The daily milk recording of dairy buffaloes involves heavy expenditure and is cost prohibitive under field conditions. The use of part and test day milk yield of daughters tends to shorten the time required to take the decision for early selection of sires and buffaloes and reducing the cost of recording. The information on the use of test day milk yield records for prediction of standard 305 days milk yield in Surti buffalo is lacking. Therefore, an attempt was made to predict the 305 days first lactation milk yield in Surti buffaloes using 3 test intervals and 2 sampling schemes.

MATERIALS AND METHODS

First lactation milk records of 453 Surti buffaloes maintained at Network Project on Surti buffaloes, Livestock Research Station, Vallabhnagar, Udaipur, Rajasthan University of Veterinary and Animal Sciences, Bikaner, over a period of 29 years (1976–2004) were utilized for the present study. The 305 days first lactation milk yield (305FLMY) was predicted from fortnightly, monthly and bimonthly test day milk yields using 2 sampling schemes (systematic and stratified random sampling) in Surti buffaloes maintained at Network Project on Surti buffaloes, Livestock Research Station, Vallabhnagar, Udaipur. The observed 305 days and total first lactation milk yield were 1,116.97 ± 13.49 and 1,155.16 ± 10.93 kg respectively. The predicted 305 days milk yield was higher than observed 305 days milk yield and showed increasing trend with increasing test day interval in both the sampling schemes. The effect of sire and season of calving was found to be highly significant on observed and predicted 305 days first lactation milk yield based on systematic and stratified sampling schemes with fortnightly, monthly and bimonthly sampling intervals. The heritability estimates for OMY305 and OMYT was high at 0.639 ± 0.181 and 0.669 ± 0.184 respectively. Similarly, the heritability estimates for predicted 305 days first lactation milk yield based on systematic sampling scheme with the interval of fortnightly, monthly and bimonthly were 0.584 ± 0.176, 0.587 ± 0.176 and 0.549 ± 0.172 respectively. The respective estimates based on stratified sampling scheme were 0.582 ± 0.175, 0.601 ± 0.177 and 0.378 ± 0.152. The genetic and phenotypic correlation coefficients of predicted milk yield based on both systematic and stratified random sampling schemes with OMY305 and OMYT were also positive, high and approaching to one. All the 5 measures, viz. average error, per cent average error, average absolute error, per cent average absolute error and variance of error under fortnightly interval were lower than monthly and bimonthly intervals in both the sampling schemes. The above measures of error were slightly lower for systematic sampling scheme as compared to stratified random sampling scheme. Keeping the cost and difficulty in data recording, both systematic and stratified random sampling with monthly interval can be used to predict 305 days first lactation milk yield with fairly accuracy.

Key words: Prediction, Stratified random sample, Systematic sample, Test day milk yield

The data being non-orthogonal were analysed by mixed model least-squares and maximum likelihood computer programme (Harvey 1990) considering period and season of calving as fixed effect and sire as random effect. The heritability and genetic correlations were computed by paternal half correlation method while the standard errors of these parameters were computed using the formula given by Swigert et al. (1964) and Robertson (1959) respectively.
The phenotypic correlations were computed after Snedecor and Cochran (1968). The following mathematical model was used for genetic parameters estimation.

\[ Y_{ijkl} = \mu + B_i + P_j + S_k + e_{ijkl} \]

where, \( Y_{ijkl} \) is the observation of \( l \)th buffalo born from \( i \)th sire, calved in \( k \)th season and \( j \)th period, \( \mu \) is the overall mean assuming equal subclass numbers, \( B_i \) is the random effect of \( i \)th sire, \( P_j \) is the fixed effect of \( j \)th period of calving, \( S_k \) is the fixed effect of \( k \)th season of calving and \( e_{ijkl} \) is the residual random error under standard assumption which make the analysis valid ie. NID \((0, \sigma^2_e)\).

### RESULTS AND DISCUSSION

The observed 305 days (OMY305) and total first lactation milk yield (OMYT) were 1116.97 ± 13.49 and 1155.16 ± 10.93 kg, higher than that observed by Nagarcenkar et al. (1985). On the other hand, higher first lactation milk yield was also reported by Tailor (1999 – 2004) than that observed in the present study. The coefficient of variation was 25.69 and 20.12%, respectively, for OMY305 and OMYT, which is lower than that obtained by Singh 2006 in Surti buffaloes.

