Research Article

EVALUATION OF PRODUCTIVE AND REPRODUCTIVE PERFORMANCES OF INDIGENOUS AND CROSSBRED DAIRY COWS AT SYLHET DISTRICT IN BANGLADESH

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Abstract

The study was carried out to investigate productive and reproductive performances of crossbreds and indigenous dairy cows. A total of 200 dairy cows belonging to 10 farms of Sylhet district were selected randomly of which 50 cows were Holstein Friesian cross, 50 cows were Sahiwal cross, 50 cows were Sindhi cross and 50 were indigenous breed. The highest average milk yields day ⁻¹ cow ⁻¹ and total lactation yield cow ⁻¹ was observed in Holstein Friesian cross (9.82 ± 2.92 ; 2899.13 ± 1280.52 liter) followed by Sahiwal cross (6.13 ± 2.85 , 1773.60 ± 1107.68 liter), Sindhi cross (4.35 ± 1.12 ; 1127.24 ± 342.32 liter) and indigenous cows (2.41 ± 0.72 ; 541.42 ± 144.71 liter). The lactation period (days) of crossbreds dairy cows was significantly (p<0.01) higher than native indigenous cows. The age at first calving (months) was almost similar in different crossbred cows but significantly (p<0.01) higher in indigenous cows. Considering all the parameters studied, Holstein Friesian cross showed better performance followed by Sahiwal cross, Sindhi cross and indigenous cows.

Keywords: Crossbreds, dairy cows, indigenous, productive and reproductive performance

Introduction

In the global efforts to overcome malnutrition and poverty in the developing countries, contribution of livestock sector is widely recognized. Dairy cattle of Bangladesh play an important role for improving human nutrition as well as national income. Dairying is nearly always part of a mixed farming system in Bangladesh (Saadullah, 2001). About 22.83% of total GDP contribution to the national economy comes from agriculture. Livestock sub-sector contribution to the GDP is 3.39% and provides about 25% full time employment and 50% of the total population partially depends on it (Bangladesh Economic Survey, 2012). About 92% of dairy cattle are local and non-descriptive type, which is termed as indigenous (Zebu) cows (Action Aid, 2014). Milk production of these cows is much lower than that of superior breeds. Still it is considered that dairying is the predominant source of income generation for the rural people in Bangladesh.

The cattle are a vital component of the agricultural farming system of Bangladesh. The total cattle population of Bangladesh is about 23.4 millions of which 11.91 millions are males and 11.49 millions are females and among the cattle populations about 3.53 millions are milking cows, 2.61 millions are dry cows (cows without milk), 2.13 millions are draught cattle, and 4.20 millions are improved cattle (Banglapedia, 2014). The average milk yield cow ⁻¹ day ⁻¹ is 1.5 litre for local and 2.5 litre for crossbred (Saadullah, 2001), but they are bearing some desirable characteristics as disease resistance, survive well in fluctuating nutrient supply and also suitable for hot humid climatic condition of Bangladesh. The average lactation length of crossbred cows is 305 days and the total lactation yield is 1613±49.03 kg lactation ⁻¹ (Hassan and Khan, 2013). The annual milk yield in Bangladesh is about 2.62 million metric tons (FAO, 2008). This quantity is below the normal requirement of 9.9 million metric tons of milk year ⁻¹. About 87% population of Bangladesh is under nourished and the country has been suffering from an acute shortage of milk and milk products (Action Aid, 2011). Daily per capita availability of milk is only 42 ml whereas the per capita nutritional requirement of milk is about 250 ml (Action Aid, 2011). To improve the productive performances of dairy herd good management system is an essential factor.

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The low productivity of a milking cow in the country is due to poor genetic characteristics, shortage of feeds and fodder and wide spread of diseases. The economic traits of cows are generally related with their reproductive capacity. It is desirable that a cow with full reproductive efficiency should have calved first at about two years of age and then again every 12 to 13 months interval to make the herd economic and profitable (Wiltbank, 1970). The reproductive performance is determined on the basis of puberty age, early first calving, high milk yield and shorter calving interval. But these parameters are different in different crosses (Rahman *et al.* 1987). The economic returns of dairy cows depend on these traits. Despite of all these problems recently some people have shown interest for development of small dairy farms. Considering the above circumstances, the present research work has been undertaken with the objectives to compare the productive and reproductive performance of indigenous and crossbred dairy cows in order to suggest the genotype suitable for sustainable small scale dairy farming in Sylhet region of Bangladesh.

