

PRODUCTIVE PERFORMANCE OF PURE BREEDS, F₁, F₂ AND F₃ GENERATIONS COWS RAISED IN CENTRAL CATTLE BREEDING AND DAIRY FARM OF BANGLADESH

M. A. Majid¹, A. I. Talukder and M. Zahiruddin²

Animal Production Research Division, BLRI, Savar, Dhaka, Bangladesh

Summary

The data on milk yield of 1837 healthy dairy cows of different genetic groups raised in Central Cattle Breeding and Dairy farms, Savar, Dhaka for the period from 1978 to 1992 were analyzed from first to 6th lactation. The mean (SE) milk yields of 100 days, 305 days, total lactation and total life time (928 ± 48.6 kg, $2,188 \pm 201.81$ kg, $2,661 \pm 385.46$ kg and $11,134 \pm 2,916$ kg) respectively, were in pure bred Friesian found to be highest among all genetic groups. The corresponding means in indigenous cows, 334 ± 12.92 kg, 946 ± 64.44 kg, 653 ± 16.31 kg and $3,934 \pm 402.21$ kg were the lowest. Among the F₁, F₂ and F₃ cross-breeds, the F₁ half bred Friesian showed the highest performance in milk yield. The half bred Friesian in successive generations yielded low milk. Similar trend was obtained in case of cross-bred with other breeds such as Jersey, Sindhi and Sahiwal. From the overall results, it can be concluded that the performance in respect to milk yield of pure bred Friesian and their F₁ half bred with indigenous and Sahiwal were superior over the F₂ or F₃ cross-breeds between Friesian and any other breed irrespective of proportion of blood. The performance in respect to production of indigenous local cow was found to be almost similar with that of Sahiwal breed.

(Key Words : Milk Yield, Purebreed, Crossbreeds, Cattle)

Introduction

A cross breeding program with improved *Bos indicus* and *Bos taurus* breeds such as Sahiwal, Sindhi, Friesian, Jersey etc, started in the Central Cattle Breeding and Dairy Farm, previously called Savar Dairy Farm (SDF) in 1978. Production performance of the imported pure bred and cross-bred produced from the breeding program has not yet been reported. A large number of data were remained to be evaluated for decades. Analysis of such a vast programme could provide variable information for making an appropriate breeding policy for the country. Identification of suitable breeds and the proportion of exotic blood in the cross-breeds suitable for the environmental condition is the thrust of any dairy breeding policy in this country. Before further planning for a dairy development program, suitable combinations of blood

level must be identified. For this purpose, different genetic groups of dairy cows raised in the Savar Dairy Farm were evaluated in respect to productive and reproductive performance. Very few segmented studies have been performed which could give information for future planning on genetic improvement of Bangladesh livestock. This paper describes a study of the productive and reproductive performances of different genetic groups of dairy cows raised in the Savar Dairy Farm (SDF).

Materials and Methods

Data on the milk production covering the period from 1978 to 1992 of a total of 1837 dairy cows of 18 different genetic groups in SDF were collected for evaluation. The cows were maintained in the farm 30 km apart from the capital city, Dhaka of Bangladesh which stand between $20^{\circ} 34'$ and $26^{\circ} 38'$ north latitude and between $88^{\circ} 01'$ and $92^{\circ} 41'$ east longitude. The ambient temperature (maximum-minimum) in the winter (November-February) and summer (March-June) were recorded 29°C - 11°C and 34°C - 21°C . The average rainfall over that farm area was recorded 1,194 mm to 3,454 mm in the monsoon. The

¹ Address reprint requests to Dr. M. A. Majid, Senior Scientific Officer, Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka, Bangladesh.

