



**RESEARCH ARTICLE :** **Effect of non-genetic factors on production traits in Deoni cows**

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**SUMMARY :** The research was conducted to evaluate the effect of non - genetic factors on production traits in Deoni cattle. Data representing 171 Deoni cows from 171 total records of lactation over a 40 years period were analysed to determine the effect of age at first calving, season of calving and period of calving on production traits. The overall least squares means of lactation milk yield, peak milk yield, days to reach peak milk yield, lactation period and dry period were  $245.92 \pm 36.78$ ,  $2.89 \pm 0.15$ ,  $39.54 \pm 1.43$ ,  $222.97 \pm 14.10$  and  $232.07 \pm 31.75$ , respectively. In Deoni cows Age at first calving, season of calving and period of calving had significant effect on LMY, PMY and LP. period of calving and season of calving had significant influence on DP. Period of calving had significant ( $P < 0.01$ ) effect on DRPMY.

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**KEY WORDS :**

CCBP, Deoni, Genetic factors, Production, Traits

**BACKGROUND AND OBJECTIVES**

India is mega cattle biodiversity of the country represented by 37 breeds evolved in different agro climatic regions. Livestock plays an important role in rural economy in India which contributes about 28-30 per cent to agricultural GDP. About 52 per cent of the population is engaged in agriculture and rearing of livestock in the country (18th Livestock census (DADF, MOA, GOI 2011). India posses 199.10 million cattle contributing about 43% of total milk production and 105.30 million buffaloes (Livestock Census, 2007). Out of these 37 cattle breeds Deoni and Red Kandhari cattle have gifted to Marathwada region. Deoni is one of the important dual

purpose cattle breeds of Marathwada native to adjoining areas of Maharashtra, Andhra Pradesh and Karnataka state. The migration of Gir breed of cattle to Marathwada region and the consequent admixture with Dangi and local cattle. The home tract of Deoni breed is Udgir, Ahmedpur, Nilanga and AUSA tehsils of Latur district of Maharashtra and adjoining areas of Andhra Pradesh, Bidar and Gulbarga districts of Karnataka state. Deoni bullocks are suitable for heavy cultivation and carting works (Suryawamshi *et al.* 2000). The population of Deoni breed of cattle is dwindling and information on the productive traits of these cattle is scanty. Hence the present investigation was taken to study productive traits of Deoni cattle with following objectives:

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- To study the productive and reproductive characteristics of first lactation traits in Deoni cattle
- To study the effect of non-genetic factors on the first lactation traits in Deoni cattle
- To estimate the heritability
- To study correlation among the first lactation traits in Deoni cattle.

## RESOURCES AND METHODS

### Study area :

This study was conducted at Cattle Cross Breeding Project (CCBP) of Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani. The CCBP is situated between 17° 35' N and 20° 40' N latitude and between 70° 40' N and 78° 15' E longitude. The mean daily maximum temperature varies from 29.1° C in December to 42.5° C in May. The mean daily minimum temperature varies from 6.9° C in December to 25.4° C in May. The relative humidity ranges from 11 to 90 per cent. Normally the summer becomes hot and general dryness persists though out the year except during south-west monsoon. The region is essentially a subtropical one and it comes under assured rainfall zones with an average rainfall of 900 mm spread in about 70 rainy days mostly received from June to September.

### Management of animals :

The management and feeding practices followed on CCBP research farm is uniform. Deoni receive their ration according to the feeding schedule. After commencement of rainy season within a month grazing is available and grazing practices are followed from mid of July to end of January in addition to grazing regular feeding of dry and green is practiced. At the time of morning and evening milking concentrates are allowed to each individual cow in accordance of their requirement for maintenance plus production. Dry roughages of sorghum and the green as per availability (Green maize, Lucerne, Green Jowar, Natural grasses) are fed to them. Good housing facilities exist at the farm. Enough health cover is provided to protect the animals from epidemics and causal incidences of ill- health and eventualities.

