

PREDICTION OF LACTATION YIELD FROM COLOSTRUM, PEAK AND 45 DAYS CUMULATIVE YIELD IN DAIRY CATTLE

R.S. CHAUHAN, R.R. MISHRA and D.S. BHATNAGAR

National Dairy Research Institute, Karnal

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INTRODUCTION

The prediction of lactation yield based on early available records of cows is used as an important tool in preliminary selection and progeny testing programmes. Various reports of early evaluation of milk production based on a few days or peak yield of cows are available (Cannon et al., 1942; Masuda and Higatis, 1953; Madden et al., 1955; Singh and Desai, 1961; Dutt et al., 1964, 1965; Singh and Acharya 1969; Chauhan et al., 1974). The present study was undertaken to predict 305 days lactation yield from the milk yield during first five days after calving (colostrum), one day recorded peak yield and milk yield during first 45 days after calving from first three normal lactation records of Sahiwal, Tharparkar and Red Sindhi cows.

MATERIALS AND METHODS

A total of 334 normal (1-3) lactations from 91 Sahiwal, 81 Tharparkar and 43 Red Sindhi cows recorded during 1968 to 1973 constituted the material for this study. This comprised of 140 lactations of Sahiwal, 130 lactations of Tharparkar and 64 lactations of Red Sindhi cows. All the cows included under this study were milked three times a day. The data of first five days yield after calving (X_1), one day recorded peak yield during lactation (X_2) and first 45 day cumulative yield (X_3) were correlated amongst each other and with 305 days milk production (Y). The multiple

regression equations of 305 days yield to first 5 days yield (colostrum), recorded one day peak yield and 45 days cumulative milk yield were obtained and prediction equations were formulated according to Snedecor (1967).

RESULTS AND DISCUSSION

The mean, standard error, coefficient of variation values for milk produced during colostrum period of first 5 days, recorded peak yield in 24 hr, first 45 days cumulative yield and 305 days milk produced for Sahiwal, Tharparkar and Red Sindhi cows are given in Table 1. The standard errors and coefficients of variations values were of lower magnitudes for all traits studied in Sahiwal than other two breeds. The coefficients of correlation values are presented in Tables 2 and 3.

Simple correlation coefficients (r) among traits X_1 , X_2 , X_3 , and X_4 were found highly significant except for first five days milk yield (X_1) to 305 days milk yield in Red Sindhi cows (Table 2). It is evident from this Table that milk yield in first five days after calving had low correlation ($r < 0.5$) with other traits studied while maximum milk yield recorded on a particular day during lactation and the cumulative milk yield in first 45 days after calving showed high correlation among themselves as well with 305 days lactation yield ($r = 0.78$ to 0.96). The square of coefficient of correlation (r^2) indicated that first five days yield could account for 16% of variation to

TABLE 1
Mean, standard error and coefficient of variation for different traits in dairy cows.

Traits	Sahiwal			Tharparkar			Red Sindhi		
	Mean	S.E.	C.V. %	Mean	S.E.	C.V. %	Mean	S.E.	C.V. %
Colostrum production (kg)	27.70	0.61	25.92	27.60	0.64	26.38	25.61	0.94	29.25
A day recorded peak yield (kg)	11.44	0.20	21.06	11.36	0.25	25.35	11.38	0.35	24.78
45 days cumulative yield (kg)	372.31	7.62	24.21	370.31	9.07	27.92	366.03	13.80	30.15
305 days yield (kg)	2188.17	34.17	18.48	2128.68	39.24	21.02	2146.22	63.95	23.84

TABLE 2
Correlation coefficients among traits (X_1 to X_4) in Sahiwal, Tharparkar and Red Sindhi cows

Traits correlated	Sahiwal (140)	Tharparkar (130)	Red Sindhi (64)
X_1 . X_2	0.4867*	0.3272*	0.3389*
X_1 . X_3	0.5465*	0.4461*	0.4064*
X_1 . X_4	0.4181*	0.3252*	0.1982*
X_2 . X_3	0.9307*	0.8820*	0.9644*
X_2 . X_4	0.7860*	0.7837*	0.8291*
X_3 . X_4	0.7640*	0.8276*	0.8191*

* = Significant at 1% level.

