



## Genetic analysis of first dry period and lifetime performance in Haryana cattle

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Milk yield is the single most important economic trait determining economic returns from the dairy animals (Patil *et al.* 2012). The indigenous cattle are of primary concern because of their disease resistance ability to many diseases, capability to produce more milk with little care and ultimately they are compatible with the Indian conditions of varying climate. The objective of cattle breeding in India is to increase production and productivity with simultaneously maintaining diversity. Among indigenous cattle breeds, Haryana is the well-known dual-purpose indigenous breed of Haryana state. It is one of the major dual-purpose breeds originally developed and reared in the north-west part of India. Lifetime performance of the dairy cattle determines the profitability of dairy enterprise because the overall productivity of dairy animals depends on their lifetime performance rather than single lactation performance. Dry period (DP) is an important economic trait which has the direct effect on lifetime milk production (Kumar 2015). Decrease in age at first calving decreases the cost of raising the animals to productive life, increases the annual genetic gain and raises the average productive life of the animal (Kumar *et al.* 2015). Improvement of fertility in lactating animals has become the key objective for selection programs in recent years in most countries (Patil *et al.* 2011). Evaluation of production potential of the dairy animals has always remained the main aim of the breeders and it is a challenge to increase production performance of our native cattle. Hence this investigation was done to study first dry period and lifetime performance traits in Haryana cattle.

*Source of data:* In the present study the breeding information of Haryana cattle maintained at DUVASU farm, Mathura and Babugarh farm, Hapur were used. The data of productive animals with date of birth from 1962 to 2013 were collected. To ensure the normal distribution, the

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outliers were removed and data within the range of mean  $\pm$  3SD were considered for the study.

*Least-squares analysis for adjustment of data:* The non-genetic factors such as period of calving/birth, season of calving/birth, AFC age group and farms on various traits were studied by least-squares analysis (mixed model least-squares and maximum likelihood computer program) using the technique suggested by Harvey (1987).

*The model used was as follows:*

First dry period:

$$Y_{ijklm} = \mu + P_i + S_j + A_k + F_l + e_{ijklm}$$

where  $Y_{ijklm}$ ,  $m^{\text{th}}$  observation in  $l^{\text{th}}$  farm,  $k^{\text{th}}$  AFC age group,  $j^{\text{th}}$  season of calving and  $i^{\text{th}}$  period of calving;  $\mu$ , overall mean;  $P_i$ , effect of  $i^{\text{th}}$  period of calving ( $i = 1$  to 6);  $S_j$ , effect of  $j^{\text{th}}$  season of calving ( $j = 1$  to 4);  $A_k$ , effect of  $k^{\text{th}}$  AFC age group ( $k = 1$  to 2);  $F_l$ , effect of  $l^{\text{th}}$  farm ( $l = 1$  to 2);  $e_{ijklm}$ , random error, NID ( $0, \sigma_e^2$ )

Lifetime traits:

$$Y_{ijklm} = \mu + P_i + S_j + A_k + F_l + e_{ijklm}$$

where  $Y_{ijklm}$ ,  $m^{\text{th}}$  observation in  $l^{\text{th}}$  farm, AFC  $k^{\text{th}}$  age group,  $j^{\text{th}}$  season of birth and  $i^{\text{th}}$  period of birth;  $\mu$ , overall mean;  $P_i$ , effect of  $i^{\text{th}}$  period of birth ( $i = 1$  to 5);  $S_j$ , effect of  $j^{\text{th}}$  season of birth ( $j = 1$  to 4);  $A_k$ , effect of  $k^{\text{th}}$  AFC age group ( $k = 1$  to 2);  $F_l$ , effect of  $l^{\text{th}}$  farm ( $l = 1$  to 2);  $e_{ijklm}$ , random error, NID ( $0, \sigma_e^2$ )

*Mean comparison:* Least-squares mean were compared using Duncan's multiple range test (DMRT) as modified by Kramer (1957).

The overall least-squares mean for first dry period (FDP) was estimated as  $198.8 \pm 6.1$  days. Farm, season of calving and period of calving had significant effect on first dry period. Singh (2001) observed similar estimates for first dry period with significant effect of period of calving. Singh (2002) observed similar estimates with significant effect of AFC age group and period of calving. Kumar *et al.* (2005) observed similar estimates for FDP. Kumar (2009) observed similar estimates with significant effect of farm and non-

significant effect of season of calving. Kaushik (2000) observed higher estimates with significant effect of season of calving and non-significant effect in AFC age group. Pandey *et al.* (2001) observed higher estimates for first dry period. Dahiya (2002) observed higher estimates with significant effect of farm, AFC age group, period of calving and season of calving. Swami *et al.* (2005) observed lower estimates for first dry period. Kumar (2006) observed higher estimates with significant effect of farm and non-significant effect of AFC age group, period of calving and season of calving.

