



## Prediction of first lactation 305-day milk yield using monthly part and test day yields in Surti buffaloes

SHANKER SINGH<sup>1</sup>, S P TAILOR<sup>2</sup>, S MISHRA<sup>3</sup>, M S KOTHARI<sup>4</sup> and M K GARG<sup>5</sup>

*Department of Animal Production, RCA, Udaipur, Rajasthan 303 001 India*

Received: 21 March 2013; Accepted: 12 August 2013

**Key words:** Accuracy of prediction, Part lactation yield, Stratified random sampling, Surti buffaloes, Systematic sampling, Test day milk yield

Selection on the basis of part lactation records facilitates early selection and reduce generation interval. Selection based on test yield further reduces cost of recording under field conditions. The main constraint is daily milk recording under field condition is neither economically nor physically feasible because of a large number of buffaloes required to be recorded. It is, therefore, important to explore the possibility of designing an appropriate test-day recording system applicable under prevailing field conditions in India without sacrificing the reliability of results. Therefore, an attempt was made for prediction of 305 days standard lactation milk yield from monthly test and part lactation records in Surti buffaloes.

A total of 453 first lactation records of Surti buffaloes maintained at Livestock Research Station, Vallabh Nagar, Udaipur from 1976 to 2004 were analyzed. The 305 days first lactation milk yield (305FLMY) was predicted from monthly test day milk yield and part yields. Two sampling schemes viz., systematic and stratified random sampling were used for test day recording. A systematic sampling scheme was applied by selecting first test record (one-day milk yield) at random from first month and subsequent test records were taken at exact interval of 30 days in monthly ( $F_{30}S_1 - F_{30}S_7$ ) from preceding date of test records till 210 days of lactation. In stratified random sampling scheme the lactation period of 210 days was divided in to 7 strata of monthly intervals. Then independent random sampling of test records (one day milk yield) was drawn from each stratum during first, second and so on up to 7 monthly strata ( $R_{30}S_1 - R_{30}S_7$ ). The monthly (MMY<sub>1</sub> - MMY<sub>7</sub>) part milk yield was taken by adding of observed daily milk yield during each month up to 210 days lactation. The milk yield for every part of lactation under both the above sampling schemes was estimated from test day milk yield as under:

$$\text{Predicted milk yield} = \sum_{i=1}^n (15 \times \text{milk yield of sampled day}) + \{[(\text{actual lactation length}) - (\text{space of sampling schemes} \times \text{number of samples})] \times \text{milk yield of last sample yield}\}$$

The lactation less than 100 days was not considered and culling in the middle of lactation, abortion, stillbirth or any other physiological causes, which affects the milk yield were considered as abnormalities and thus, such records were not included in the study. A simple linear regression analysis with only one independent variable at a time and step-wise forward multiple linear regression analysis was used to predict 305FLMY.

**Prediction of 305FLMY using simple regression:** A linear regression model was fitted among all the 7 monthly systematic sampled test records. When a single test record was considered, it was seen that sixth monthly test record under systematic sampling scheme gave highest accuracy of prediction at 52.60% closely followed by accuracy of 51.80% for third month. The initial monthly test record ( $F_{30}S_1$ ) gave lowest accuracy of prediction at 17.80%.

In Surti buffaloes, when a single monthly test record was considered to predict 305FLMY using monthly stratified random test records, the sixth monthly test record gave highest accuracy of fitting (47.10%) followed by accuracies of 46.90% for third month, 45.30% for seventh month and 44.20% for second month. The initial monthly test record gave lowest accuracy of 16.80%.

The seventh month part lactation record gave highest accuracy of prediction (64.50%) when a single monthly part record was considered to predict 305FLMY. It was followed by accuracy of 62.20% for fifth month, 57.00% for fourth month. The lowest accuracy was observed (29.20%) when first monthly part record was considered to predict milk yield.

The results depicted that the accuracy of prediction was higher when sixth and seventh months test and part records were considered. Higher predictability using middle part of lactation was also reported by Gokhale (1974), Singh *et al.*

Present address: <sup>1</sup>Agriculture Officer, <sup>2</sup>Professor (sptailor07@yahoo.co.in), <sup>3</sup>Assistant Professor, <sup>4,5</sup>Associate professors.

(2007) and Singh and Rana (2008). The accuracies obtained by single records (test and part records) were less than 75% and hence, step-wise multiple regression model was applied.

*Prediction of 305FLMY using step-wise forward multiple linear regression:* The prediction equations were constructed using monthly systematic sampled test records. When 2 test records were used for prediction of lactation milk yield, it was found that the test records during third and sixth months gave highest accuracy (71.50%). The optimum equation having three sampling records (third, sixth and seventh months) gave an accuracy of prediction of 76.90%. When all the 7 monthly test records were considered the highest accuracy was 81.60%.

The prediction equations and their accuracy based on monthly stratified random sampled test records also revealed that an equation having three variables (third, sixth and seventh months test day records) was found to be optimum having  $R^2$  value of 75.10%. When all the 7 monthly stratified random sampled test records were considered the highest accuracy at 82.00% was obtained.

Similarly, an equation having 3 monthly part yields (first, third and seventh months) gave  $R^2$  value of 87.30%. This equation was considered as an optimum equation. When all 7 monthly part yields were considered as independent variable, the accuracy of prediction was 91.10%. These estimates of accuracy of prediction from optimum equations were higher than the estimates reported by Gokhale (1974) in Murrah buffaloes and Tailor and Banerjee (1996) in Surti buffaloes and Singh *et al.* (2007) in Karan Fries cattle.

It is thus found that the accuracy of prediction was slightly higher when part records were used as compared to test day yields. However, systematic sampling scheme had upper edge over stratified random sampling scheme. It was concluded

that three records drawn during third, sixth and seventh months either by systematic or stratified random sampling schemes would be adequate for prediction of first lactation 305 days milk yield under field conditions.

#### SUMMARY

Data on 453 Surti buffaloes maintained at Livestock Research Station, Vallabh Nagar, Udaipur were used to predict 305FLMY from monthly test day (systematic and stratified random sampling) and part milk yields. The sixth month test record taken by systematic (52.60%) and stratified random sampling schemes (47.10%) gave the highest accuracies of prediction of 305FLMY. Similarly, seventh monthly part yield also gave the highest accuracy of prediction (64.50%). The optimum equations incorporated 3 variables (third, sixth and seventh test records) under both the sampling schemes and first, third and seventh part lactation yields. The accuracy of prediction from these equations were 76.90, 75.10 and 87.30%, respectively. The inclusion of more number of test and part lactation records did not contribute significantly for enhancing the accuracy of prediction.

#### REFERENCES

- Gokhale S B. 1974. 'Inheritance of part lactations and their use in selection among Murrah buffaloes.' Ph. D Thesis. Agra University, Agra, India.
- Singh Avtar and Rana J S. 2008. Prediction of 305-day milk yield based on test day values in Murrah buffaloes. *Indian Journal of Animal Sciences* 78: 1131–33.
- Singh Avtar, Singh S and Aynalem H. 2007. Prediction of 305-day milk yield based on monthly milk records in Karan Fries cattle. *Indian Journal of Animal Sciences* 77: 1448–50.
- Tailor S P and Banerjee A K. 1996. First lactation partial records as aid to selection in Surti buffaloes. *Indian Journal of Dairy Science* 49: 530–31.