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Research article

Comparative performance of high yielding crossbred dairy cows reared at different farms level in Chattogram metropolitan area of Bangladesh

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A B S T R A C T

Progress of production in dairy cattle is frequently considered possible by either improving the genetic merit and/or by husbandry practices. The study aims to evaluate of productive and reproductive performance of dairy cows considering genotype at different selected dairy farms in Chattogram metropolitan area. A total of 80 crossbred dairy cows belong to four different genetic groups *eg.* Friesian × Local, Friesian × Jersey, Friesian × Sahiwal (25%) and Friesian × Sahiwal (50%) were randomly selected and their information regarding milk yield and other reproductive parameters were collected from farm record for a period of last five years (January 2015 to March 2019). The overall age at 1st heat and age at 1st calving differ significantly ($p<0.05$) among the breeds. The lowest age at 1st heat (15.5±0.81 months) and age at 1st calving (25.90±0.82 months) were found in Friesian × Jersey. There were no significant differences ($p>0.05$) was found in case of service per conception and calving interval. A significant difference ($p<0.05$) was found in the lactation length and birth weight of calves of different genotypes of dairy cows. The lowest post-partum heat period (89.10±1.50 days) was found in Friesian × Sahiwal (50%) and the highest (91.15±1.73 days) in Friesian × Local (25%). The milk yield of Friesian × Local differs significantly ($p<0.05$) with other genotypes. The highest milk yield (14.90±0.41 liters) was observed in Friesian (75%) × Sahiwal (25%) and the lowest milk yield (11.50±0.87 liters) in Friesian × Local. The highest birth weight of calves (14.27 ± 0.51 kg) was observed for Friesian × Jersey. The productive and reproductive performance of Friesian × Jersey cows was superior to the rest of the genetic groups under the study. Friesian × Local ranked the lowest and Friesian × Sahiwal (25%) and Friesian × Sahiwal (50%) performed nearly similar. It can be concluded that in intensive farming condition Friesian × Jersey crossbred cattle rearing is profitable under better management practices.

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1. INTRODUCTION

Bangladesh is the most densely populated nations of the world (1253 persons per Km^2) with an estimated population of 163.30 million in which 75% live in rural areas (BBS, 2019). As a result, the nation is facing very difficult to acquire food security and safety (Rahman and Salim, 2013). Livestock plays an important role in the persistent agro-based economy performing multifaceted functions such as ensuring food security and source of income, earning foreign revenue through export. This sector employs 14 percent of the total labor force, but more than 70 percent of rural households are engaged in livestock production. Currently, 68 percent of the agricultural labor forces are women and they are mainly involved in livestock and poultry production. The magnitude of the contribution of livestock sub-sector to the GDP is 1.60 percent. Share of Livestock in Agricultural GDP is 14.31%. It generates 20 percent full times and 50 percent partly in employment (BBS, 2018). It generates 13 percent of the total foreign exchange earnings and provides fulltime employment to about 20 percent of the rural population (BOS, 2014).

Dairying is one of the most effective instruments for supplementing farmer's income and generating employment in the rural sector (Bedi, 1989) and a part and parcel of integrated farming system in Bangladesh (Saadullah et al., 2002). Total cattle population in Bangladesh is 24.391 million and among them 3.93 million is milking cows which represent 16% of the total cows (BBS, 2018), and milk production is 10.680 million Metric ton (DLS, 2019-20), which have an irrefutable role for fulfilling the demand of protein. Despite such a highly dense cattle population, the country has been deficient in milk, meat and draught power for quite some time. Such as, the daily per capita availability and requirement of milk are estimated at 175.63 ml/day/head and 250 ml, respectively to fulfill the normal requirement of people (DLS, 2019-20). The most economic traits of the milk-producing animals are average body weight, milk yield, calving interval, conception rate, birth weight of calves, gestation length etc. Indigenous cows (*Bos indicus*) are our genetic resource but the productive and reproductive performance is not up to the mark (Rahman et al., 1998). It varies between 300 to 400 liters per lactation period of 180 to 240 days of a local cow. On the contrary crossbred cows yield from 600 to 800 liters per lactation of 210 to 240 days (Islam, 1999). But we cannot ignore local cattle because they possess some unique characteristics, like they have more resistance capacity against the diseases; sustain production in low-quality nutrition, well-adjusted with hot and humid climatic conditions. On the other hand, HYV resistance capacity is low against the prevalent diseases and thrives in adverse climate. However, the number of crossbred cattle is increasing day by day with the availability of artificial insemination (AI) practices throughout the country. Reasonable numbers of landless and marginal farmers have found crossbred cows as a profitable enterprise under improved nutrition, better disease control and management. Thus, the present study was undertaken to evaluate the productive and reproductive performances of the different crossbred cows at the various farming condition and to recommend farmers about the breed and type of animals which are to be suitable in existing ecological and socio-economical condition in Bangladesh.

