NON - GENETIC FACTORS AFFECTING MONTHLY TEST DAY MILK YIELDS IN MURRAH BUFFALOES

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ABSTRACT

The present investigation was carried out using data of first lactation monthly test day milk yields (MTDMY) of 191 Murrah buffaloes maintained at Govt. Livestock Farm (GLF), Hisar and Livestock Research Centre (LRC), Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut over a period of 12 years (2003 to 2014). The data were classified according to season, period and age groups to study the effect of non- genetic factors. The mean of MTDMY increased from 4.625±0.145 kg on MTDMY11 to a peak yield of 10.636±0.214 kg MTDMY3 for first lactation. The season of calving had highly significant (P<0.01) effect on first lactation MTDMY *viz*. TD1, TD2, TD3 and TD4 in first lactation. However, significant (P<0.05) effect was found on MTDMY *viz*. TD5, TD6 and TD7, whereas non significant effect was observed on all remaining monthly test day milk yields. The effect of period of calving on monthly test day yields was highly significant (P<0.01) on TD2, TD3 and TD7, while significant (P<0.05) effects was observed on TD1, TD4, TD5 and TD8 monthly test day milk yields. The effect of period of calving on all remaining monthly test day yields was non-significant. The age groups had significant (P<0.05) effect on TD2 and TD3, whereas non-significant effect on rest of the monthly test day milk yields was observed.

Keywords: *Bubalus bubalis*, buffaloes, Murrah buffaloes, non-genetic factors, monthly test day milk yields

INTRODUCTION

India is the treasure house of world's best buffalo germplasm. The buffalo is not only a better source of milk but also provides meat and draught power. The Indian buffalo contributes 17% of world milk production and 48% of Asian milk production

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(FAO, 2012). Buffaloes contribute around 21.23% of the total livestock population. India is having 108.7 million buffaloes as per Livestock Census 2012.

Murrah is one of the best milch breed of buffaloes with superior genetic potential for milk production and can be considered as black diamond or Holstein-Friesian of the buffalo world. The home tract of this buffalo breed lies in the districts Jind and Rohtak of state Haryana. The test-day milk yield models have recently evoked considerable interest of the animal breeders. A test day (TD) record is the milk yield (morning and evening) of a buffalo at the time of testing on a particular day. Test-day milk yield measurements could be used in genetic evaluation of males and females directly without extension of records. A test-day milk yield model (TDM) is a statistical procedure which considers all genetic and environmental effects directly on a test-day basis (Swalve, 1995).

MATERIALS AND METHODS

Data

The relevant data on first lactation monthly test day milk yields were collected from the history-cum-pedigree sheets and daily milk yield recording registers of 191 Murrah buffaloes maintained at GLF, Hisar and LRC, SVPUT, Meerut from 2003 to 2014. The records of animals with milk production less than 500 kg were discarded. Culling, disposal in middle lactation, abortion, stillbirth and other pathological conditions which affect the lactation yield were considered as abnormalities and hence such records were not taken in for the study. The data were classified into different seasons, periods and age groups. Each year was divided into 4 seasons on the basis of rainfall, temperature and humidity over the years-winter (December to March); Summer (April to June); Rainy (July to September) and Autumn (October to November). The data spread over 12 years (2003 to 2014) were classified into 12 periods of 3 consecutive years. The data were classified into ten different age groups according to the age at first calving. The data were classified into ten groups based on Sturges (Sturges, 1926) formula as follows:

$$\text{Number of agegroups} = \frac{\text{Range}}{1+3.322\log_{10}N}$$

Where, N = No. of observations

Statistical methods

Data were first analyzed by least squares analysis of variance (Harvey, 1987) to identify the significant effects and to standardize the data using least squares constants. The model use was:

$$Y_{ijkl} = \mu + S_i + P_j + A_k + e_{ijkl}$$

Where, Y_{ijkl} = Observation on the Ith individual in ith season, jth period and kth age group

