STUDIES ON MILK PRODUCTION PROFILE ATTRIBUTES AFFECTED BY ENVIRONMENT AND HEREDITY IN (ZEBU X EUROPEAN) CROSSBRED CATTLE

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INTRODUCTION

In recent past the main thrust in developing countries has been on crossbreeding of Zebu cattle with temperate breeds such as Holstein Friesian, Brown- Swiss, Jersey and Red Dane to improve genetic potentiality for milk production by introducing exotic inheritance on a large scale. Environmental factors play a crucial role to affect the production level of these crossbred animals in addition to the genetic make up. Thus, present study was undertaken to determine the effect of genetic and non-genetic factors affecting the milk production performance profiles in these crossbred animals.

MATERIAL AND METHODS

The data utilized for this study pertained to 335 records spreading over a period of 21 years (1970-1990) maintained at Animal Farm of CCSHAU, Hisar. Total duration of 21 years was divided into four periods i.e. P_1 (1970-76), P_2 (1977-81), P_3 (1982-86) and P_4 (1987-90). Based on climatic conditions, each year was further sub- divided into four seasons viz. S_1 (Winter), S_2 (Summer), S_3 (Rainy) and S_4 (Autumn). The animals were identified on the basis of genetic group of their parents i.e. sire group (Half Friesian and Full Friesian) and dam group viz., DG1 (FH); FH (1) DG2 (FJH), DG3 (FBH) and DG4 (FRH); FRH (1). The method of least- squares analysis of Harvey (1987), was used to study the effect of genetic and non- genetic factors on first lactation milk yield (FLMY), lifetime milk production (LTMP) and peak milk yield of the first three lactations.

RESULTS AND DISCUSSION

Sire group. Perusal of the Table 1 revealed that the effect of the sire group was found non – significant (P<0.05) except PMY3 on FLMY, LTMP, PMY1, PMY2. The non- significant effect of sire groups suggested that different sire groups used over the periods in this herd were of practically the same genetic worth. However, higher peak milk yield (17.19± 1.30) in the third lactation produced by using SG2 as compared to SG1 (14.49±0.90) confirmed the findings of Singh (1981) that Friesian sires pass genes for higher milk production level. Friesian sires should be used more extensively in the cross breeding programme to improve the local breeds of cattle for higher milk production.

Dam Group. The effect of dam group was found statistically significant (P<0.05) for LTMP and PMY2. Significant superiority of FH group over other genetic groups was also reported by (Yadav et. al., 1989; Godara et al., 1990 and Singh et al., 1995). Significant effect of dam group on LTMP and PMY2 indicated that as the age of the cow advances in different dam groups their performance level differ due to the difference in the degree of expressibility of genes controlling physiogical functions and other unknown responses.

Table 1 Least squares means and analysis of variance for first lactation milk yield, lifetime production and peak yield of first three lactations

Analysis of Variance	FLMY (Kg)	LTMP (Kg)	PMY1 (Kg)	PMY2 (Kg)	PMY3 (Kg)
µ	2475.86±67.91	11255.08±902.58	11.01±0.55	14.03±0.49	15.84±0.48
Sire MS	227018	33760693	12.51	10.82	10.69
Sire group MS	48084	5950943	0.55	10.83	15.38*
Dam group MS	2859.52	170392697*	1.22	42.39*	78.01
Period MS	602345*	82928687*	34.21*	29.85*	16.20
Season MS	3854.55	8255441	13.10	6.18	14.03
AFC Linear MS	2054138*	3904643	1.98	5.20	6.35
AFC Quad. MS	158110	11728295	11.02	2.38	49.02*
Error MS	215311	20131544	6.40	8.21	8.62
Mean across periods					
1970-76	2689.73^{A}±184.14	8586.04^{B}±1885.19	8.37^{B}±1.08	16.77^{A} ±1.16	17.77±1.18
1977-81	2362.97^{B}±141.42	12566.96^{A}±1501.15	10.39^{AB}±0.87	13.82^{B}±0.91	16.24±0.92
1982-86	2618.93^{A}±125.10	14329.45^{A} ±1358.99	12.24^{A}±10.80	12.76^{A}±0.81	15.06±0.82
1987-90	2231.81^{B}±188.22	9267.86^{B}±1922.49	13.02^{A}±1.10	12.76^{A}±0.19	14.30±1.21
Mean across season					
Winter	2511.40±91.90	11662.18±83.15	11.14±0.65	14.60±0.62	16.11±0.62
Summer	2419.74±91.08	11393.11±1076.63	10.70±0.65	13.84±0.61	15.13±0.61
Rainy	2368.94±96.80	10571.60±1122.32	10.38±0.67	13.79±0.65	15.63±0.65
Autumn	2603.36±102.86	11393.42±1171.68	11.80±0.70	13.89±0.68	16.48±0.68
Mean across season group					
SG I	2400.20±138.73	12096.75±1477.55	11.26±0.86	12.89±0.89	14.49^{B}±0.90
SG 2	2551.52±203.07	10413.40±2058.92	10.75±0.18	15.16±1.28	17.19^{A}±1.30
Mean across dam group					
DG 1	2478.47±83.41	14282.52±1016.88	11.23±0.51	12.91±0.57	14.39±0.57
DG 2	2386.01±109.26	11269.94±1224.50	11.06±0.72	13.83±0.72	16.17±0.72
DG 3	2377.24±109.99	10524.01±1233.76	10.37±0.73	15.21±0.72	17.47±0.73
DG 4	2661.72±120.80	8943.84±1339.13	10.76±0.79	14.16±0.80	15.33±0.80
Reg. Linear	0.628 ±0.203	-0.865 ±1.96	0.0006 ±0.001	0.0009 ±0.001	0.0005 ±0.001
Reg. Quadratic	-0.003	-0.000	-0.000	-0.000	-0.0009

