RELATIVE EFFICIENCY OF SELECTION BASED ON PART LACTATION MILK YIELD IN SAHIWAL CATTLE

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Data on part production records of first lactation of 259 Sahiwal cows maintained at the Livestock Production Research Institute, Bahadurnagar (Okara), during 1979-89 were collected and analysed. The relative efficiency of selection based on 61-90 days milk yield or first 90 days cumulative yield was high i.e. 1.211 and 1.278 as compared to that of selection using total lactation milk yield. Thus the selection of cows can be made earlier, after third month of lactation.

INTRODUCTION

Sahiwal cows are considered to be the best dairy animals among the indigenous cattle breeds. Selection of the animals is the process to choose better animals and to cull the low producers. The selection criteria mainly practised are based on total lactation milk yield or milk yield day^{-1} of age at 2nd and 4th calving. This is a lengthy process and results into delayed selection.

Partial lactation records can provide reasonably good guess regarding first lactation milk yield and as such selection of a dairy cow can be exercised at an early stage. These will also serve a good purpose in preliminary sire evaluation and help in saving cost and time of progeny testing. Madden *et al.* (1955) and Khan and Johar (1985) reported that it is possible to achieve more rapid progress unit^{-1} time in selection from partial milk yield than from direct selection of a desired trait i.e. lactation milk yield. A study was thus designed to work out the relative efficiency of selection based on part lactation milk yield in Sahiwal cows.

MATERIALS AND METHODS

The data on first lactation records of 259 Sahiwal cows maintained at the Livestock Production Research Institute, Bahadurnagar (Okara), during 1979-1989 were collected for the present study. Milk yield for 300 days or less was taken as total first lactation milk yield. The lactation yield of each cow was arranged for each 30 days period. The period of colostrum was excluded. The data on part milk production at 30, 31-60, 61-90, 91-120 121-150, 151-180, 181-210, 211-240, 241-270, 271-300 days of first lactation were recorded from daily milk record register maintained at the farm. The data were analysed for heritability, genetic, phenotypic and environmental correlations by paternal half-sib correlation method using LSMLMW PC-I version Mixed Model Least Squares and Maximum Likelihood computer programme developed by Harvey (1988). The relative efficiency (R.E) of selection of part lactation milk yield was calculated according to Wilk *et al.* (1963).

R.E. = (hT/hM) x GTGM

where

hT = The square root of heritabilities of part milk production.

hM = The square root of heritability for the lactation milk yield.

GTGM = The genetic correlation between part lactation record and lactation milk yield.

RESULTS AND DISCUSSION

The average milk yield at 30, 31-60, 61-90, 91-120, 121-150, 151-180, 181-210, 211-240, 241-270 and 271-300 days was 191.15 ± 3.39, 212.33 ± 4.25, 197.84 ± 3.94, 182.93 ± 3.37, 172.64 ± 3.17, 160.15 ± 2.92, 149.71 ± 2.68, 143.74 ± 2.77, 144.36 ± 6.84 and 144.92 ± 4.60 l, respectively (Table 1). The genetic, phenotypic and environmental correlations

Table 1. Least squares means and standard errors of part lactation milk yield

Part lactation yield (days)	Number of observations	Least squares means	Standard error
1-30	259	191.15	3.39
31-60	259	212.33	4.25
61-90	259	197.84	3.94
91-120	259	182.93	3.37
121-150	259	172.64	3.17
151-180	259	160.15	2.92
181-210	259	149.71	2.68
211-240	222	143.74	2.77
241-270	161	144.36	6.84
271-300	100	144.92	4.60

Table 2. Genetic, phenotypic and environmental correlations between part lactation and total first lactation milk yield

Part lactation yield (days)	Genetic correlation	Phenotypic correlation	Environmental correlation
1-30	4.666 ± 3.085	0.537	0.454
31-60	1.359 ± 0.476	0.689	0.613
61-90	1.168 ± 0.227	0.741	0.680
91-120	1.239 ± 0.429	0.756	0.712
121-150	0.896 ± 0.237	0.771	0.755
151-180	0.910 ± 0.226	0.767	0.787
181-210	1.174 ± 0.282	0.787	0.745
211-240	1.512 ± 0.885	0.746	0.676
241-270	-	-0.027	-

Table 3. Genetic, phenotypic and environmental correlations between cumulative part lactation and total first lactation milk yield

Cumulative part lactation yield (days)	Genetic correlation	Phenotypic correlation	Environmental correlation
1-90	1.341 ± 0.458	0.729	0.663
1-120	1.350 ± 0.468	0.767	0.706
1-150	1.235 ± 0.320	0.802	0.754
1-180	1.139 ± 0.217	0.831	0.796
1-210	1.107 ± 0.182	0.863	0.836
1-240	1.083 ± 0.131	0.922	0.905
1-270	1.095 ± 0.151	0.935	0.922

Table 4. Relative efficiency of different part records as selection criteria over total lactation milk yield

Part lactation yield (days)	Heritability estimate	Relative efficiency
1-30	0.005	0.952
31-60	0.088	1.163
61-90	0.129	1.211
91-120	0.066	0.919
121-150	0.108	0.850
151-180	0.114	0.886
181-210	0.082	0.970
211-240	0.064	1.104
1-300	0.120	

between part lactation milk yield and total first lactation milk yield are presented in Table 2. Genetic correlation ranged from 0.896 to 1.512. Similarly, the genetic, phenotypic and environmental correlations of cumulative part lactation milk yield with total first lactation milk yield are given in Table 3. The heritability of total first lactation milk yield was 0.120 (Table 4). The relative efficiency of selection based on part lactation yield is presented in Table 4. It is evident from this table that part records of 61-90 days gave higher value of relative efficiency (1.211). Similarly, relative efficiency of selection based on 90 days cumulative part record is also high (Table 5).

Table 5. Relative efficiency of cumulative part record as selection criterion

Cumulative part lactation yield (days)	Heritability estimate	Relative efficiency
1-90	0.019	1.278
1-120	0.103	1.251
1-150	0.118	1.225
1-180	0.139	1.225
1-210	0.155	1.258
1-240	0.141	1.174

The results of the present study are in line with the results reported by Khan and Johar (1985) and Shrivastava and Khan (1988). They reported that relative efficiency of selection is high on 61-90 and 91-120 days yield or first 90 days cumulative yield as compared to that of selection using 300 days cumulative yield, a first lactation yield. Madden *et al.* (1955) also reported relative efficiency of selection based on cumulative milk yield as compared to first lactation ranged from 0.74 to 1.04. Gokhale (1976) also reported higher relative efficiency of selection based on 3rd and 5th month yield.

As the ultimate aim is to find out the part lactation yield on the basis of which selection of animals can be practised at an early stage of lactation with sufficient precision. It is evident from the results that first 90 days production can be considered in preference to longer records as criterion for selection for high producing Sahiwal cows.

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