EFFECT OF GENETIC AND SOME OTHER SOURCES OF VARIATION ON DRY PERIOD IN MALVI COWS

Harish Sharma, S.S. Tomar and Amit Kumar

Department of Animal Genetics and Breeding
College of Veterinary Science and Animal Husbandry,
NDVSU, Campus, Mhow -453446 (M.P.) India

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Corresponding Author : jha.amit002@gmail.com

ABSTRACT

The data for the present investigation pertained to 1647 observations of dry period (DP) on 409 Malvi cows maintained at Govt. Cattle Breeding Farm, Agar, Shajapur (M.P.), covering a period of 48 years from 1962 to 2009. The least squares analysis of variance revealed mean dry period in these cows to be 130.78±9.10 days and was significantly affected by period (P< 0.01), season (P< 0.01), parity (P< 0.01) and inbreeding (P< 0.05) while effect of sire was non-significant. The mean dry period for inbred animals was significantly higher than that of non-inbred. Heritability estimates for DP was obtained as 0.09±0.11. It was therefore concluded, that inbreeding had deteriorating effect on the dry period and hence to improve this trait in the herd, avoidance of inbreeding along with ameliorative managerial practices should be undertaken.

KEYWORDS : Malvi cows, inbreeding, dry period, heritability.

INTRODUCTION

Milk production of dairy animals is the main component on which the economics of dairy enterprise is dependant. A period of rest i.e. dry period prior to parturition is necessary for realizing the true potential of milk production in the subsequent lactation. Hence, from the profitability point of view and successful lactation cycle of a cow, it is an important trait which warrants sufficient attention. But being an unproductive phase, dry period generally receives less attention from the breeders. 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 along with other factors on dry period. In view of the above, the present study was taken up to assess the effect of sire, inbreeding and some other non-genetic factors on dry period in Malvi cows.

MATERIALS AND METHODS

The data for the present investigation pertained to 1647 observations of dry period (DP) on 409 Malvi cattle 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 determine the effect of order of lactation on dry period, ten consecutive parities were taken and denoted as Pt1, Pt2, Pt3, Pt4, Pt5, Pt6, Pt7, Pt8, Pt9 and Pt10. 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 inbreeding. Heritability estimate of dry period was 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. The higher coefficient of inbreeding (0.25) of all the inbred animals was due to the limited number of sires. Out of 12 sires, three sires were used continuously for 4 to 7 years, thus enhancing chances of daughter x sire mating (Tomar *et. al*, 2012).

The overall least squares mean for dry period in the herd was found to be 130.78±9.10 days (Table 1). This estimate is close to that reported by Chaturvedi (1991) in this breed. The longer dry period in this herd as compared to desired length of dry period (about 60 days) might have been due to inbreeding and poor feeding and management in the herd.

The effect of sire was found to be non significant on this trait. There appears no report on the effect of sire on dry period in Malvi cows. However, Dhoke and Johar (1977) in Hariana and Parmar (1978) in Tharparkar reported non sigificant effect of sire on this trait. Whereas, Rajoriya (2009) in Gir cows reported significant effect of sire on dry period.

The significant effect of period ($P<0.01$) on dry period as observed in this study has also been reported by Verma (1981) and Singh et al. (1986) in Malvi, Bhadoria et al. (2003) and Rajoriya (2009) in Gir, and M'hamdi et al. (2012) in Tunisian Holstein cows. The least squares analysis of variance revealed significant effect of season ($P<0.01$) on dry period in this study. This is in conformity with the findings of Verma (1981) in Malvi cattle and Dangi et. al (2013) in Rathi cows. However, the non significant effect of season on dry period was reproted by Singh et al. (1986) in Malvi cows. Cows calving in winter season recorded the significantly shorter dry period and the cows calving in summer season recorded significantly longest dry period (Table 1). This could be due to the fact that during descending phase of lactation green succulent fodder is available to winter calvers making these cows to sustain longer lactation and resultant shorter dry period. This advantage of green fodder is not available to summer calvers during their descending phase of lactation with resultant shortening of lactation period and lengthening of their dry period.

