LIVESTOCK RESEARCH INTERNATIONAL
Journal homepage: www.jakraya.com/journa/lri

ORIGINAL ARTICLE

Sire Evaluation on The Basis of First Lactation Traits Using Best Linear Unbiased Prediction (BLUP) Method in Sahiwal and Crossbred Cattle

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Received: 21/10/2015

Revised: 06/12/2015

Accepted: 07/12/2015

Abstract

The performance records of 1170 crossbred daughter of 65 sires, maintained at Instructional Dairy Farm of the institute, during 1970 to 2004 were used to estimate sire's breeding value for first lactation traits. First lactation traits included were age at first calving, first lactation milk yield, first lactation period, first dry period, first calving interval, and first service period. The Best Linear Unbiased Prediction (BLUP) was used to obtain the estimates of breeding values. The estimated breeding values (EBVs) of sires showed large genetic variation between sires for all first lactation traits. There were changes in the rank of first few top sires by BLUP method of sire evaluation. These results indicated that all Sires would not rank same for first lactation traits. However, the rank of sires for different traits revealed that 4-5% of top Sires almost had similar rank for first lactation traits.

Key words: Breeding value, First lactation traits, Lifetime performance traits, Product moment correlation, Rank correlation, Sire evaluation.

1. Introduction

The production efficiency traits considering both the production and reproduction aspect of an animal are important parameters for ensuring profitability of dairy animal over longer period (Verma and Thakur, 2015). The evaluation of sire has been of prime importance from long past. The prediction of breeding values constitutes an integral part of most breeding programmes for genetic improvement of sires for different productive and reproductive traits. Traditionally, the breeding value was estimated as the individual or progeny deviation from contemporary performance within an environment. In dairy cattle breeding, the selection of sire for milk yield is the most important aspect of genetic improvement (Raheja, 1992; Bajetha and Singh, 2015). Sire evaluation programmes are also essential because the majority of genetic improvement can be attained through the selection of males rather than selection of females. Relationship between sire's breeding value for first lactation traits and life time performance traits in dairy cattle is important in determining whether accommodation to select dairy sire's based on performance of their daughter's first lactation would improve the total life time production or not. In view of the above consideration, it was planned to employ Best Linear Unbiased Prediction (BLUP) method to estimate the breeding value of sires for first lactation traits to determine relationship among estimates of sire's breeding value.

2. Materials and Methods

The performance records of 1170 (S x HF, S x J, S x RD, S x HF x RD, S x RD x J, Rathi x HF x J, S x HF x J and S x HF x RD x J) daughter of 65 sires, maintained at Instructional Dairy Farm, G.B. Pant University of Agriculture and Technology, Pantnagar, during 1970 to 2004 were used to estimate sire's breeding value for first lactation traits. Cows with abnormal and incomplete records were excluded from the study. Each year was divided into three seasons, viz- summer (March to July), rainy (August to October) and winter (November to February) based on climatologically conditions.

Sires were grouped into 8 sires genetic groups on the type of inheritance and period of calving divided into 7 periods on the basis of period in which their first daughter was born. First lactation traits included in this study were age at first calving, first lactation milk yield, first lactation period, first dry period, first calving interval and first service period. Breeding values of sires for first lactation traits were estimated -

Table 1: Estimated Breeding Value Of Sire And Their Ranks(R) For First Lactation Traits By Best Linear Unbiased Prediction.