μ = Overall mean

S_i = Fixed effect of ith season

P_j = Fixed effect of jth period

A_k = Fixed effect of Kth age group

e_{ijkl} = Random error, NID (0, σ^2_e)

RESULTS AND DISCUSSION

The overall least square means of different individual monthly test day milk yields (MTDMY) varied from 4.625±0.145 kg (MTDMY11) to 10.636±0.214 kg (MTDMY3) for first lactation (Table 2). In accordance with the present findings, Chakraborty *et al.* (2010) observed the minimum least-square means as 4.43±0.09 kg on MTDMY1 (6^{th} day) and maximum as 8.11±0.25 kg on MTDMY3 (65^{th} day) in Murrah buffaloes. Similar estimates study was reported by Geetha (2005); Katneni (2007) in Murrah buffaloes. The minimum least-squares means were obtained as 3.91±0.17 kg (Geetha, 2005) on Test day 1 (5^{th} day), 4.17±0.12 kg (Katneni, 2007) on Test day11 (305^{th} day), 4.19±0.09 kg (Patil, 2011) on Test day 11 (305^{th} day) while, maximum least-squares means were obtained as 7.15±0.15 kg (Geetha, 2005) on Test day 3 (65^{th} day), 8.05±0.11 kg (Katneni, 2007) on Test day 3 (65^{th} day), 8.10±0.09 kg (Patil, 2011) on Test day 3 (65^{th} day) in first lactation of Murrah buffaloes.

Effect of non-genetic factors

The non-genetic factors included in the least squares model for different individual monthly test day milk yields were season of calving, period of calving and various groups for age at first calving. The least squares means for individual test day milk yields have been given in Table 1.

Season

The effect of season of calving on all the monthly test day milk yields (MTDMY) were statistically found to be highly significant ($P<0.01$) on MTDMY1, MTDMY2, MTDMY3 and MTDMY4, significant ($P<0.05$) effect on MTDMY5, MTDMY6, and MTDMY7; whereas non significant effect was observed on all remaining MTDMYs (Tables 1). However, Katneni (2007) reported that season of calving had significant effect on MTDMY5 to MTDMY9; whereas Patil (2011) reported that season of calving had significant effect on MTDMY2, MTDMY5 and MTDMY7 in Murrah buffaloes. Similarly, Khosla *et al.* (1984); El-Arian (1986) reported that season of calving had significant effect on the entire MTDMYs in Murrah buffaloes. On the other hand, Singh and Yadav (1987); Sahana (1993); Rana (2008) observed a non- significant effect of season of calving on test day milk yield in Murrah buffaloes. The highest individual monthly test day milk yields were observed for the buffaloes calved during the winter season for most of the monthly test days except MTDMY2 and MTDMY3, whereas lowest MTDMYs were observed for the buffaloes calved during the autumn season except for MTDMY1, MTDMY9 and MTDMY10. The highest individual MTDMY was observed for MTDMY3 (11.516±0.847 kg) during winter whereas the lowest individual MTDMY was observed for MTDMY2 (4.424±0.724 kg) for buffaloes calved during summer season (Table 2).

Period

The effect of period of calving on monthly test day yields was highly significant ($P<0.01$) on MTDMY2, MTDMY3 and MTDMY7, while significant ($P<0.05$) effect was observed on MTDMY1, MTDMY4, MTDMY5 and MTDMY8 monthly test day milk yields. The effect of period of calving on all remaining monthly test day yields was non-significant (Table 1). This study was similar to the earlier reports of El-Arian (1986); Rana (2008) in different breeds of buffaloes. Dass (1995) observed that the effect of period of calving was significant on all the test day milk yields except for 6^{th} monthly test-day (155^{th} day) milk yield in the first lactation of Murrah buffaloes. In general, the average monthly test day milk yield was highest for MTDMY3 and lowest for MTDMY11 during the period 2003 to 2005 in first lactation (Table 2).

