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Shivajee Pal
Ph.D. Scholar, Department of Livestock Production Management, College of Veterinary and Animal Sciences G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Brijesh Singh
Professor, Department of Livestock Production Management, College of Veterinary and Animal Sciences G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Shive Kumar
Professor, Department of Livestock Production Management, College of Veterinary and Animal Sciences G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

RK Sharma
Professor, Department of Livestock Production Management, College of veterinary and animal sciences G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Anil Kumar
Professor, Department of Livestock Production Management, College of Veterinary and Animal Sciences G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Anita
Assistant Professor, Department of Livestock Products Technology, College of Veterinary and Animal Sciences G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Deepikesh Joshi
Ph.D. Scholar, Department of Livestock Production Management, College of Veterinary and Animal Sciences G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Manoj Kumar Singh
Assistant Professor, Department of Livestock Products Technology, College of Veterinary and Animal Sciences G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Corresponding Author:
Shivajee Pal
Ph.D. Scholar, Department of Livestock Production Management, College of Veterinary and Animal Sciences G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Sire evaluation based on lactation traits using D and BLUP methods in Sahiwal cattle

Shivajee Pal, Brijesh Singh, Shive Kumar, RK Sharma, Anil Kumar, Anita, Deepikesh Joshi and Manoj Kumar Singh

Abstract
To calculate a sire's breeding value for lactation traits, 184 Sahiwal daughters of 21 sires had their performance records kept at the institute's Instructional Dairy Farm from 1986 to 2017. The 305 days lactation milk yield, total milk yield, and peak yield were all considered as lactation traits. The estimates of breeding values were obtained using the Simple Daughter Average ($\overline{\mathbf{D}}$) and Best Linear Unbiased Prediction (BLUP) method. For all traits considered, the estimated breeding values (EBVs) of the sires revealed genetic variation between sires. By using the BLUP method of sire evaluation, the rankings of the first few top sires were found to be changed. The findings depict that not all sires would rank equally for lactation traits. However, the sire rankings for several traits showed that four to five of the best sires almost had comparable rankings in both methods.

Keywords: Breeding value, lactation traits, sire evaluation

Introduction
Performances parameters that take animal's production component into account are crucial criteria for ensuring dairy animals to be profitable over the long term. (Verma and Thakur, 2015) [11]. Since ancient times, sire evaluation has been of utmost importance. The majority of breeding programmes are for increasing sires' genetic makeup for various productive and reproductive traits. The breeding value has generally estimated as the individual or progeny deviation from actual performance within a specific environment. The most essential genetic improvement in dairy cattle breeding is sire selection for milk production. (Bajetha and Singh. 2015) [2]. The fact that selecting males rather than females can result in the majority of genetic improvement makes sire evaluation programmes important. When determining whether to select or not to select dairy sires based on the performance of their daughter's. It is vital to consider the relationship between a sire's breeding value for lactation traits and performance abilities in dairy cattle. It was designed to use the Best Linear Unbiased Prediction (BLUP) method to estimate the breeding value of sires for performance traits in order to determine the relationship between estimations of sire's breeding value.

Materials and Methods
The Data for present investigation were collected from history sheet of Sahiwal cattle at Instructional dairy farm and AICRP on cattle DRU Sahiwal of Govind Ballabh Pant University of Agriculture and Technology Pantnagar, Uttarakhand. The data pertained to 184 Sahiwal cattle from 21 sires were distributed over a period of 31 years from 1986 to 2017 were utilised to determine the sire's breeding value for lactation traits. Cows with unusual or partial records were not included in the investigation. Based on climatological factors, each year was split into three distinct seasons: summer (March through July), rainy (August through October), and winter (November through February).
According to the date of calving, the calving period was divided into five periods. The 305-day lactation milk yield, total milk yield, and peak yield were the lactation traits examined. Sires' breeding values for characteristics related to lactation were estimated.

Statistical analysis
In order to explore the impact of non-genetic factors on various lactation traits, the data in the present research were subjected to least squares analysis of variance without interactions using two models because they were non-orthogonal in nature and had unequal subclass numbers

numbers Harvey, (1990) [7]. The major goal of sire evaluation is to determine a reliable and unbiased estimation of a bull's breeding value and rank them according to the performance of their daughters. This will allow breeders to select the best bull for future herd improvement. There are many sire evaluation techniques that are based on the performance of a sufficient number of progeny that have been recorded. To calculate the breeding values of sires, the two methods of sire evolution listed below were employed.

Simple Daughters Average ($\overline{D}$)

Sires were evaluated by Simple Daughter's Average as proposed by Edward, (1932) [5].

The breeding values of sires were computed as follows
S1= (D),

Where,
(D) is the average milk production of all sire's daughters.

