International Journal of Applied Research 2020; 6(10): 1105-1109

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2020; 6(10): 1105-1109
www.allresearchjournal.com
Received: 22-08-2020
Accepted: 29-09-2020

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Evaluation of Frieswal sires for lifetime milk yield

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Abstract
The data on Holstein Friesian x Sahiwal cows maintained at Military Dairy Farm, Pimpri, Pune (Maharashtra) were collected for the present study. A total of 9094 lactation records belonging to 3425 Frieswal cows born to 239 sires were collected. The data available from various records viz. pedigree register, history sheets, lactation register, dry cow register and disposal register were collected and compiled. The data were standardized by removing the sires with less than five progenies. The breeding values of the top 15 sires were predicted up to first three lactations on the basis of daughter's performance by using Best Linear Unbiased Prediction (BLUP) as given by Henderson (1976). It was observed that overall mean (μ) for breeding value of sires up to three lactations predicted using BLUP was 9530.12± 99.89 kg. The sire DEVTA was ranked first on the basis of breeding values estimated by BLUP on the basis of daughter's performance (11061.89 ± 938.8 kg) whereas lowest predicted breeding value was recorded for sire SPAM (6724.92 ± 923.47). The overall mean (μ) for breeding value of sires up to five lactations predicted using BLUP was 16538.28 ± 195.22 kg. It was observed that the predicted breeding value of sire DEVTA was highest while the breeding value of sire SPAM was lowest amongst all sires studied.

Keywords: Frieswal sires, BLUP, breeding value

Introduction
India is one of the world's largest milk-producing countries, and milk is an important part of the Indian diet. The dairy sector in India is largely dominated by small-scale farmers, and milk production has been increasing steadily in recent years. According to the latest data from the Ministry of Agriculture and Farmers' Welfare, the total milk production in India during 2020-21 was 208.43 million tonnes, which is an increase of 6.5% from the previous year. The average milk yield per animal per day was 3.05 kg, which is an improvement from the previous year's average of 2.93 kg. Dairy sector an important sector of the Indian economy as it contributed about 20 % to the total GDP first time in the last 17 years during 2020-21 (Economic survey of India 2020-2021). The sires plays very important role in milk production by contributing high yielding daughters in the flock. In this context, estimation of breeding values is important in cattle breeding as it allows breeders to select the best sires for producing the next generation of animals. Breeding values are estimates of the genetic merit of an animal for a particular trait, such as milk production or meat quality. By estimating the breeding values of sires, breeders can identify the animals that are likely to produce offspring with desirable traits. By selecting sires with high breeding values for desirable traits, breeders can improve the overall quality of their herd and increase productivity. For example, selecting sires with high breeding values for milk production can increase the milk yield of the herd, while selecting sires with high breeding values for meat quality can improve the quality of the meat produced by the herd. Considering the fact the present investigation is carried out to estimate the breeding values of sires and ranking them as per their performance.

Materials and Method
All available data on Holstein Friesian x Sahiwal cows maintained at Military Dairy Farm, Pimpri, Pune (Maharashtra) were collected for the present study. A total of 9094 lactation records belonging to 3425 Frieswal cows born to 239 sires were collected.

The data available from various records viz. pedigree register, history sheets, lactation register, dry cow register and disposal register were collected and compiled. The information included was on animal ID, name, date of birth, sire ID and name, dam ID and name, grand sire ID and name, grand dam ID and name, calving and lactation data along with disease and immunization records. Similarly, the record on date of birth, date of calving, date of drying and date of death along with reason of death was also noted. Based on this information, age at first calving, dry period, and inter-calving periods were estimated. The sires with less than five progenies were omitted from the study. The lifetime milk yield was divided into lifetime milk yield up to three and five lactations. The data were tested for normal distribution using PROC UNIVARIATE, of SAS9.13. If the data were found to be deviating from normal distribution then appropriate transformation viz., log transformation, square root transformation, deleting the outliers and others was carried. The descriptive statistics viz., number of observation, minimum, maximum, mean, standard errors and coefficient of variation (CV) were estimated using PROC MEAN procedure of SAS 9.13 for different traits. The Genetic parameters of sires were estimated by average information Restricted Maximum Likelihood (AIREML) programme developed by Gilmour (1995) using animal model.

