PERFORMANCE OF BOS TAURUS × ZEBU CROSSBREDS UNDER VILLAGE CONDITIONS

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SUMMARY
Data on first lactation performance of 751 Holstein×zebu and Jersey×zebu crossbred heifers of various grades were collected under rural field conditions in Maharashtra. The heifers were the progeny of seven Danish Holstein (Sortbroget Dansk Malkekveg) sires, 33 homebred Holstein sires, six Danish Jersey sires and 35 homebred Jersey sires. The least-squares analysis showed that the location and genetic group within the two classes of crossbreds significantly affected the milk yield. In pooled data the 7/8 Holstein crossbreds produced by homebred sires were significantly superior to other genetic groups of either Holstein or Jersey inheritance. The milk yield increased with increasing level of homebred Holstein inheritance and with Jersey inheritance. Danish Holstein sires were the best to produce the halfbred Holstein crosses. The differences in the genetic groups accounted for 20% of the phenotypic variance in 305-day milk yield and for 2% of the variance of the lactation length in the crossbred population. It is inferred that the optimum level of exotic breed inheritance in Maharashtra would be above 50% and that the genetic group of the dams needs to be considered when evaluating the performance of a sire's progeny.

INTRODUCTION
Upgrading of zebu cattle with Bos taurus (exotic) breeds in India is aimed at enhancement of milk production through improved productivity of resulting crossbred females. Several reports have conclusively proved the favourable effect of crossbreeding in cattle (Amble and Jain, 1969; Katpatal, 1977). However, the majority of findings are usually based on the performance of cows maintained at organised farms. The performance of crossbreds under semi-extensive managemental conditions in the field has rarely been reported. Lack of organised milk recording and its high cost are the major reasons for the absence of the necessary data. Further the small size of herds (mostly two or three cows) and their wide distribution makes the task difficult. Climatic variations in the field are extreme and the feeding generally poor. The effects of various non-genetic and genetic factors influencing crossbred performance under these conditions are unknown. The objectives of these studies were therefore to evaluate the performance of crossbred females under field conditions and to investigate the influence of genetic and non-genetic factors on the first lactation performance of crossbred heifers.

MATERIALS AND METHODS
The semen from USA, Canada, Britain and Denmark was used on Danish imported Holstein and Jersey cows. Frozen semen imported from Denmark and also that produced from homebred Holstein and Jersey bulls was used randomly across 40 artificial insemination (AI) centres in Maharashtra State. Each AI centre operated by the Bharatiya Agro Industries Foundation provides insemination.
services within a cluster of 10 to 20 villages. Performance recording of the crossbred heifers was initiated at each centre beginning from January 1980. The present investigation is based on performance records collected subsequent to calvings in 1980 and 1981. The use of semen was controlled so that contemporary crossbred progeny groups born after inseminations with imported semen and frozen semen of homebred bulls would be available in the approximate ratio of 20:80.

The recorded progeny groups were genetically heterogeneous. The dams were either nondescript or of indigenous breeds such as the Gir, Hariana, Deoni, Khillar or their crosses with Holstein or Jersey. First lactation performance of the crossbred heifers was recorded at approximately fortnightly intervals by weighing the milk in a pail. Most of the owners allowed the calves to suckle the dams; no allowance was made in the analysis for the milk suckled by the calf. The milk yield for 100 and 305 days was estimated from the fortnightly samples as:

$$PN = \sum_{n=1}^{20} LI_n \times \frac{1}{2} (P_{n-1} + P_n)$$

where $PN$ is the 100- or 305-day milk yield

$LI$ is the length of the test interval estimated by \(LI=(DIM-DIM_{n-1})\)

$DIM_n$ being the day's in milk at $n$th sample

$P_n$ is the production on $n$th sample day.

Data was analysed by least-squares analysis (Harvey, 1960) for Jersey and Holstein crosses separately. The following biometrical models were adopted

$$Y_{ijklm} = \mu + C_i + A_j + S_k + G_l + e_{ijklm}$$  \hspace{1cm} (1)

$$Y_{ijklm} = \mu + C_i + A_j + (SG)_{kl} + e_{ijklm}$$  \hspace{1cm} (2)

where $Y_{ijklm}$ is the $ijklm$th observation of the concerned trait

$\mu$ is the population mean for the crossbred heifers of the same paternal breed (either Holstein or Jersey)

$C_i$ is the effect of $i$th AI centre (location)

$A_j$ is the effect of $j$th age-season subclass (age <760, 761–912, 913–1,096 and >1,096 days; seasons March–May, June–August, September–November and December–February)

$S_k$ is the effect of $k$th sire group (Danish sires and homebred exotic breed sires)

$G_l$ is the effect of $l$th genetic group of heifer progeny (½ E1, ½ E1+¼ E2, ¾ E1, ¾ E1, where E1 and E2 are the two breeds of exotic sires)

$(SG)_{kl}$ is the effect of $k$th sire group× genetic group subclass

$e_{ijklm}$ is the random error associated with the $ijklm$th observation \(\sigma(0, \sigma_e^2)\).

The sire group×genetic group interaction sum of squares were obtained as the reduction in sum of squares due to the full model (model 2) over the reduced model (model 1).

To estimate the variance associated with sire's breed and level of exotic inheritance in crossbred heifers the data on the Jersey×zebu and Holstein×zebu crosses were pooled and variance estimates were obtained by iterative MINQUE (Rao, 1971). The model used was the same as model 2 except that $\mu$ is the population mean for all crossbred progeny irrespective of sire breed and there were twice the number of $(SG)_{kl}$ subclasses \(\sim(0, \sigma^2_{SG})\).