### Sources and nature of data :

Data representing 171 Deoni cows from CCBP with 171 total records of lactation over a 40 years period (1975 to 2014) were collected and organized to study

the effect of age at first calving, season of calving and period of calving on production traits. The complete years was divided into 3 seasons and 8 periods having 5 years each. Five levels of age at first calving (AFC) were coded as A<sub>1</sub> < 1200 days to A<sub>5</sub> < 1600 days with class interval 150 days. The three seasons namely winter (October to January), summer (February to May) and monsoon (June to September) were coded as S<sub>1</sub>, S<sub>2</sub> and S<sub>3</sub>. Each cow having at least three offsprings was considered in this study.

### Statistical analysis :

The analysis of data will be done by method of Least Squares Techniques as outlined by Harvey (1990) and Statistical Analysis System model (SAS, 2002). The following mathematical model will be employed for analysis the data.

$$Y_{ijkl} = \mu + S_i + P_j + A_k + e_{ijkl}$$

where,

Y<sub>ijkl</sub> = is the record of a cow calved during j<sup>th</sup> period in i<sup>th</sup> season

μ = is the population mean common to all the observations

S<sub>i</sub> = is the effect of i<sup>th</sup> season of calving (1..4)

P<sub>j</sub> = is the effect of j<sup>th</sup> period of calving (1..6)

A<sub>k</sub> = is the effect of k<sup>th</sup> AFC group (1..5)

e<sub>ijkl</sub> = is the random error assumed to be NID (0, σ<sup>2</sup>, e)

The significant effect will be further analyzed to have all pair's wise comparison by Kramer (1957).

## OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads :

### Productive characteristics :

#### Lactation milk yield :

Performance of dairy animal is judged from the milk it produces during a specified period of lactation. Variation observed in lactation milk yield from lactation to lactation in the same animal. The main reason of variation attributed to the physiology of lactation is the given set of genes and their reaction with non - genetic factors. The lactation performance of dairy cattle is usually measured by total milk yield per lactation.

The least squares means and ANOVA of lactation milk yield as affected by AFC, season and period of calving are presented in Table 1 and 2, respectively. The overall least squares means for LMY of Deoni cows were  $245.92 \pm 36.78$ . These results were close to Thombre (1996), Chakravarthi *et al.* (2002) Salunkhe (2007), Mruttu (2013) in Deoni cattle, Acharya (2014) in Sahiwal cattle.

Effect of age at first calving on lactation milk yield :

The analysis of variance indicated that effect due to age at first calving groups on LMY in Deoni cows was non significant. The DMRT indicated that mean LMY (Kg) for cows born in  $A_2$  had significantly higher LMY than cows born in  $A_3, A_1, A_4$  and  $A_5$ . Similar results were reported by Natarajan (1989) in Tharparkar cattle and Umrikar *et al.* (1990) in Gir cattle.

Effect of season of calving on lactation milk yield :

The effect of season of calving on LMY in Deoni cows was non significant. The LSM for LMY (Kg) was higher in cows calved during  $S_2$  followed by  $S_3$  and lowest in  $S_1$ . These results were in agreement with Shelke *et al.* (1992) in Red Kandhari, Jagtap *et al.* (1994) in Red Sindhi, Mathur and Khosla (1994) in Gir cattle, Thombre *et al.* (2002), Salunkhe (2007), Manoj *et al.* (2012) in Sahiwal cattle, Mruttu (2013) in Deoni cattle, Bhutkar *et al.* (2015) in Deoni cattle.

*al.* (2015) in Deoni cattle.

Effect of period of calving on lactation milk yield :

The analysis of variance revealed non significant effect of period of calving on LMY in Deoni cows. Similar results are showing by Chawala and Mishra (1982) in Sahiwal cattle and Duc and Taneja (1984) in Haryana cattle, reported non significant influence of period of calving on LMY. The DMRT revealed that the LMY of Deoni cows calved during  $P_7$  was significantly higher than cows calved in  $P_6, P_5, P_1, P_3, P_8, P_4,$  and  $p_2$ , respectively.