Best Linear Unbiased Prediction (BLUP) Method

Method proposed by **Henderson (1985)** as modified maximum likelihood mixed model for sire evaluation was used to obtain BLUP estimators of sire's breeding value.

Model

$Y = X\beta + Zu + e$

Where,
Y = n x 1 vector of observation,
X = n x p known matrix of fixed effects (viz. season, period and genetic group),
B = p x 1 unknown vector of fixed effects,
Z = n x q known matrix corresponding to random effect,
U = q x 1 unknown random vector,
E = random vector of residual errors associated with each observation,
u and e are non-observable random vectors with null means and

$$\text{Var} = \begin{pmatrix} u \\ e \end{pmatrix} = \begin{pmatrix} G & O \\ O & R \end{pmatrix} \sigma^2$$

Where,
σ^2 Was a scalar which is unknown and G and R are both singular. The following mixed model equations are generated to obtain the best linear unbiased estimators of sire's breeding value:

$$\begin{pmatrix} X'X & X'Z \\ Z'X & Z'Z + IK \end{pmatrix} \begin{pmatrix} b \\ u \end{pmatrix} = \begin{pmatrix} X'Y \\ Z'Y \end{pmatrix}$$

Table 1: Estimated breeding value of sire and their ranks(R) for lactation traits as 305 days lactation milk yield by simple daughter average ($\overline{D}$) in I[st], II [and] III[rd] parties.

Sr. no.	Sire Code	N	R	Parity-1	Sire Code	N	R	Parity-2	Sire Code	N	R	Parity-3
1	13	7	1	2333.07	6	6	1	2469.47	10	4	1	2353.68
2	6	6	2	2266.49	9	24	2	2347.05	11	18	2	2253.42
3	3	4	3	2217.97	7	20	3	2238.13	4	4	3	2226.07
4	10	5	4	2160.54	10	5	4	2218.78	1	18	4	2200.66
5	21	3	5	2067.47	11	20	5	2125.54	6	6	5	2181.44
6	12	3	6	2052.17	3	4	6	2093.63	12	3	6	2114.16
7	9	24	7	2040.17	12	3	7	2044.02	9	20	7	2077.29
8	11	20	8	1963.19	5	5	8	2037.29	3	3	8	2040.31
9	18	9	9	1898.81	20	6	9	2006.00	20	1	9	1978.08
10	7	21	10	1882.37	18	7	10	2004.85	7	18	10	1970.05
18	4	6	18	1624.80	16	2	18	1832.53	2	2	18	1763.69
19	14	4	19	1620.15	14	4	19	1819.96	21	1	19	1685.41
20	2	2	20	1533.38	2	2	20	1818.67	15	11	20	1621.36
21	16	2	21	1403.91	21	3	21	1604.79	16	.	21	.

Table 2: Estimated breeding value of sire and their ranks(R) for lactation traits as total milk yield by simple daughter average ($\overline{D}$) in I[st], II [and] III[rd] parties.

Sr. no	Sire Code	N	R	Parity-1	Sire Code	N	R	Parity-2	Sire Code	N	R	Parity-3
1	3	4	1	2545.41	3	4	1	2523.62	3	3	1	2866.97
2	13	7	2	2388.94	9	24	2	2397.24	10	4	2	2606.43
3	10	5	3	2386.48	6	6	3	2323.09	4	4	3	2487.46
4	6	6	4	2278.06	11	20	4	2304.71	12	3	4	2365.20
5	12	3	5	2115.52	10	5	5	2302.62	1	18	5	2352.80
6	9	24	6	2091.50	18	7	6	2250.25	11	18	6	2324.11
7	11	20	7	2015.47	7	20	7	2246.59	6	6	7	2193.95
8	8	15	8	1952.09	5	5	8	2108.93	2	2	8	2168.99
9	18	9	9	1898.81	12	3	9	2044.02	9	20	9	2160.13
10	7	21	10	1891.75	17	4	10	2032.48	7	18	10	1984.54
11	21	3	11	1889.56	20	6	11	2028.64	20	1	11	1978.08
12	5	5	12	1875.28	8	15	12	1965.89	17	2	12	1934.52
13	1	18	13	1872.03	13	7	13	1963.64	8	14	13	1920.39
14	20	6	14	1775.21	4	6	14	1959.20	19	3	14	1913.60
15	4	6	15	1767.79	1	18	15	1953.21	18	5	15	1850.79

16	19	6	16	1729.82	19	6	16	1905.21	5	5	16	1829.38
17	15	14	17	1717.16	15	14	17	1851.36	14	4	17	1791.60
18	17	4	18	1652.53	16	2	18	1832.53	13	4	18	1788.31
19	14	4	19	1620.15	14	4	19	1819.96	21	1	19	1685.41
20	2	2	20	1542.72	2	2	20	1818.67	15	11	20	1621.36
21	16	2	21	1403.91	21	3	21	1604.79	16	.	21	

Table 3: Estimated breeding value of sire and their ranks(R) for lactation traits as peak yield by simple daughter average ($\overline{D}$) in I[st], II [and] III[rd] parties.

