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EFFECT OF SOME NON-GENETIC FACTORS ON PRODUCTIVE AND REPRODUCTIVE TRAITS OF MEHSANA BUFFALOES

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ABSTRACT

The records of 7782 Mehsana buffaloes sired by 184 sires maintained at Dudhsagar Research and Development Association (DURDA), Dudhsagar Dairy, Mehsana, Gujarat born during 1989 to 2012 were collected and analysed to examine the effect of non-genetic factors *viz*. period and season of calving and age at first calving. The least squares analysis was used for estimation of various non-genetic factors on First Lactation Milk Yield (FLMY), First Lactation Fat Yield (FLFY), Average Fat Percentage (AFP) and Age at First Calving (AFC). The least squares mean with standard error of FLMY, FLMY, AFP and AFC were estimated to be 1900.68±7.65 lit., 135.04±0.57 kg, 7.11±0.11 percentage and 1407.18±4.36 days, respectively. Highly significant (P≤0.01) effect of all the non-genetic factors (period and season of calving and age at first alving group) under study was observed on FLMY, FLMY and AFP in Mehsana buffaloes. Further, highly significant (P≤0.01) effect of season and period of birth was recorded on AFC. It is worthy to note that in Mehsana breed evaluation programme these factors should be considered as they have great influence of them.

Keywords: *Bubalus bubalis*, buffaloes, age at first calving, average fat percentage, first lactation fat yield, first lactation milk yield, Mehsana buffalo, non-genetic factors

INTRODUCTION

Buffalo is the backbone of the Indian dairy industry. India is the treasure house of world's best buffalo germplasm with the population of about 108.7 million, which is about 57.3% of total buffalo population of the world (19th Livestock Census Anonymous, 2012). Today, the average per capita availability of milk in India has reached 375 gram/day. In India, buffaloes are important source of milk supply and yield nearly three times as much milk as compare to cow's milk (Animal Husbandry, 2014). The small farm holders generally prefer to raise buffaloes because of its milk production,

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draught power, manure as fertilizer for crop fields etc. Gujarat is the 4th largest milk producing state in India, contributing around 7.99% (11.69 million tons) of the total milk production of the country (NDDB, 2017). The population of Mehsana buffalo is 3.6 million, which share 3.33% with respect to total buffalo population in India (DAHD, 2013).

Milk Yield and fat percentage are the most important economic trait determining economic returns to the dairy farmers and is influenced by several factors. Age at first calving is one of essential traits for bringing improvement in milk production. It considerably affects the productive life of an animal and the number of calves obtained during the life time of that animal. Non-genetic factors tend to suppress or inhibit the expressivity of the true genetic ability of the animals in various ratios according to climatic conditions. Hence, to find out the true genetic ability of the animals it is essential to estimate the contribution of environmental factors in milk production in the model. Study of these non-genetic factors will help breeder to prepare breeding protocol as to enhance the milk production as well other economic traits. Knowledge of the various climatic factors affecting the production performance of these animals shall go a long way in improving the overall productivity of the animals and shall result in better genetic gain. Keeping all this in mind, the present investigation was carried out to know the effect of various non-genetic factors on First Lactation Milk Yield (FLMY), First Lactation Fat Yield (FLFY), Average Fat Percentage (AFP) and Age at First Calving (AFC) in Mehsana buffaloes.

MATERIALS AND METHODS

Data of first lactation production records pertaining to 7782 Mehsana buffaloes sired by 184 bulls spread over a period of 24 years from 1989 to 2012 were collected from the Dudhsagar Research and Development Association (DURDA), Dudhsagar Dairy, Mehsana, Gujarat. Considering the contiguous years to have more or less similar effect, the entire data was grouped into the four periods. The year was classified into 2 seasons (Breeding season-1, January to June and Breeding season-2, July to December). Age at first calving was classified (using Sturges' rule) into 3 groups AFC_1 (677 to 1100), AFC_2 (1101 to 1680) and AFC_3 (1681 to 2555).

