EFFECT OF GENETIC AND NON-GENETIC SOURCES OF VARIATION ON SERVICE PERIOD IN GIR COWS

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ABSTRACT

Effects of Inbreeding, sire, period and season of calving and parity on service period (SP) were studied on Gir cows maintained at the Kasturba Gandhi National Memorial Trust Dairy Farm, Kasturbagram, Indore (M.P.). A total of 542 observations of SP on 191 cows were included in the study. The service period in these cows averaged 182.58±9.13 days and was significantly affected by inbreeding ($p<0.01$), parity ($p<0.05$) and season ($P<0.05$). The effects due to period and sire were non- significant. It was concluded that inbreeding had deteriorating effect on the service period and hence to reduce the service period in this herd inbreeding should be avoided by replacing the sires before their daughters attain sexual maturity.

KEY WORDS : Service period, Gir, inbreeding,

INTRODUCTION

The service period is the interval from calving to the next conception. It has obvious economic importance because a longer service period increases the calving interval, resulting in a reduced life time production. From economic point of view the management of service period assumes prime significance for profitable of dairy farming. The service period together with the gestation period constitute the calving interval. Thus, actually the service period determines the length of calving interval because the gestation period is the character which is relatively constant. Thus, by giving attention to this character and properly dealing with the factors affecting it the breeder can succeed in getting a calf a year. In India most of the cattle herds are small in size. In small size herds inbreeding is inevitable. There is paucity of information on the effect of inbreeding on economic traits in Indian breeds of cattle. Therefore, the present study was planned to assess the effect of inbreeding and some other factors on service period in Gir cows.

MATERIALS AND METHODS

The data included in the present study pertained to 542 observations of service period on 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 entire duration of 36 years was delineated into six periods of six years each while the year was divided into four seasons viz., spring (February - March), summer (April - June), rainy (July - September) and winter (October - January) considering the climatic conditions prevailing in the region. The inbreeding coefficient for each animal was calculated using path coefficient method (Wright, 1922). Since only source of inbreeding in the herd during the period under study was found to be daughter x sire mating, each inbred animal was having an inbreeding coefficient of 0.25. Therefore, on the basis of level of inbreeding the animals could be classified into two groups only viz., non-inbred (IL1) and inbred (IL2). 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 the level of inbreeding.

RESULTS AND DISCUSSION

A total of 542 observations included in the study were the records of service period on 191 cows. Out of 191 cows under study 38 were found to be inbred leading to 19.89 per cent incidence of inbreeding in the herd. The only source of inbreeding in the herd during the above period was daughter x sire mating which seems to be a consequence of using a sire for longer period as the number of sires used during the period of 36 years was only 14. Different incidences of inbreeding have been reported in various breeds and herds by different workers in India and abroad. Saha *et al.*, (2001) reported the incidence of inbreeding to be 21.0 and 36.2 per cent in herds of Karan Swiss and Karan Fries cattle, respectively. These differences in incidence of inbreeding among different herds might be due to differences in population size of breeding herds, structure of breeding population and in breeding practices.

Table1 : Least squares means and standard errors for service period in Gir cows

Effect	No. of observations	Mean±S.E. (days)	Effect	No. of observations	Mean±S.E. (days)
Overall mean (μ)	542	182.58±9.13	**Period**		
Sire			P_1 (1974-1979)	74	189.09±17.68
S_1	74	201.71±13.14	P_2 (1980-1985)	92	169.27±15.51
S_2	51	210.70±15.23	P_3 (1986-1991)	115	158.11±14.77
S_3	35	196.52±17.73	P_4 (1992-1997)	72	186.30±14.74
S_4	101	166.20±11.79	P_5 (1998-2003)	79	195.47±14.19
S_5	99	166.13±12.16	P_6 (2004-2009)	110	197.25±10.47
S_6	28	216.53±19.11	**Parity**		
S_7	23	228.63±21.53	Pt_1	191	211.56±8.82^{b}
S_8	34	195.23±17.98	Pt_2	145	177.84±10.03^{a}
S_9	24	147.43±21.98	Pt_3	93	173.78±13.22^{a}
S_{10}	31	186.65±19.47	Pt_4	68	175.22±14.89^{a}
S_{11}	9	132.57±34.97	Pt_5	45	174.51±17.37^{a}
S_{12}	17	160.42±27.90	**Season**		
S_{13}	8	170.72±37.70	S_1 (Spring)	135	195.75±11.71^{c}
S_{14}	8	176.72±36.41	S_2 (Summer)	103	194.73±12.58^{bc}
Inbreeding			S_3 (Rainy)	86	165.89±13.27^{a}
IL_1 (Non-inbred)	439	157.26±8.15^{a}	S_4 (Winter)	218	173.96±10.23^{ab}
IL_2 (Inbred)	103	207.91±13.23^{b}			

a, b, c: Least squares means for a particular class with at least one common alphabet as superscript donot differ significantly with each other