The averages for predicted 305 days first lactation milk yield based on systematic sampling scheme with the interval of fortnightly, monthly and bimonthly in Surti buffaloes were 1142.79 ± 11.96, 1152.82 ± 12.05 and 1189.36 ± 14.65 kg respectively. The respective values based on stratified random sampling scheme were 1142.90 ± 12.04, 1151.44 ± 12.25, and 1192.29 ± 14.60 kg. The predicted milk yield was higher than observed 305 days milk yield and showed increasing trend with increasing test day interval in both the sampling schemes. The CV ranged from 22.28 to 26.22%, which is almost similar to observed milk yield.

The effect of sire and season of calving was highly significant on observed and predicted 305 days first lactation milk yield based on systematic and stratified sampling schemes with fortnightly, monthly and bimonthly sampling intervals. However, the effect of period of calving was nonsignificant on these traits. The results corroborated with the findings of Kothari (2004) and Singh (2006) on observed milk yield and Das and Sharma (2000) on predicted milk yield based on systematic and stratified random sampling schemes of 3 sampling intervals i.e. fortnightly, monthly and bimonthly.

The heritability estimates for OMY305 and OMYT were high at 0.639 ± 0.181 and 0.669 ± 0.184 respectively. Similarly, the heritability estimates for predicted 305 days first lactation milk yield based on systematic sampling scheme with the interval of fortnightly, monthly and bimonthly were 0.584 ± 0.176, 0.587 ± 0.176 and 0.549 ± 0.172 respectively. The respective estimates based on stratified random sampling scheme were 0.582 ± 0.175, 0.601 ± 0.177 and 0.378 ± 0.152. High estimates of heritability for observed 305 days first lactation milk yield were also reported by Tailor (1995) and Singh (2006) in Surti buffaloes. The heritability estimates of predicted milk yield were slightly lower in magnitude than observed milk yield in the present study. High estimates of heritability for first lactation milk yield (observed and predicted) indicated that sufficient additive genetic variation available in these traits for exploitation.

<table>
<thead>
<tr>
<th>Name of sampling scheme/ intervals</th>
<th>Genotypic correlation</th>
<th>Phenotypic correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OMY305</td>
<td>OMYT</td>
</tr>
<tr>
<td><strong>Systematic sampling scheme</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fortnightly interval</td>
<td>0.999±0.010</td>
<td>0.997±0.017</td>
</tr>
<tr>
<td>Monthly interval</td>
<td>0.998±0.012</td>
<td>0.995±0.093</td>
</tr>
<tr>
<td>Bimonthly interval</td>
<td>0.992±0.028</td>
<td>0.972±0.065</td>
</tr>
<tr>
<td><strong>Stratified sampling scheme</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fortnightly interval</td>
<td>0.988±0.012</td>
<td>0.957±0.049</td>
</tr>
<tr>
<td>Monthly interval</td>
<td>0.999±0.011</td>
<td>0.971±0.097</td>
</tr>
<tr>
<td>Bimonthly interval</td>
<td>0.999±0.043</td>
<td>0.964±0.082</td>
</tr>
</tbody>
</table>

**P < 0.01.**
The results revealed that the average error, per cent average error, average absolute error and per cent average absolute error under monthly interval were higher than those obtained under fortnightly intervals. Similarly, the above measures were also higher under bimonthly interval than monthly interval. The comparison of error variances for same test interval under 2 sampling schemes indicated that all the 5 measures were slightly lower for systematic sampling scheme as compared to stratified random sampling scheme. It is therefore, concluded that the accuracy of prediction was better at shorter interval of milk recording under systematic and stratified random sampling schemes i.e., fortnightly interval was better than monthly and bimonthly interval and monthly interval were better than bimonthly interval under both the sampling schemes. Systematic and stratified random sampling schemes are almost equally efficient under all the 3 test day intervals of recording. However, systematic sampling scheme had upper edge over stratified random sampling scheme. Keeping the cost and difficulty in data recording both systematic and stratified random sampling with monthly interval can be used to predict 305 days first lactation milk yield with fairly accuracy.

Amble et al. (1959) and Amble and Rajagopalan (1960) reported that systematic sampling scheme was better than simple random sampling method for estimation of lactation yield from test records. Dass (1991) observed that the accuracy was better with shorter intervals. Gujar et al. (1996) concluded that recording once per month on a fixed date would be satisfactory under practical conditions. Cunningham and Vial (1968) found that bimonthly testing was little less accurate than monthly testing. These findings corroborated with the present results.

REFERENCES