Sr. no.	Sire Code	N	R	Parity-1	Sire Code	N	R	Parity-2	Sire Code	N	R	Parity-3
1	21	3	1	12.19	19	6	1	12.51	10	4	1	13.67
2	19	6	2	12.17	6	6	2	12.46	6	6	2	13.15
3	1	18	3	11.20	11	20	3	12.19	21	1	3	12.46
4	6	6	4	10.93	7	20	4	12.13	9	20	4	12.35
5	10	5	5	10.79	9	24	5	11.85	1	18	5	12.31
6	18	9	6	10.64	17	4	6	11.82	11	18	6	12.16
7	15	14	7	10.58	20	6	7	11.65	17	2	7	12.00
8	13	7	8	10.53	13	7	8	11.55	12	3	8	11.60
9	11	20	9	10.49	5	5	9	11.48	15	11	9	11.45
10	9	24	10	10.48	14	4	10	11.17	18	5	10	10.79
11	20	6	11	10.40	8	15	11	11.03	2	2	11	10.50
12	12	3	12	10.36	15	14	12	10.85	19	3	12	10.40
13	8	15	13	10.10	10	5	13	10.79	8	14	13	10.38
14	7	21	14	9.93	1	18	14	10.35	13	4	14	10.22
15	14	4	15	9.78	12	3	15	9.58	14	4	15	10.17
16	17	4	16	9.34	18	7	16	9.37	3	3	16	10.16
17	2	2	17	9.06	16	2	17	9.17	7	18	17	10.12
18	5	5	18	8.38	2	2	18	8.96	5	5	18	9.88
19	3	4	19	7.72	3	4	19	7.77	20	1	19	9.27
20	16	2	20	7.47	21	3	20	7.38	4	4	20	8.98
21	4	6	21	5.97	4	6	21	6.35	16	.		.

Table 4: Estimated breeding value of sire and their ranks(R) for lactation traits as 305 days lactation milk yield, total milk yield and peak yield by best linear unbiased prediction (BLUP).

Sr. no.	Sire Code	N	MY305	Rank	Sire Code	N	TMY	Rank	Sire Code	N	PY	Rank
1	8	15	2127.42	1	5	5	2235.56	1	4	6	12.48	1
2	14	4	2119.78	2	2	2	2232.27	2	16	2	11.89	2
3	2	2	2096.13	3	14	4	2224.21	3	8	15	11.35	3
4	16	2	2092.44	4	16	2	2183.20	4	3	4	11.22	4
5	15	14	2081.67	5	8	15	2182.78	5	10	5	11.20	5
6	5	5	2061.13	6	15	14	2175.33	6	2	2	11.12	6
7	10	5	2002.85	7	1	18	2123.40	7	12	3	11.07	7
8	1	18	1995.60	8	21	3	2110.67	8	18	9	11.04	8
9	17	4	1990.92	9	9	24	2097.00	9	7	21	10.92	9
10	19	6	1986.27	10	4	6	2079.61	10	14	4	10.90	10
11	4	6	1972.86	11	19	6	2061.54	11	21	3	10.88	11
12	11	20	1966.20	12	17	4	2052.21	12	9	24	10.76	12
13	21	3	1965.60	13	10	5	2045.62	13	13	7	10.70	13
14	9	24	1963.80	14	20	6	2032.94	14	17	4	10.69	14
15	20	6	1957.13	15	11	20	2023.32	15	15	14	10.56	15
16	7	21	1937.95	16	7	21	1995.93	16	20	6	10.53	16
17	18	9	1873.35	17	6	6	1987.22	17	11	20	10.46	17
18	6	6	1867.48	18	13	7	1941.97	18	6	6	10.16	18
19	13	7	1856.58	19	18	9	1891.31	19	5	5	10.13	19
20	12	3	1852.44	20	12	3	1879.73	20	19	6	9.83	20
21	3	4	1762.37	21	3	4	1605.71	21	1	18	9.11	21

Results and Discussion

Simple daughter's average method ($\overline{D}$)

The average breeding value of sires was found to be 1403.91 and 2333.07 (minimum and maximum) for 305 days of lactation milk yield respectively in the first parity, whereas the minimum and maximum breeding values were 1604.79, 2469.47 and 1621.36, 2353.68 in the second and third parity respectively out of 21 sires. From the parity result indicates for 305 days of lactation milk yield sire code 6 was better in three parities.

