A Study of Some Economic Traits of Indigenous Cattle and their Crossbreeds in Southern Bangladesh

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ABSTRACT : The experiment was conducted on 69 cows to identify the quantitative variations of some economic traits of five genetic groups as Local × Friesian F_1, Local × Sahiwal F_1, Local (indigenous zebu type), Local × Sindhi F_1, and Local × Hariana F_1. The traits studied were age at weaning, age at first heat, age at first conception, services per conception, daily milk yield, lactation length, lactation yield and post partum heat period. The records on milking and reproduction performances of cows and heifers were obtained from farm register and by interviewing the farmers. It was observed that the lowest age at weaning, age at first heat and age at first conception were 5.37 ± 0.24, 27.17 ± 1.72 and 27.83 ± 1.82 months respectively in Local × Hariana F_1. Services per conception were lowest in Local × Sahiwal F_1 (1.08 ± 0.18) although not significantly ($p>0.05$) affected by farms, genetic groups and farm × genetic groups interaction. Average daily milk yield was highest in Local × Friesian F_1 (5.81 ± 0.40 kg). Lactation length and lactation yield were highest in Local × Sahiwal F_1 (299.38 × 9.74 days and 1863.00 ± 141.00 kg respectively). Average post partum heat period was lowest in Local × Sindhi F_1 (3.19 ± 0.38 months). Least squares ANOVA showed that farm had significant ($p<0.001$) effect on age at weaning, age at first heat, age at first conception and post partum heat period. There was insignificant ($p>0.05$) effect of farm on services per conception, daily milk yield, lactation length and lactation yield, whereas genetic groups had a significant effect for all the traits under review except services per conception. Farm × genetic groups interaction was insignificant for all of the traits under consideration except age at weaning. (*Asian-Aus. J. Anim. Sci. 2000. Vol. 13, No. 9 : 1189-1192*)

Key Words : Performance, Indigenous, Crossbred, Cattle

INTRODUCTION

In Bangladesh a small number of improved cattle is maintained in governmental and private farms. These animals have been produced by 35 years of an artificial insemination program carried out by the Directorate of livestock services and Bangladesh Agricultural University. It is not possible to expect high performance from imported European breeds, because they cannot adjust to a hot and humid climate. If some of them survive they need costly management and care. Ultimately farmers do not get any benefit by rearing imported European breeds. So it is necessary to improve Local (indigenous zebu type) cattle, which are adapted to this climate by selection and breeding.

The scope of research concerning economic animal breeding, dairy cattle breeding in particular, is limited in Bangladesh due to limitations in record keeping. The purpose of this study was to find out the crossbred combination most suitable for milk production in the semi-urban areas of Bangladesh.

MATERIALS AND METHODS

This study was conducted in the Khulna region, a southern part of Bangladesh, which is a saline-prone area. The study covered from 10th January to 30th June, 1998. The investigation was conducted at L. B. Dairy farm (Farm 1), Arif Dairy farm of Nirala (Farm 2) and Milcom Dairy Farm, Batiaghata (Farm 3), in the Khulna district. Farm 1 had no record register so the owner was interviewed about his animals' milking and reproduction performances. Cows belonging to 5 genetic groups, Local × Friesian F_1, Local × Sahiwal F_1, Local, Local × Sindhi F_1 and Local × Hariana F_1, were evaluated with respect to several milking and reproduction traits. Stall feeding with roughages and some concentrate mixtures were the main feature of feeding, although very limited grazing was also allowed in those farms.

Both milking and reproduction traits of cattle were considered in this study. The milking traits were daily milk yield, lactation length and lactation yield, and reproduction traits were age at weaning, age at first conception, services per conception and post partum heat period.