The effect of non-genetic factors for all traits were estimated using least-squares analysis of variance (Harvey 1990) as per the model,

$$Y_{ijkl} = \mu + A_i + B_j + C_k + e_{ijkl}$$

Where, Y_{ijkl}, is the observations of buffalo calved in i^{th} period, j^{th} season and k^{th} age group of first calving. Here, i varies from 1 to 4, j varies from 1 to 2 and k from 1 to 3. μ is the population mean and e_{ijkl}, random error, assumed to be normally and independently distributed with zero mean and constant variance, *i.e.* (NID, 0, σ2).The difference of means between any two subclasses of period, season and age at first calving group was tested for significance using Duncan's Multiple Range Test (DMRT) as modified by Kramer (1957).

RESULTS AND DISCUSSIONS

The least squares mean for first lactation milk yield was found to be 1900.68±7.65 litre with the coefficient of variation of 23.7% (Table 1). The FLMY in the present study was in agreement with those reported by Prajapati *et al.* (2018) in Mehsana

buffaloes. However, the present finding of FLMY was lower than those reported by Chaudhari (2016) in Mehsana buffaloes. Further, the estimate obtained in present study was lower than those obtained by Chitra *et al.* (2016); Jakhar *et al*. (2016); Verma *et al.* (2017) in Murrah buffaloes. The results of analysis of variance showed that period of the calving, season of calving and age at first calving had highly significant (P≤0.01) effect on FLMY in the present investigation. The means comparison of FLMY by Duncan's Multiple Range Test (DMRT) inferred that the FLMY for the animals born in P_1 and P_2 as well as P_1 and P_3 did not differ significantly. FLMY was found to be significantly higher in January to June (S_1) in comparison of July to December (S_2) season. Similar significant effects of period and season of calving were also observed by Chaudhari (2016); Prajapati *et al.* (2018) in Mehsana buffaloes; Chitra *et al*. (2016); Verma *et al.* (2017); Jakhar *et al.* (2017) in Murrah buffaloes and by Bharat *et al*. (2004) in Surti buffaloes. Prajapati *et al.* (2018) reported significant effect of AFC group on FLMY in Mehsana. Furthermore, Dev *et al.* (2015); Pandey *et al.* (2015) obtained non-significant effect of age at first calving group on FLMY in Murrah buffaloes.

The first lactation fat yield in Mehsana buffaloes was estimated as 135.04±0.57 kg with the coefficient of variation of 24.8 % (Table 1). The present finding of FLFY was in agreement with those reported by Yadav *et al*. (2013); Oliveira *et al*. (2014) in Murrah buffaloes. However, contradictory to present finding lower estimate of FLFY was reported by Kumar *et al*. (2016) in Murrah buffaloes. The present finding of highly significant (P≤0.01) effect of period and season of calving on FLFY was in equivalence with those reported by Kumar *et al.* (2016) in Murrah buffaloes and El-Bramony (2017) in Egyptian buffaloes. The present finding of highly significant (P≤0.01) effect of age at first calving group on FLFY was in equivalence with those reported by El-Bramony *et al*. (2010); El-Bramony (2017) in Egyptian buffaloes.

The overall average fat percentage in Mehsana buffaloes was estimated as 7.11±0.11 (%). The coefficient of variation of overall average fat percentage was observed as 9.0% in Mehsana buffaloes (Table 1). The present estimate of AFP was lower than those obtained by Annual Progress Report (2015) in Mehsana and Banni buffaloes, Verma *et al.* (2017) in Murrah buffaloes. Contradictory, to the present finding estimates of average fat percentage was much higher than those reported by Barros *et al*. (2016) in Murrah buffaloes and by Verma *et al.* (2016) in Sahiwal cattle. The analysis of variance revealed highly significant (P≤0.01) effect of period and season of calving on average fat percentage. The present findings are in agreement with that of Yadav *et al.* (2013); Verma *et al.* (2017), who reported highly significant effect of the period and season of calving in Murrah buffaloes. The age at first calving group had highly significant effects on average fat percentage in the present study. The AFP was estimated to be A_1 group which was 7.26±0.19 (%).