Materials and Methods

The study was conducted at sadar upazilla (sub district) of Sylhet district in Bangladesh for the period of three years from July 2010 to June 2013. A total of 200 dairy cows belonging to 10 farms of Sylhet district were selected randomly of which 50 cows were Holstein Friesian cross, 50 cows were Sahiwal cross, 50 cows were Sindhi cross and 50 were indigenous breed. Simple random sampling procedure were followed for selecting farms and cows within the farms. A scheduled questionnaire was used for face to face interview of the farmers of selected farms to collect productive and reproductive parameters of selected dairy cows. As feeding and management practices in selected dairy farms were almost similar throughout the year. The parameters related to feeding and management practice were not included in this study.

The productive and reproductive performances of different breed of dairy cows were compared using following economic traits.

Daily milk yield (liter)

Daily milk yield means total amount of milk produced day ⁻¹ cow ⁻¹. Milk yield is the most important economic traits and important criterion to choose a dairy cows. It was measured in liters.

Lactation length (days)

Lactation length was calculated by subtracting the date of starting of milking from the date of beginning of dry period. Lactation length was measured in days.

Lactation yield (liter)

The total production of milk by an individual cow throughout the lactation length was defined as lactation yield. The unit of measurement for this parameter was liter.

Services conception ⁻¹

Service conception ⁻¹ was determined as the average number of services or insemination required for each successful conception. It is a major indicator of the fertility and also the reproductive efficiency of cows.

Age at first calving

Age at first calving included the age when a cow given birth of a calf for first time. It was calculated from the intervals between the dates of birth to the date of first calving.

Postpartum heat period

The onset of postpartum heat period was calculated as interval between the date of calving and the date of first detected heat or oestrus after calving. It was calculated in terms of days.

Calving interval (days)

Calving interval was defined as the interval between two successive calving. The interval between first calving and the second calving were considered the first calving interval. Similarly, the interval between second calving and third calving were considered the second calving interval. It was measured in days.

Gestation length (days)

The total gestation length was calculated by the time of conceives to parturition. This trait was measured in days.

Statistical analysis

Both productive and reproductive parameters were analyzed in this study. The collected data covered for five (5) different genetic groups. The numbers of animals in different farms and group were unequal. As a result, the data confirmed a non-orthogonal factorial experiment (Snedecor and Cochran, 1980)

The collected data were statistically analyzed by using SPSS (Statistical Package for the Social Science) software. Analysis of variance test was performed to find the statistical difference between the productive and reproductive traits of different breeds.

Results and Discussion

The productive and reproductive performance of crossbreds and indigenous dairy cows are shown in Table 1 and 2, respectively.

Tuble 1.1 Foundative performances of unferent cross breed and mulgenous dury cows (mean 20D)					
Parameters	Holstein- Friesian cross cow	Sahiwal cross cow	Sindhi cross cow	Indigenous cow	P value
Average milk yield	9.82 ^a ±2.92	$6.13^{b} \pm 2.85$	4.35 ^C ±1.12	$2.41^{d}\pm0.72$	**
Lactation length(days)	284.69 ^a ±46.78	277.13 ^a ±55.00	258.80 ^b ±34.317	228.85 ^c ±31.971	**
Total Lactation yield lactation ⁻¹	2899.13 ^a ±1280.52	1773.60 ^b ±1107.68	1127.24 ^c ±342.32	$541.42^{d} \pm 144.71$	**

Table 1 Productive performances of diffe	erent cross breed and i	indigenous dairy cows	(mean+SD)

 a^{bcd} data having similar superscript did not differ significantly (P>0.05); ** = 1% level of significance