Experimental design and analysis of data

Data covered 5 different genetic groups. The number of animals in different farms and genetic groups were unequal. As a result, the data formed a non-orthogonal factorial experiment (Snedecor and Cochran, 1980). To overcome this situation the Least-squares and Maximum Likelihood Computer Program (MLCP) of Harvey (1990) was used to analyze the data. Analysis of variance was done on each of the traits for different farms, genetic groups

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and farm × genetic groups interaction variances. The general linear fixed model for least-squares analysis was :

$Y_{ijk} = \mu + F_i + G_j + (FG)_{ij} + e_{ijk}$

where μ = The overall mean
F_i = Effect of farm
G_j = Effect of genetic groups
$(FG)_{ij}$ = Interaction effect of farm × genetic groups
e_{ijk} = Random error associated with each observation
Y_{ijk} = k-th records of j-th genetic groups and i-th farm.

Least significant difference (LSD) (Snedecor and Cochran, 1980) test was done to compare the mean farms and genetic groups, while significant differences among farm and genetic groups means for a certain trait were found by analysis of variance (ANOVA).

RESULTS AND DISCUSSION

The total picture of the results of the traits review is given in table 1. Least-squares means along with their standard errors showing the comparison of farms and genetic groups on various milking and reproduction traits are presented in table 2 and table 3 respectively. These tables also show the significant differences of farms and genetic groups, which is shown by superscripts.

Genetic groups had a significant effect on age at weaning, age at first heat, age at first conception, daily milk yield, lactation length, lactation yield and post partum heat period ($p<0.001$). There was insignificant effect of genetic groups on number of services per conception ($p>0.05$).

Farm to farm variation had significant effect on age at weaning, age at first heat, age at first conception and post partum heat period ($p<0.001$). Number of service per conception, daily milk yield, lactation length and lactation yields were not significantly affected by individual farm ($p>0.05$).

Farm × genetic groups interaction had significant effect ($p<0.001$) on age at weaning. But farm × genetic groups interaction was not significant on age at first heat, age at first conception, number of services per conception, daily milk yield, lactation length, lactation yield or post partum heat period ($p>0.05$).

Age at weaning

The average age at weaning was 5.8 ± 2.3 months. The highest value was observed in Farm 1 (7.88 ± 0.19 months) and the lowest was in Farm 3 (3.80 ± 0.14 months). In considering genetic groups the highest and the lowest values were found in Local × Sahiwal F_1 (6.91 ± 0.19 months), and Local × Hariana F_1 (5.37 ± 0.24 months) respectively. In the present study, genetic groups and farm × genetic groups interaction had highly significant ($p<0.001$) effect on age at weaning (table 1).

Age at first heat

The highest age at first heat was observed in Farm 2 (35.97 ± 1.11 months) and the lowest in Farm 3 (28.88 ± 1.01 months). Among different genetic groups in the present study the highest and the lowest values were observed in Local (37.87 ± 1.44 months) and in Local × Hariana F_1 (27.17 ± 1.72 months) respectively. In this study different farms and genetic groups were highly significant ($p<0.001$) on age at first heat (table 1), which was consistent with the findings of Islam and Bhuiyan (1997) and Majid et al. (1998). However, Chaudhry et al. (1994) found non-significant the effect of genetic groups on age at first heat. Rahman et al. (1993) reported that ages at first heat of Local × Sindhi F_1, Local × Sahiwal F_1, Local × Jersey F_1 and Local × Friesian F_1 were 35 ± 1.9, 19 ± 2.3, 32 ± 4.6 and 21 ± 2.8 months, respectively. In the present study the overall age at first heat was 30.5 ± 8.08 months, whereas Jabbar and Ali (1988) observed that the overall age at first heat was 45 ± 10.2 months; they also reported that the age at first heat of crossbred, Local (milk producing) and Local (draft) were 46 ± 8.6, 45 ± 6.7 and 57 ± 9.6 months, respectively. Farm × genetic groups interaction was not significant ($p>0.05$) for age at first heat.

Age at first conception

The mean of age at first conception in the present study was 31.7 ± 8.4 months. Considering different genetic groups, the highest and the lowest values were found in Local (39 ± 1.5 months) and Local × Hariana F_1 (28 ± 1.8 months). The least-squares analysis of variance showed that age at first conception was significantly ($p<0.001$) affected by farms and genetic groups but it was insignificantly ($p>0.05$) affected by farm × genetic groups interaction (table 1).

