# EFFECT OF INBREEDING AND SOME OTHER FACTORS ON BREEDING EFFICIENCY IN GIR COWS

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## ABSTRACT

Effects of period and season of first calving, sire and inbreeding on breeding efficiency by Wilcox (BEW) and Tomar (BET) methods were studied on 188 *Gir* cows maintained at the Kasturba Gandhi National Memorial Trust Dairy farm, Kasturbagram, Indore (M.P.). The least squares means of BEW and BET were found to be 79.29±1.10 and 67.12±0.85 per cent, respectively. Significant effect of sire ($P<0.05$) and inbreeding ($P<0.01$) were found on both the breeding efficiencies while period and season had non-significant effect. Inbred cows had significantly lower breeding efficiency in comparison to non-inbred cows. From the observations it could be concluded that inbreeding had deteriorating effect on breeding efficiency.

**KEYWORDS** : *Gir* cattle, Inbreeding, breeding efficiency

## INTRODUCTION

Profitability of the dairying depends upon the efficient reproductive performance of the animals. In country like India where most of the herds of cattle are small in size, inbreeding is inevitable. Inbreeding tends to lower the reproductive efficiency of animals which is reflected as longer generation interval and thereby low genetic gain per year. Hence to make the dairy animals economical, it is imperative to improve the breeding efficiency. There appears no report on the effect of inbreeding on breeding efficiency in *Gir* cows. Therefore the present investigation was conducted to study the effect of sire, period, season and inbreeding on breeding efficiency in *Gir* breed of cattle.

## MATERIALS AND METHODS

The records of 188 *Gir* cows maintained at the Kasturba Gandhi National Memorial Trust Dairy farm, Kasturbagram, Indore (M.P.) covering a period of 36 years (1974-2009) were analysed. The breeding efficiency of each animal was calculated by two methods, one considering calving interval (Wilcox *et al*., 1957) and the other considering age at first calving and calving interval (Tomar, 1965). The calculated values of breeding efficiency in percentages were transformed using arcsine transformation for the purpose of analysis and observations were arranged according to the date of first calving. The entire duration of 36 years was delineated into six periods of six years each and the year was divided into four seasons viz., Spring (Feb-Mar), Summer (Apr-Jun), Rainy (Jul-Sept) and Winter (Oct-Jan) depending upon 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 viz., non-inbred ($IL_1$) and inbred ($IL_2$). The data were analysed by least squares technique using " Mixed Model Least Squares and Maximum Likelihood Computer Programme PC-2" (Harvey, 1990). The four way classification model was used for explaining variation in breeding efficiency by including inbreeding, period and season as fixed effects and the sire as random effect.

## RESULTS AND DISCUSSION

The least squares means for breeding efficieny by Tomar (BET) and by Wilcox (BEW) methods

were found to be 79.29±1.10 and 67.12± 0.85 per cent, respectively. The cows seem to have better breeding efficiency on an average on the basis of BEW in comparison to BET. This may be attributed to the fact that BEW takes into account the calving interval only while BET encompasses age at first calving and calving interval both and the studies on calving interval and age at first caving in this herd have revealed that the observed age at first calving (1787.46±36.11 days) was far above the ideal age at first calving (1020 days) as compared to the difference between observed calving interval (469.06±9.12 days) and the ideal (365 days) calving interval. The mean breeding efficiencies obtained in the present study are lower than the mean values reported by Barwe *et al*. (1998) and Bhadoria and Tomar (2002) in *Gir* cows.