$$Y=Xb + Zu + e$$

Denote the linear model of analysis for q trait with y vector of N observations for the trait; b the vector of fixed effects; x the incidence or design matrix for fixed effects; u the vector of all random effects fitted; Z the incidence matrix for random effects; and e the vector of N random residual errors. Assumption: V (u) =G, V (e) = R and Cov (u, e) = 0 With the likelihood maximized was

$$\text{Log } L = - 1/2[\text{constant} + \log | v | + \log |X^*V\text{-}1X^* |+(y - x\hat{b})v\text{-}1'(y- x\hat{b})]$$

The Genetic Parameters were estimated by AIREML computer programme using a bivariate model.

Results and Discussions

The estimated breeding values of sires for lifetime milk yield up to three lactations by using the BLUP is presented in table 1. Total eighty one sires were evaluated for their milk performance. It was observed that the average breeding values of sires up to first three lactations was 9530.125 ± 99.89 Kg. There were almost more than twenty sires with breeding values more than 10000 Kg indicating that the flock is well maintained and the pedigree record is kept in well manner.

Table 1: Estimated breeding values of sires using BLUP and various prediction models up to three lactations

Sr. No.	Sire	Breeding values of sires estimated using BLUP
1	μ	9530.125 ± 99.89
2	001KARAN	9886.81 ± 883.03
3	009HARISH	9801.92 ± 949.09
4	04TYSON	9507.7 ± 784.87
5	112ADARSH	8075.85 ± 919.43
6	114HONDA	10970.51 ± 973.58
7	126LION	9285.48 ± 766.14
8	132NAZIR	9922.13 ± 1191
9	161ALOK	9262.02 ± 853.52
10	173LOHAN	9806.37 ± 628.23
11	179GAGAN	8060.16 ± 709.31
12	243HAZAR	10076.13 ± 1112
13	301SHIVA	8859.13 ± 1038
14	32FAIZ	8682.13 ± 1026
15	572LORD	10612.51 ± 926.18
16	477BAAZ	9584.1 ± 868.51
17	519HIRA	8351.62 ± 970.21
18	548COBRA	9953.02 ± 759.46
19	551HARI	9491.52 ± 566.95
20	638GAJRAJ	10157.82 ± 956.3
21	652MADHAV	8884.13 ± 1161
22	693JATIN	9185.07 ± 869.1
23	698HASP	9461.31 ± 713.03
24	871HIPPY	8779.15 ± 601.23
25	921LOTAN	8209.35 ± 771.6
26	987TYSON	7653.25 ± 625.53
27	ANGAR	8825.71 ± 984.68
28	BAAZ	10089.13 ± 1042
29	BHARAT	9731.13 ± 1110
30	CJH339TORA	11061.4 ± 769.66
31	CLK332ANKIT	10271.87 ± 547.88
32	CLK347RAM	9515.84 ± 614.11
33	CLK399HARSH	9566.99 ± 916.49
34	CMO609INDIA	10253.77 ± 915.27
35	CMT318SAJAN	10394.81 ± 971.75
36	CMT337JASBIR	10963.76 ± 668.71
37	CMT398SETH	9928.92 ± 976.08