The overall least squares mean for service period was found to be 182.5±9.13 days which is more or less close to that reported by Barwe *et al*. (2002) in this breed. Higher mean service period have

been reported by Shrivastava *et al*. (2002) in Malvi and Tomar and Joshi (2008) in Kenkatha breed of cattle. The least squares analysis of variance revealed that inbreeding ($P < 0.01$), parity($P < 0.05$) and season of calving($P < 0.05$) influenced the service period significantly, while the effect of sire and period of calving on this trait were non-significant. Reports on the effect of sire on this trait in Gir bred do not appear to be readily available. However, our finding is in agreement with the finding of Sharma (2010) in Malvi breed. The non significant effect of period of calving on this trait in the present study is in consonance with the findings of Wagh *et al.* (1988) in Gir crosses. However, the significant period effect has been reported by Barwe *et al*. (2002) in Gir cows. Although, the effect of period on service period was non significant comparatively higher service period was observed from period 4 to period 6 which may be due to increase in number of inbred animals in the herd over these periods as well as due to the differences in managerial practices, climatic conditions, and other environmental factors operating in different periods.

Significant effect of season of calving on service period obtained in the present investigation is in agreement with the findings of Wagh *et al.* (1988) in Gir cows. However, contrary to present findings non significant season effect on this trait has been reported by Barwe *et al.* (2002) in this breed. The cows calving in rainy season (S3) had the lowest service period while spring (S1) and summer calvers (S2) had the longest service period. This could be attributed to the scarcity of green fodder and disturbed hormonal profile of cows due to heat stress in spring and summer leading to lengthening of service period.

Significant effect of parity on service period as obtained in present study align well with the findings of Barwe *et al.* (2002) in this breed. Duncan's multiple range test revealed (Table 1) that primipara had significantly longer service period as compared to pluriparous animals. This might probably be due to the fact that primipara have not yet attained maturity and, therefore, it takes longer time for the involution of uterus to sustain next pregnancy and hence longer service period in them (Barwe *et al*., 2002).

In present study inbreeding has been found to have adverse effects on service period as revealed by significantly longer service period in inbred cow as compared to non inbred cow (Table 1). This is in agrrement with the findings of Khanna *et al*. (1979) in Hariana, Beekett *et al*. (1979) in Holstein, Srinivas and Gurnani (1981) in Sahiwal, Singh and Gurnani (2003) in Karan Fries and Sharma (2010) in Malvi breed of cattle. These workers have also reported significantly longer service period in inbred/highly inbred as compared to non-inbred/ lowly inbred cows. Further, significant adverse effect of inbreeding has also been reported on breeding efficiency, a trait determined largely by service period in Malvi and Gir cows (Tomar *et al*., 2012 and Tomar *et al*., 2013). Significantly longer service period in inbred cows as compared to non-inbred cows corroborate the generally accepted view that reproductive traits are adversely affected by inbreeding due to loss of heterozygosity as these traits are mainly governed by non-additive gene action.

Table 2 : Least squares analysis of variance for service period in Gir cows

Source of variation		d.f.	S.S.	M.S. F
Sire	13	171135.15	13164.24	1.476
Period	5	62365.85	12473.17	1.399
Season	3	71736.37	23912.12	2.682 *
Parity	4	135473.09	33868.27	3.798 *
Inbreeding	1	153339.83	153339.83	17.196 **
Error	515	4592251.49	8916.10	-

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

From the above observations it could be concluded that inbreeding has deteriorating effect on the service period and hence it should be avoided. The sires should be replaced after every two years so that sire-daughter mating could be averted. Out crossing along with ameliorative managerial practices will lead to reduction in service period and the herd will attain optimum reproductive efficiency.

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