Significant effect of parity as revealed by least squares analysis of variance on dry period is in consonance with the findings of Verma (1981) and Singh et al. (1986) in Malvi and Rajoriya (2009) in Gir cows. However, Bhadoria et al. (2003) in Gir and Dangi et. al (2013) in Rathi cattle reported a non significant effect of parity on dry period. Primipara were found to have significantly longer (180.85±7.31 days) dry period as compared to other parities. The length of dry period tended to decrease with the advancing parity. The probable reason for this may be that in first parity, cows did not attain full reproductive and productive efficiency resulting into highest dry period. Least squares analysis of variance indicated that the inbreeding had significant ($P<0.05$) effect on dry period. There appears no reports on effect of inbreeding on dry period in Malvi cattle. However, Odedra et al. (1979) and Rajoriya (2009) in Gir and Reddy and Nagarcenkar (1990) in Sahiwal also reported significant effect of inbreeding on this trait.

Heritability estimate: The heritability estimate of dry period was found to be 0.09±0.11. Similar lower estimates of heritability have also been reported by Verma (1981) in Malvi cows. Very low estimate of heritability of dry period as obtained in this study indicates that phenotypic selection for the trait will not be effective and hence the trait can only be improved by providing better management.

From the results of the present study it can be concluded that among various sources of variation influencing dry period in the present herd, inbreeding warrants major chunk of attention as it led to significantly longer mean dry period in inbred cows as compared to non-inbred. This deterioration

Table 1. Least squares means and standard errors for Dry Period

Effect	No. of observations	Mean ± S.E. (days)	Effect	No. of observation	Mean ± S.E. (days)
Overall mean (μ)	1647	130.78±9.10			
Sire			**Season**		
S_1	286	142.25±9.54	S_1	234	135.29±10.18 ^{bc}
S_2	114	138.76±9.57	S_2	258	143.85±10.27 ^{c}
S_3	200	143.42±7.72	S_3	348	125.96±9.61 ^{ab}
S_4	273	144.13±8.05	S_4	807	118.02±9.15 ^{a}
S_5	29	137.95±16.15	**Parity**		
S_6	47	138.31±14.37	Pt_1	327	180.85±7.31 ^{e}
S_7	182	137.09±11.83	Pt_2	269	147.95±8.28 ^{d}
S_8	76	124.26±13.28	Pt_3	234	135.87±9.05 ^{cd}
S_9	356	115.38±13.77	Pt_4	201	125.87±9.60 ^{bc}
S_{10}	64	106.72±19.82	Pt_5	171	123.20±10.36 ^{abc}
S_{11}	12	108.64±28.22	Pt_6	146	118.38±11.14 ^{ab}
S_{12}	8	132.42±32.40	Pt_7	116	107.87±11.95 ^{a}
Period			Pt_8	85	116.64±13.04 ^{ab}
P_1	17	119.77±27.21 ^{bc}	Pt_9	58	123.92±14.72 ^{abc}
P_2	135	101.39±19.38 ^{a}	Pt_{10}	40	127.23±16.68 ^{bcd}
P_3	254	129.56±15.27 ^{bc}	**Level of inbreeding**		
P_4	260	128.90±12.36 ^{bc}	IL_1	1511	114.20±7.46 ^{a}
P_5	252	118.74±9.80 ^{b}	IL_2	136	147.36±11.74 ^{b}
P_6	293	131.54±7.54 ^{cd}			
P_7	274	171.55±8.13 ^{e}			
P_8	162	144.76±9.42 ^{d}			

a, b, c, d, e: 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 Dry Period.

Source of variation	d.f.	S.S.	M.S.	F
Sire	11	50318.62	4574.42	0.822
Period of calving	7	240103.32	34300.47	6.161**
Season of calving	3	142172.29	47390.76	8.513**
Parity	9	581410.61	64601.18	11.604**
Inbreeding	1	28406.69	28406.69	5.103*
Error	1615	8990826.36	5567.08	-

***** Significant (P< 0.05) ****** Significant (P< 0.01)

in performance (inbreeding depression) can be checked by avoidance of inbreeding in the herd. Therefore breeding bulls should be replaced every one or two years by bulls from other purebred herds of this breed so as to avert the ill effects of inbreeding.

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