38	CMT516PURAN	9422.2 ± 519.38
39	CMT525NAHAR	8720.13 ± 1110
40	CMT548MADHOSH	9545.97 ± 688.73
41	CMT619MITU	9610.45 ± 708.29
42	CMT633BALWAN	10374.11 ± 948.15
43	CMT634ZUMKA	8594.13 ± 995.63
44	CMT678UTTRA	8518.13 ± 816.79
45	CNK574RONAK	10158.87 ± 568.36
46	DEVTA	11061.89 ± 938.8
47	HEERA	9853.03 ± 759.49
48	HF	10514.2 ± 802.58
49	HF05	9206.13 ± 1074
50	HF104	7721.98 ± 711.97
51	HF117	10521.45 ± 941.76
52	HF13	9697.13 ± 1071
53	HF15	7784.13 ± 1007
54	HF305	7448.42 ± 910.15
55	HF3124	10314.7 ± 807.49
56	HF769	9809.13 ± 1034
57	HF99	9908.13 ± 1070
58	HFADIL	9722.13 ± 1018
59	KANWAR	8142.13 ± 1074
60	KARAN	10262.4 ± 998.82
61	NJM683NATA	9516.13 ± 1211
62	NPK341SHYAM	9835.89 ± 570.22
63	NPK430SHIV	10619.31 ± 819.25
64	PETERSON	10066.89 ± 869.48
65	SARTAJ	10663.13 ± 1034
66	SPAM	6724.92 ± 923.47
67	SW125	9129.72 ± 997.38
68	WAM211MANGU	10536.37 ± 617.3
69	WAM331KENU	10794.18 ± 854.32
70	WAM331SARWAN	10757.34 ± 919.88
71	WAM332DEEPAK	9137.81 ± 755.12
72	WAM417MAHI	10071.23 ± 650.59
73	265SALVI	10410.87 ± 441.33
74	CJH386GYAN	9158.26 ± 571.95
75	WAM445OM	10464.28 ± 747.68
76	WAM540FORN	9794.33 ± 732.02
77	WAM560MONTY	10808.32 ± 839.15
78	WAM569BOXER	9935.9 ± 995.74
79	WAM675LOZER	9305.57 ± 708.61
80	WJR267FLORA	9299.59 ± 749.57
81	WJR984KANS	9723.78 ± 809.81

The sire Devta was ranked first on the basis of breeding values estimated by BLUP on the basis of daughter's performance (11061.89 ± 938.8 kg) whereas lowest predicted breeding value was recorded for sire SPAM (6724.92 ± 923.47). Contrary to the present findings the lower estimates of breeding value were reported by Lodhi *et al.* (2016) [4], Singh and Singh (2016) [5], Dongre (2012) [2], Bajetha and Singh (2015) [1] and Kumar *et al.* (2008) [3] reported lower estimates of breeding value for first lactation in different breeds of cattle.

The breeding values were also estimated by considering the lifetime milk yield up to five lactations and presented in table 2.

Table 2: Estimated breeding values of sires using BLUP and various prediction models up to five lactations

Sr. No.	Sire	BV5±SE
1	μ	16538.28 ± 195.22
2	001KARAN	16791.28 ± 1535
3	009HARISH	16208.13 ± 1665
4	04TYSON	15945.18 ± 1392
5	112ADARSH	15551.24 ± 1705
6	114HONDA	19086.47 ± 1678
7	126LION	16125.12 ± 1468
8	132NAZIR	17390.23 ± 2009
9	161ALOK	16575.43 ± 1721
10	173LOHAN	15863.12 ± 1629
11	179GAGAN	18436.19 ± 1154
12	243HAZAR	15334.09 ± 1302