Services per conception

The analysis of variance showed that services per conception was not significantly ($p>0.05$) affected by farm or genetic groups or farm × genetic groups interaction (table 1). Islam and Bhuiyan (1997) and Bhuiyan and Sultana (1994) found similar results.

Daily milk yield

The average daily milk yield was 5.20 ± 0.44 kg, 4.93 ± 0.34 kg, and 5.47 ± 0.31 kg in Farm 1, Farm 2 and Farm 3, respectively. Among different genetic groups in the present study the highest and the lowest values were in Local × Friesian F_1 (5.81 ± 0.40 kg) and in Local × Sindhi F_1 (4.17 ± 0.55 kg). It was significant ($p<0.05$) for genetic groups. Significant effect of genetic groups on daily milk yield was also found by

Table 1. Summary showing the effect of farms, genetic groups and farm × genetic groups interaction on various traits as determined by ANOVA

Traits	p-values		
	Farm	Genetic groups	Farm × Genetic groups
Age at weaning	0.001	0.001	0.001
Age at first heat	0.001	0.001	0.2357
Age at first conception	0.001	0.001	0.3611
No. of services per conception	0.9576	0.2685	0.9080
Daily milk yield	0.2202	0.0360	0.5707
Lactation length	0.4149	0.001	0.3901
Lactation yield	0.0575	0.001	0.6094
Post partum heat period	0.000	0.001	0.1370

Islam and Bhuiyan (1997), Chaudhry et al. (1994), Bhuiyan and Sultana (1994), Nahar et al. (1992) and Rahman et al. (1987). Bhuiyan et al. (1992) concluded that both genetic and non-genetic factors such as lactation, season of calving and period of calving had significant effect on daily milk yield.

Lactation length

Lactation length of the present study was the longest in Farm 3 (273.1 ± 7.16 days) and the shortest was in Farm 2 (259.5 ± 7.83 days) (table 2). Among different genetic groups the longest and the shortest lactation length were found in Local × Sahiwal F_1 (299 ± 9.7 days) and in Local × Sindhi F_1 (224 ± 12.6 days). The average lactation length was 271 ± 43.5 days (table 3). Farm and farm × genetic groups interaction had insignificant ($p>0.05$) effect on lactation length (table 1). On the other hand genetic groups had highly significant ($p<0.001$) effect on lactation length. Significant effect of genetic groups on lactation length was also found by Islam and Bhuiyan (1997), Bhuiyan and Sultana (1994) and Nahar et al. (1989). Sultana (1995) also found a highly significant ($p<0.001$) effect of genetic groups on lactation length along with longest lactation period in Sahiwal cows (293 days) over eight genetic groups. There was insignificant effect ($p>0.05$) of farm and farm × genetic groups interaction on lactation length which varied little (5% or less) from farm to farm. Breed difference was the major cause of the variation in lactation length.

Lactation yield

The average lactation yield was 1611.98 ± 607.99 kg. Among different farms the highest milk production per lactation was observed in Farm 3 (1604 ± 104.1 kg) and the lowest lactation yield was in Farm 2 (1314 ± 113.9 kg). Among different genetic groups the highest and the lowest values were in Local × Sahiwal F_1 (1863 ± 14 kg) and in Local (937 ± 183 kg) and Local × Sindhi F_1 (937.00 ± 183.00 kg). Least-squares analysis of variance showed a highly significant ($p<0.001$) effect of genetic groups on lactation yield (table 1) which is consistent with the findings of Islam and Bhuiyan (1997), Chaudhry et al. (1994) and Nahar et al. (1989). Breed type and year of calving had significant effect on lactation yield concluded by Syed et al. (1996). They also found the mean lactation yield of crossbred types (2063 to 2552 kg) was greater than ($p<0.05$) purebred Sahiwal.