Peak milk yield :

The least squares means and ANOVA of peak milk yield as affected by AFC, season and period of calving are presented in Table 1 and 2, respectively. The overall least squares means for PMY of Deoni cows were  $2.89 \pm 0.15$ . The results were similar to Ghafoor *et al.* (1980) in Red kandhari cattle, Siddiqui *et al.* (2000) in Red kandhari cattle and Gaur *et al.* (2003) in ponwar cattle breed,

Effect of age at first calving on peak milk yield :

The analysis of variance indicated that effect due to age at first calving groups on PMY in Deoni cow was non significant. The DMRT indicated that mean PMY

**Table 1 : Least square means and standard error for Lactation milk yield ( LMY), Peak milk yield (PMY), Days to reach peak milk yield (DRPMY), Lactation period ( LP) and Dry period ( DP) as affected by AFC groups, season of calving and period of calving in Deoni cows**

Source	Code	LMY (kg)	PMY (Kg)	DRPMY (days)	LP (days)	DP (days)
Overall mean	$\mu$	$245.92 \pm 36.78$	$2.89 \pm 0.15$	$39.54 \pm 1.43$	$222.97 \pm 14.10$	$232.07 \pm 31.75$
AFC groups	$A_1$	$237.79 \pm 58.68$	$2.95 \pm 0.31$	$41.44 \pm 2.95$	$238.03 \pm 29.08$	$133.16 \pm 35.48$
	$A_2$	$313.80 \pm 20.48$	$2.92 \pm 0.21$	$37.89 \pm 2.02$	$209.07 \pm 19.95$	$251.55 \pm 34.92$
	$A_3$	$129.67 \pm 50.69$	$2.86 \pm 0.21$	$40.40 \pm 1.97$	$214.93 \pm 19.43$	$293.48 \pm 33.75$
	$A_4$	$206.38 \pm 47.24$	$2.97 \pm 0.19$	$39.07 \pm 1.84$	$225.21 \pm 18.11$	$227.92 \pm 40.77$
	$A_5$	$241.38 \pm 39.53$	$2.75 \pm 0.16$	$38.88 \pm 1.54$	$227.61 \pm 15.18$	$254.25 \pm 34.17$
Season of calving	$S_1$	$264.60 \pm 42.26$	$2.84 \pm 0.17$	$39.10 \pm 1.64$	$235.99 \pm 16.20$	$228.87 \pm 36.48$
	$S_2$	$299.32 \pm 44.75$	$2.98 \pm 0.18$	$33.84 \pm 1.74$	$223.68 \pm 17.16$	$177.36 \pm 38.63$
	$S_3$	$273.85 \pm 43.33$	$2.85 \pm 0.17$	$39.68 \pm 1.68$	$209.25 \pm 16.61$	$269.99 \pm 37.40$
Period of calving	$P_1$	$266.11 \pm 24.63$	$2.70 \pm 0.17$	$34.06 \pm 0.96$	$223.15 \pm 9.44$	$215.46 \pm 21.26$
	$P_2$	$201.60 \pm 37.34$	$2.70 \pm 0.15$	$43.45 \pm 1.45$	$240.62 \pm 14.31$	$192.76 \pm 32.32$
	$P_3$	$263.64 \pm 14.75$	$3.02 \pm 0.61$	$53.44 \pm 5.75$	$176.78 \pm 16.58$	$265.82 \pm 27.38$
	$P_4$	$208.98 \pm 20.75$	$3.17 \pm 0.86$	$36.51 \pm 8.09$	$254.08 \pm 19.56$	$118.90 \pm 29.12$
	$P_5$	$304.81 \pm 62.00$	$3.04 \pm 0.25$	$35.75 \pm 2.42$	$228.05 \pm 23.79$	$202.65 \pm 23.57$
	$P_6$	$338.05 \pm 62.00$	$2.75 \pm 0.24$	$41.39 \pm 2.34$	$202.31 \pm 23.08$	$248.05 \pm 21.96$
	$P_7$	$374.14 \pm 61.97$	$3.20 \pm 0.25$	$40.45 \pm 2.41$	$254.31 \pm 23.76$	$156.97 \pm 23.49$
	$P_8$	$248.02 \pm 64.92$	$2.55 \pm 0.26$	$31.24 \pm 2.53$	$204.46 \pm 24.89$	$255.98 \pm 26.03$