² Livestock Officer, Central Cattle Breeding & Dairy Farm, Savar, Dhaka, Bangladesh

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genetic groups were constituted on the basis of proportion of blood level of different breeds. According to generation, eighteen genetic groups were divided into 4 (four) broad groups such as pure, F_1 , F_2 and F_3 . Pure group comprised of Indigenous, Sahiwal and Friesian breeds; F_1 group-1/2 Local 1/2 Friesian, 1/2 Local 1/2 Jersey, 1/2 Sahiwal 1/2 Friesian, and 1/2 Sindhi 1/2 Friesian; F_2 -1/2 Local 1/2 Friesian, 1/2 Local 1/2 Jersey, 3/4 Sahiwal 1/4 Kenian, 1/4 Local 1/4 Sindhi 1/2 Friesian, 1/4 Local 3/4 Friesian, 1/4 Local 1/4 Sahiwal 1/2 Friesian and 1/4 Sindhi 1/4 Sahiwal 1/2 Friesian; and F_3 group comprised of 3/8 Local and 5/8 Friesian, 1/8 Local 1/8 Sahiwal 3/4 Friesian and 5/8 Sahiwal 1/8 Sindhi 1/4 Friesian. All of these crossbred cows were produced out of a crossbreeding programme which was started initially in 1978 with some Friesian bulls imported from Australia and Sahiwal and Sindhi from Pakistan. Data from only healthy cows which were kept under stall feeding system and supplied with green grass and locally available feed ingredients (wheat bran, rice polish, khesari bran, oil cake etc.) according to their body requirements as per ARC recommendations. The cows were milked twice daily, one at 4 a.m. (early morning) and the other at 3 p.m. (afternoon) using hand milking system for low yielder and machine milking for high yielder.

Milk yield from first to 6th lactation of their productive life was considered for analysis although the lactation number ranged from 1 to 10. Parameters studied were as follows:

1. Milk yield in 100 days, i.e., average milk yield in first 100 days of first to 6th lactation of each individual cows.
2. Milk yield in 305 days, of first to 6th lactation of each cow.
3. Total lactation milk yield.
4. Total lifetime milk yield i.e., average milk yield in whole productive life which was not limited to 6th lactation.

Data were analysed by using the following model for the analysis of variance of various productive and reproductive parameter.

$$Y_i = \mu + G_i + e_i$$

Where, Y_i = Individual observation
 μ = Grand mean
 G_i = Effect of *i*th genetic group
 e_i = Random error associated with Y_i .

ANOVA were performed using General Linear Model (GLM) in SAS, 1985. The Duncan's Multiple Range Test (DMRT) was used for comparison of means.

Results and Discussion

Results of 4 production parameters i.e., 100-day milk yield, 305-day milk yield, total lactation milk yield and total life time milk yield across 18 genetic groups are presented in table 1. Results are described as follows:

Milk yield in 100 days :

The average values of 100 days milk yield of 18 different genetic groups are shown in table 1. Among different genetic groups the highest yield was obtained in the pure breed Friesian (928 ± 48.6 kg) and the lowest in the indigenous dairy cows (334 ± 12.9 kg). Among the cross-bred cows, differences in milk yield in different generations were found to be insignificant. Average 100-day milk yield in 1/2 Local 1/2 Friesian cows was 839 ± 50.71 kg which was higher than that in the F_2 -1/2 Local 1/2 Friesian. Similar trend of decreasing yield with the increase of generation was noticed in case of Jersey crosses. In some cases, it was found that the milk yield was increased with the increased proportion of blood level in the successive generations. Average 100 days milk yield in F_1 -1/2 Local 1/2 Friesian was 839 ± 50.71 and in F_2 -1/4 Local 3/4 Friesian 731 ± 26.29 kg which was not significantly different. In case of $L \times S1 \times F$, milk yield was significantly ($p < 0.05$) decreased with the increased proportion of Friesian blood in their successive generations (table 1, figure 1). Average milk yield of

