

FACTORS AFFECTING TOTAL MILK YIELD, YIELD UP TO PEAK AND PERSISTENCY OF FIRST LACTATION IN SAHIWAL COWS

Muhammad Shafiq, M.E. Babar", Abdul Rehman & Gulraiz Ahmad*
Livestock Production Research Institute, Bahadurnagar (Okara)
**University of Agriculture, Faisalabad*

Overall, least square means for total milk yield, yield up to peak and persistency of first lactation from 257 Sahiwal cows were 1478.93 \pm 30.62 litres, 572.65 \pm 12.40 litres and 1.61 \pm 0.04, respectively for progeny of 15 sires and calved during 1980 to 1989 at Livestock Production Research Institute, Bahadurnagar (Okara). The effect of sire, sire group and year of calving was non-significant while season of calving had significant effect on these traits. The genetic, phenotypic and environmental correlation coefficients between total milk yield and yield up to peak were 0.287, 0.734 and 0.661 while the heritability values of these two traits were 0.123 \pm 0.132 and 0.109 \pm 0.127, respectively. The phenotypic correlation between total milk yield and persistency was 0.305.

INTRODUCTION

High peak milk yield and highest degree of persistency for first lactation are desirable economic traits for early selection and can also be used as a measure of milk production potential of dairy animals. These traits are fairly affected by the genetic and non-genetic factors. Productivity of dairy animals can be improved in its early stage of life by knowing the factors affecting these traits. The present study was, therefore, undertaken to determine the effect of sire, sire group and year and season of calving on total milk yield, yield up to peak and persistency of first lactation in Sahiwal cows.

MATERIALS AND METHODS

The data on 257 first lactation records of Sahiwal cows progeny of 15 sires and calved during 1980 to 1989 was utilized in the present study. These cows were maintained under standard feeding and management practices at Livestock Production Research Institute, Bahadurnagar (Okara).

The first lactation milk yield of individual cow was recorded twice daily throughout the lactation period. Milk yield for 300 days or less was taken as the total lactation milk yield. Lactation records for less than 180 days lactation period were deleted from the data due to short lactation. The bulls with less than 6 daughters were not considered for this study. The cows were hand milked. The initial yield up to first 90 days of lactation was considered as yield up to peak.

The persistency value for each cow was calculated by the method of Mahadcvan (1951) according to which persistency is equal to $(a-b)/b$, where 'a' is the total milk yield in the lactation and 'b' is the total initial milk yield up to attainment of the maximum yield i.e. yield up to first 90 days.

The data was analyzed for heritability, genetic, phenotypic and environmental correlation coefficients by the method of paternal half-sib correlation using Mixed Model Least-squares and Maximum Likelihood (LSMLMW) Computer Programme Version PC-1 developed by Harvey (1988). The effect of sire, sire group, year and season of

calving on all traits was also determined by the method of filling constant using same computer programme. Each year was divided into summer (April to September) and winter (October to March) season. To find out the effect of sire group, all sires were divided into following three groups according to their place of birth: First Bahadurnagar (B), second Allah Dad (A) and third Jahangirabad (~).

RESULTS AND DISCUSSION

Table 1 revealed that the average total milk yield, yield up to peak and persistency was 1478.93 ± 30.62 litres, 572.65 ± 12.40 litres and 1.61 ± 0.04 litres.

Effect of sire: The highest total milk yield up to peak was obtained from the sire B-61/1.4, whereas, the lowest values for these traits were obtained from the sires .1-44/2.4 and B-140/2.7, respectively. The minimum (1.46 ± 0.11) and maximum (1.82 ± 0.19) persistency was found in the cows sired by .1-14/1.9 and A-19/1.9, respectively (Table 1). The effect of sire on all these traits was non-significant (Table 2).

The findings of the present study are in agreement with many earlier workers (Alrawi and Alani, 1981; Maarof and Tahir, 1988; Subrt *et al.*, 1989). Alrawi and Alani (1981) reported that origin of bulls (imported vs native) had no significant effect on total milk yield and persistency in Friesian cows. Maarof and Tahir (1988) stated that persistency was not affected by sire in Friesian cows. Subrt *et al.* (1989) reported that the effect of sire was non-significant on persistency index in 2132 Czech Pied cows. However, the results of the present study are not in agreement with Pathak *et al.* (1980) and Ibeawuchi (1988) who reported significant effect of sire on persistency.