The values superscripted by different letters differ significantly among themselves. * P<0.05

Period of calving. The effect of period of calving was observed significant ($P<0.05$) for FLMY, LTMP, PMY1 and PMY2. Significant effects of period of calving on various milk production traits were reported by (Mejia et. al., 1983; Godara, et. al., 1990 and Dalal, et. al., 1993) in different crossbred cattle. The perusal of results in Table 1 revealed that the maximum milk yield was obtained in P_1 (2289.73±184.14) and minimum was in P_4 (2231.73±188.22), whereas the difference among milk yield of P_1 and P_3 was non- significant. Similar results were obtained for first lactation milk yield of P2 and P4. The highest PMY1 (13.02±1.10) was obtained in P4 calvers, whereas PMY2 was the maximum (16.77±1.16) in P1 calvers. Significant differences in peak yield of first three lactations over different periods were also reported by (Singh, 1981; Yadav, et. al., 1989 and Singh, et. al., 1995) in different breeds of cattle. The maximum value of LTMP (14329.45±1358.99) was observed in P3 and the minimum (8586.04±1885.19) in P1 calvers. The LTMP for the animals calved during P1 and P4 were not statistically different from each other. The highest LTMP in P3 calvers could be due to more number of lactations covered by animals during this period. The significant effect of period of calving in FLMY, LTMP, PMY1 and PMY2 revealed the varying managemental practices, feeding regimes and set of sire used over different periods.

Season of calving. Perusal of Table 1 indicated that the effect of season of calving was found statistically non- significant on FLMY, LTMP, PMY1, PMY2 and PMY3 suggesting that uniform management practices were maintained throughout the year. Similar results were also reported by Godara et al. (1990); Dalal et al. (1993) and Singh et al. (1995) for different milk and fat production traits. On the contrary, Yadav, et al. (1989) observed significant effect of seasons of calving on first lactation milk yield of different breeds of cattle.

The non-significant effect of season of calving on all milk production traits revealed that fluctuations in climatic conditions, managemental practices and feeding regimes were of little consequence to effect milk production potential of animals calved during different season and further indicated that these genotypes are well adopted to environmental conditions prevailing in the region.

Age at first calving. Significant effect of AFC was found for FLMY. But the magnitude of regression (linear) coefficients was very small (0.628) suggesting that with one-day increase in AFC the yield of first lactation will increase by 628 gms. The effect of AFC (linear) was observed non- significant for LTMP, PMY1, PMY2 and PMY3, whereas it was significant (quadratic) for PMY3. The results further showed the decrease of 9 gms. With increase in one day of AFC in third lactation peak yield. Significant effects of AFC on milk and fat yield were also reported by Singh et al. (1995) in different breeds of crossbred cattle.

CONCLUSION

The overall picture of the results of this investigation leads to the conclusions that milk production efficiency of these genotypes are not much affected by heredity and environmental factors and are well adapted in the region.

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