

Prediction of lactation milk yield from test day records in Murrah buffaloes

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ABSTRACT

The data pertaining to 326 Murrah buffaloes, pregnancy of 48 bulls calved during period from 1987 to 2006 maintained at the University were considered for the present study. The index involving test day records from first to seventh had an accuracy of selection of 0.593, which is greater than accuracy of direct selection and thereafter, there was trivial increase in accuracy by adding subsequent test day records. Accuracy of bimonthly test day recording is good as accuracy for lactation yield and accuracy for monthly records. The accuracy of selection (r_{IH}) for odd test day records (TD1 + TD2 + TD3 + TD4 + TD5 + TD7 + TD9) was 0.686 and for even test day records (TD2 + TD4 + TD6 + TD8 + TD10) was 0.652. Both the alternate test day records of first lactation had higher accuracy of selection than the accuracy of direct selection (0.566). Therefore, the bimonthly recording of test day could be better alternative for selection of bulls as it saves cost of recording. The coefficient of determination (R^2) was maximum (39.89%) for TD8 among all ten prediction equations having only one variable and minimum for TD2 (4.69%). The equation having the combination of test day recording third, seventh, eighth, and tenth is recommended for prediction of first lactation milk yield as it has 56.97% value for R^2 and after that there was slight increase in the value of coefficient of determination.

Key words: Buffaloes, Genetic improvement, Milk yield, Test day records

For a breeder, it is mandatory to access the rate of changes occurring in the traits of economic importance over a period of time to estimate net gain as a result of breeding programme. The selection of sires is mostly based on the complete lactation yield that is predicted from individual test day milk records taken at monthly intervals (Pander *et al.* 1992). However, Danell (1990) and Machado *et al.* (2000) reported that test day milk yield records in mid lactation have high genetic and phenotypic correlations with lactation yield, thereby, increase the accuracy of sire evaluation. Hence, the investigation was also planned to study the inter-relationship of test day with that of first lactation milk yield to develop suitable predictors for the prediction of phenotypic value and breeding value of first lactation milk yield.

MATERIALS AND METHODS

The present study was conducted on data pertaining to 326 Murrah buffaloes maintained at Buffalo Research Centre (BRC) of the university, Hisar over a period of 20 years from 1987 to 2006, were delineated as summer (March to June), monsoon (July to October) and winter (November to February) on the basis of geo-climatic conditions prevailing in the region.

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Determination of accuracy of prediction of phenotypic and breeding value was obtained from test day records.

First test day yield was recorded from the seventh day after calving, and 10 test day milk records were taken at every 4 week interval. Multiple regression analysis was used to predict lactation production from test day records.

Test day records were used for genetic prediction of lactation yield using selection index procedure.

RESULTS AND DISCUSSION

Prediction of breeding value of FLY from test day records:

Ten independent variables on terms of test day milk records from TD1 to TD10 were taken for this purpose. Table 1 presents the accuracy of selection for the prediction of breeding value of FLY from test day records. The accuracy of direct selection for first lactation yield is 0.566. The index involving only first test day had an accuracy of 0.076 and the accuracy of selection increased by 264.47% when TD1 + TD2 were considered. Subsequently, the accuracy of selection increased with the incorporation of later test day in the index. The index involving test day records from first to seven had an accuracy of selection 0.593, which is greater than accuracy of direct selection and thereafter, there was trivial increase in accuracy by adding subsequent test day records. Therefore, it is worth to include the test day records up to seventh to get better results for bull selection. The

Table 1. Accuracy and genetic gain in breeding value of FLY from selection on test day records

Traits in index	Accuracy of selection (r_{IH})	% increase in r_{IH}	Genetic gain (ΔG)	% increase in ΔG
TD1	0.076	—	1.39	—
TD1+TD2	0.277	264.47	18.10	1202.16
TD1+TD2+TD3	0.299	7.94	21.10	16.57
TD1+TD2+TD3+TD4	0.395	32.10	36.85	74.64
TD1+TD2+TD3+TD4+TD5	0.460	16.46	50.08	35.90
TD1+TD2+TD3+TD4+TD5+TD6	0.464	0.87	50.82	1.48
TD1+TD2+TD3+TD4+TD5+TD6+TD7	0.593	27.80	83.22	63.75
TD1+TD2+TD3+TD4+TD5+TD6+TD7+TD8	0.632	6.58	94.44	13.42
TD1+TD2+TD3+TD4+TD5+TD6+TD7+TD8+TD9	0.701	10.92	117.74	24.67
TD1+TD2+TD3+TD4+TD5+TD6+TD7+TD8+TD9+TD10	0.725	3.42	124.18	5.47

Accuracy of direct selection = 0.566

accuracy of prediction of breeding value using the sum of 10 test day records is 0.725. The result was in close agreement with the findings of Pander *et al.* (1993).

Recording of daily yield at monthly interval is costly and hence an attempt was made to predict the breeding value of FLY from bimonthly recording. Results of bimonthly recording (Table 2) indicated that the indexes involving bimonthly recording had accuracy of 0.62 and 0.652 for odd and even test day bimonthly recording, which are greater than the accuracy of direct selection (0.566). The increase in accuracy of selection over that of accuracy of direct selection was 21.20 and 15.19%, respectively, for odd and even test day bimonthly recording. Therefore, the bimonthly recording of test day could be a better alternative for selection of bulls. Similar findings were reported by Pander and Hill (1993) in Hostein-Friesian cattle.

Prediction of phenotypic value of FLY from test day records: The prediction equation and their R^2 values for the prediction of phenotypic value of lactation milk yield from test day records are presented in Table 3. The coefficient of determination (R^2) for prediction equation for the prediction of phenotypic value of lactation milk yield from the test day records involving only TD1 was 4.92%. The coefficient of determination (R^2) was the maximum (39.89%) for TD₈ among all 10 prediction equations having only 1 variable and minimum coefficient of determination (R^2) was obtained for TD2 (4.69%). Moreover, several other prediction equations were also developed by utilizing various combinations of test day recording. First, third, fourth and seventh to tenth was having the maximum (R^2) to the tune of 60.78%. The equation having the combination of test day

recording third, seventh, eighth and tenth is recommended for prediction of first lactation milk yield as it had 56.97% value for R^2 and after that there was slight increase in the value of coefficient of determination. Similarly, Saini *et al.* (2005) also reported that prediction equation having 3 variables, i.e. first, second and seventh test day milk yield could give adequate accuracy (78.42%) in estimating 300 days milk yield in Rath cows. However, Appannavar *et al.* (1995) reported that when 3 test day yields were incorporated the accuracy was 67.43%; when 4 test day yields were incorporated, the accuracy was 76.01%; when 5 test day yields were incorporated the accuracy was 81.64% and when 6 test day yields were incorporated the accuracy was 85.49%.

From the results, it may be inferred that accuracy of bimonthly test day records is as good as accuracy of lactation yield and accuracy of monthly records and it could be taken as better alternative for selection of bulls and is cost effective also. The equation having the combination of test day recording third, seventh, eighth and tenth is recommended for prediction of first lactation milk yield.

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Table 2. Accuracy in breeding value of FLY from selection on alternate test records

Traits in index	Accuracy of selection (r_{IH})	%increase in r_{IH}
TD1+TD2+TD5+TD7+TD9	0.686	21.20
TD2+TD4+TD6+TD8+TD10	0.652	15.19