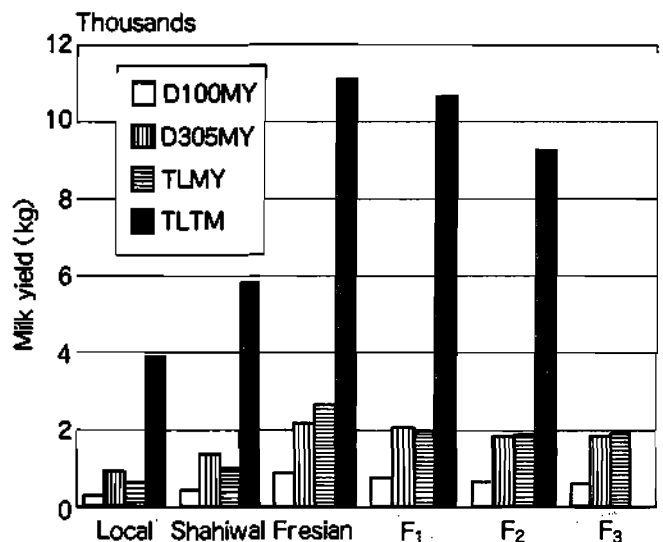


Figure 1. Milk yield of different breeds and generations of dairy cows where D100MY = milk yield in 100 days, D305MY = milk yield in 305 days, TLMY = total lactation milk yield and TLTM = total life time milk yield.

TABLE 1. MILK YIELD IN 100 DAYS, 305 DAYS, WHOLE LACTATION AND TOTAL LIFE TIME IN DIFFERENT GENETIC GROUP OF PURE, F₁, F₂ AND F₃ DAIRY COWS RAISED IN SAVAR DAIRY FARM

Generation	Genetic group	100 days milk (kg)	305 days milk (kg)	Total fact. milk (kg)	Total life time milk (kg)
Pure	Local indigenous	334 ^c ± 12.92 (274)	946 ^c ± 64.44 (274)	653 ^c ± 16.31 (274)	3,934 ^c ± 402.21 (200)
	Sahiwal	472 ^b ± 30.45 (308)	1,412 ^c ± 18.66 (306)	1,056 ^b ± 84.69 (308)	5,891 ^{bc} ± 808.06 (308)
	Friesion	928 ^a ± 48.6 (77)	2,188 ^a ± 201.81 (77)	2,661 ^a ± 385.46 (77)	11,134 ^a ± 2,916.79 (76)
F ₁	1/2 L 1/2 F	839 ^a ± 50.71 (89)	2,150 ^{ab} ± 131.15 (89)	1,956 ^{ab} ± 130.15 (89)	7,147 ^b ± 2,268.81 (78)
	1/2 L 1/2 J	632 ^b ± 40.91 (37)	1,712 ^{ab} ± 92.5 (17)	1,743 ^b ± 138.74 (26)	10,355 ^a ± 2,509.2 (47)
	1/2 SL 1/2 F	839 ^a ± 36.74 (100)	2,083 ^{ab} ± 96.91 (100)	2,239 ^a ± 24.62 (100)	16,164 ^a ± 1,037.80 (20)
	1/2 S 1/2 F	765 ^a ± 106.80 (92)	2,084 ^{ab} ± 79.84 (92)	1,900 ^{ab} ± 95.61 (92)	8,789 ^b ± 2,145.93 (152)
F ₂	1/2 L 1/2 F	639 ^b ± 27.68 (152)	1,716 ^{ab} ± 57.31 (151)	1,897 ^b ± 235.4 (152)	8,969 ^b ± 897.08 (22)
	1/2 L 1/2 J	617 ^b ± 71.14 (33)	1,788 ^{ab} ± 164.29 (31)	1,534 ^b ± 105.93 (33)	—
	1/4 L 1/4 S 1/2 F	578 ^b ± 18.60 (22)	1,771 ^{ab} ± 213.67 (21)	1,875 ^{ab} ± 223.12 (22)	11,537 ^a ± 3,963.20 (8)
	1/4 L 3/4 F	731 ^a ± 26.29 (151)	1,755 ^{ab} ± 52.4 (96)	1,872 ^{ab} ± 19.23 (151)	11,756 ^a ± 112.00 (84)
	3/4 S1 1/4 K	471 ^c ± 40.74 (37)	1,030 ^c ± 84.25 (36)	891 ^c ± 428.15 (36)	—
	1/4 L 1/4 SL 1/2 F	833 ^a ± 53.7 (39)	1,902 ^a ± 158.6 (38)	2,041 ^a ± 48.77 (39)	9,678 ^{bc} ± 1,745.20 (16)
	1/4 S 1/4 SL 1/2 F	640 ^b ± 42.26 (15)	2,016 ^a ± 254.57 (8)	1,802 ^{ab} ± 371.51 (11)	—
F ₃	3/8 L 5/8 F	667 ^b ± 60.67 (5)	1,892 ^a ± 300.40 (2)	1,809 ^{ab} ± 241.39 (1)	—
	1/8 L 1/8 SL 3/4 F	615 ^b ± 55.72 (16)	1,638 ^b ± 102.56 (11)	1,967 ^{ab} ± 166.12 (11)	—
	5/8 SL 1/8 S 1/4 F	699 ^b ± 39.15 (9)	2,128 ^a ± 18.25 (6)	2,117 ^a ± 298.19 (6)	—