A reduction in AFC is desirable for economizing milk production cost. It also reduces the generation interval and thereby increases genetic gain. The overall least squares mean for AFC in the present study was estimated to be 1407.18±4.36 days (Table 1). The present estimate of AFC in Mehsana buffaloes was close to those reported previously by Charlini and Sinniah (2015) in Surti buffaloes. Whereas, it was lower than the values reported by Galsar *et al.* (2016) in Mehsana buffaloes. On other hand, the LSM for AFC in the current study was higher than those reported by Prajapati *et al.* (2018); Parmar *et al.* (2019) Mehsana

Table 1. Least squares means ± SE and coefficient of variations for various first production and fertility traits.

Traits	FLMY (lit.)	FLFY (kg)	AFP (%)	AFC (days)
μ	1900.68±7.65 (23.7,7782)	135.04±0.57 (24.8,7782)	7.11±0.11 (9.0,7782)	1407.18±4.36 (20.9,7782)
Period	**	**	**	**
1	1878.80 ± 12.60^{bc} (21.8,1576)	131.31 ± 0.93^{a} (22.4,1576)	7.00 ± 0.18^{b} (8.1, 1576)	1392.08 ± 7.29^{a} (23.2, 1854)
2	1899.11 ± 12.00^{b} (22.9,1677)	135.56 ± 0.89^{b} (23.8,1677)	7.15 ± 0.17^{a} (8.9, 1677)	1435.66 ± 7.58^{b} (20.4, 1688)
3	1853.85 ± 10.34^{c} (24.7,2683)	132.19 ± 0.77^{a} (26.0,2683)	7.13 ± 0.15^{a} (8.9,2683)	1411.06 ± 6.23^{c} (20.8,2742)
4	1970.97 ± 11.68^{a} (24.1,1846)	141.07 ± 0.87^{c} (25.4,1846)	7.17 ± 0.16^{a} (9.8, 1846)	1389.90 ± 7.91^{a} (18.0, 1498)
Season	**	**	**	**
1	1962.68 ± 12.57^{a} (24.1,1362)	138.94 ± 0.93^{a} (24.8,1362)a	7.09 ± 0.18^{a} (9.3, 1362)	1431.35 ± 7.85^{a} (20.3, 1362)
2	1838.68 ± 6.70^{b} (23.5,6420)	131.13 ± 0.49^{b} (24.7,6420)	7.14 ± 0.97^{b} (9.0,6420)	1383.01 ± 3.69^{b} (20.9,6420)
AFC Group	**	**	**	
1	1904.77 ± 13.45^{ab} (22.8,1230)	137.91 ± 1.00^{a} (24.2,1230)	7.26 ± 0.19^{a} (9.4,1230)	-
2	1923.46 ± 7.41^{a} (23.9,5344)	136.75 ± 0.55^{a} (24.9,5344)	7.12 ± 0.10^{b} (8.9,5344)	-
3	1873.82 ± 13.33^{b} (23.9,1208)	130.45 ± 0.99^{b} (25.0,1208)	6.97 ± 0.19^{c} (8.9,1208)	-

Figures within parentheses are the coefficient of variation and number of observations, ** = $P \leq 0.01$; * = $P \leq 0.05$; NS: non-significant, Superscripts may be read column wise for each effect for mean comparison. Similar superscript shows that the means do not differ significantly.

buffaloes. The analysis of variance revealed highly significant (P≤0.01) effect of period and season of birth on AFC. The present findings of significant effect of period and season of birth on AFC is similar with those reported by Prajapati *et al.* (2018); Parmar *et al.* (2019) in Mehsana buffaloes; Jamal *et al.* (2017) in Murrah buffaloes; and by Pawar *et al.* (2017) in Surti buffaloes.

CONCLUSION

From the findings of the above study, it can be concluded that the effect of period and season of birth on age at first calving and season and period of calving and age at first calving group on the production traits suggested that traits should be adjusted for non-genetic factors. Milk production with significant up and down during various period indicative of better environment can give better production and good economic return. Furthermore, reduction in AFC is desirable for reducing rearing cost of heifer and for economizing milk production cost.

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