For total milk yield (TMY), the average breeding value of sires was determined to be 1403.91 (minimum) and 2545.41 (maximum), but the minimum and maximum breeding values were 1604.79, 2523.62 and 1621.36, 2353.68 in the second and third parties, respectively out of 21 sires. Parity result indicates that the sire code 3, 6 and 10 were better in three parities as compared to sire code 6 in third parity.

The average breeding value of sires were found to be 5.97

(minimum) and 12.19 (maximum) for peak yield (PY) in first parity, however in the second and third parties, the minimum and maximum breeding values were 6.35, 12.51 and 8.98, 13.67, respectively out of 21 sires. These values indicate that the performance of sire 06 was better for 305 days lactation milk yield, total milk yield and peak yield.

Best Linear Unbiased Prediction (BLUP) method

The average breeding value of Sahiwal sires was observed to be 1762.37 and 2127.42 (minimum and maximum) for 305 days of lactation milk yield respectively, whereas the minimum and maximum breeding values were 1604.71, 2235.56 and 9.11 and 12.48 on total milk yield and peak yield respectively out of 21 sires. Based on estimated breeding values for 305 days lactation milk yield, total milk yield and peak yield by using BLUP method of sire evaluation revealed that sire 2, 8, 14, 15 and 16 were best in performance as compared to other sires.

Deulkar and Kothekar (1999) [3] reported estimated breeding value of Sahiwal sires for TMY ranged from 1262.90 to 1543.65 kg using BLUP method of sire evaluation. Comparatively lower estimates were reported by Pundir *et al.* (2004) [10], Banik and Gandhi (2006) [6], Kumar and Gandhi (2010) [9] as 1463.33, 1520 72 and 1522.53 kg respectively than the present estimates of breeding value in Sahiwal sires by using LSM,. Kumar and Gandhi (2010) [9] as 1581.80 kg breeding value for TMY and Dongre and Gandhi (2014) [4] reported estimated average breeding value of 1869.91 kg (928.33 to 2641.06 kg). The differences between the estimated values of present study and the reported work of various researchers were due to varying genetic make-up of herd and the management practices used at farms.

Conclusion

The estimated breeding values (EBVs) of sires showed genetic variation between sires for all lactation traits. BLUP method of sire evaluation revealed that sire 2, 8, 14, 15 and 16 were best in performance as compared to other sires. There were difference in the rank of top sires by simple daughter average ($\overline{\mathbf{D}}$) and BLUP method of sire evaluation. These results indicated that both method of sire evaluation would not rank same for lactation traits. However, the rank of sires for lactation traits revealed that five top Sires almost had not similar rank in both methods for lactation traits.

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References

1. Bajetha G. Selection of sires by using different sires evaluation methods in crossbred cattle. Ph.D. Thesis, G.B. Pant University of Agriculture and Technology, Pantnagar, U. S. Nagar, Uttarakhand; c2006.
2. Bajetha G, Singh CV. Efficiency of different sire evaluation methods to improve life time production traits in crossbred cattle. Livestock Research International. 2015;3(3):64-70.
3. Duelkar PB, Kothekar MD. Sire evaluation considering FLY for improvement of lifetime production in Sahiwal. Indian Journal of Animal Sciences. 1999;69:240-242.
4. Dongre VB, Gandhi RS. Study on sire evaluation methods in Sahiwal cattle. Indian Journal of Veterinary & Animal Science Research. 2014;43:174-179.
5. Edward J. The progeny test as a method of evaluating the dairy sire. Journal of Agricultural Science. 1932;22:810-837.
6. Gandhi RS. Animal model versus conventional models of sire evaluation in Sahiwal cattle. Asian Australasian Journal of Animal Sciences. 2006;19:1225-1228.
7. Harvey WR. User guide for LSMLMW and MIXMDL package. Mix model least squares and maximum likelihood computer programme. PC-2 Version Mimeograph, Columbia, Chio, USA; 1990.
8. Henderson CR. Recent development invariance and covariance estimation. Journal of Animal Science. 1986;63:208-216.
9. Kumar A, Gandhi RS. Comparison of sire evaluation methods for first lactation milk yield and lifetime traits in Sahiwal cattle. Indian J Anim Sci. 2010;80(12):1198-1202.
10. Pundir RK, Malik RPS, Prakash B. Comparision of different site evaluation methods in Sahiwal cattle Indian J Anim Sel. 2004;74(2):229-231.
11. Verma N, Thakur YP. Effect of genetic and non-genetic factors on production efficiency traits of Red Sindhi x Jersey crossbred cows maintained under subtemperate Indian conditions. Livestock Research International. 2015;1(2):58-60.