

Original Research Article

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Effect of Genetic and Non-Genetic Factors on First Lactation Production Traits in Tharparkar Cattle

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ABSTRACT

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The present study was conducted on 91 Tharparkar cows maintained at the Livestock Research Station, Beechwal, Bikaner for 11 years i.e. from 2006 to 2016. The data were analysed with the objective of performance appraisal of Tharparkar cattle with respect to production traits and to study the effect of genetic factor i.e. sire group and non genetic factors i.e. period and season of calving on production traits. The overall least-squares means for first lactation milk yield (FLMY), first lactation length (FLL), first lactation dry period (FDP), lactation milk yield per day of first lactation length (LMY/FLL) and lactation milk yield per day of first calving interval (LMY/FCI) were found to be 1832.99 ± 42.43 kg, 283.65 ± 7.65 days, 148.14 ± 6.05 days, 6.18 ± 0.14 kg/day and 4.03 ± 0.12 kg/day. The effect of sire was found to be significant on first lactation production traits. The Period of calving had significant effect on FLL and LMY/FCI, while season of calving had no significant effect on first lactation production traits. The AFC had significant effect on FLMY and FLL.

Introduction

Livestock sector is the backbone of Indian rural economy in terms of sustaining income and employment. Due to tremendous contribution of cattle to the Indian agriculture, livelihood and food security, cow has occupied a prime position in rural life of India. Various indigenous breeds of cattle in the country are the result of selection for thousands of years, evolution and development of the wild species in the process of domestication to the local agro

climatic conditions. These breeds are now losing ground due to intense competition from other breeds and risk of economic viability under the present system of management.

Tharparkar breed is adapted to the harsh climatic conditions with extremes of temperature, sand storms, recurrent famines and xeric vegetation which are totally unsuitable for dairy animals. In arid and semi arid zones, Tharparkar cattle play an important role in milk production and reared in the drought prone region of northwest

India, especially Jaisalmer, Jodhpur (Rajasthan) and Kutch region of Gujarat. Since this breed has been used extensively for crossbreeding in the past, only limited number of purebred animals of this breed is available at present in their home tract. In view of the importance of the breed, efforts need to be made for the conservation of Tharparkar cattle. Various criteria of selection can be used to bring about genetic improvement in overall performance of Tharparkar cattle. For formulating breeding programmes for dairy cattle it is essential to evaluate the performance in terms of various production traits which are of economic importance. Knowledge of genetic and non genetic factors influencing performance traits is also important for the success of any breeding programme.

Materials and Methods

The data for the present investigation were obtained from the records of Tharparkar cattle, located at the Livestock Research Station, Beechwal, Bikaner. Records of the 91 cows which calved during the year 2006 to 2016 were included in the study. Some animals were shifted from Livestock Research Station, Chandan, Jaisalmer to Livestock Research Station, Beechwal, Bikaner in the year 2011 along with their records. Records of these animals were also included in the study.

The production traits studied were first lactation milk yield (FLMY), first lactation length (FLL), first dry period (FDP), lactation milk yield per day of first lactation length (LMY/FLL), lactation milk yield per day of first calving interval (LMY/FCI). The entire duration from year 2006 to 2016 was divided into four periods viz. P₁ (2006 - 2008), P₂ (2009 - 2010) P₃ (2011-2013), P₄ (2014-2016). Each year divided into three seasons viz. summer S₁ (March to June), monsoon S₂ (July to October) and winter S₃ (November to

February). The analysis was carried out using least-squares and maximum likelihood computer program of Harvey (1990) with the following mixed model:

$$Y_{ijkl} = \mu + S_i + A_j + B_k + b (X_{ijkl} - \bar{X}) + e_{ijkl}$$

Where, Y_{ijkl}= observation on the lth cow of ith sire, born in jth period and kth season, μ = Overall population mean, S_i = random effect of ith sire, A_j= fixed effect of jth period of calving, B_k = fixed effect of kth season of calving, b = The regression of variable on age at first calving, X_{ijkl} = age at first calving corresponding to Y_{ijkl}, \bar{X} = average age at first calving, e_{ijkl}= Random error NID(0, σ^2).