Productive performance

Among the productive trait, average daily milk yield cow ⁻¹, lactation length and lactation yield were found statistically significant. Statistical analysis showed that there was significant difference (p<0.01) in average daily milk yield of different breeds. The average daily milk yield were 9.82 ± 2.92 , 6.13 ± 2.85 , 4.35 ± 1.12 and 2.41 ± 0.72 liters for Holstein Friesian crosses, Sahiwal crosses, Sindhi crosses and indigenous cow, respectively. This variation in daily milk production performance might be due to the variation in genetic makeup of different breeds of cows included in the study. Results of the present study were also in line with several previous studies. Sarker (1995) stated that the average yield of milk day⁻¹ from crossbred and indigenous dairy cows were 6.74 and 1.63 litres, respectively. Islam (2008) found that average daily milk yield in crossbreed and indigenous cattle were 6.894 ± 0.229 , 3.955 ± 0.113 , respectively. Bhuiyan and Sultana (1994) and Kabir and Islam (2009) stated that comparatively higher milk yield performance of Holstein Friesian cross bred cows than the indigenous cows. The similar results were also reported by several authors (Ahmed and El-Amin, (1997), McDowell *et al.* (1996) and Rokunuzzaman *et al.* (2009).

The average lactation length of different cross bred and indigenous dairy cows were shown in Table 1. From this Table it was evident that highest length of lactation was found in Holstein Friesian crosses (284.69 ± 46.78) and lowest (228.85 ± 31.971) in indigenous cows. It was observed that the average lactation length was similar in different cross bred cows however it was significantly (p<0.01) different from the average lactation length of indigenous cow. The lactation length of the present study is in agreement with the previous findings of Zaman *et al.* (1996), Bhuiyan and Sultana (1994), Nagare and Patel (1997) and Islam (1998).

Asfaw *et al.* (2001) and Nahar *et al.* (1992) also reported higher lactation length of Holstein Friesian crosses than indigenous cows. However, the average lactation length of indigenous cow reported in this study were higher (248 ± 3.81) than that found in the present study.

Reproductive performance

Table 2 shows the average service per conception of different cross bred and indigenous dairy cows. The highest rate of service per conception was in indigenous breed (1.92 ± 0.88) and lowest in Sahiwal (1.37 ± 0.75) crossbred cows. Statistical analysis showed that there were significant differences (p<0.01) rate in service per conception of different genetic groups of cows. This variation probably indicate that there are genetic variations among the different cow breeds in terms of service per conception and crossbred cows require minimum rate of service per conception. Jabbar and Ali (1988) studied the productive performance of indigenous and crossbred cows in Bangladesh and demonstrated the overall service per conception was 1.66. Chowdhury (1995) reported that average services per conception for Indigenous cows, Sahiwal cross and Holstein Friesian were 1.70, 1.72 and 2.01, respectively (Table 2). This result disagreed with the result of present study. These two studies conducted in two different geographical areas which may cause the variation.

Parameters	Holstein- Friesian cross	Sahiwal cross	Sindhi cross	Indigenous	P value
Service per conception (no.)	$1.63^{b} \pm 0.76$	$1.37^{d} \pm 0.75$	1.48°±0.59	$1.92^{a} \pm 0.88$	**
Age at first calving (months)	$36.88^{\circ} \pm 6.06$	41.13 ^b ±5.39	$40.3^{b} \pm 2.83$	50.252.42	**
Postpartum heat period (days)	$89.48^{\circ} \pm 28.66$	$105.68^{b} \pm 41.09$	127.08 ^a ±43.47	$119.42^{a} \pm 52.10$	**
Calving interval (days)	391.93 ^b ±33.88	$398.26^{b} \pm 42.74$	422.00 ^a ±42.03	422.69 ^a ±64.16	**
Gestation Length (days)	279 ± 3.85	280±4.27	278±3.32	281±2.31	NS
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abcd data having similar superscript did not differ significantly (P>0.05); ** = 1% level of significance

It was evident that the shortest average age of calving for Holstein Friesian cross, Sahiwal cross, Sindhi cross and Indigenous cows were 36.88 ± 6.058 , 41.13 ± 5.394 , 48.36 ± 2.827 and 50.25 ± 2.424 months, respectively. From that Table 2 it was clear that shortest age at first calving was found in Holstein Friesian cross and longest for indigenous cows.

