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RESEARCH ARTICLE

Effect of non-genetic factors on persistency of milk yield in jersey cattle

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Abstract : The present investigation was carried out on 251 Jersey cows maintained at Bull Mother Farm Tathawde, Pune over a period of 10 years (1996-2005). The least square means for persistency of milk yield in Jersey cattle were, 12.99±0.40, 0.88±0.009 and 67.83±0.73 by Method I (Mahadevan,1951), Method II (Ludwick and Peterson, 1943) and Method III (McDowell *et al.*, 1961), respectively. Effect of period of calving had significant (P<0.01) on persistency of milk yield (Method II and Method III). Effect of season of calving on all three Methods had non-significant. Lactation order had significant (P<0.01) effect on persistency of milk yield (Method III).

Key words : Persistency of milk yield, Jersey cattle

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INTRODUCTION

Persistency of milk yield means ability of an animal to give continuous milk throughout the loctation from parturition up to drying off without extreme changes in milk production performance. Performance of the pure breed Jersey cattle in temperate region is documented to the great extent but in tropical countries, particularly in India, where this exotic breed of cattle have been introduced has not documented to the greater extent. Keeping this view in mind the research work was carried out to study the effect of non-genetic factors on persistency of milk yield in Jersey cattle.

RESEARCH METHODOLOGY

The data of 251 Jersey cows maintained at Bull Mother Farm Tathawde, Pune over a period of 10 years (1996-2005) were used for the study. Period of 10 years were divided into 2 periods of 5 years each (P_1 and P_2). The year was subdivided into 3 seasons *i.e.* Rainy (S_1) June-September, Winter (S_2) October-January and Summer (S_3) Feb-May. Order of lactation was considered up to 4th lactation and coded as L_1 to L_4.

Statistical methods :

Persistency of milk yield was calculated by formula as below :

Method-I :

The method developed by Mahadevan (1951) was used for estimation of persistency of milk yield :

$$P = \frac{(A - B)}{B}$$

where,
P = Persistency of milk yield,
A = Total lactation milk yield,
B = Initial milk yield up to attainment of peak yield.

Method-II :

The method developed by Ludwick and Peterson (1943) was used for estimation of persistency of milk yield :

$$P = R_1K_1 + R_2K_2 + R_3K_3$$

$$R_1 = \frac{X_2}{X_1} R_2 = \frac{X_3}{X_2} R_3 = \frac{X_4}{X3}$$

$$K_1 = \frac{R_1}{R_1R_2R_3} K_2 = \frac{R_2}{R_1R_2R_3} K_3 = \frac{R_3}{R_1R_2R_3}$$

where,

P = Persistency of milk yield,

R = Ratios of two successive milk yield observations of lactation *i.e.* R_1, R_2, R_3,

X_1 = Milk yield during the period of 2nd and 3rd months,

X_2 = Milk yield during the period of 4th and 5th months,

X_3 = Milk yield during the period of 6th and 7th months,

X_4 = Milk yield during the period of 8th and 9th months,

The constants K_1, K_2 and K_3 represents the weights of the three ratios *i.e.* X_2/X_1, X_3/X_2 and X_4/X_3.

Method-III :

The method developed by McDowell *et al.* (1961) was used for estimating persistency of milk yield :

$$\%P = \frac{2S(x > \ddot{X}) - n\ddot{X}}{Sx} \times 100$$

where,

%P = Per cent persistency of milk yield,

S ($x > \ddot{x}$) = Sum of yield for 30 days period greater than average 30 days yield for the lactation,

n = Number of period when 30 days yield exceeded to average for the lactation,

Sx = Sum of all 30 days yield,

$\ddot{x}$ = Average yield for all 30 days period

Least squares analysis :

In order to overcome non orthogonal data resulting from unequal number of observations and disproportionate sub-class frequencies and to study the various non-genetic factors, the least squares technique (Harvey, 1991) by fitting constants was used. For estimation of the effect of non-genetic factors, the following biometrical model was used.

Least squares analysis of variance for non-genetic factors:

$$Y_{ijklm} = \mu + P_i + S_j + L_k + e_{ijkm}$$

where,

Y_{ijklm} = Persistency of milk yield value of the mth animal belonging to ith period of calving, jth season of calving and kth lactation order

μ = Overall mean,

p_i = Effect of ith period of calving, (i = 1,2),

S_j = Effect of jth season of calving (j = 1,2,3),

L_k = Effect of kth lactation order, (k=1,2,3 and 4),

e_{ijklm} = Random error, NID with mean and variance (0, d^2e), respectively.

RESULTS AND DISCUSSION

The least square means for persistency of milk yield in Jersey cattle are presented in Table 1.