Post partum heat period

The longest and the shortest post partum heat periods were in Farm 2 (4.67 ± 0.23 months) and in Farm 3 (2.59 ± 0.21 months), respectively. Among different genetic groups the longest and the shortest values were found in Local × Friesian F_1 (4.69 ± 0.27 months) and in Local × Sindhi F_1 (3.19 ± 0.38 months); the observed mean value was 3.61 ± 1.50 months (table 3). Farm and genetic groups had a highly significant ($p<0.001$) effect on this trait (table 1) in the present study. But farm × genetic groups interaction was insignificant ($p>0.05$) on post partum heat period. Significant effect of genetic groups on this trait was also found by Nahar et al. (1992); however, Islam and Bhuiyan (1997) and Majid et al. (1998) found insignificant effect of genetic group.

Table 2. Summary showing least squares means ± SE with comparison of farms on various traits

Traits	Farm 1	Farm 2	Farm 3
Age at weaning (months)	$7.88^{a} \pm 0.19$	$7.81^{a} \pm 0.15$	$3.80^{b} \pm 0.14$
Age at first heat (months)	$34.13^{a} \pm 1.42$	$35.97^{a} \pm 1.11$	$28.88^{b} \pm 1.01$
Age at first conception (months)	$36.33^{a} \pm 1.49$	$37.22^{a} \pm 1.16$	$29.39^{b} \pm 1.07$
No. of services per conception (no.)	$1.30^{a} \pm 0.19$	$1.24^{a} \pm 0.14$	$1.24^{a} \pm 0.13$
Daily milk yield (kg)	$5.20^{a} \pm 0.44$	$4.93^{b} \pm 0.34$	$5.47^{ab} \pm 0.31$
Lactation length (days)	$262.33^{a} \pm 10.03$	$259.54^{a} \pm 7.83$	$273.06^{a} \pm 7.16$
Lactation yield (kg)	$1382.00^{a} \pm 145.96$	$1314.21^{ab} \pm 113.89$	$1604.05^{a} \pm 104.12$
Post partum heat period (months)	$4.48^{a} \pm 0.30$	$4.67^{a} \pm 0.23$	$2.59^{b} \pm 0.21$

Means without common superscripts in the same row are significantly different ($p<0.05$).

Table 3. Summary showing Least-squares mean ± SE with comparison of genetic groups on various traits

Groups traits	Local × Friesian F_1	Local × Sahiwal F_1	Local	Local × Sindhi F_1	Local × Hariana F_1	Overall mean
Age at weaning (months)	$6.54^{a} \pm 0.17$	$6.91^{a} \pm 0.18$	$6.82^{a} \pm 0.24$	$6.83^{a} \pm 0.24$	$5.37^{b} \pm 0.24$	5.80 ± 2.34
Age at first heat (months)	$27.18^{a} \pm 1.30$	$35.42^{bc} \pm 1.38$	$37.87^{c} \pm 1.44$	$37.33^{c} \pm 1.79$	$27.17^{a} \pm 1.72$	30.49 ± 8.08
conception (months)	$28.73^{a} \pm 1.37$	$37.08^{b} \pm 1.65$	$39.48^{b} \pm 1.51$	$38.44^{b} \pm 1.88$	$27.83^{a} \pm 1.82$	31.71 ± 8.41
No. of services per conception (no.)	$1.11^{a} \pm 0.17$	$1.08^{a} \pm 0.18$	$1.60^{bc} \pm 0.18$	$1.17^{ac} \pm 0.23$	$1.33^{ac} \pm 0.23$	1.26 ± 0.59
Daily milk yield (kg)	$5.81^{a} \pm 0.40$	$5.77^{a} \pm 0.43$	$5.01^{ac} \pm 0.44$	$4.17^{bc} \pm 0.55$	$5.25^{ac} \pm 0.53$	5.65 ± 1.58
Lactation length (days)	$271.44^{a} \pm 9.19$	$299.38^{a} \pm 9.74$	$244.63^{bc} \pm 10.16$	$224.44^{bc} \pm 12.64$	$285.00^{ab} \pm 12.24$	271.16 ± 43.56
Lactation yield (kg)	$1633.00^{a} \pm 133.00$	$1863^{a} \pm 141.00$	$937.00^{b} \pm 183.00$	$937.00^{a} \pm 183.00$	$1495.00^{a} \pm 178.00$	1611.98 ± 607.99
Post partum heat period (months)	$4.69^{a} \pm 0.27$	$4.15^{a} \pm 0.29$	$3.37^{b} \pm 0.30$	$3.19^{b} \pm 0.38$	$4.21^{a} \pm 0.36$	3.61 ± 1.50

Means without common superscipts in the same row are significantly different ($p<0.05$).

