EFFECT OF INBREEDING AND SOME OTHER FACTORS ON LACTATION LENGTH IN MALVI COWS

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ABSTRACT

The data for the present investigation pertained to 1647 observations of lactation length (LL) on Malvi cattle maintained at Govt. Cattle Breeding Farm, Agar, District Shajapur (M.P.), covering a period of 48 years from 1962 to 2009. The least squares analysis of variance revealed the mean lactation length in these cows to be 263.85±6.95 days and the trait was significantly affected by sire (P< 0.01), period of calving (P< 0.01), season of calving (P< 0.01) and parity of the cow (P< 0.01). Although, inbred cows had lower lactation length as compared to non-inbred cows, the effect of inbreeding was not significant. Heritability estimate for lactation length in the herd was obtained as 0.08±0.11. It was concluded that to improve the lactation length in this herd, ameliorative managerial practices should be adopted along with avoidance of inbreeding.

KEYWORDS : Malvi cows, inbreeding, lactation length, heritability.

INTRODUCTION

Lactation length in dairy animals is an important trait as it is one of the prime determinants of lactation milk yield. The animals with shorter lactation period are generally poor milk producers. Shorter lactation length is one of the factors responsible for the poor lactation yield in the Zebu breeds of cattle. The, ideal lactation period i.e. 305 days closely corresponds with the breeders' strategy of "a calf in a year" for optimum life time performance of the dairy animal. The investigation on the factors affecting the lactation period constitute an important field of investigation in the milch breeds of dairy cattle. In India, most of the herds of cattle are small in size and in small population maintained for long time inbreeding is inevitable. Therefore, there is a need to study the incidence and degree of inbreeding at organized farms and its impact on lactation length. In view of paucity of information on effect of inbreeding on lactation length of Malvi cows, the present study was taken up.

MATERIALS AND METHODS

The data for the present investigation pertained to 1647 observations of lactation length (LL) on Malvi cows maintained at Govt. Cattle Breeding Farm, Agar, District Shajapur (M.P.), spanning a period of 48 years from 1962 to 2009. Inbreeding coefficient for each animal was calculated using path coefficient method (Wright, 1922). It was observed that all the inbred animals under study had an inbreeding coefficient of 0.25 as they were all produced by sire-daughter mating. Therefore, on the basis of level of inbreeding animals were classified into two groups only viz., non-inbred (IL1) and inbred (IL2). The entire period of 48 years was delineated into eight periods of six years each and each year was divided into four seasons, viz., spring (February - March), summer (April - June), rainy (July - September) and winter (October - January). 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 Square and Maximum Likelihood Computer Programme PC-2" (Harvey, 1990) employing the statistical model which included the effects of sire, period of calving, season of calving,

parity and level of inbreeding. Heritability estimates of lactation length and its genetic and phenotypic correlations with other traits were obtained by paternal half sib correlation method.

RESULTS AND DISCUSSION

Out of 409 animals, 45 were found to be inbred leading to 11.00% incidence of inbreeding in the herd. The inbreeding coefficient of each inbred cow came out to be 0.25 as they were all produced

Table 1. Least squares means and standard errors for Lactation Length in *Malvi* cows

Effect	No. of observations	Mean ± S.E. (days)	Effect	No. of observations	Mean ± S.E. (days)
Overall mean (μ)	1647	263.85±6.95			
Sire			**Season**		
S_1	286	287.22±7.28 ^{d}	S_1	234	264.72±7.77 ^{b}
S_2	114	285.60±7.30 ^{cd}	S_2	258	275.09±7.83 ^{c}
S_3	200	279.38±5.89 ^{cd}	S_3	348	261.58±7.33 ^{b}
S_4	273	269.40±6.14 ^{bc}	S_4	807	254.01±6.98 ^{a}
S_5	29	269.37±12.32 ^{bc}	**Parity**		
S_6	47	240.61±10.96 ^{a}	Pt_1	327	283.99±5.58 ^{c}
S_7	182	245.88±9.02 ^{a}	Pt_2	269	267.82±6.32 ^{b}
S_8	76	269.26±10.13 ^{bc}	Pt_3	234	266.74±6.90 ^{b}
S_9	356	274.87±10.50 ^{c}	Pt_4	201	269.05±7.33 ^{b}
S_{10}	64	256.75±15.12 ^{ab}	Pt_5	171	265.49±7.90 ^{b}
S_{11}	12	243.59±21.53 ^{a}	Pt_6	146	261.06±8.50 ^{ab}
S_{12}	8	244.29±24.72 ^{a}	Pt_7	116	264.03±9.12 ^{ab}
Period			Pt_8	85	258.60±9.95 ^{ab}
P_1	17	270.19±20.76 ^{cd}	Pt_9	58	246.52±11.23 ^{a}
P_2	135	250.88±14.79 ^{ab}	Pt_{10}	40	255.19±12.73 ^{ab}
P_3	254	247.00±11.65 ^{a}	**Inbreeding**		
P_4	260	252.80±9.43 ^{ab}	IL_1	1511	267.27±5.69
P_5	252	264.96±7.48 ^{c}	IL_2	136	260.43±8.95
P_6	293	261.69±5.75 ^{bc}			
P_7	274	284.40±6.20 ^{d}			
P_8	162	278.88±7.19 ^{d}			

