STUDIES ON SOME GENETIC AND NONGENETIC FACTORS AFFECTING LACTATION PERIOD IN GIR COWS

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ABSTRACT

A total of 599 records of lactation period on 191 Gir cows maintained at Kasturba Gandhi Memorial Trust, Indore, M. P. over a period of 36 years (1974-2009) were analyzed by least squares technique of fitting constants to estimate the effect of sire, period of calving, season of calving, parity and inbreeding. The overall least squares mean of lactation period was found to be 303.28 ± 5.67 days. The results revealed that sire ($p<0.05$), period of calving ($p<0.01$), parity ($p<0.01$) and level of inbreeding ($p<0.01$) had significant effect on lactation period while the effect of season of calving was non-significant. Inbred cows were found to have significantly shorter lactation period as compared to non-inbred cows. Thus, it can be inferred that inbreeding had deteriorating effect on lactation period in the present herd and hence it should be avoided by formulating proper breeding plan along with other ameliorative managerial practices.

KEY WORDS: Inbreeding, Gir cows, lactation period

INTRODUCTION

In order to enhance productivity of a dairy animal, it is necessary to develop an understanding of the factors affecting its milk production. Lactation period, one of the important parameters in dairy animals, gets influenced by both genetic and non-genetic factors. Shorter lactation period is one of the factors responsible for the poor lactation yield in the Zebu breeds of cattle. Genetic improvement may be brought about by selection. The non-genetic factors such as management, period, season etc. also influence lactation length, and hence need to be assessed in a production set up. In India where the dairy herds are small in size, inbreeding is conspicuous with its ill effects on productive and reproductive traits. Hence, the present study was planned to assess the effect of sire, inbreeding and some non-genetic factors on lactation period in Gir cows.

MATERIALS AND METHODS

The data utilized for the present investigation comprises 599 records of lactation period of 191 Gir cows maintained at the Kasturba Gandhi National Memorial Trust Dairy Farm, Kasturbagram, Indore (M.P.) covering a period of 36 years (1974 to 2009). The inbreeding coefficient for each animal was calculated using path coefficient method. Since only source of inbreeding in the herd during the period under study was found to be daughter x sire matings, each inbred animal was having an inbreeding coefficient of 0.25 (Tomar *et al.*, 2013). Therefore on the basis of level of inbreeding the animals could be classified into two groups only viz., non-inbred (IL1) and inbred (IL2). The entire duration of 36 years was delineated into six periods of six years each to overcome the differences in managemental practices while year was divided into four seasons viz., spring (February - March), summer (April - June), rainy (July - September) and winter (October - January) depending upon the climatic conditions prevailing in the region. To determine the effect of sequencing of calving on dry period, five consecutive parities were taken and denoted as Pt1, Pt2, Pt3, Pt4 and Pt5. To study the effect of genetic and non-genetic factors the data were analyzed by least squares technique of fitting constants using "Mixed Model Least Squares and Maximum Likelihood Computer Programme PC-2" employing the statistical model which included the effects

of sire, period of calving, season of calving, parity and the inbreeding (Harvey, 1990).

RESULTS AND DISCUSSION

The overall least squares mean of lactation period was found to be 303.28 ± 5.67 days (Table 1). This mean lactation period is in agreement with the estimates reported by D'souza *et al.* (1995),

Table 1: Least squares means and standard error for lactation period

Effect	No. of observations	Mean±S.E. (days)	Effect	No. of observations	Mean±S.E. (days)
Overall mean (μ)	599	303.28 ± 5.67	**Period**		
Sire			P1 (1974-1979)	78	$298.04^{ab} \pm 11.53$
S_1	79	$294.42^{abc} \pm 8.75$	P2 (1980-1985)	95	$283.38^{a} \pm 9.96$
S_2	50	$313.08^{cd} \pm 10.34$	P3 (1986-1991)	126	$304.09^{bc} \pm 9.38$
S_3	37	$298.95^{bc} \pm 11.88$	P4 (1992-1997)	76	$320.00^{c} \pm 9.61$
S_4	110	$276.55^{a} \pm 7.84$	P5 (1998-2003)	85	$321.08^{c} \pm 9.08$
S_5	106	$295.88^{bc} \pm 8.02$	P6 (2004-2009)	139	$293.10^{ab} \pm 6.56$
S_6	32	$317.60^{cd} \pm 12.30$	**Parity**		
S_7	27	$299.20^{bc} \pm 13.74$	Pt1	191	$275.16^{a} \pm 5.89$
S_8	38	$304.59^{bc} \pm 11.71$	Pt2	156	$299.07^{b} \pm 6.56$
S_9	24	$280.69^{ab} \pm 15.02$	Pt3	129	$311.80^{b} \pm 7.51$
S_{10}	36	$268.67^{a} \pm 12.24$	Pt4	77	$331.53^{c} \pm 9.57$
S_{11}	13	$334.94^{cd} \pm 20.40$	Pt5	46	$298.85^{b} \pm 11.60$
S_{12}	25	$311.93^{bcd} \pm 16.17$	**Season**		
S_{13}	11	$354.78^{d} \pm 22.39$	Spring	147	299.54 ± 7.41
S_{14}	11	$294.66^{abc} \pm 21.72$	Summer	113	302.13 ± 8.03
Inbreeding			Rainy	102	304.98 ± 8.42
Non-inbred	477	$323.23^{b} \pm 5.12$	Winter	237	306.47 ± 6.51
Inbred	122	$283.34^{a} \pm 8.32$			