The overall least-squares mean for lifetime 2 milk yield (LT2MY) was estimated as 1802.8±42.3 litres and only period of birth had significant effect on LT2MY. Dash *et al.* (2018) observed higher estimates with significant effect in period of birth in Karan Fries cattle. The overall least-squares mean for lifetime 3 milk yield (LT3MY) was estimated as 2797.0±68.6 litres, season of birth and period of birth had significant effect on LT3MY. Ambhore *et al.* (2017) observed higher estimates in Phule Triveni cattle with significant effects in period of birth and age groups. Dash *et al.* (2018) observed higher estimates with significant effect in period of birth in Karan Fries cattle. The overall least-squares mean for lifetime 4 milk yield (LT4MY) was estimated as 3886.6±100.3 litres, season of birth and period of birth had significant effect on LT4MY. Ambhore *et al.* (2017) observed higher estimates in Phule Triveni cattle and had significant effects in period of birth and age groups. Dash *et al.* (2018) observed higher estimates with significant effect only in genetic groups of Karan Fries cattle. The overall least-squares means for lifetime 5 milk yield (LT5MY) was estimated as 4984.9±141.9 litres. Season and period of birth had significant effect on LT5MY. Dash *et al.* (2018) observed higher estimates for LT5MY with significant effects in season of birth and period of births in Karan Fries cattle.

The overall least-squares mean for actual lifetime milk yield (ALT) was estimated as 4598.3±144.7 litres. AFC, farm and period of birth had significant effect on actual lifetime milk yield. Doharey (2012) had observed lower estimates than the present study with significant effect of farm. Singh and Singh (2016) observed higher estimates for ALT in Sahiwal cattle. Ankuya *et al.* (2017) observed higher estimates for ALT in Kankrej cattle. Ambhore *et al.* (2017) observed higher estimates for ALT in Phule Triveni cattle and had significant effects in period of birth. Effa *et al.* (2013) had observed higher estimates for ALT in Boran crossbred cows.

Dash *et al.* (2018) had observed higher estimates for ALT with observed significant effect in period of birth of Karan Fries cattle. Lodhi *et al.* (2016) had observed higher estimates for ALT in crossbred cattle. Vinothraj *et al.* (2016) had observed lower estimates in Jersey × Red Sindhi crossbred cows. Kumar (2007) had reported higher actual lifetime milk yield in Sahiwal cattle. Kathiravan (2009) reported higher estimates for ALT in Sahiwal cattle. Thiruvankadan *et al.* (2015) had observed higher estimates

for ALT in Murrah buffalo. Dev *et al.* (2016) had observed higher estimates for ALT in Murrah buffalo and the effect of period, season of calving and age at first calving was statistically non-significant.

#### SUMMARY

The present study was aimed to study lifetime milk production of Haryana cattle in organized farms. The non-genetic factors such as period of calving/birth, season of calving/birth, AFC age group and farms on these traits were studied by least-squares analysis and the means were compared using Duncan's multiple range test. The least-squares means for first dry period, lifetime 2 milk yield, lifetime 3 milk yield, lifetime 4 milk yield, lifetime 5 milk yield and actual lifetime milk yield were estimated as 198.8±6.1 days, 1802.8±42.3 litres, 2797.0±68.6 litres, 3886.6±100.3 litres, 4984.9±141.9 litres and 4598.3±144.7 litres respectively. Farm, season of calving and period of calving had significant effect on first dry period. Farm and AFC class had significant effect on actual lifetime milk yield. Period of birth had significant effect on lifetime 2 milk yield, lifetime 3 milk yield, lifetime 4 milk yield, lifetime 5 milk yield and actual lifetime milk yield. Season of birth had significant effect on lifetime 3 milk yield, lifetime 4 milk yield and lifetime 5 milk yield. The autumn season born animals had lowest first dry period and highest lifetime 2 milk yield, lifetime 3 milk yield, lifetime 4 milk yield, lifetime 5 milk yield and actual lifetime milk yield.

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