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Milk yield variation in different genotypes of dairy cows

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ABSTRACT

The effects of genotypes and lactation periods on daily milk yield of dairy cows reared at Bangladesh Agricultural University (BAU) Dairy Farm were investigated. A total of 48 (n= 12x4) dairy cows belonging to different genotypes, viz., Holstein cross (n=12), Jersey cross (n=12), Shahiwal cross (n=12) and Red Chittagong (n=12) were selected. BAU Dairy Farm records regarding the daily milk yields were collected during the period of 2000 to 2005 (five years records). Analysis revealed that Holstein cross and Red Chittagong cows showed the highest (5.37 litre/day) and lowest (2.83±0.61 litre/day) milk yield, respectively, among the different genotypes of dairy cows. Statistical analysis showed that there was significant ($p<0.01$) difference in milk yield for different genotypes. Milk production for all dairy cows was lowest in first lactation and there after production increased during the 2nd and 3rd lactation period. Jersey cross and Shahiwal cross showed significant difference for milk yield in different lactations, whereas Holstein cross and Red Chittagong showed non-significant difference. It can be concluded that genotypic variation and lactation number may affect the milk yield in different breeds of cows. Highest milk production was observed at 3rd lactation period for all types of dairy cows.

Introduction

Bangladesh has high density of cattle population and at present, the total population of cattle is about 23.79 million (DLS, 2017). The majority of the cattle population is comprised of indigenous cattle, sometimes mentioned as non-descriptive types which have no specific breed characteristics. However, the highly densed cattle population cannot fulfill the daily fluid milk demand in Bangladesh for long time and we are always in acute shortage of milk. In our country annual milk production is about 7.28 million metric tons but our demand is about 14.7 million metric tons (250 ml/day/head basis) with a deficit of about 7.42 million metric tons (DLS, 2017). At present, on an average per capita availability of fluid milk is about 125.59 ml/head/day. Haque (2009) stated that the shortage of fluid milk is due to mainly the poor quality species of cattle with low productivity. So we have to increase the milk production to fulfil the shortage of milk.

World milk production has a great economical importance in food production and human nutrition. The milk is obtained from cows, buffalo, sheep, goats, camels, donkey etc. Bangladesh Agricultural University (BAU), Mymensingh, is the largest and oldest agricultural university in South East Asia, and has great contribution in the field of agriculture and livestock economy of Bangladesh. BAU Dairy Farm is one of the lucrative component of BAU which is well equipped for conducting different types of research works and demonstrating the students about practical aspects of dairy cattle management and dairy farming. BAU Dairy Farm is governed by the Department of Dairy Science, Faculty of Animal Husbandry, BAU, Mymensingh, and fulfilling a small part of demand of milk and milk products of people of in and around BAU campus. Farm records reveal that the dairy cattle are belonging to Holstein cross, Jersey cross, Shahiwal cross and Red Chittagong. Therefore, the present study was aimed to observe the effects of genotypic variation on daily milk yield of dairy cows at BAU Dairy Farm.

Materials and methods

The experiment

Farm records regarding daily milk yield were analyzed based on five years milk yield performances of a total 48 dairy cows were selected which were of different genotypes such as Holstein cross, Jersey cross, Shahiwal cross and Red Chittagong, where each genotypic class comprised of 12 cows. The overall management conditions of the cows were similar as all the cows were reared in the same condition prevailed in the Dairy Farm of the Bangladesh Agricultural University. All the selected cows were maintained on stall-feeding, though very limited grazing was also practiced. Moreover, at least three lactation periods for all cows were considered for data collection.

Statistical analysis

Statistical analyses were accomplished for the data obtained from this study which was designed in Completely Randomized Design (CRD) to find out the statistical differences among the treatment means using “MSTATC” program. To find out the significant differences among the treatment means, F-value was calculated. Latin Square Design (LSD) was employed to compare among the different treatment means.

Results and Discussion

Daily Milk yield

The five years farm records regarding the daily milk yield of the selected 48 cows belonging to different genotypic classes reared at BAU Dairy Farm were analyzed and revealed that the average milk yield of Holstein cross, Jersey cross, Shahiwal cross, and Red-Chittagong were 5.37±0.77, 4.43±0.48, 3.86±0.39, and 2.83±0.61 litre/day, respectively (Table 1). The significant difference ($p<0.01$) within the milk yield of different breeds' milk yield was indicated through the statistical analysis. Among the different genotypes of dairy cows, the highest (5.37 litre/day) and lowest (2.83±0.61 litre/day) milk production were recorded in case of Holstein cross and Red Chittagong cows, respectively.