(Kg) for cows born in A<sub>4</sub> had significantly higher PMY than cows born in A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub> and A<sub>5</sub> groups. Non significant effect of AFC on PMY was reported by Gaur and Raheja (1996) in Sahiwal cattle and Salunkhe (2007) in Deoni cattle.

Effect of season of calving on peak milk yield :

The influence of season of calving on PMY in Deoni cows was non significant. The LSM of PMY (Kg) was higher in Deoni cows calved during S<sub>2</sub> followed by S<sub>3</sub> and lowest in S<sub>1</sub>. These results were in agreement with Chauhan *et al.* (1976) in Sahiwal, Tharparkar and Red Sindhi cattle, Gogoi *et al.* (1993) in Red Sindhi cattle, Patil (1997) in Sahiwal cattle, Salunkhe (2007) in Deoni cattle, Manoj *et al.* (2012), Ahlawat *et al.* (2013) in Gir cows and Bhutkar *et al.* (2015) in Deoni cattle.

Effect of period of calving on peak milk yield :

The analysis of variance revealed non significant effect of period of calving on PMY in Deoni cows. Similar results showing non significant effect of period of calving on PMY were reported by Mishra *et al.* (1989) in Sahiwal cattle, Tomar and Pande (1995) in Tharparkar cattle and Salunkhe (2007) in Deoni cattle. The DMRT revealed that the PMY of Deoni cow calved during P<sub>4</sub> was significantly higher than cows calved in P<sub>7</sub>, P<sub>5</sub>, P<sub>3</sub>, P<sub>6</sub>, P<sub>2</sub>, P1 and P8.

Days to reach peak milk yield :

Days to reach peak yield is one of the major factor which determines the lactation yield, lactation length and shape of lactation curve. The least squares means and ANOVA of days to reach peak milk yield as affected by AFC, season and period of calving are presented in Table 1 and 2, respectively. The overall least squares means for DRPMY of Deoni cows were 39.54 ± 1.43 days. The results were close to Deshpande and Singh (1977)

in Deoni cattle, Chakravarthi *et al.* (2002) in Deoni cattle, Nanavati and Qureshi (1996) in Gir cattle, Bhutkar (2014) in Deoni cattle.

Effect of age at first calving on days to reach peak milk yield :

The analysis of variance indicated that effect due to age at first calving groups on DRPMY in Deoni cows was non significant. The DMRT indicated that mean significant DRPMY (Days) for cows born in A<sub>1</sub> had significantly higher DRPMY than cows born in A<sub>3</sub>, A<sub>4</sub>, A<sub>5</sub> and A<sub>2</sub> groups. Non significant effect of AFC group on DRPMY was reported by Raheja (1982) in Haryana cattle, Kulkarni (2001) in Red Sindhi cattle and Salunkhe (2007) in Deoni cattle.

Effect of season of calving on days to reach peak milk yield :

The influence of season of calving on DRPMY in Deoni cow was non significant. The LSM for DRPMY (Days) was higher in cows calved during S<sub>3</sub> followed by S<sub>1</sub> and lowest in S<sub>2</sub>. These results were in agreement with Raheja (1982) in Haryana cattle, Nanavati and Qureshi (1996) in Gir cattle, Salunkhe (2007) in Deoni cattle and Khadda *et al.* (2012) in Tharparkar cattle, Manoj *et al.* (2012) and Bhutkar *et al.* (2015) in Deoni cattle.

