RESEARCH ARTICLE

BREEDING VALUE ESTIMATION ON SELECTION TRAIT OF MURRAH BUFFALO

*Vijay Kumar and Chakravarty, A. K.

Department of Animal Genetics and Breeding, U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan
Vishwavidyalaya Evam Go Anusandhan Sansthan, Mathura, Uttar Pradesh, India

ARTICLE INFO	ABSTRACT
	In the present study, breeding information spread over a period of 14 years from 1995 to 2008, was collected from the history-cum-pedigree sheets and milk yield registers of Murrah buffaloes maintained in four centres of Network Project on Murrah Buffalo Improvement (National Dairy Research Institute, Karnal; Central Institute for Research on Buffalo, Hisar and Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana and Choudhary Charan Singh Haryana Agricultural University, Hisar). Data on Average first lactation daily milk yield (MY/FLL) of 832 Murrah buffaloes sired by 95 bulls were used for the study. Farm had significant effect on MY/FLL, while season and year of calving did not affect significantly in the present study. Breeding value for MY/FLL was estimated using best linear unbiased prediction (BLUP) method. The breeding value of different bulls varied from 5.750 kg in first set to 7.065 kg in seventh set.

INTRODUCTION

Agriculture is and will continue to be the mainstay of Indian economy. Agriculture sector contributes nearly 14.7 % of gross domestic production (GDP) in India. Livestock sector including dairying, which is the component of the agriculture sector in India, has shown remarkable development in the recent past and contributes to about 28–30 % in the agricultural GDP. Buffaloes play a pivotal role in Indian livestock industry which includes their contribution in terms of milk, meat, skin, manure, and draft animal power. About 63 % of the world's buffalo milk and 95% of buffalo milk in Asia is contributed by Indian buffaloes (Anonymous, 2012). India possesses the largest buffalo population of the world, which is about 105.34 million (Anonymous, 2008), and their numbers are showing positive growth trends. Among the 13 buffalo breeds present in India, Murrah breed is essentially the cynosure for dairy animal and constitutes about 19 % of the total buffalo population. Selection of the superior sires with maximum accuracy is of utmost importance for any breed improvement programme, as sires are easily and rapidly disseminated in various herds under progeny testing programme. Robertson and Randle (1954) opined that as much as 61% of genetic gain in dairy cattle resulted from selection of sires through two paths, i.e. bulls to breed cows and bulls to breed bulls. Hence, accurate selection of bulls used in artificial insemination (AI) programme is of prime importance for long-term genetic progress in the population.

*Corresponding author: Vijay Kumar,
Department of Animal Genetics and Breeding, U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan, Mathura, Uttar Pradesh, India

The prediction of breeding values constitutes an integral part of most breeding programmes for genetic improvement of the sire for different economic traits. The accuracy of estimating the breeding value of an animal is the major factor that affects the genetic progress due to selection. The sire evaluation based on milk yield was most widely used criteria. To make rapid genetic progress in performances through selection for traits of economic importance, the animals must be chosen accurately for their superior breeding values. Over the times various methods have been used for sire evaluation, Henderson's (1973) mixed model or best linear unbiased prediction (BLUP) procedure has become the method of choice for evaluating the genetic worth of the bulls. BLUP is one of the accurate sire evaluation methods to obtain unbiased estimates of breeding values of sires (Mukherjee *et al.,* 2007). The model of analysis under BLUP takes into account, the fixed effect and relationship among animals. Therefore, the breeding values of animals are estimated with higher accuracy.

MATERIALS AND METHODS

The Murrah bulls in 7 sets (11, 12, 15, 14, 15, 16 and 12 bulls) were inducted for progeny testing at Central Institute for Research on Buffalo (CIRB), Hisar, National Dairy Research Institute (NDRI), Karnal Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana, Choudhary Charan Singh Haryana Agricultural University (CCSHAU), Hisar. The daughters of first 7 sets have completed their first lactation records. The Average first lactation daily milk yield (MY/FLL) records of 832 daughters of 95 bulls calved during 14 years from 1995 to 2008, were

used for this study. The period of 14 years was divided into 14 years. Each year of calving was further classified into 2 seasons, viz. most calving season (January to June) and least calving season (July to December) based on calving pattern. All information was classified in four farms viz. NDRI, CIRB, GADVASU and CCSHAU. The breeding value of sires was estimated by best linear unbiased prediction (BLUP) method as given by Henderson (1973).

The model of BLUP estimation was considered as follows:

$$Y= Xb +Za + e$$

Where

Y, b, a and e denotes the vector of observations (MY/FLL)), fixed effects (farm, season and period effect), random effect (sire effect) and random error and X and Z are incidence matrices pertaining to fixed effects and random effects.

RESULTS AND DISCUSSION

The data were adjusted for significant non-genetic factors. The overall least-squares mean for MY/FLL was estimated as 6.34 ± 0.10 kg. Higher than this was reported by Katneni (2007). Farm had significant effect on MY/FLL in the present study.