2. MATERIALS AND METHODS

Study area

The study was conducted in the Chattogram metropolitan area based on 80 crossbred dairy cows at different farm condition.

Animal selection

The dairy cows had been selected based on milking period was ongoing. The cows were in 3rd lactation period. About 80 crossbred cows were selected from different dairy farms (Table 1).

Method of data collection

The data was collected from records books of respective farms and confusion was met up discussing with owners, managers and employs.

Questionnaire and data collection

The requisite primary data for this study were collected through survey method. For collecting

Table 1. Farm wise number of genotypes and animals

Dairy Farm name	No of animals	Genotypes			
		75% HF× 5% L	75% HF×25% SL	75% HF×25% JS	50% HF×50% SL
Shahnewaz farm	20	5	5	5	5
Super farm	20	5	5	5	5
Diamond farm	20	5	5	5	5
Jarip farm	20	5	5	5	5
Total	**80**	**20**	**20**	**20**	**20**

the necessary data questionnaire/interview schedule was prepared following the objectives of the study. The questionnaire was pretested and then finalized. The respondents were given information related to the objectives of the study as well as their role. The questionnaire contained following productive and reproductive parameters of crossbred cows such as milk yield (lit/day), length of lactation (days), post-partum heat period (days), service per conception (Number), age at 1st heat, calf birth weight, length of calving interval (days).

Parameters studied

The productive and reproductive traits were considered:

Productive traits

Birth weight: The birth weight of the calves were measured in kg within 24 hours of birth with the help of digital weighing balance and recorded in the data sheet.

Lactation length: It is defined as the period from calving to dry off of the cow and recorded in days.

Average daily milk yield: The amount of milk produces per day per cow throughout the lactation period and recorded in liter per day.

Reproductive traits

Age at sexual maturity: The period when an animal produce mature fertile ova and expressed in month.

Age at first calving: It indicates the age when a cow give birth a calf for first time. The age at first calving was recorded in month.

Number of services per conception: The average number of services required for conception in a defined population. It is used as a measurement of reproductive efficiency in cows.

Gestation period: It is the period from the date of conception to the date of parturition. The duration of gestation was determined in days.

Post-partum first heat: Time of post-partum heat period was calculated as the interval between parturition to next heat that was observed after a certain period of parturition. The period was considered in days.

Calving interval: The interval between the dates of one calving to the dates of next calving is known as calving interval. The calving intervals were recorded in days.

Statistical analysis

The collected data were organized, tabulated, structured and analyzed by using both tabular and graphical method following the objectives of the study. The data were subjected to statistical analysis using MS Excel program to compute analysis of variance and means of each variance with standard error (SE) according to Steel and Torrie (1980).