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.

Table 2. Least squares analysis of variance for Lactation length in Malvi cows

Source of variation	d.f.	S.S.	M.S.	F
Sire	11	143590.59	13053.69	4.029**
Period of calving	7	69318.43	9902.63	3.056**
Season of calving	3	86599.43	28866.48	8.909**
Parity	9	83478.72	9275.41	2.863**
Inbreeding	1	4736.83	4736.83	1.462
Error	1615	5232678.47	3240.05	-

** Significant (P< 0.01)

by sire X daughter mating because of retention of service sires for longer period in the herd thereby enhancing chances of sire X daughter mating (Tomar *et. al*, 2012). The overall least squares mean for lactation length in the herd was found to be 263.85±6.95 days (Table 1). The present estimate is quite close to the estimates reported by Chaturvedi (1991) in Malvi (270.42±1.85 days) and Dangi *et. al* (2013) in Rathi (267.09±8.04) cows. The probable reasons for lower mean lactation length as compared to the standard lactation length (305 days) in this herd might be both genetic (inherent potential) as well as environmental (poor feeding, management etc).

The least squares analysis of variance (Table 2) revealed significant effect of sire (P<0.01) on lactation length. The significant effect of sire on lactation length as obtained in this study was also reported by Sharma *et al*. (1987) in Sahiwal, and D'Souza *et al*. (1995) and Rajoriya (2009) in Gir cows.

The significant effect of period (P<0.01) on lactation length as obtained in present study is in agreement with the findings of Verma (1981) in Malvi and Rajoriya (2009) in Gir cattle. However, Chaturvedi (1991) in Malvi reported non-significant effect of period on lactation length. The mean lactation length gradually declined to a significantly lower level upto period 4 as compared to period 1. Subsequently it increases to significantly higher level in period 7 and 8 as compared to period 4. This could be attributed to the differences in feeding and other managerial practices on the farm over the periods. The effect of Season of calving was also significant (P<0.01) on lactation length (Table 2) in the present study. This is in agreement with the findings of Bhadoria *et al*. (2003) in Gir. However, Chaturvedi (1991) in Malvi and Rajoriya (2009) in Gir observed non-significant effect of season on this trait. These differences could be attributed to availability or non-availability of good quality fodder and concentrate during different seasons.

The least squares analysis of variance revealed significant effect of parity (P<0.01) on lactation length (Table 2). This is in agreement with the findings of Chaturvedi (1991) in Malvi, Rajoriya (2009) in Gir, Alkoiret *et. al* (2011) in Girolando and Dangi *et. al* (2013) in Rathi cows. Results in present study indicate that primipara had significantly longer lactation period as compared to other parities. 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 findings indicate that as the cow grows older; her capacity to sustain longer lactation reduces.

Inbreeding was found to have non-significant effect on lactation length (Table 2), which is in agreement with the findings of Reddy and Nagarcenkar (1997) in Sahiwal cattle. However, Rajoriya (2009) in Gir, reported significantly shorter lactations in inbred cows as compared to non-inbred cows. On the contrary, Srinivas and Gurnani (1981) in Sahiwal and Bhagat *et al*. (2007) in Friesian X Gir crosses have reported longer lactation length in inbreds than non-inbreds.

Heritability estimate of lactation length

The heritability estimate obtained for the lactation length was 0.08± 0.11. The lower estimate for heritability of lactation period as obtained in present study has also been reported by Chaturvedi (1991) in Malvi. Low estimate of heritability in the present investigation indicate that non-additive gene action and environmental factors are playing an important role in the expression of this trait. It also suggests that there is low correlation between phenotype and genotype of the individual, thus individual selection alone cannot be successfully employed for improving this trait and calls for ameliorative feeding and management practices.

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