Effect of sire group: The highest total milk yield and yield up to peak was obtained from

the progeny of Jahangirabad group of sire whereas the highest persistency was obtained from Bahadurnagar group. The lowest values for total milk yield (1527.56 ± 67.42 litres), yield up to peak (598.85 ± 10.56 litres) and persistency (1.48 ± 0.07) was observed from the progeny of Allah Dad, Bahadurnagar and Jahangirabad group of sire, respectively (Table 1). The non-significant effect of sire group on all traits revealed that the progeny of three groups of Sahiwal bulls is the same in production performance (Table 2).

Effect of calving year: The total milk yield (litres), yield up to peak (litres) and persistency in Sahiwal cows calved during different years varied from 1161.64 ± 161.08 to 1581.00 ± 123.40 , 443.97 ± 65.23 to 664.67 ± 59.33 and 1.33 ± 0.19 to 2.00 ± 0.13 , respectively (Table 1). All these traits were not affected by year of calving (Table 2).

The results of the present study are in line with Koley *et al.* (1980) and Roy and Katpatal (1987). They observed that there were non-significant differences in lactation persistency associated with year of calving. The results of the present study are not in line with Maarof and Tahir (1988) who reported significant ($P < 0.01$) effect of year of calving on persistency and peak yield.

Effect of calving season: Table 1 revealed that higher total milk yield and yield up to peak for first lactation was observed in the winter calvers as compared to summer calvers but persistency of first lactation was higher (1.68 ± 0.05) in summer as compared to winter calvers (1.54 ± 0.04). All these traits were significantly affected by season of calving.

The results of the present study are in line with Pathak *et al.* (1980) who reported that the persistency was significantly affected by season of calving. The findings of the present investigation are also in agreement with Maarof and Tahir (1988) who obtained

Table 1. Least square means and standard error of total milk yield, yield up to peak and persistency of first lactation

Effects	Number	Total yield			Yield up to peak			Persistency		
		Mean	±	SE	Mean	±	SE	Mean	±	SE
MU	257	1478.93	±	30.62	572.65	±	12.40	1.61	±	0.04
Sire										
B-34/1.8	39	1471.21	±	81.02	592.38	±	32.81	1.55	±	0.10
A-23/1.2	12	1484.63	±	119.40	611.90	±	48.35	1.49	±	0.15
B-54/2.5	18	1698.24	±	105.15	649.91	±	42.58	1.68	±	0.14
B-172/2.2	28	1401.44	±	74.81	570.26	±	30.29	1.54	±	0.10
B-90/1.4	8	1456.53	±	133.36	584.17	±	54.00	1.57	±	0.17
J-14/1.9	28	1561.74	±	88.80	651.15	±	35.96	1.46	±	0.11
B-88/3.9	31	1540.59	±	85.26	572.38	±	34.53	1.68	±	(UI
B-I40/2.7	8	1292.22	±	129.55	442.36	±	52.46	1.81	±	0.17
B-3/1.6	22	1396.19	±	95.35	529.65	±	38.61	1.61	±	0.12
B-221/4.3	14	1429.75	±	111.08	538.37	±	44.98	1.60	±	0.14
B-85/3.9	13	1433.65	±	125.15	544.20	±	50.68	1.63	±	0.16
A-19/1.9	8	1574.15	±	146.53	565.11	±	59.33	1.82	±	0.19
A-31/1.0	7	1364.67	±	175.63	537.85	±	71.12	1.49	±	0.23
J-44/2.4	10	1285.88	±	141.11	474.66	±	57.14	1.64	±	0.19
B-61/1.4	11	1792.68	±	121.63	723.36	±	49.25	1.54	±	0.16
Sire group										
Bahadurnagar	192	1541.70	±	25.28	598.85	±	10.56	1.62	±	0.03
Allah Dad	27	1527.56	±	67.42	602.67	±	28.16	1.56	±	0.08
Jahangirabad	38	1544.97	±	56.38	630.67	±	23.74	1.48	±	0.07
Year										
1980	6	1166.64	±	161.08	443.97	±	65.23	1.56	±	0.21
1981	20	1486.03	±	96.87	480.31	±	39.23	2.00	±	0.13
1982	41	1555.85	±	87.10	560.75	±	35.27	1.73	±	0.11
1983	47	1428.66	±	85.22	539.68	±	34.51	1.62	±	0.11
1984	12	1453.96	±	124.21	553.31	±	50.30	1.62	±	0.16
1985	21	1462.64	±	83.70	599.73	±	33.89	1.52	±	0.11
1986	44	1578.74	±	75.24	617.72	±	30.47	1.63	±	0.10
1987	38	1528.43	±	73.08	634.15	±	29.59	1.51	±	0.09
1988	19	1581.81	±	123.40	632.17	±	49.97	1.56	±	0.16
1989	9	1546.58	±	146.51	664.67	±	59.33	1.33	±	0.19
Season										
Summer	93	1392.60	±	42.42	520.78	±	17.18	1.68	±	0.05
Winter	164	1565.27	±	33.93	624.51	±	13.74	1.54	±	0.04