a, b, c, d: Least squares means for a particular class with at least one common alphabet as superscript do not differ significantly with each other

Nanavati et al. (1996) and Bhadoria *et al.* (2003) in this breed. The least squares analysis of variance revealed significant effect of sire (P<0.05) on lactation period (Table 2). The significant effect of sire on lactation period as obtained in the present study was also reported by D'Souza *et al.* (1995) in Gir.

The least squares analysis of variance revealed (Table 2) significant effect of period (P<0.01) on lactation period. The significant effect of period of calving on lactation period as obtained in this study was also reported by Queiroz et al. (1993), Nanavati et al. (1996) and Bhadoria *et al.* (2003) in Gir, Alkoiret *et al.* (2011) in Girolando, Dangi *et al.* (2013) in Rathi breed, Wondifraw *et al.* (2013) in Holstein Friesian × Deoni crossbred cows and Rehman *et al.* (2014) in Sahiwal breed. However, Jadhav *et al.* (2010) in Gir half-breds reported non-significant effect of period of calving on this trait.

Season of calving was found to exert a non significant effect on lactation period (Table 2). Similar findings were reported by Jadhav *et al.* (2010) in Gir half-breds. However, contrary to present findings the significant effect of season of calving on lactation period has been reported by Queiroz et al. (1993), D'Souza *et al.* (1995), Nanavati *et al.* (1996) and Bhadoria *et al.* (2003) in Gir cows and Alkoiret *et al.* (2011) in Girolando cows.

Table 2: Least squares analysis of variance for lactation period

Source of variation	d.f.	S.S.	M.S.	F
Sire	13	107171.43	8243.95	1.92*
Period	5	73365.77	14673.15	3.40**
Season	3	4404.45	1468.15	0.34
Parity	4	180889.50	45222.37	10.54**
Inbreeding	1	109618.40	109618.40	25.54**
Error	572	2454230.23	4290.61	

* Significant at P< 0.05   ** Significant at P< 0.01

The least squares analysis of variance indicated (Table 2) significant effect of Parity (P<0.01) on lactation period. This is in agreement with the findings of Bhadoria *et al.* (2003) in Gir, Dangi et al. (2013) in Rathi, Wondifraw *et al.* (2013) in Holstein Friesian × Deoni crossbred and Rehman *et al.* (2014) in Sahiwal cows. Results in present study indicated that there was an increasing trend in lactation period over the parity but its decline in parity five corroborates the view that as the cow grows older; her capacity to sustain longer lactation reduces. This is in conformity with the finding of D'Souza *et al.* (1995) who reported significantly longer lactation in younger than in older cows.

The inbreeding exerted a significant effect (P<0.01) on lactation period. The inbred animals had significantly shorter lower lactation period (283.34±8.32 days) as compared to non- inbred cows (323.23 ± 5.12 days). Similar findings have also been reported by Odedra et al. (1979) and Queiroz et al. (1993) in Gir cow and Sharma (2010) in Malvi cattle.

 From the results of present study, it can be concluded that inbreeding has adverse impact on lactation period. Results vividly indicated that inbreeding leads to significantly reduced shorter lactation period in the herd. This would ultimately lower down the economic returns from dairy

farming. Thus, inbreeding has serious economic implications. Therefore efforts should be made to avoid inbreeding by bringing or purchasing sires from the other purebred herds of Gir, and by replacing the sires every one or two years so that daughter sire mating could be avoided.

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