Sire no	AFC	R	FLMY	R	FLP	R	FDP	R	FCI	R	FSP	R
11	1333.37	9	3026.26	52	351.02	56	172.97	24	524.95	16	275.33	59
12	1368.14	39	3034.53	48	361.30	16	167.51	11	529.46	24	269.57	17
13	1333.60	10	3100.17	21	347.19	61	174.70	31	522.62	9	273.62	46
14	1378.77	50	3004.15	58	354.06	42	191.78	58	546.58	55	273.72	49
15	1374.21	45	3219.93	3	349.43	57	171.75	22	521.71	7	271.45	31
16	1384.76	55	3078.08	29	368.62	4	184.66	52	554.03	62	270.08	21
17	1340.61	14	2998.77	59	364.21	6	170.46	19	535.38	35	265.16	4
18	1354.85	27	3137.88	14	351.94	53	192.50	59	545.12	54	269.11	14
19	1378.39	49	3132.77	16	364.19	7	168.37	13	536.50	38	274.01	51
20	1344.51	17	3168.04	8	375.10	1	177.78	40	553.98	61	269.94	19
21	1315.73	3	3068.08	37	358.92	26	178.33	42	538.37	42	276.18	62
22	1355.11	28	3163.74	9	353.11	49	181.26	46	535.22	34	270.35	23
23	1365.34	37	3149.10	12	354.30	40	164.97	6	521.65	6	271.69	33
24	1387.31	59	2963.94	64	348.89	58	169.12	15	518.74	2	267.61	10
25	1410.24	65	3029.44	50	355.41	36	202.57	64	558.77	64	271.40	30
26	1376.87	47	3065.75	39	356.39	32	167.71	12	524.87	15	269.20	16
27	1330.86	8	3043.07	45	352.96	50	175.79	36	529.62	25	274.36	55
28	1345.87	18	2971.16	63	351.29	54	172.09	23	523.66	12	268.01	12
29	1322.82	4	3197.98	6	362.00	13	189.81	55	553.75	60	266.26	6
30	1352.39	21	3074.72	31	354.14	41	185.28	53	539.84	45	269.90	18
31	1362.28	32	3086.14	24	358.42	28	185.97	54	544.44	51	271.03	28
32	1408.49	64	3066.95	38	361.42	15	175.48	34	538.42	43	270.90	26
33	1362.57	33	3008.38	57	362.10	12	171.25	20	533.53	31	274.81	57
34	1387.24	58	3155.87	10	346.05	62	173.60	26	523.17	11	277.79	65
35	1344.31	16	3089.97	23	359.65	25	164.03	4	524.40	14	272.01	37
36	1346.10	19	3134.64	15	360.29	20	174.66	30	536.85	40	273.90	50
37	1303.56	2	2972.02	62	344.08	65	173.64	27	517.89	1	272.32	39
38	1405.55	62	3072.12	34	354.37	39	180.05	43	534.55	33	269.17	15
39	1334.31	11	3070.61	35	348.09	60	180.15	44	531.88	28	275.68	61
40	1392.41	60	3076.57	30	355.82	35	174.75	32	531.21	26	267.98	11
41	1376.88	48	3085.57	25	360.08	21	178.11	41	539.06	44	266.71	7
42	1368.13	38	3040.77	46	370.47	3	190.42	56	561.57	65	273.18	43
43	1359.02	30	3198.87	5	361.87	14	165.73	9	528.20	20	271.78	34
44	1362.83	34	3044.74	44	362.38	10	175.36	33	540.42	46	263.69	2
45	1337.78	13	3023.73	53	354.57	38	192.57	60	547.98	56	271.49	32
46	1385.07	57	3154.36	11	348.20	59	182.60	49	531.69	27	274.32	54
47	1383.49	54	3072.78	33	359.73	24	195.94	62	556.51	63	270.08	20
48	1372.45	44	3117.31	18	353.57	46	171.28	21	525.67	18	270.61	24
49	1364.41	35	3026.97	51	353.61	45	167.30	10	521.79	8	272.39	40
50	1354.04	26	3017.53	54	362.18	11	158.07	1	521.06	4	275.63	60
51	1325.89	6	3193.75	7	360.84	18	174.39	29	536.09	36	272.52	41
52	1371.60	42	3090.49	22	359.96	23	176.66	38	537.36	41	274.45	56
53	1382.29	53	3010.66	56	353.79	44	197.17	63	551.77	59	270.20	22
54	1358.09	29	3209.70	4	366.41	5	177.53	39	544.54	52	273.63	47
55	1334.32	12	3139.61	13	361.08	17	165.47	8	527.17	19	272.53	42
56	1368.42	40	3074.52	32	344.55	64	204.67	65	549.98	57	271.20	29
57	1324.36	5	3014.37	55	360.31	19	162.56	2	523.85	13	267.60	9
58	1393.14	61	3080.78	28	352.59	51	169.30	16	524.97	17	267.53	8
59	1353.75	25	3031.03	49	356.39	33	164.17	5	521.57	5	273.59	45
60	1380.61	51	3126.70	17	357.21	31	183.16	50	541.36	49	273.70	48
61	1371.64	43	2944.47	65	356.26	34	194.28	61	551.44	58	273.26	44
62	1384.90	56	3049.73	41	351.26	55	184.07	51	536.23	37	265.99	5
63	1375.96	46	3049.26	42	354.65	37	176.48	37	533.59	32	274.09	52
64	1293.11	1	3332.41	1	371.14	2	169.47	17	541.18	47	271.82	35
65	1344.18	15	3085.33	26	353.31	48	174.32	28	528.67	21	263.93	3

