

## International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693  
 ISSN Online: 2617-4707  
 IJABR 2024; SP-8(6): 679-680  
[www.biochemjournal.com](http://www.biochemjournal.com)  
 Received: 06-03-2024  
 Accepted: 10-04-2024

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## Assessment of sires for first lactation traits using best linear unbiased prediction (BLUP) method in Tharparkar cattle

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DOI: <https://doi.org/10.33545/26174693.2024.v8.i6Si.1396>

### Abstract

The research utilized performance data from 91 cows, descendants of 10 sires, monitored over an 11-year period (2006 to 2016) at LRS, Beechwal, Bikaner, to assess sire performance. The study focused on several first lactation traits, including age at first calving, first lactation milk yield, first lactation period, first dry period, first calving interval, and first service period. Best Linear Unbiased Prediction (BLUP) was applied to estimate breeding values (EBVs) of the sires, revealing substantial genetic variability across all first lactation traits. Importantly, the use of BLUP resulted in changes in the ranking of top sires, highlighting that sire rankings can differ based on the specific trait under evaluation.

**Keywords:** BLUP, cattle, sire evaluation and Tharparkar

### Introduction

Efficiency traits that encompass both production and reproductive aspects are essential for ensuring sustained profitability in dairy farming (Verma and Thakur, 2015) [14]. Evaluating sires has always been a priority, with predicting breeding values playing a pivotal role in breeding programs aimed at enhancing various productive and reproductive traits. Traditionally, breeding values were estimated by comparing individual or progeny deviations from contemporaneous performance within specific environments. In dairy cattle breeding, selecting sires primarily based on milk yield is crucial for achieving genetic progress (Raheja, 1992; Bajetha and Singh, 2015) [10, 2]. Sire evaluation programs are crucial because the majority of genetic improvements are achieved through the selection of males rather than females.

Understanding the relationship between a sire's breeding value for first lactation traits and its impact on their lifetime performance in dairy cattle is crucial for determining whether selecting dairy sires based on their daughters' first lactation performance enhances overall lifetime production. Given these considerations, this study aims to employ the Best Linear Unbiased Prediction (BLUP) method to estimate sire breeding values for first lactation traits and explore the relationships among these estimates (Sahana and Gurnani, 1999; Mukherjee, 2005; Banik and Gandhi, 2006; Singh and Singh, 2011; Kishore, 2012; Singh, 2015) [11, 8, 1, 13, 7, 12].

This approach ensures that the selection of sires is based on robust genetic evaluations, optimizing genetic progress in dairy herds over time.

### Materials and Methods

The study utilized performance data from 91 daughters of 10 sires, housed at LRS Beechwal, Bikaner, between 2006 and 2016, to estimate sire breeding values for first lactation traits. Cows with abnormal or incomplete records were excluded from the analysis. Each year was divided into three seasons based on climatic conditions: summer (March to July), monsoon (August to October), and winter (November to February).

The first lactation traits assessed included age at first calving, first lactation milk yield, first lactation period, first dry period, first calving interval, and first service period. Sire breeding values for these traits were estimated using the Best Linear Unbiased Prediction (BLUP) method, proposed by Henderson in 1975 [6].

This method ensures robust genetic evaluations of sires, enhancing the genetic progress of dairy herds by selecting sires with superior first lactation trait performances across

various climatic seasons.

## Results and Discussion

**Table 1:** Estimates of breeding values of sires and their ranks for AFC, FSP, FCI, FDP, FLL and FLMY by BLUP method of sire evaluation

Sire No.	AFC	Rank	FSP	Rank	FCI	Rank	FDP	Rank	FLL	Rank	FLMY	Rank
1997	1609.49	8	151.54	6	432.37	7	154.26	9	296.29	3	1936.62	2
2081	1570.35	4	152.29	9	432.36	6	152.90	4	281.25	9	1725.21	9
2087	1621.98	10	149.82	2	432.19	4	153.67	8	289.88	5	1928.58	3
2164	1519.03	2	150.85	5	433.54	8	156.66	10	290.10	4	1807.15	8
2249	1555.39	3	150.21	3	432.30	5	153.54	6	285.83	7	1914.41	4
2355	1572.56	5	156.99	10	440.39	10	152.49	3	324.75	1	1992.97	1
2385	1596.25	7	149.32	1	433.74	9	150.06	1	283.51	8	1870.34	6
Tb-01	1595.21	6	151.72	7	427.42	1	153.36	5	266.49	10	1673.45	10
Tb-02	1497.97	1	150.35	4	431.51	3	151.34	2	287.90	6	1859.36	7
Tb-03	1617.60	9	151.80	8	430.53	2	153.61	7	307.34	2	1882.17	5

The breeding values estimated through the BLUP method for sires and their rankings across first lactation traits are presented in Table 1. Significant genetic variability was observed among sires for these traits. Specifically, the breeding values ranged widely: from 1497.97 to 1621.98 days for age at first calving, 1673.45 to 1992.97 kg for first lactation milk yield, 266.49 to 324.75 days for first lactation period, 150.06 to 156.66 days for first dry period, 427.42 to 440.39 days for first calving interval, and 149.32 to 156.99 days for first service period. These findings corroborate with previous studies, such as those by Dalal *et al.* (1999) [4], highlighting substantial genetic diversity among sires for first lactation traits.

In general, the breeding values did not exhibit a clear systematic trend across first lactation traits in this study. The variation observed among sires underscores the genetic heterogeneity within the herd, possibly influenced by the retention of animals with lower production levels.

Among the top-ranked sires based on specific traits, Sire No. TB-02 excelled in age at first calving, Sire No. 2355 led in first lactation milk yield and first lactation length, and Sire No. 2385 performed best in the first dry period. For first calving interval, Sire No. TB-01 ranked highest, while Sire No. 2385 achieved the top ranking for first service period according to BLUP.

The variations in sire rankings across different first lactation traits, as determined by the BLUP method, emphasize that sires may demonstrate varying levels of performance across different traits. These findings are consistent with earlier studies by Pundir and Raheja (1994) [9], Dalal *et al.* (1999) [4], Dubey and Singh (2005) [5], and Bajetha *et al.* (2015) [3], which similarly highlighted the diverse genetic profiles and performance rankings of sires across various production traits.

## Conclusion

The estimated breeding values (EBVs) of sires showed considerable genetic variability across all initial lactation traits. The ranking of top sires varied noticeably when evaluated using the BLUP method for sire assessment. These results indicate that the ranking of sires for initial lactation traits is not uniform. The study underscores significant genetic diversity among sires concerning their EBVs for these traits, highlighting a wide spectrum of genetic variation within the herd.

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