Cuban Zebu cows. Revista de Salud Anim. 4: 151-157 (Anim. Breed. Abstr. 51: 1445; 1983).

Prasad, J. and M.B. Pereir. 1985. Effect of month of calving on the subsequent lactation milk yield and length in Jersindh cows. Livestock Advisor, 10: 15-17. (Anim. Breed. Abstr. 54: 5051; 1986).

Shafiq, M. 1987. Genetic and non-genetic factors affecting first lactation milk yield and reproductive efficiency in Friesian-Sahiwal halfbreds. M.Sc. Thesis, Univ. of Agri., Faisalabad.