13	301SHIVA	15611.17 ± 1798
14	32FAIZ	16857.42 ± 1856
15	572LORD	17459.28 ± 1587
16	477BAAZ	17472.87 ± 1568
17	519HIRA	15307.13 ± 1712
18	548COBRA	17555.20 ± 1425
19	551HARI	16728.28 ± 1062
20	638GAJRAJ	16744.23 ± 1653
21	652MADHAV	14359.34 ± 1712
22	693JATIN	16085.13 ± 1502
23	698HASP	16255.47 ± 1355
24	871HIPPY	14673.55 ± 1099
25	921LOTAN	14990.81 ± 1448
26	987TYSON	13807.14 ± 1253
27	ANGAR	15173.78 ± 1785
28	BAAZ	17767.87 ± 1799
29	BHARAT	16418.12 ± 2014
30	CJH339TORA	17420.21 ± 2134
31	CLK332ANKIT	15836.46 ± 1535
32	CLK347RAM	16463.15 ± 1526
33	CLK399HARSH	16538.20 ± 2253
34	CMO609INDIA	16538.46 ± 2253
35	CMT318SAJAN	15633.21 ± 2134
36	CMT337JASBIR	18127.24 ± 1675
37	CMT398SETH	16538.16 ± 2253
38	CMT516PURAN	15929.87 ± 1127
39	CMT525NAHAR	16538.46 ± 2253
40	CMT548MADHOSH	16947.21 ± 1294
41	CMT619MITU	16538.78 ± 2253
42	CMT633BALWAN	16538.91 ± 2253
43	CMT634ZUMKA	16538.56 ± 2253
44	CMT678UTTRA	16538.24 ± 2253
45	CNK574RONAK	16538.26 ± 2253
46	DEVTA	19639.07 ± 1720
47	HEERA	16137.42 ± 1363
48	HF	19552.08 ± 1429
49	HF05	17492.09 ± 1860
50	HF104	14103.45 ± 1265
51	HF117	19114.37 ± 1679
52	HF13	17610.46 ± 1859
53	HF15	15157.93 ± 1734
54	HF305	13274.28 ± 1518
55	HF3124	17536.11 ± 1628
56	HF769	16028.25 ± 2032
57	HF99	16241.14 ± 1859
58	HFADIL	16499.26 ± 1860
59	KANWAR	14822.64 ± 1867
60	KARAN	18793.67 ± 1726
61	NJM683NATA	16538.12 ± 2253
62	NPK341SHYAM	16609.30 ± 1337
63	NPK430SHIV	17158.78 ± 1933
64	PETERSON	18598.82 ± 1662
65	SARTAJ	19618.44 ± 1727
66	SPAM	12693.28 ± 1549
67	SW125	16538.14 ± 2253
68	WAM211MANGU	18586.47± 1269
69	WAM331KENU	17795.93± 1624
70	WAM331SARWAN	16585.32 ± 1856
71	WAM332DEEPAK	15906.09 ± 1667
72	WAM417MAHI	17373.45 ± 1495
73	265SALVI	19377.28 ± 965.3
74	CJH386GYAN	16709.25 ± 1490
75	WAM445OM	17510.36 ± 1794
76	WAM540FORN	16785.43 ± 1611
77	WAM560MONTY	17684.67 ± 1528
78	WAM569BOXER	16538.46 ± 2253
79	WAM675LOZER	16824.24 ± 1424
80	WJR267FLORA	14563.47 ± 1606
81	WJR984KANS	16279.10 ± 1493

The overall mean (μ) for breeding value of sires up to five lactations predicted using BLUP was 16538.28 ± 195.22 kg. It was observed that the predicted breeding value of sire DEVTA was highest while the breeding value of sire SPAM was lowest amongst all sires studied. Similar results were reported by Lodhi *et al* (2016) [4] in crossbred cattle. However, the contradictory results were reported by Singh and Singh (2016) [5], Dongre (2012) [2], Bajetha and Singh (2015) [1] and Kumar *et al.* (2008) [3] reported lower estimates of breeding value for first lactation in different breeds of cattle.

Conclusion

The present study indicated that the breeding value of sire estimated using BLUP for lifetime milk yield up to three lactations and lifetime milk yield up to five lactations was highest for the sire DEVTA and lowest for the sire SPAM. So the sire DEVTA was the superior to all the other sires studied in the present investigation.

Acknowledgement

We are thankful to Lt.Col, Military Dairy Farm, Pimpri, Pune, Maharashtra state of India for providing data on various production parameters. We also thanks to the Director ICAR- CIFE and Principal Scientist, Dept of Fish Genetics and Biotechnology, ICAR-CIFE, Varsova, Mumbai for providing computer laboratory facilities and technical guidance. Similarly, we are thankful to Mr. Nitin Patil for developing the software for data collection.

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