Results and Discussion

The least squares means of first lactation production traits are presented in Table 1. The least-squares mean for first lactation milk yield was observed to be 1832.99 ± 42.43 kg in present investigation. Similar findings were reported by Rahumathulla *et al.*, (1994) and Hussain *et al.*, (2015) in Tharparkar cows. The effect of period of calving on FLMY was found to be non- significant. Doharey (2012) in Haryana cattle also reported similar results.

Effect of season of calving did not exhibit significant effect on FLMY. The present results are in line with the results of Hussain *et al.*, (2015) in Tharparkar, Dahiya (2002) and Doharey (2012) in Haryana cattle. This might be due to adaptability of animals to local climatic conditions. The effect of sire on first lactation milk yield in Tharparkar cows was observed to be significant. Similar findings were also reported by Dahiya (2002) and Doharey (2012) in Haryana cattle. The results suggested that sire is a significant source of causing variability in the first lactation milk yield. The significant effect of sire indicated that sire selection for this trait can bring further genetic improvement in the herd.

Table.1 Least-squares mean \pm SE for FDP, FLL, FLMY, LMY/FLL and LMY/FCI

Traits	FLMY	FLL	FDP	LMY/FLL	LMY/FCI
Over all mean	1832.99 \pm 42.43 (91)	283.65 \pm 7.65 (91)	148.14 \pm 6.05 (83)	6.18 \pm 0.14(91)	4.03 \pm 0.12 (83)
Sire	*	**	*	*	*
Period	NS	*	NS	NS	*
P1 (2006 - 2008)	1842.83 \pm 163.44 (18)	297.91 \pm 28.09 ^a (18)	109.84 \pm 23.42 (16)	6.04 \pm 0.47 (18)	4.43 \pm 0.40 ^{ab} (16)
P2 (2009 - 2010)	1618.34 \pm 155.95 (15)	239.57 \pm 27.16 ^b (15)	148.37 \pm 24.08 (9)	6.49 \pm 0.44 (15)	3.81 \pm 0.42 ^{bc} (9)
P3 (2011- 2013)	1864.13 \pm 139.19 (28)	278.10 \pm 25.11 ^a (28)	153.07 \pm 18.31 (28)	6.33 \pm 0.39 (28)	4.60 \pm 0.29 ^a (28)
P4 (2014- 2016)	1880.84 \pm 145.14 (30)	299.13 \pm 25.83 ^a (30)	171.54 \pm 21.72 (30)	6.03 \pm 0.41 (30)	3.33 \pm 0.36 ^c (30)
Season	NS	NS	NS	NS	NS
S1 (Summer)	1806.44 \pm 132.79 (40)	282.20 \pm 24.34 (40)	149.43 \pm 18.59 (34)	6.16 \pm 0.37 (40)	3.99 \pm 0.29 (34)
S2 (monsoon)	1778.96 \pm 195.09 (9)	275.57 \pm 32.17 (9)	152.37 \pm 26.60 (9)	6.29 \pm 0.57 (9)	4.02 \pm 0.47 (9)
S3 (winter)	1819.20 \pm 131.36 (42)	278.26 \pm 24.18 (42)	135.32 \pm 17.53 (40)	6.22 \pm 0.36 (42)	4.11 \pm 0.27 (40)
Regression on AFC	*	**	NS	NS	NS
Regression coefficient	0.4444 \pm 0.2218	0.1104 \pm 0.0326	0.0413 \pm 0.0345	-0.0009 \pm 0.0007	-0.0005 \pm 0.0007

(** - Highly significant (P \leq 0.01); * - Significant (P \leq 0.05); NS - Non-significant)