Age groups

The age groups had statistically significant

(P<0.05) effect on MTDMY2 and MTDMY3 only and non significant effect on rest of the MTDMYs in first lactation (Tables 1). Rana (2008) also reported the effect of age group on MTDMYs to be highly significant in Murrah buffaloes, whereas in contrast Appanvar (1997); Kokate (2009) reported non - significant effect of age groups on MTDMYs.

The average monthly test day milk yields were highest for the heifers calving for the first time at an early age of 900 days or less and lowest for age group 1441 days or more. However, the individual test day milk yields have been observed highest for MTDMY3 (11.901±1.434 kg) and lowest for MTDMY11 (3.588±0.432 kg) for the heifers calved in the age between 900 or less days and 1441 or more days, respectively (Table 2).

CONCLUSION

The results obtained in present study indicated that the differences in different test day milk yields over the periods may be attributed to the differential culling levels on the basis of production as well as difference in feeding and managemental practices besides the changing population dynamics over the periods. The effect of season of calving on MTDMYs followed a peculiar trend showing that as the days in lactation increases the effect of season become trivial. Results showed that the highest individual monthly test day milk yields were observed for the buffaloes calved during the winter season this may be due to good management practices and supply of good quality fodder in sufficient amount during ensuing seasons. It was evident that the average monthly

Table 1. Least squares analysis of variance (mean squares only) for first lactation individual test day milk yields (kg) in Murrah buffaloes.

Traits	**Season**	**Period**	**Age group**	**Error (174)**	**R^2-value (%)**
d. f.	(3)	(3)	(10)		
MTDY1	43.409**	15.346*	6.020	5.356	19.2
MTDY2	35.255**	40.739**	14.940*	7.488	23.8
MTDY3	32.279**	29.494**	17.799*	7.327	23.9
MTDY4	29.748**	20.039*	12.464	6.692	20.4
MTDY5	22.301*	21.054*	9.923	6.520	18.0
MTDY6	22.768*	11.992	10.863	6.257	17.4
MTDY7	18.596*	23.287**	9.194	5.306	19.8
MTDY8	4.456	18.453*	9.050	4.959	16.8
MTDY9	6.151	9.139	4.928	4.865	10.7
MTDY10	1.419	6.024	7.765	4.224	12.9
MTDY11	0.396	6.199	5.430	3.915	10.8

*Significant at 5% level (P<0.05);

**Significant at 1% level (P<0.01)

Table 2. Least squares means for individual monthly test day milk yields (kg) of first lactation in Murrah buffaloes.

