



Effect of Parity, Period and Season of Calving on Production and Reproduction Traits on Deoni Cattle

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Abstract | A total of 710 lactation records of 274 Deoni cattle, maintained at ICAR-National Dairy Research Institute, Southern Campus, Bangalore were used to study the effect of non-genetic factors on production and reproduction traits. Lactation records of Deoni cows were classified into five parity (1, 2, 3, 4 and ≥ 5), six period of two years interval (2002 to 2013) and three seasons i.e., winter (November - February), summer (March - June) and rainy (July - October). Statistical analysis was performed by using SPSS 16.0 software for Windows. On analysis, overall mean lactation milk yield, lactation length, service period and calving interval were estimated as 819.98 ± 16.5 kg, 195.23 ± 2.62 , 158.78 ± 3.5 and 445.97 ± 3.67 days, respectively. Effect of parity and period on lactation milk yield and length was found to be highly significant ($P < 0.01$). Significant influence ($P < 0.01$) of period was observed on service period and calving interval of the cattle. Lactation milk yield of Deoni cattle was significantly influenced ($P < 0.05$) by season of calving. Effect of season on lactation length, service period and calving interval was found to be non-significant, however on lactation milk yield it was found to be significant ($P < 0.05$). Thus, present study concludes the significant influence of parity, period and season of calving on lactation milk yield that would be helpful for estimation of genetic parameters and further improvement of the breed.

Keywords | Deoni, Non genetic factors, Production traits, Reproduction traits

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INTRODUCTION

Deoni is one of the dual purpose cattle genetic resources among the forty one descriptive breeds of India. Deoni Improvement Centre (DIC) was established in the year 2002 for genetic improvement of the breed at Southern Regional Station, ICAR-NDRI, Bangalore. The Deoni cattle are being maintained under semi-intensive management system since introduction in the farm from its home tract (Das et al., 2011). Deoni, is a medium to heavy sized cattle which is found in three colour variations i.e., balankya (clear white colour body), wannera (clear white with black colour at both the sides of the face) and shevera (white body with irregular black spots). Cows of Deoni breed have a milk yield of 868.24 ± 49.56 kg per lactation. Deoni bullocks are also very good for drought purpose.

They are suitable for heavy work and intensive cultivation as well (Singh et al., 2002).

Variations on productive and reproductive performances of cattle depend on the genotype of the animal and environment. Influence of non-genetic factors confers the environmental deviation of the performances from its mean value. Therefore, genetic merit of the cattle can be estimated by minimizing environmental influences. Various non-genetic factors like, period, parity and period of calving influence the productive (lactation milk yield) and reproductive performances i.e., service period and calving interval of indigenous dairy cattle (Nagpal and Acharya, 1971; Dhumal et al., 1993; Gandhi et al., 1995; Kumar et al., 2003; Dhaware et al., 2008). It is necessary to assess the effects of non-genetic factors i.e., parity, period of calving

and season of birth on these traits. Therefore, in current study the effects of non-genetic factors including parity, period of calving and season of birth was explored on the reproduction and production traits of Deoni cattle.

MATERIALS AND METHODS

The data of 710 lactation record of 274 Deoni cattle (Figure 1) maintained at National Dairy Research Institute, Southern campus, Bangalore calved between the year 2002 to 2013 were used for the present study. The production traits i.e., total lactation milk yield, lactation length and reproductive traits i.e., service period and calving interval were studied. Records of the productive and reproductive traits were classified on the basis of five classes of parity, six classes of period and three classes of season of calving of the cattle. First parity to fourth parity of the cows was taken as four distinct classes and more than fourth parity as separate class. Classes of period of calving were taken as two years interval i.e., period I (2002-03), period II (2004-05), period III (2006-07), period IV (2008-09), period V (2010-2011) and period VI (2012-2013). Season of calving were divided into three classes as, winter (November-February), summer (March-June) and monsoon (July-October). Animals having incomplete records due to abortion and still birth were excluded from the study. The data were standardized by taking the records of the performances within the range of two Standard deviation from the mean value. Least squares analysis technique (Harvey, 1966) were used for non-orthogonal data to find the effect of parity, period and season of calving on lactation milk yield (LMY), lactation length (LL), service period (SP) and calving interval (CI) of the cattle as per the following formula,

$$Y_{ij} = \mu + F_i + e_{ij}$$

Where, Y_{ij} = Performance record (LMY, LL, SP and CI) of the j^{th} cow under i^{th} subclass of the non-genetic factor

μ = overall population mean

F_i = i^{th} subclass of the non-genetic factor

($i = 1, 2, 3, 4$ and ≥ 5 for Parity)

$i = 1, 2, 3, 4, 5$ and 6 for period of calving and

$i = 1, 2$ and 3 for season of calving)

e_{ij} = Random error which is normally independently distributed ($0, \sigma_e^2$)

Pairwise comparison of the least squares means was analysed by Duncan's Multiple Range Test (DMRT), as modified by Kramer (1957) using SPSS 16.0 software.