CONCLUSION

The results of the present study indicated that Local × Hariana F_1 is superior for age at weaning, age at first heat and age at first conception compared to other genetic groups. Lactation length and lactation yields were better in Local × Sahiwal F_1 than other genetic groups. Post partum heat period was the lowest in Local × Sindhi F_1 compared to all the other genetic groups. Daily milk yield was the highest in Local × Friesian F_1. So it can be concluded here that Local × Sahiwal F_1 cows are better for most of the milking traits and Local × Hariana F_1 cows are better for most of the reproduction traits than the other crossbreds.

REFERENCES

Bhuiyan, A. K. F. H., M. A. Matin and M. O. Faruque. 1992. Performances of Purebred and Crossbred Dairy Cattle in Bangladesh. Proceedings of the 6th AAAP Animal Science Congress, Ahat, Bangkok. 8:182.

Bhuiyan, A. K. F. H. and R. Sultana. 1994. Analysis of performance of exotic cattle breeds and their crosses in Bangladesh. Proceedings of the 5th World Congress on Genetic Applied to Livestock Production. 20:355-358.

Chaudhry, M. Z., M. J. Tahir and M. Rafique. 1994. Production performance and milk producing efficiency in different filial groups of H Friesian × Sahiwal half-breds. Asian-Aus. J. Anim. Sci. 7(3): 383-387.

Harvey, W. R. 1990. Mixed Model least-squares and maximum likelyhood computer program. PD-2 version. Mimeograph, Ohio State University, Ohio, USA.

Islam, S. S. and A. K. F. H. Bhuiyan. 1997. Performance of Crossbred Sahiwal Cattle at the Pabna Milkshed Area in Bangladesh. Asian-Aus. J. Anim. Sci. 10(6):581-586.

Jabbar, M. A. and S. Z. Ali. 1988. The limitations of crossbreeding for improvement of cattle in Bangladesh. Oxford Agrarian Studies. Vol. 19.

Majid, M. A., T. N. Nahar, A. I. Talukder and M. A. Rahman. 1998. Reproductive performances of Purebreds, F_1, F_2 and F_3 cows raised in Savar Dairy Farm. Bangladesh J. Livest. Res. 2(1, 2, 5):63-71.

Nahar, T. N., K. G. Mostafa and M. R. Amin. 1989. A comparative study on the performances of F_1 crossbred cows. Bangladesh J. Anim. Sci. 18(1-2): 55-62.

Nahar, T. N., M. Islam and M. A. Hasnath. 1992. A comparative study on the performance of F_1 crossbred cows under rural conditions. Asian-Aus. J. Anim. Sci. 5(3):435-438.

Rahman, M. F., N. Ahmed and A. R. Ahmed. 1987. A comparative study on some procuctive and reproductive performances of Dairy cows at Savar Dairy and Cattle Improvement Farm. Bangladesh Vet. J. 21(1-10):55-61.

Rahman, M. F., M. S. Islam, M. A. Hossain, M. A. M. Prodhan and A. Rahman. 1993. Reproductive patterns of different breeds of cows in Bangladesh. Bangladesh J. Livest. Res. 1(1):19-24.

Snedecor, G. W. and W. G. Cochran. 1980. Statistical Methods. Seventh edition. Iowa State Univ. Press, USA. 271-273.

Sultana, R. 1995. Quantitative analysis of reproductive performance of purebred and their crosses in the Savar Dairy Farm. M. Sc. Thesis, Dept. of Animal Breeding and Genetics, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Syed, M., A. Rahman and M. Ali. 1996. Production performance of Sahiwal and various grades of crossbred cattle. J. Agrl. 12:(6):601-610(Abstr.).