Statistical analysis showed that the average age at first calving between different cross bred and indigenous dairy cows differed significantly (p<0.01). Lahouse (1960) noticed that the age at first calving was between 21 and 31 months for 67 Friesian cows. Japri *et al.* (1997) also reported the first calving age of crossbreed cows about 30.62 months in his study that may agree with this study. Similarly, first calving between 32 to 40 months for 51 Friesian cows were also reported by Kaya *et al.* (2003) and Rokunuzzarnan *et al.* 2006. The results of the present study were within the range of the results reported in the aforementioned studies. This indicates that the average ages of first calving of different breeds are similar in different geographical location. The lowest postpartum heat period (PPHP) was found in Holstein Friesian cross (89.48±28.66 days) and highest (127.08±43.47 days) in Sindhi cross. Statistical analysis showed that there was significant difference (p <0.01) between the postpartum heat period of different types of crossbred and indigenous dairy cows. Ali (1998) conducted an experiment and reported the PPHP of crossbred and indigenous cows were 109.59 and 103.83 days, respectively. The result of the present study agrees with the findings of this study.

It was observed that calving intervals was highest for indigenous cows rather than cross bred type. Statistical analysis showed that there were significant differences (p<0.01) within the calving interval of different types of dairy cows. Halim (1992) worked on local and crossbred dairy cows and reported that average calving interval was 445 and 425 days, respectively and these values slightly higher than the present study. Similarly, Asfaw *et al.* (2001) and Rokunuzzaman *et al.* (2006) concluded significant differences (p<0.01) within the calving interval of different types of dairy cows.

The gestation length of crossbreds and indigenous dairy cows was almost similar and no significant difference was observed between different genetic groups. Hasan (1995) observed that the gestation length for indigenous, Jersey cross, Sindhi cross, Sahiwal cross and Holstein cross was 284, 281, 286, 282 and 284 days, respectively. It was observed from the above discussion that crossbreds and indigenous cows have no significant effect on gestation length.

From the above discussion it is assumed that crossbreds are better both for productive and reproductive performances and may recommend replacing with indigenous dairy cows.

Different environmental factors, genetic variations between breeds, housing, feeding and management system vary in different farms, that is why there are variation among breeds in productive and reproductive performances. It may be concluded from the above findings that the productive and reproductive performances were better in Holstein Friesian crossbred and gradually decreased in Sahiwal cross and Sindhi cross. Our native local cows were comparatively lower in production.

References

Action Aid. 2011. Action Aid US reports 2011. Retrieved on 03 November 2015 from http://www.actionaid.org.uk.

- Ahmed M M M and El-Amin A. 1997. Effect of dry summer tropical climate on forage intake and milk yield in Holstein-Friesian an indigenous Zebu cows. J. Arid. Environ. 35(4):737-745.
- Ali M H. 1998. A comparative performance study on the cross-bred and locals dairy cattle under small holder dairy farming. Condition in Gaibandha district. M.S. Thesis, Department of Dairy Science, BAU, Mymensingh.
- Asfaw Y, Molla B, Zessin K H, Tegegne A and Baumann N I. 2001. Reproductive and productive performance in urban and pen-urban dairy cattle production systems in the Addis Ababa Region, Ethiopia. http://www.ajol.info/index.php/bahpa/issue/view/12053.