RESULTS AND DISCUSSION

In the present study, overall mean lactation milk yield and lactation length was estimated as 819.98 ± 16.50 kg

and 195.23 ± 2.62 days respectively (Table 1). Das et al. (2011) and Chakravarthi et al. (2002) reported lower lactation milk yield and lactation length as 779.27 ± 18.31 and 238.86 ± 76 kg and 186.61 ± 3.02 and 149.43 ± 33.52 days than the present study in Deoni cattle. Records of higher lactation milk yield and lactation length were reported by Deshpande and Singh (1977^a and 1977^b) and Singh et al. (2002) as 942.7 ± 16.6 and 868.24 ± 49.56 kg and 293.3 ± 2.9 days, respectively in Deoni cattle. Bhutkar et al. (2014) reported lower least square mean of lactation milk yield as 358.31 ± 27.18 kg and higher lactation period 213.90 ± 13.74 days in Deoni cattle than the present study. Estimated overall mean service period of Deoni cattle was 158.78 ± 3.50 days which was similar to the reports of Chakravarthi et al. (2002) as 152.14 ± 15.08 days. However, the estimated overall mean service period of Deoni cattle was lower than the previous reports of 184.2 ± 4.6 and 170 ± 7.0 days reported by Deshpande and Singh (1977^c) and Singh et al. (2002), respectively. Estimated overall mean calving interval of Deoni cattle was 445.97 ± 3.67 days which was with the agreement of Singh et al. (2002), Chakravarthi et al. (2002) and Das et al. (2011) as 447.0 ± 8.0 , 452.55 ± 19.88 and 447.22 ± 6.64 days, respectively. However in Deoni cattle Deshpande and Singh (1977^c) reported higher overall mean calving interval of 466.0 ± 4.6 days than the present finding on Deoni cattle.



Figure 1: Photograph of Deoni cattle maintained at National Dairy Research Institute, Southern campus, Bangalore.

Lactation milk yield and lactation length of Deoni cattle were highly influenced ($P < 0.01$) by parity of the cows whereas, effect on service period and calving interval were non-significant (Table 2). In Ongole cattle, Kumar et al. (2003) reported significant effect of parity on lactation milk yield and service period. In the same study, effect of parity on lactation length and calving interval were non-significant. Reports of Dhumal et al. (1993) revealed that effect of parity on lactation milk yield and lactation length of Deoni cattle was non-significant.

Statistically distinct groups of lactation milk yield, lactation length, service period and calving interval were found on parity basis in the studied population. Maximum lactat-

Table 1: Least squares means \pm standard error for lactation milk yield, lactation length, service period and calving interval in Deoni cattle

Subclass	LMY	n	LL	n	SP	n	CI	n
Overall	819.98 \pm 16.50	710	195.23 \pm 2.63	710	158.78 \pm 3.50	547	445.97 \pm 3.67	519
Parity								
1	671.25 \pm 27.30 ^a	231	184.77 \pm 4.65 ^a	231	171.64 \pm 6.11 ^b	187	457.28 \pm 6.23 ^b	183
2	794.72 \pm 30.63 ^b	190	189.85 \pm 5.01 ^{ab}	190	153.03 \pm 6.28 ^{ab}	153	439.83 \pm 7.0 ^{ab}	135
3	894.23 \pm 37.45 ^{bc}	125	201.75 \pm 6.3 ^{abc}	125	155.75 \pm 8.89 ^{ab}	92	444.66 \pm 9.3 ^{ab}	88
4	977.62 \pm 49.93 ^{cd}	75	204.09 \pm 7.40 ^{bc}	75	153.94 \pm 10.5 ^{ab}	62	442.9 \pm 11.1 ^{ab}	60
≥ 5	1022.84 \pm 46.28 ^d	89	217.24 \pm 7.26 ^c	89	140.98 \pm 10.4 ^a	53	428.23 \pm 10.5 ^a	53
Period								
I	814.17 \pm 28.39 ^b	120	198.21 \pm 4.98 ^b	120	138.75 \pm 7.43 ^a	112	423.40 \pm 7.41	112
II	823.72 \pm 25.37 ^b	192	187.02 \pm 4.37 ^{ab}	192	150.33 \pm 6.37 ^{ab}	161	437.46 \pm 6.39	161
III	842.50 ^b \pm 32.05 ^c	138	199.21 \pm 5.79 ^b	138	170.49 \pm 9.24 ^{bc}	89	457.48 \pm 9.36	89
IV	962.28 \pm 52.76 ^c	106	222.27 \pm 8.10 ^c	106	175.84 \pm 9.03 ^{bc}	77	461.74 \pm 9.06	77
V	735.45 \pm 54.57 ^{ab}	110	183.25 \pm 7.52 ^{ab}	110	182.70 \pm 9.73 ^c	77	469.00 \pm 9.91	76
VI	621.71 \pm 74.87 ^a	45	175.60 \pm 11.03 ^a	45	139.65 \pm 8.99 ^a	31	422.75 \pm 30.08	4
Season								
Winter	869.10 \pm 29.01 ^b	252	200.58 \pm 4.58	252	161.31 \pm 6.62	182	449.45 \pm 6.75	179
Summer	763.63 \pm 27.68 ^a	242	190.55 \pm 4.46	242	163.32 \pm 5.57	186	450.05 \pm 5.71	180
Monsoon	825.75 \pm 28.40 ^{ab}	217	194.22 \pm 4.54	217	151.50 \pm 5.95	179	437.48 \pm 6.57	160