Effect of period of calving on days to reach peak milk yield :

The analysis of variance revealed significant (P < 0.01) effect of period of calving on DRPMY in Deoni cows. Similar results showing significant effect of period of calving on DRPMY by Nanavati and Qureshi (1996) in Gir cattle, Salunkhe (2007) in Deoni cattle, Khadda *et al.* (2012) in Tharparkar cattle, Manoj *et al.* (2012) and Kumar *et al.* (2012) in Sahiwal cattle. The LSM for

**Table 2 : Analysis of variance for Lactation milk yield ( LMY), Peak milk yield (PMY), Days to reach peak milk yield (DRPMY) on AFC groups, season of calving and period of calving in Deoni cows**

Sources	DF	LMY		PMY		DRPMY	
		MSS ('000)	F value calculated	MSS ('000)	F value calculated	MSS ('000)	F value calculated
AFC	4	1353000.0	0.32 <sup>NS</sup>	0.35	0.49 <sup>NS</sup>	32.62	0.51 <sup>NS</sup>
Season	2	4116000.0	0.98 <sup>NS</sup>	0.27	0.38 <sup>NS</sup>	8.41	0.13 <sup>NS</sup>
Period	7	716100.00	0.17 <sup>NS</sup>	0.60	0.84 <sup>NS</sup>	485.80	7.65 <sup>**</sup>
Error	157	4173000.0		0.71		63.45	
Total	170						

NS=Non-significant

DRPMY (Days) was higher in cows calved during P<sub>3</sub> followed by P<sub>2</sub>, P<sub>6</sub>, P<sub>7</sub>, P<sub>4</sub>, P<sub>5</sub>, P<sub>1</sub> and lowest in P<sub>8</sub>.

#### Lactation period :

The least squares means and ANOVA of lactation period as affected by AFC, season and period of calving are presented in Table 1 and 3, respectively. The overall least squares means for LP of Deoni cows were 222.97 ± 14.10 days, The results were in agreement with Dhumal *et al.* (1989) in Red Kandhari cattle, Joshi *et al.* (2005) in Ongole cattle, Vinoo *et al.* (2005) in Ongole cattle Dhaware *et al.* (2008) in Khillar cattle, Mruttu (2013) in Deoni cattle and Bhutkar (2014) in deoni cattle.

#### Effect of age at first calving on lactation period :

The analysis of variance indicated that effect due to age at first calving groups on LP in Deoni cows was non significant. The LSM for LP (Days) was higher in cows born during A<sub>1</sub> followed by A<sub>5</sub>, A<sub>4</sub>, A<sub>3</sub> and lowest in A<sub>2</sub>. Similar results were reported by Balaine *et al.* (1970) in Haryana cattle, Umrikar *et al.* (1990) in Gir cattle, Gaur and Raheja (1996) in Sahiwal cattle, Salunkhe (2007) in Deoni cattle, Mruttu (2013) in Deoni cattle and Bhutkar (2014) in deoni cattle.

#### Effect of season of calving on lactation period :

The effect of season of calving on LP in Deoni cow was non significant. The LSM for LP (Days) was higher in cows calved during S<sub>1</sub> followed by S<sub>2</sub> and lowest in S<sub>3</sub>. These results were in agreement with Latpate (1995) in Red Kandhari cattle, Patil (1997) in Sahiwal cattle, Vinoo *et al.* (2005) in Ongole cattle Salunkhe (2007) in Deoni cattle, Manoj *et al.* (2012) in Sahiwal cattle and Bhutkar *et al.* (2015) in Deoni cattle.