- Bangladesh Economic Survey. 2012. Department of finance, Ministry of Finance and Planning, Government of the people's Republic of Bangladesh, Dhaka. pp.71.
- BBS. 1994. Bangladesh Bureau of Statistics. Planning Division, Ministry of Planning, and Government of the People's Republic of Bangladesh.
- BBS. 1997. Bangladesh Bureau of Statistics. Planning Division, Ministry of Planning. Government of the People's Republic of Bangladesh.
- Bhuiyan A K F H and Sultana R. 1994. Analysis of performance of exotic cattle breeds and their crosses in Bangladesh. www.ajas.info/upload/pdf/12-20.pd
- Chowdhury A R. 1995. Influence of season, age, parity, service per conception and conception rate in local and crossbred cattle. M.S. Thesis, Department of Dairy Science, BAU, Mymensingh.
- DLS. 1992. Annual report of Directorate of livestock services: Bangladesh.
- Banglapedia. 2014. National Encyclopedia of Bangladesh. wikipedia.org/wiki/Banglapedia.
- FAO. 2008. FAOSTAT data. Rome: Food and Agricultural Science Organization. http://www.fao.org/docrep
- Halim. 1992. Comparative economic analysis of local and cross-breed dairy cows in a selected area of Dhaka district, Bangladesh. M. S. Thesis, Department of Agricultural Economics, BAU, Mymensingh.
- Hasan M M. 1995. Distribution pattern and some economic dairy characters of locals and crossbred cows in Mymensingh Sadar. M.S. Thesis, Department of Dairy Science, BAU, Mymensingh.
- Hassan F and Khan M S. 2013. Performance of crossbred dairy cattle at military dairy farms in Pakistan, J Ani Plant Sci. 23:3.
- Islam M S. 1998. A study on some productive and reproductive parameters of Local×Friesian upgraded dairy cows at Government Dairy Farm, Faridpur, Bangladesh. M S Thesis, Department of Dairy Science, BAU, Mymensingh.
- Islam S, Goswami A and Mazumdar D. 2008. Comparative Profitability of Cross Breed and Indigenous Cattle in West Bengal. Indian Res. J. Ext. Edu. 8:1.
- Jabbar M A and Ali S Z. 1988. The insemination of cross breeding for improvement of cattle in Bangladesh. Oxford Agranian Studies, 19:17-19.
- Japri B M, Majial, Fauziah A M and Adrien K P. 1997. Effects of breed of sire, percentage of BOS Taurus inheritance and season of birth on calving performance of cross-bred dairy cattle. http://www.ajas.info/articles/archive.php.
- Kabir F and Islam M R. 2009. Comparative study of productive and reproductive performance of local and different crossbred dairy cows at Daulatpur, Khulna, Bangladesh. Bangladesh Res. Pub J. 3(2):909-914.
- Lahouse A. 1960. The effect of age at first calving on milk production, J. Dairy Sci. 24:172.
- McDowell R E, Wilk J C and Talbott C W. 1996. Economic viability of crosses of *Bos taurus* and *Bos indicus* for dairying in warm climates. J. Dairy Sci. 79(1):1292-1303.
- Nagare Q K and Patel A M. 1997. The comparative performance of Geir crosses breeds under Moharasta, India. Ind. J. Anim. Prod. and Man. 13(2):87-92.
- Nahar T N, Islam M and Hasnath M A. 1992. A comparative study on the performance of F. Crossbred cows under rural conditions in and around the BAU campus, Asian-Australisian J. Anim. Sci. 5(3):435-438.
- Rahman M G, Ahmed N and Ahmed A R. 1987. A comparative study on some productive and reproductive perfomance of dairy cows at Savar Dairy and Cattle Improvement Farm. Bangladesh Vet. J. 21:55-61.
- Rokunuzzaman M, Hassan M R, Islam S and Sultana S. 2009. Productive and reproductive performance of crossbred and indigenous dairy cows under smallholder farming system. J. Bangladesh Agricul. Univ. 7(1):69-72.
- Saadullah M. 2001. Smallholder Dairy Production and Marketing in Bangladesh. NDDB-ILBS, 13-16 March, 2001. Ahmedabad, India.
- Sarker M A. 1995. Economic Analysis of Dairy Cattle Enterprise and its pattern of contribution to Farm income in a selected area of Bangladesh. M.S. Thesis, Department of Agricultural Economics, BAU, Mymensingh, Bangladesh.
- Wiltbank J B. 1970. Research needs in beef cattle reproduction. J. Anim. Sci. (3: 1)155-762.
- Zaman O, Das D, Roy T C. and Nahardeka N. 1996. Studies on lactation length and lactation yield in Jersey cattle. J. Assarn Vet. Coun. 14:18.