Mondal *et al*. (2010) found 7.68 litres/day as the average daily milk yield in cross bred dairy cows. However, the report of Nahar *et al.* (1992) are in close agreement with the findings of the present study, where the authors found the average milk yield of Sindhi × Deshi, Shahiwal × Deshi, Jersey × Deshi and Holstein × Deshi graded cows were 3.0±0.1, 2.9±0.1, 3.8±0.1 and 5.5±0.1 kg, respectively. Baset *et al*. (2016) reported that season had no influence on milk yield, but genotype significantly ($p\leq0.01$) influenced daily milk yield, even milk proteins and minerals.

Table 1. Summary of milk yield form different genotypes of dairy cows

Characters	Genotypes				LSD	LoS
	Holstein cross	Jersey Cross	Shahiwal cross	Red Chittagong		
Milk yield (litre/day)	5.37± 0.77[a]	4.43± 0.48[b]	3.86± 0.39[c]	2.83± 0.61[d]	0.421	**

*Note: Figure showing dissimilar superscripts in the same row differs significantly; **= Significant at 1% level of probability; LoS= Level of significant*

Table 2. Milk yield (liter/day) of different genotypes in different lactations

Genotypes	Lactation No			LSD	Level of significance
	1st lactation	2nd lactation	3rd lactation		
Holstein cross	4.83±1.12	5.44±0.47	5.83±0.31	2.144	NS
Jersey cross	4.09±0.70[ab]	4.59±0.78[a]	4.61±1.02[a]	0.058	**
Shahiwal cross	3.40±0.35[b]	3.64±0.31[b]	4.52±0.75[a]	0.783	**
RCC	2.52±0.55	2.84±0.69	3.11±0.68	1.262	NS

*Note: Figure showing dissimilar superscripts in the same row differs significantly;**= Significant at 1% level of probability; NS= Non-significant; RCC= Red Chittagong cattle*

We have to remember that we cannot ignore the values of our local or native cows. From any aspects, the milk production of Red-Chittagong dairy cows are much lower than crossbred cows, however, regarding other performances, they are quite good, even better. Smaller size, climate adaptation and diseases resistant capacity contribute to the high values of local breeds of Bangladesh. To generate a good dairy breed, suitable in our country condition, the selective breeding of better type of native Red Chittagong cows is of great importance. Moreover, the native cows are well adopted in the prevalent local climatic condition, so as they can easily adjust with the fluctuation of nutrition, temperature and humidity; and they are relatively resistant to various common infectious diseases.

Milk yield of crossbred cows during different lactations

Milk yield of crossbred cows during different lactations are presented in Table 2. From the Table it is observed that there was no significant effect of lactation number on the milk yield of Holstein Friesian cows and Red Chittagong but significant ($p<0.01$) effect was in case of Jersey cross and Shahiwal cross. Milk production for all dairy cows was lowest in first lactation and there after production increased during the 2nd and 3rd lactation period. Highest milk production was seen at 3rd lactation for all types of dairy cows. The milk yield of lactation agrees with the work of Kennedy (2003), who found that lactation had no significant effect on milk yield except Jersey cross and Shahiwal cross.

But some worker reported that lactation had significant effect on milk yield (Chowdhury and Barhat, 1979). In our experiment, although the lactation effect was not significant at the case of Holstein cross and Red Chittagong but the production increases gradually during the subsequent lactation. The gradual increase in lactation yield was reported by Chowdhury and Barhat (1979).

In fact, the cows are not in fully productive stage in early lactation period, even in growing stage; moreover, their mammary gland and mammary vein are not well developed at that stage to produce sufficient amount of milk. It is usually expected that

the maximum milk yield can be found when the cows have grown fully at about 3rd lactation (Chowdhury and Barhat, 1979). So the result of our study regarding lactation supports the results of above workers.

Conclusion

From the above discussion it was observed that the highest milk yield was obtained from Holstein cross cows and lowest for Red Chittagong cow. Highest milk production was also observed at 3rd lactation for all types of dairy cows. Therefore, it could be concluded that genotypic variation may affect the milk yield in different breeds of cows.

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