Persistency of milk yield :

Method-I (Mahadevan, 1951) :

The least squares means for persistency of milk yield estimated by this method was 12.99+0.40 (Table 1). Almost similar result was reported by Gawari (1999) in triple

Table 1: Least squares means for persistency of milk yield in Jersey cattle

Source of variation	Code	No. of observations	Persistency of milk yield		
			Method–I	Method–II	Method–III
Overall	μ	526	12.99+0.40	0.88+0.009	67.83+0.73
Period of calving					
1996-2000	P_1	289	13.05+0.85	0.90a+0.019	66.10b+1.54
2001-2005	P_2	237	12.94+0.51	0.86b+0.011	69.56a+0.92
Season of calving					
Rainy	S_1	170	12.66+0.72	0.90+0.016	67.79+1.30
Winter	S_2	182	13.63+0.58	0.87+0.013	68.57+1.05
Summer	S_3	174	12.69+0.59	0.88+0.013	67.12+1.06
Lactation order					
1st lactation	L_1	191	12.40+0.85	0.86+0.019	69.76a±1.54
2nd lactation	L_2	125	13.88+0.68	0.89+0.015	68.16 a±1.22
3rd lactation	L_3	106	11.92+0.72	0.88+0.016	69.31a +1.31
4th lactation	L_4	104	13.78+0.74	0.90+0.016	64.08b+1.33

Means under each class in the column with different superscript differed significantly.

Table 2 : Least squares analysis of variance for persistency of milk yield in Jersey cattle

Persistency	Source of variation							
	Period of calving		Season of calving		Lactation order		Error	
	d.f.	Mss	d.f.	Mss	d.f.	Mss	d.f.	Mss
Method-I	1	1.276699	2	53.36081	3	114.5488	517	48.56343
Method-II	1	0.1604931**	2	0.06109447	3	0.04865049	517	0.024711
Method-III	1	1459.118**	2	92.67192	3	763.7665**	517	157.3545

** indicates significance of value at P=0.01

crossbred cattle. Whereas, the lower values of persistency of milk yield were recorded by Koley *et al.* (1979) in J x Hariana, Jain *et al.* (1981) in Gir, Kulkarni (2001) in Red Sindhi cattle.

Method-II (Ludwick and Peterson, 1943) :

The estimated value of persistency of milk yield in present study was 0.88±0.99 (Table 1). Higher values were reported by Roy and Katpatal (1987) in Jersey cattle. However Sharma and Bhatnagar (1974) in Red Sindhi and Sahiwal, Gupta and Johar (1982) in Tharparkar and Gawari (1999) in triple crossbred cattle recorded lower values of persistency of milk yield.

Method-III (Mcdowell et al., 1961) :

The persistency of milk yield estimated by this method was 67.83±0.73 (Table 1).The higher values were reported by Mahto *et al*. (1981) in Haryana crosses with, HF, Jersey and Brown Swiss, Gawari (1999) in triple crossbred and Kulkarni (2001) in Red Sindhi cattle for the persistency of milk yield.

Effect of period of calving :

The variance analysis showed that the period of calving had significant (P<0.01) influence of persistency of milk yield estimated by Method II and III in Jersey cattle (Table 2). The availability of feeds, fodder and management conditions may vary from period to period which might have reflected on persistency of milk yield.

Similar significant effect of period of calving on persistency of milk yield was reported by Shah *et al*. (1983) in HF crossbred. The higher values of persistency of milk yield in (Method II) and (Method III) were noticed during P_1(0.90+0.009) and P_2(69.56+0.92), respectively.

The variance analysis indicated non-significant effect of period of calving on persistency of milk yield (Method I). These findings were supported by Koley *et al*. (1979), Gupta and Johar (1983) and Roy and Katpatal (1987) in J x Hariana, HF x Tharparkar and Jersey cattle, respectively.

Effect of season of calving :

The effect of season of calving on persistency of milk yield was found to be non-significant in all estimates obtained by three methods (Table 2). Similar results were reported by Koley *et al.* (1979) in J x Hariana, Roy and Katpatal (1987) in Jersey cattle.

Effect of lactation order :

Variance analysis revealed that lactation order had non-significant effect on persistency of milk yield estimated by Method I and II. These results were agreed upon with the findings of Singh and Gopal (1982) in Rathi cattle.

The persistency estimated by Method III differed significantly (P<0.01) from each other due to the influence of lactation order (Table 2). The persistency of milk yield was highest (69.76±1.54) in first lactation, whereas lowest (64.08±1.33) in fourth lactation. Similar inferences were drawn by Singh and Shukla (1985) and Yadav *et al*. (1994b) in Gir and Tharparkar cattle, respectively. Shah *et al.* (1983) worked on the related topic is crossbred friesian cows.

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