66	1353.51	23	3069.93	36	353.47	47	165.30	7	519.66	3	270.98	27
67	1382.05	52	2993.33	60	357.77	29	170.43	18	529.08	23	276.95	64
68	1364.93	36	3080.84	27	362.52	9	169.06	14	532.62	30	270.89	25
69	1353.67	24	3040.17	47	353.94	43	181.84	48	536.75	39	271.91	36
70	1361.94	31	3057.35	40	352.25	52	191.48	57	544.84	53	268.46	13
71	1353.14	22	2986.43	61	345.87	63	175.69	35	522.67	10	275.28	58
72	1348.75	20	3113.43	19	360.01	22	180.87	45	541.99	50	272.02	38
73	1368.86	41	3103.73	20	357.67	30	173.43	25	532.17	29	276.61	63
74	1326.96	7	3221.79	2	364.14	8	163.63	3	528.93	22	261.25	1
75	1407.72	63	3047.42	43	358.68	27	181.51	47	541.24	48	274.29	53

AFC=age at first calving, FLMY=first lactation milk yield, FLP=first lactation period, FDP=first dry period, FCI=first calving interval, and FSP= first service period.

by Best Linear Unbiased Prediction (BLUP) method as proposed by Henderson (1975).

3. Results and Discussion

The estimated breeding values (EBVs) by Least squares procedure of sires along with their ranks for first lactation traits are given in the Table l. The estimated breeding values of sires showed large genetic variation between sires for first lactation traits. The estimated breeding values (EBVs) for sires ranged from -67.64 to 49.49 (1293.11-1410.24) days for age at first calving, -136.93 to 251.01 (2944.47-3332.41) kg for first lactation milk yield, -12.80 to 18.22 (344.08-375.10) days for first lactation period, –19.11 to 27.49 (158.07-304.67) days for first dry period, –17.26 to 26.42 (517.89-561.57) days for first calving interval, -10.09 to 6.45 (261.25-277.79) days for first service period respectively. Dalal *et al.* (1999) also reported large genetic differences between breeding values of sires for first lactation traits.

In general, EBVs for sires did not showed any systematic trend of first lactation traits. In the present investigation the estimated breeding values of sires for first lactation traits showed large variation between EBVs of sires which revealed more genetic variation in the herd. This might be due to fact that this herd had number of genetic groups and maintained as close herd and animals with low production might have not been culled from the herd. The large variation in the estimated breeding values might be due to procedure used for estimating the breeding values of sires. Tajane and Rai (1990) ranked Sahiwal and Holstein Friesian sires using LS and BLUP method and reported that BLUP method was the best method. Raheja (1992) also evaluated Sahiwal sires using D, LS and BLUP methods and reported that LS and BLUP methods were the most accurate method, but LS to be more accurate than BLUP when variance is not known. Dahia *et al*. (2003) and Dubey (2004) reported that EBVs estimated by BLUP method showed small genetic variation in comparison to Least Squares method because of its derivable properties. Bajeetha (2006), Dubey *et al.* (2006), Moges *et al.* (2009) and Singh and Singh (2011) also reported that BLUP as best procedure in comparison to other procedures of sire evaluation.

The top sires ranked on the basis of age at first calving revealed that sire No. 64 ranked 1st and Sire No. 37 ranked 2nd, while sire No. 51, 74, 65 and 21 ranked third respectively on the basis of AFC. The top sires ranked on the basis of first lactation milk yield revealed that Sire No. 64 ranked 1st and sire No. 74 ranked 2nd. Sire No. 64, 74 and 15 ranked 1st, 2nd and 3rd by BLUP method respectively for first lactation milk yield. The top sires ranked on the basis of first lactation period revealed that sire No. 20 ranked 1st and sire No. 64 ranked 2nd and sire No. 42 ranked 3rd.The top sires ranked on the basis of First dry period revealed that sire No. 58 ranked 1st, sire No. 59 ranked 2nd and sire No. 74 ranked 3rd by BLUP method. The top sires ranked on the basis of first calving interval revealed that Sire No. 37 59 ranked 1st, sire No. 24 ranked 2nd and sire No. 66 ranked 3rd by BLUP method. The top sires ranked on the basis of FSP revealed that sire No. 74 ranked 1st by BLUP, sire No. 44 ranked 2nd and sire No. 65 ranked 3rd for first service period.

There were changes in the rank of first few top Sires by BLUP method of sire's evaluation. These results indicated that all sires would not rank same for first lactation traits. However, the rank of sires for different traits revealed that 4-5% of top sires almost had similar rank for first lactation traits. The present results are in agreement of Pundir and Raheja (1994), Dalal *et al*. (1999), Dubey and Singh (2005) and Bajetha (2006) on the basis of first lactation and lifetime traits.

4. Conclusion

The estimated breeding values (EBVs) of sires showed large genetic variation between sires for all first lactation traits. There were changes in the rank of first few top sires by BLUP method of sire evaluation. These results indicated that all Sires would not rank same for first lactation traits. However, the rank of sires for different traits revealed that 4-5% of top Sires almost had similar rank for first lactation traits. In the present investigation the estimated breeding values of

sires for first lactation traits showed large variation between EBVs of sires which revealed more genetic variation in the herd.

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