TABLE 3
Partial correlation coefficients for traits affecting 305 days milk yield by holding other two factors constant at a time

Traits correlated	Sahiwal (140)	Tharparkar (130)	Red Sindhi (64)
$r_{12.23}$	0.0470	-0.0575	-0.2119
$r_{23.12}$	0.4193	0.1927*	0.2145
$r_{34.12}$	0.3636*	0.4569†	0.5762†

* = Significant at 5% level.

† = Significant at 1% level.

- 1 or X_1 = Milk yield during first five days after calving (colostrum).
 2 or X_2 = Maximum yield recorded on a particular day in the lactation period of an animal (recorded peak yield).
 3 or X_3 = Milk yield during first 45 days after calving.
 4 or X_4 = Milk yield during 305 days of lactation period (Y).

305 days yields, while maximum milk yield recorded on a particular day and the first 45 days cumulative yield accounted 87, 78 and 93 and 62, 61 and 69% of variations to total milk yield in 305 days among Sahiwal, Tharparkar and Red Sindhi cows respectively. This showed that maximum milk yield recorded on a particular day and the milk yield obtained in first 45 days after calving are quite reliable and breeder could select the animals on any of these traits or both the traits whichever is available earlier. On further investigation by applying partial correlation for the traits X_1 , X_2 , X_3 with 305 days lactation yield keeping of these two traits constant at a time (Table 3), first 45 days cumulative yield was found better for estimating 305 days milk yield in all the three breeds. Dutt et al. (1964) reported coefficient of correlation as 0.501, 0.737 and 0.859 for first 15, 75 and 135 days cumulative yield with 305 days milk yield in Haryana cows. They also observed regression of 7.63, 7.54 and 1.68 lbs respectively for the above periods with 305 days yield. Singh and Acharya (1969) observed from 462 first lactation records of Haryana cows that coefficients of correlation values from months to months yield with lactation yield were low than that of cumulative yield for the 1st two months up to middle month's of milk production during lactation period of a cow.

The regression prediction equation formulated by taking into account all the four traits

(X_1 , X_2 , X_3 and X_4) by multiple linear equation in this study were :

Sahiwal

$$Y = 704.13 + 0.67 X_1 + 86.77 X_2 + 1.27 X_3$$

Tharparkar

$$Y = 754.85 - 2.19 X_1 + 35.96 X_2 + 2.77 X_3$$

Red Sindhi

$$Y = 700.87 - 9.02 X_1 + 83.30 X_2 + 1.99 X_3$$

where X_1 , X_2 , X_3 are the traits as given under Table 3 and Y is predicted yield.

The coefficient of determination (R^2) was found 62.75, 69.58 and 70.70% in Sahiwal Tharparkar and Red Sindhi cows respectively.

SUMMARY

A total of 334 normal (1-3) lactations amongst Sahiwal, Tharparkar and Red Sindhi cows were studied for deriving prediction equation of milk yield for first 305 days lactation yield (Y) from first five days cumulative milk yield (X_1 -Colostrum), maximum milk yield recorded on a particular day in a lactation period of an animal (X_2 -peak yield) and cumulative milk yield during first 45 days after calving (X_3).

The mean, standard errors and coefficients of variation of these traits were calculated for all the breeds under study. The simple correlation coefficients and the square of correlation coefficients indicated poor correlation

values of first five days milk yield after calving (colostrum) to 305 days milk yield while maximum milk yield recorded on a particular day and the first 45 days cumulative yield after calving showed higher correlation value.

The partial correlation values showed that milk yield in first 45 days after calving could give better estimation of 305 days milk yield. The multiple regression equations were derived among these three breeds.

The coefficient of determination (R^2) among these breeds were 62.75, 69.68 and 70.70% in Sahiwal, Tharparkar and Red Sindhi cows respectively.

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