#### Effect of period of calving on lactation period :

The analysis of variance revealed non significant effect of period of calving on LP in Deoni cows. Similar

results showing non significant effect of period of calving on LP was reported by Malhotra and Singh (1980) and Gupta Tripathi (1994) in Red Sindhi cattle Vinoo *et al.* (2005) in Ongole cattle and Bhutkar (2014) in deoni cattle. The LSM for LP (Days) was higher in cow calved during P<sub>7</sub> followed by P<sub>4</sub>, P<sub>2</sub>, P<sub>5</sub>, P<sub>1</sub>, P<sub>8</sub>, P<sub>6</sub> and lowest in P<sub>3</sub>.

#### Dry period :

Dry period is important economic trait causing the variations in calving interval and thus indirectly affects production efficiency of cattle. The least squares means and ANOVA of dry period as affected by AFC, season and period of calving are presented in Table 1 and 3, respectively. The overall least squares means for DP of Deoni cows were 232.07 ± 31.75 days. The results were close to Chourasia *et al.* (1983) in Rathi cattle, Atharkar (1990) and Shelke *et al.* (1992) in Red Kandhari cattle, Joshi *et al.* (2005) in Khillar cattle, Joshi *et al.* (2005) in Nimari cattle, Jaiswal *et al.* (2012) in Gangotri cattle and Bhutkar (2014) in Deoni cattle.

#### Effect of age at first calving on dry period :

The analysis of variance indicated that effect due to age at first calving groups on DP in Deoni cows was non significant. The LSM for DP (Days) was higher in cows born during A<sub>3</sub> followed by A<sub>5</sub>, A<sub>2</sub>, A<sub>4</sub> and lowest in A<sub>1</sub>. Similar results were reported by Dubey and Singh (2005) in Sahiwal cattle, Vinoo *et al.* (2005) in Ongole cattle, Mruttu (2013) in Deoni cattle and Bhutkar (2014) in Deoni cattle.

#### Effect of season of calving on dry period :

The effect of season of calving on DP in Deoni cows was significant (P < 0.01). The LSM for DP (Kg) was higher in cows calved during S<sub>3</sub> followed by S<sub>1</sub> and lowest in S<sub>2</sub>. Significant effect of season of calving on DP was reported by Reddy and Nagarsenkar (1990) in Sahiwal cattle and Salunkhe (2007) in Deoni cattle.

**Table 3 : Analysis of variance for Lactation period (LP) and Dry period ( DP) on AFC groups, season of calving and period of calving in Deoni cows**

Sources	DF	LP		DP	
		MSS ('000)	F value calculated	MSS ('000)	F value calculated
AFC	4	2441.00	0.39 <sup>NS</sup>	46530.00	1.49 <sup>NS</sup>
Season	2	9700.00	1.58 <sup>NS</sup>	153200.00	4.92 <sup>**</sup>
Period	7	4756.00	0.77 <sup>NS</sup>	91900.00	2.95 <sup>*</sup>
Error	157	6134.00		31090.00	
Total	170				

NS=Non-significant

Effect of period of calving on dry period :

The analysis of variance revealed significant ( $P < 0.05$ ) effect of period of calving on DP in Deoni cows. Similar results showing significant effect of period of calving on DP was reported by Reddy and Nagarsenkar (1990) in Sahiwal cattle, Nanavati and Singh (2009) in Nimari cattle, Mruttu (2013) in Deoni cattle, Manoj *et al.* (2012) in Sahiwal cattle and Bhutkar (2014) in Deoni cattle. The DMRT revealed that the DP of Deoni cows calved during  $P_3$  was significantly higher than  $P_8, P_6, P_1, P_5, P_2, P_7$  and lowest in  $P_4$ .

### Conclusion :

This study indicates that the performance of Deoni cows for lactation milk yield, peak milk yield and lactation period is comparatively low which needs an improvement in overall management of the dairy cows. Moreover, for all productional traits concerns seasonal changes had not any affects. Therefore, additional production strategies like improving enviornmental factors and managerial factors needed to improve the production performance. On the basis of the findings given above it was concluded that Age at first calving in Deoni cows was higher therefore, it is recommended to breed / mate heifers as early as possible so as to increase productive life of Deoni cows.

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