The least-squares analysis of variance of data revealed that regression of first lactation milk yield on age at first calving was significant (P \leq 0.05) and positive. The least squares estimate of first lactation length was 283.65 \pm 7.65 days in the present study. It is almost similar to the estimates reported by Panneerselvon *et al.*, (1990) and Rahumathulla *et al.*, (1994) in Tharparkar cattle. The analysis of variance (Table 1) revealed that the effect of period of calving was significant (P \leq 0.05) for first lactation length. Gahlot(1999) and Hussain *et al.*, (2015) in Tharparkar cattle also observed

significant effect of period of calving on FLL. The significant difference in FLL is probably due to different fodder availability and different managerial conditions in different periods. Effect of season of calving did not exhibit significant effect on first lactation length. The present results are in line with the results of Gahlot (1999) in Tharparkar and Doharey (2012) in Harijana cattle. The results of this study revealed that the effect of sire on FLL in Tharparkar cows was observed to be highly significant. Similar findings were also reported by Singh (2015) in Sahiwal cattle. The regression of FLL on

AFC was found to be highly significant ($P \leq 0.01$) in present study.

The first dry period of Tharparkar cows was observed to be 148.14 ± 6.05 days in the present investigation. It is almost similar to the estimates reported by Swami *et al.*, (2005) in Haryana cattle and Singh *et al.*, (2005) in Sahiwal cattle. The result of present study revealed that the period of calving had non-significant influence on first dry period. Doharey (2012) in Haryana breed of cattle also reported non-significant effect of period of calving on first dry period. Effect of season of calving had non-significant influence on FDP. The present results are in line with the results of Nehra (2004) in Rathi, Singh (2015) in Sahiwal, Doharey (2012) in Haryana and Hussain *et al.*, (2015) in Tharparkar cattle. The results of this study revealed that the effect of sire on first dry period in Tharparkar cows was observed to be significant. Similar findings were also reported by Doharey (2012) in Haryana cattle and Singh (2015) in Sahiwal cattle. Regression of AFC on first dry period was found to be non-significant in present study.

The least-squares mean of lactation milk yield per day of first lactation length was estimated as 6.18 ± 0.14 kg/day. Almost similar findings were reported by Gahlot (1999) as 6.15 ± 0.10 kg/day in Tharparkar cattle. The effect of period of calving and season of calving on lactation milk yield per day of first lactation length was found to be non-significant in present investigation. This study revealed that the effect of sire on lactation milk yield per day of first lactation length in Tharparkar cows was observed to be significant. Regression of AFC on LMY/FLL was found to be non-significant in present study.

The least-squares mean of lactation milk yield per day of first calving interval was estimated

as 4.03 ± 0.12 kg/day. The analysis of variance (Table 1) revealed that the effect of period of calving was significant ($P \leq 0.05$) for lactation milk yield per day of first calving interval. Effect of season of calving did not exhibit significant effect on lactation milk yield per day of first calving interval. The results of this study revealed that the effect of sire on lactation milk yield per day of first calving interval in Tharparkar cows was observed to be significant. The least-squares analysis of variance of data revealed that regression of LMY/FCI on AFC was non-significant.

In conclusion, the least squares means for FLMY, FLL, FDP, LMY/FLL and LMY/FCI were found to be 1832.99 ± 42.43 kg, 283.65 ± 7.65 days, 148.14 ± 6.05 days, 6.18 ± 0.14 kg/day and 4.03 ± 0.12 kg/day. The effect of season of calving was found non-significant whereas, the effect of period of calving was found to be significant on FLL and LMY/FCI. The significant difference in FLL and LMY/FCI in different periods was probably due to climatic changes and availability of feed across the different periods and managemental conditions practiced in particular period. Significant effect of sire on all the first lactation reproduction traits under study indicated that sire selection can bring further genetic improvement in the Tharparkar herd for these traits.

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