OVER ALL	MTDMY1 (6th day)	MTDMY2 (35th day)	MTDMY3 (65th day)	MTDMY4 (95th day)	MTDMY5 (125th day)	MTDMY6 (155th day)	MTDMY7 (185th day)	MTDMY8 (215th day)	MTDMY9 (245th day)	MTDMY10 (275th day)	MTDMY11 (305th day)
	5.373±0.177	10.311±0.217	10.636±0.214	10.078±0.200	9.311±0.195	8.707±0.190	7.762±0.178	7.142±0.169	6.236±0.161	5.696±0.152	4.625±0.145
Season											
Winter	6.378±0.537	10.717±0.635	11.022±0.628	10.783±0.601	10.231±0.593	9.710±0.581	8.908±0.535	7.715±0.517	6.921±0.512	6.002±0.477	4.795±0.459
Summer	4.424±0.724	10.775±0.856	11.516±0.847	10.525±0.810	9.610±0.799	8.633±0.783	7.375±0.721	6.904±0.697	5.797±0.690	5.388±0.643	4.583±0.619
Rainy	6.243±0.445	10.814±0.527	10.818±0.521	10.265±0.498	9.184±0.492	8.790±0.482	7.703±0.443	7.123±0.429	6.275±0.425	5.773±0.396	4.598±0.381
Autumn	4.445±0.529	8.937±0.626	9.189±0.619	8.741±0.592	8.219±0.584	7.695±0.572	7.063±0.527	6.827±0.509	5.949±0.505	5.620±0.470	4.525±0.453
Period											
2003-2005	4.579±1.416	11.174±1.674	11.426±1.656	10.449±1.583	9.003±1.562	8.361±1.530	6.785±1.409	6.583±1.362	5.741±1.349	5.733±1.257	3.936±1.211
2006-2008	4.912±0.358	8.905±0.424	9.405±0.419	9.138±0.400	8.624±0.395	8.200±0.387	7.278±0.357	6.614±0.345	5.934±0.341	5.347±0.318	4.723±0.306
2009-2011	5.897±0.325	10.859±0.384	11.050±0.380	10.495±0.363	10.049±0.359	9.250±0.351	8.728±0.324	7.939±0.313	6.859±0.310	6.099±0.289	5.274±0.278
2012-2014	6.103±0.399	10.305±0.471	10.665±0.466	10.232±0.446	9.568±0.440	9.018±0.431	8.258±0.397	7.434±0.384	6.409±0.380	5.604±0.354	4.566±0.341
Age group (days)											
< 900	6.225±1.226	11.871±1.450	11.901±1.434	11.143±1.370	10.766±1.353	10.742±1.325	9.742±1.220	9.881±1.180	7.283±1.168	6.932±1.089	4.884±1.048
901-960	6.283±1.037	10.892±1.226	10.496±1.213	9.691±1.159	9.435±1.144	9.506±1.121	8.540±1.032	7.097±0.998	6.921±0.988	7.071±0.921	6.086±0.887
961-1020	5.414±1.025	9.746±1.211	8.971±1.198	8.806±1.145	7.592±1.130	7.572±1.107	6.966±1.020	6.776±0.986	6.080±0.976	6.443±0.910	5.044±0.876
1021-1080	4.846±0.657	10.338±0.777	11.452±0.769	10.281±0.735	9.638±0.725	8.992±0.711	7.879±0.654	7.689±0.633	6.894±0.627	6.039±0.584	4.930±0.562
1081-1140	5.103±0.549	9.672±0.649	10.459±0.642	10.133±0.614	9.493±0.606	8.529±0.593	7.690±0.546	7.068±0.528	5.982±0.523	5.100±0.487	4.232±0.469
1141-1200	6.110±0.753	11.062±0.890^{i}	11.421±0.880	10.648±0.841	9.179±0.830	8.610±0.814	7.970±0.749	7.349±0.724	6.235±0.717	5.187±0.668	4.397±0.644
1201-1260	4.199±0.621	9.461±0.734	10.359±0.726^{c}	9.830±0.694	9.859±0.685	8.960±0.671	8.005±0.618	6.741±0.598	6.045±0.592	5.050±0.552	4.511±0.531
1261-1320	5.163±0.677	10.129±0.801	10.948±0.792	10.192±0.757	9.494±0.747	8.698±0.732	7.186±0.674	6.462±0.652	5.532±0.645	5.418±0.601	4.276±0.579
1321-1380	4.796±0.652	9.966±0.771	10.495±0.763	9.911±0.729	9.149±0.720	8.331±0.705	7.122±0.649	7.031±0.628	5.905±0.622	4.953±0.579	4.258±0.558
1381-1440	6.192±0.787	11.641±0.930	11.625±0.920	11.587±0.880	9.785± 0.868	8.646±0.850	7.882±0.783	6.482±0.757	6.359±0.750	5.912±0.699	4.669±0.673
1441<	4.771±0.505	8.640±0.597	8.873±0.591	8.641±0.565	8.031±0.558	7.192±0.546	6.402±0.503	5.989±0.486	5.354±0.482	4.550±0.449	3.588±0.432

test day milk yields were highest for the heifers calving for the first time at an early age of 900 days or less and lowest for age group 1441 days or more, it shows that as the age of first calving increase the average monthly test day milk yields goes on decreasing. The value of Least squares means for individual monthly test day milk yields indicate that the peak yield in buffaloes may be obtained around 65 days of lactation.

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