Table 1. Least-squares means of average first lactation daily milk yield in Murrah buffaloes

Factor	No. of Observation	MY/FLL
Overall (μ)	832	6.34 ± 0.10
Farm		*
NDRI	305	6.25 ± 0.09 [b]
CIRB	314	5.79 ± 0.11 [a]
GADVASU	188	6.74 ± 0.12 [c]
CCSHAU	25	6.59 ± 0.30[c]
Season of calving		
Least calving season	291	6.43 ± 0.12
Most calving season	541	6.26 ± 0.10
Year of calving		
1995	5	7.05 ± 0.64
1996	19	6.64 ± 0.34
1997	33	5.97 ± 0.26
1998	9	5.58 ± 0.48
1999	77	6.35 ± 0.18
2000	66	6.45 ± 0.18
2001	67	5.95 ± 0.19
2002	72	6.16 ± 0.18
2003	108	6.21 ± 0.15
2004	91	6.56 ± 0.16
2005	81	6.55 ± 0.16
2006	87	6.44 ± 0.16
2007	89	6.61 ± 0.15
2008	28	6.25 ± 0.27

Table 2. Breeding values of Murrah buffalo bulls in set 1

Sire	No. of Daughters	Breeding Value	Rank
1	5	6.488	25
2	6	6.579	15
3	8	6.576	16
4	18	6.573	17
5	19	6.299	52
6	18	5.750	93
7	10	5.832	91
8	4	6.373	40
9	5	6.175	69
10	2	6.139	71
11	11	6.128	72

Table 3. Breeding values of Murrah buffalo in set 2

Sire	No. of Daughters	Breeding Value	Rank
12	9	6.270	58
13	8	6.356	44
14	11	6.422	33
15	7	6.673	07
16	2	6.304	50
17	8	6.328	46
18	11	5.857	90
19	15	6.494	22
20	10	6.584	14
21	9	5.912	89
22	9	6.057	78
23	13	6.280	55

Table 4. Breeding values of Murrah buffalo bulls in set 3

Sire	No. of Daughters	Breeding Value	Rank
24	9	6.241	61
25	4	6.498	21
26	8	6.379	39
27	11	6.047	79
28	3	6.483	26
29	6	6.544	19
30	4	6.084	75
31	3	6.024	84
32	2	6.363	42
33	3	6.425	32
34	5	5.994	85
35	21	6.219	64
36	11	6.196	65
37	7	6.045	80
38	9	6.276	56

Table 5. Breeding values of Murrah buffalo bulls in set 4

Sire	No. of Daughters	Breeding Value	Rank
39	18	6.292	54
40	9	6.295	53
41	5	6.351	45
42	9	6.156	70
43	6	6.252	60
44	5	6.386	38
45	6	6.076	76
46	11	6.429	31
47	7	6.471	28
48	9	6.037	82
49	11	6.393	37
50	5	6.305	49
51	11	6.490	24
52	8	6.358	43

Table 6. Breeding values of Murrah buffalo bulls in set 5

Sire	No. of Daughters	Breeding Value	Rank
53	16	6.097	73
54	3	6.367	41
55	12	5.808	92
56	7	6.224	62
57	6	6.351	45
58	6	6.419	34
59	6	6.472	27
60	8	6.265	59
61	3	6.043	81
62	6	6.461	29
63	11	6.653	10
64	9	6.319	47
65	22	6.620	12
66	12	6.844	03
67	12	6.656	09

Table 7. Breeding values of Murrah buffalo bulls in set 6

Sire	No. of Daughters	Breeding Value	Rank
68	10	6.095	74
69	20	6.719	04
70	7	6.058	77
71	2	5.925	88
72	3	6.302	51
73	4	6.565	18
74	8	6.457	30
75	15	6.397	36
76	14	6.499	20
77	5	5.957	87
78	7	6.176	68
79	10	6.623	11
80	10	6.684	05
82	4	6.696	86
83	7	5.967	67

Table 8. Breeding values of Murrah buffalo bulls in set 7

Sire	No. of Daughters	Breeding Value	Rank
84	18	6.669	08
85	8	6.272	57
86	13	6.221	63
87	8	7.046	02
88	6	7.065	01
89	4	6.185	66
90	3	6.032	83
91	13	6.492	23
92	6	6.499	20
93	13	6.316	48
94	9	6.402	35
95	17	6.619	13

Farm-wise least-squares means for NDRI, CIRB, GADVASU and CCSHAU were found to be 6.25 ± 0.09, 5.79 ± 0.11, 6.74 ± 0.12 and 6.59 ± 0.30 kg, respectively. Season and year of calving did not affect MY/FLL of Murrah buffaloes in the present study.

The information on bulls along with their breeding values is given in Table 2 to Table 8. The breeding value of different bulls varied 5.750 to 6.579 kg in first set, 5.912 to 6.673 kg in second set, 5.994 to 6.544 kg in third set, 6.037 to 6.471 kg in fourth set, 5.808 to 6.844 kg in fifth set, 5.925 to 6.719 kg in sixth set and 6.032 to 7.065 kg in seventh set. The highest breeding value was observed for sire 88 (set 7) followed by 87 (set 7) and 66 (set 5). Singh and Singh (1999) observed breeding value of Murrah bulls between 4.52 to 3.50 kg using BLUP method.

REFERENCES

Anonymous. 2008. 18th Livestock Census All India Report, DAHD & F, 2008. Ministry of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India. (www.dahd.nic.in)

Anonymous. 2012. Food and Agriculture Organization, 2012. Buffalo production and research. (http://www.fao.org/statistics/en)

Henderson, C.R. 1973. Proceedings of the Animal Breeding and Genetics Symposium in honor of Dr. Jay L. Lush. American society of Animal Science and American Dairy Science Association, Chanpaign, Illinois (USA): 10.

Katneni, V.K. 2007. Studies on breeding values for persistency in Murrah buffaloes. Ph.D. Thesis, National Dairy Research Institute (Deemed University), Karnal, India.

Mukherjee, S., Joshi, B.K. and Gaur, G.K. 2007. Comparison of sire evaluation methods in Frieswal cattle. *Indian J. Anim. Sci.,* 77(8): 773-776.

Robertson, A. and Randel, J.M. 1954. The performance of heifers got by artificial insemination. *J. Agri. Sci.,* 44: 184-192.

Singh, P.K. and Singh, B.P. 1999. Efficacy of different methods in genetic evaluation of Murrah sires. *Indian J. Anim. Sci.,* 69(12): 1044-1047.

****