LMY: Lactation milk yield, LL: lactation length, SP: Service period, CI: Calving interval and n: Number of observation

ion milk yield (1022.84 \pm 46.84 kg) and lactation length (217.24 \pm 7.26 days) and lowest service period (140.98 \pm 10.40 days) and calving interval (428.23 \pm 10.47 days) were observed from the fifth and above parity. However, minimum lactation milk yield (671.25 \pm 27.30 kg) and lactation length (184.77 \pm 4.65 days) and highest service period (171.64 \pm 6.11 days) and calving interval (457.28 \pm 6.23 days) were found in first lactation. This might be due to delayed maturity and higher selection towards the productive and reproductive performances at the stage of five and above lactation of the cattle.

Table 2: Analysis of variance for lactation milk yield, lactation length, service period and calving interval in Deoni cattle

Traits	Mean sum of squares (degree of freedom)		
	Parity	Period	Season
Lactation milk yield	28,61,654.8** (4)	9,55,628.3** (5)	6,91,766.0* (2)
Lactation length	21,271.1** (4)	25,369.0** (5)	6,371.3 (2)
Service period	13,765.99 (4)	29,295.8** (5)	7,245.5 (2)
Calving interval	11,477.1 (4)	28,423.5** (5)	8,344.8 (2)

**Significant at P<0.01 and *Significant at P<0.05

Effect of period of calving on lactation milk yield, lactation length, service period and calving interval were found to be highly significant (P<0.01). Similar agreement was observed by [Dhumal et al. \(1993\)](#) in Deoni cattle, [Kumar et al. \(2003\)](#) in Ongole cattle and [Dhaware et al. \(2008\)](#) in Khillar cattle. [Basu et al. \(1982\)](#) in Tharparkar cattle and [Gandhi et al. \(1995\)](#) in Sahiwal cattle reported effect of period on calving interval was non-significant.

The lactation milk yield (962.28 \pm 52.76 kg) and lactation length (222.27 \pm 8.10 days) were observed to be maximum in the cows, which calved in the period IV (2008-09) whereas, the lactation milk yield (621.71 \pm 74.87 kg) and lactation length (175.60 \pm 11.03 days) were minimum in the cows calved during period IV. This could be due to better combination of the genotypes in the cows at the period IV for lactation milk yield and lactation length among the studied population.

However, season of calving showed significant influence (P<0.05) on lactation milk yield of Deoni cattle. Effect of season of calving on lactation length, service period and calving interval were found to be non-significant. Similar effect of season of calving was reported in Ongole cattle ([Kumar et al., 2003](#)) and Khillar cattle ([Dhaware et al., 2008](#)) on lactation milk yield, service period and calving interval. [Dhumal et al. \(1993\)](#) reported that effect of season of calving on lactation milk yield and lactation length was

non-significant in Deoni cattle. The cows calved in winter season (869.10 ± 29.01 kg) produced higher lactation milk yield than in summer season (763.63 ± 27.68 kg). This could be due to availability of sufficient good quality fodder resources.

CONCLUSION

The present investigation was focused on the effect of non-genetic factors on production and reproduction performances of Deoni cattle. Significant influence of parity, period and season of calving on lactation milk yield would be helpful for estimation of genetic parameters and further improvement of the breed.

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CONFLICT OF INTEREST

There are no conflict of interest.

AUTHORS CONTRIBUTION

The present paper is part of MVSc study of Dr. Sukanta Basak. Whereas Dr. Dayal Nitai Das worked as supervisor of MVSc scholar.

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