**Table 1. Least squares means and standards errors for breeding efficiency**

| Subclass Description | Number of observations | Mean±S.E. (%) | |
|---|---|---|---|
| | | BEW | BET |
| Overall mean | 188 | 79.29±1.10 | 67.12±0.85 |
| **Sire** | | | |
| $S_1$ | 23 | 76.89±2.61$^{ab}$ | 61.32±1.63$^{a}$ |
| $S_2$ | 13 | 77.32±2.73$^{ab}$ | 65.71±3.71$^{abc}$ |
| $S_3$ | 9 | 79.21±3.13$^{b}$ | 62.33±2.91$^{a}$ |
| $S_4$ | 34 | 81.98±1.16$^{c}$ | 62.78±1.43$^{a}$ |
| $S_5$ | 36 | 80.92±1.14$^{bc}$ | 75.36±1.42$^{d}$ |
| $S_6$ | 9 | 73.72±1.92$^{a}$ | 62.41±3.93$^{a}$ |
| $S_7$ | 9 | 71.34±2.13$^{a}$ | 65.39±2.89$^{ab}$ |
| $S_8$ | 10 | 76.41±2.91$^{ab}$ | 72.27±2.82$^{d}$ |
| $S_9$ | 11 | 82.91±2.82$^{c}$ | 69.31±2.73$^{bc}$ |
| $S_{10}$ | 10 | 79.73±2.95$^{b}$ | 71.36±2.79$^{cd}$ |
| $S_{11}$ | 5 | 84.22±3.42$^{c}$ | 72.24±3.97$^{d}$ |
| $S_{12}$ | 9 | 83.16±3.11$^{c}$ | 64.52±3.93$^{ab}$ |
| $S_{13}$ | 5 | 82.18±3.39$^{c}$ | 70.38±4.98$^{cd}$ |
| $S_{14}$ | 5 | 80.17±3.41$^{bc}$ | 64.35±4.96$^{ab}$ |
| **Period** | | | |
| $P_1$ (1974-1979) | 39 | 81.70±3.93 | 67.62±2.76 |
| $P_2$ (1980-1985) | 32 | 82.81±3.97 | 69.21±2.82 |
| $P_3$ (1986-1991) | 34 | 81.67±2.96 | 68.35±2.81 |
| $P_4$ (1992-1997) | 28 | 77.21±4.32 | 67.21±3.91 |
| $P_5$ (1998-2003) | 32 | 76.03±2.98 | 65.22±2.87 |
| $P_6$ (2004-2009) | 23 | 76.33±2.45 | 65.13±3.94 |
| **Season** | | | |
| $S_1$ (spring) | 58 | 78.34±1.89 | 67.12±2.76 |
| $S_2$ (summer) | 37 | 77.21±3.42 | 69.13±3.92 |
| $S_3$ (rainy) | 31 | 81.25±3.61 | 67.11±4.34 |
| $S_4$ (winter) | 62 | 80.37±1.81 | 65.12±2.71 |
| **Inbreeding** | | | |
| $IL_1$ (non-inbred) | 151 | 83.78±1.98$^{b}$ | 71.18±1.42$^{b}$ |
| $IL_2$ (inbred) | 37 | 74.81±4.03$^{a}$ | 63.06±4.36$^{a}$ |

a, b, c : 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 BEW and BET (Mean squares only)

| Source of variation | d.f. | Mean Squares | |
|---|---|---|---|
| | | BEW | BET |
| Sire | 13 | 340.63* | 185.93* |
| Period | 5 | 314.74 | 107.63 |
| Season | 3 | 184.81 | 119.11 |
| Inbreeding | 1 | 1337.21** | 1927.19** |
| Error | 165 | 168.01 | 95.34 |

* P < 0.05 ** P<0.01

The analysis of variance revealed that sire has significant effect on both the breeding efficiencies (BET and BEW). The reports on the effect of sire on breeding efficiency in cattle do not appear to be readily available. In the present study period had non-significant effect on both BEW and BET. However, Gandhi and Gurnani (1990) and Pundhir (1994) in *Sahiwal*, Barwe *et al.* (1998) and Bhadoria and Tomar (2002) in *Gir* and Tomar *et al*. (2011) in *Malvi* cows have reported significant effect of period on breeding efficiency. The effect of season on breeding efficiency (BEW and BET) was also found to be non significant. This finding is in congruence with the findings of Pundhir (1994) in *Sahiwal*, Barwe *et al*. (1998) and Bhadoria and Tomar (2002) in *Gir* and Tomar *et al.* (2011) in *Malvi* cattle. However, contrary to our findings Gandhi and Gurnani (1990) in *Sahiwal* cows have reported significant effect of season on breeding efiiciency. The effect of inbreeding on both the breeding efficiencies in the present study was found to be significant (P<0.01). Inbred cows have significantly lower breeding efficiency than the non-inbred cows. There appears no report on the effect of inbreeding on BEW and BET in *Gir* breed of cattle. However, present findings are in agreement with the results of our previous findings in *Malvi* cattle (Tomar *et al*. , 2011) where inbreeding had significant and deteriorating effect on breeding efficiency. From the observations it could be concluded that inbreeding has adverse effect on breeding efficiency which in turn is reflected as delayed age at puberty, higher age at first calving and longer inter-calving period.

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