Table 2. Least squares analysis of variance of total milk yield, yield up to peak and persistency of first lactation

Traits	Source of variation	df	Mean squares	F. ratio	Probability
Total milk yield					
	Sire	14	178307.391	1.583	0.085
	Year	9	120663.897	1,071	0.385
	Season	1	1561052.107	13,861	0.000
	Remainder	232	112624.700		
	Sire group	2	2775.103	0.023	0.978
	Remainder	254	122711.906		
Yield up to peak					
	Sire	14	29867.837	1.617	0.076
	Year	9	26177.404	1,417	0.181
	Season	1	563413.741	30,507	0.000
	Remainder	232	18468.224		
	Sire group	2	10073.134	0.751	0.473
	Remainder	254	21412.241		
Persistency					
	Sire	14	0.111	0.5111	0.926
	Year	9	0.339	1,797	0.700
	Season	1	1,082	5.729	0.018
	Remainder	232	0.189		
	Sire group	2	0.322	1,161	0.188
	Remainder	254	0.192		

significant effect of season of calving on peak yield and persistency in Friesian cows of Iraq. The present findings are not in line with Koley *et al.* (1979) and Ray and Kathatal (1987). They found non-significant effect of season of calving on persistency.

Heritabilities and correlation coefficients:
The heritability of total milk yield and yield up to peak was 0.123 ± 0.132 and 0.109 ± 0.127 , respectively. The genetic, phenotypic

and environmental correlations between total milk yield and yield up to peak were 1.283, 0.734 and 0.661, respectively. The phenotypic correlation between total milk yield and persistency was 0.305 (Table 3). The high correlation coefficients between total milk yield and yield up to peak has been indicated that a cow can be selected on the basis of her yield up to peak in its early life for milk production.

Table 3. Heritability and correlation coefficients of various traits

a. Heritability	Traits		
	Total milk yield	Yield up to peak	
	0.123 ± 0.132	0.109 ± 0.127	
b. Correlation coefficients	Traits		
Traits	Genetic	Phenotypic	Environmental
Total milk yield with:			
i. Yield up to peak	1,287	0.734	0.661
ii. Persistency	-	0.305	-

REFERENCES

- Alrawi, AA and L.M. Alani. 1981. Evaluation of imported vs native-born Friesian bulls in Iraq. *Indian J. Anim. Sci.* 10(51): 395-397.
- Harvey, R.W. J. 1988. Mixed Model Least-squares and Maximum Likelihood (LSMLMW) PC-1 version Computer Programme.
- Ibeawuchi, J.A. 1988. Persistency of milk production in F₂ Friesian x White Fulani cattle in a tropical environment. *Bull. Anim. Hlth. Prod. in Africa*, 36: 215-219 (*Anim. Breed. Abst.*, 57: 3150, 1989).
- Koley, N., G. Choudhury and D.K. Mitra, 1979. Persistency of lactation yield in Jersey Haryana crossbred cows. *Indian J. Dairy Sci.* 32: 302-305.
- Maarof, N.N. and K.N. Tahir. 1988. Studies on the performance of Friesian cattle in Iraq. 11. Persistency of lactation and peak yield. *ZANCO*, 6: 29-39 (*Anim. Breed. Abst.*, 58: 4170, 1990).
- Mahadevan, P. 1951. The effect of environment and heredity on lactation. 2. Persistency of lactation. *J. Agri. Sci.* 41: 89-93.
- Pathak, S.c., M.M. Dhingra and B.S. Guring. 1980. Studies on certain attributes of Gir cattle. 11. Peak yield, days to attain peak yield and persistency of first lactation yield. *Indian J. Heredity*, 12: 1-6.
- Roy, T.e. and J.U. Katpatal. 1987. Genetic studies on persistency of first lactation yield in Jersey cattle. *Livestock Advisor*, 12: 17-21.
- Subrt, J., J. Berka, Z. Pospisil, B. Piza and S. Jirka. 1989. The effect of breeding on the performance of cows from an absorption crossbreeding programme. *Zivocisna- Vyroba*, 34: 385-391 (*Anim. Breed. Abst.*, 58: 4993, 1990).