Note : 1. Figures in parenthesis indicates number of observation.

2. Abbreviations : L = Local S1 = Sahiwal S = Sindhi F = Friesian J = Jersey K = Kenian.

3. Means with similar superscript do not differ significantly (p > 0.05).

different cross-bred cows were found to be highest in the F_1 -1/2 Sahiwal 1/2 Friesian, (839.78 ± 36.74 kg) and lowest in the 3/4 Sahiwal 1/4 Kenian. Sahiwal and Friesian mixed with local in F_2 generation produced moderately high milk in 100 days of their lactation period (table 1, figure 1). The same proportion of same breed in F_3 produced lower than those in F_1 and F_2 . So it was evident that as the generation numbers were increased, the milk production was found to be decreased.

Milk in 305 days :

Average milk yield in 305 days in different genetic groups among of cows in the SDF are presented in table 1. The highest milk yield in 305 days was found in the pure breed Friesian group ($2,188 \pm 201.81$ kg) and the lowest in the indigenous groups of cows (946 ± 64.44 kg). Among the cross-breds, F_1 -1/2 L 1/2 F group yielded highest milk ($2,150 \pm 131.15$ kg) while the lowest was $1,030 \pm 84.25$ kg in the 3/4 S1 1/4 K group. The trend of milk yield was noticed to be declining as the generation number was increasing (table 1, figure 1). Differences in milk production in different genetic groups except local indigenous, 3/4 S1 1/4 K and Friesian cows were found statistically insignificant. Milk yield of local indigenous cows and 3/4 S1 1/4 K was found to be significantly ($p < 0.05$) lower than that of Friesian which was significantly ($p < 0.05$) higher than all other genetic groups.

Total lactation milk yield :

Results presented in the table 1 showed that pure Friesian had the highest lactation yield ($2,661 \pm 385.46$ kg) among all genetic groups. In case of cross-breds, highest lactation milk yield ($2,239 \pm 24.62$ kg) was obtained in the 1/2 S1 1/2 F cows in first generation which was not significantly different ($p > 0.05$) from all other genetic groups (figure 1). The trend of decreasing milk yield with increasing generation number was also observed in this parameter as shown in case of milk yield in 100 and 305 days. The mean lactational milk yield in this study was found to be consistent with that of Friesian crossbred cows, $2,385 \pm 49.6$ kg (Tibbo, et al., 1994) and slightly different from that reported by Dalal, et al. (1991). The result also closely agreed with a finding reported by Jahan, et al. (1990) who conducted a separate study in the same farm with a low number of animals.

Total lifetime milk yield :

Mean milk yields in total life time of dairy cows in different genetic groups are shown in tabel 1. The highest life time milk yield was observed in the F_2 -1/4 L 3/4 F

group ($11,756 \pm 1,591.22$ kg) and the lowest 3,934 \pm 402.21 kg, was found in the indigenous group. The F_2 -1/4 L 1/4 S 1/2 F got the second position whose mean yield was $11,537 \pm 3,963.20$ kg. The F_1 and F_2 1/2 L 1/2 F cows had moderately high milk yield $7,147 \pm 2,268.81$ and $8,969 \pm 897.08$ kg, respectively (figure 1). The lifetime milk yield of pure breed Friesian was $11,134 \pm 2,916.79$ kg which was almost similar with that of highest yield group of the preset study. The effect of breed, lactation and their interaction on total life time milk yield was found highly significant ($p < 0.05$).

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