3. RESULTS AND DISCUSSION

Age at 1st heat

Age at first service is the age at which heifers attain body condition and sexual maturity for attempting service for the first time. The average age at 1st heat of HF 75% × L 25% genotype in Shahnewaz, Super dairy, diamond and Jarip farm was 23.80±0.58, 23.80±0.80, 24.20±1.06 and 23.80±0.80 months,

respectively (Table 2). Similarly, in Shahnewaz, Super dairy, Diamond and Jarip farm the average age at 1st heat of HF 75% × SL 25% genotype, HF 75% × JS 25% genotype and HF 50% × SL 50% genotype was 23.8±0.8, 23.8±0.8, 22.6±0.68 and 24.4±0.93 months (Table 3); 14.6±0.51, 12.8±0.37, 20.4±0.93 and 14.4±1.69 months (Table 4); 15.2±0.86, 12.8±0.37, 22.2±0.58 and 21.4±0.51 months (Table 5), respectively. In Diamond dairy farm, HF 75% × JS 25% genotype showed significantly highest ($p<0.05$) age at 1st heat compare to other farms. Similar trend also observed in case of HF50% × SL50% genotype. Considering the genotype, the average age at 1st heat of HF 75% × L 25%, HF 75% × SL 25%, HF 75% × JS 25% and HF 50% × SL 50% crossbred cows was 23.9±0.38, 23.6±0.4, 15.5±0.81 and 17.9±0.96 months, respectively (Table 6). HF 75% × JS25% and HF 50% × SL 50% crossbred cows got significantly early puberty ($p<0.05$) as compare to other two genotypes. These findings are in agreement with Morrow (1987) who found the age at puberty ranging from 1.4 months to over 2 years. In contrast, Rahman et al. (1998) found that the age at puberty of Friesian × Local cows was 19.0±2.3 months.

Service per conception

The average number of service per conception of HF 75% × L 25% genotype in Shahnewaz, Super dairy, diamond and Jarip farm was 2.40±0.24, 1.80±0.37, 1.60±0.24 and 1.60±0.24 number, respectively (Table 2). Service per conception of other three genotypes did not show any significant differences considering the farms (Tables 3, 4 and 5).

Table 2. Performance of crossbred cows (HF 75% × L 25%) at different farms level

Parameters	Dairy farms			
	Shahnewaz	**Super**	**Daimond**	**Jarip**
	Mean±SE	Mean±SE	Mean±SE	Mean±SE
Age at 1st heat (months)	23.80±0.58	23.80±0.80	24.20±1.06	23.80±0.80
Service per conception (no.)	2.40±0.24	1.80±0.37	1.60±0.24	1.60±0.24
Gestation length (days)	273.60±1.36	274.20±1.77	278.00±1.22	275.60±1.93
Age at 1st calving (months)	33.40±0.50	32.60±0.75	33.40±0.92	33.20±0.80
Calf birth Weight (Kg)	10.90^{a}±0.40	12.10^{ab}±0.78	14.00^{b}±0.71	13.96^{b}±0.94
Avg. daily milk yield (liters)	8.80^{a}±0.84	10.0^{ab}±2.34	13.60^{b}±0.92	13.60^{b}±1.86
Lactation length (days)	275.40±1.60	273.20±3.69	279.60±1.28	280.00±4.06
Calving interval (months)	14.00±0.31	14.00±0.31	14.20±0.37	13.40±0.40
Post-partum heat period (days)	84.00^{a}±0.44	86.20^{a}±2.00	99.20^{b}±2.45	95.20^{b}±2.72

The mean difference is significant at the 0.05 level.

Table 3. Performance of crossbred cows (HF 75% × SL 25%) at different farms level

Parameters	Dairy farms			
	Shahnewaz	**Super**	**Daimond**	**Jarip**
	Mean±SE	Mean±SE	Mean±SE	Mean±SE
Age at 1st heat (months)	23.8±0.8	23.8±0.8	22.6±0.68	24.4±0.93
Service per conception (no.)	2.2±0.2	1.6±0.24	1.8±0.37	1.8±0.37
Gestation length (days)	281.20±1.15	279.80±1.56	275.80±1.77	278.40±2.24
Age at 1st calving (months)	33.4±0.6	33.2±0.66	32.0±0.63	34.0±0.63
Calf birth Wt(Kg)	13.4^{a}±0.43	16.4^{b}±0.67	12.9^{a}±0.4	13.1^{a}±0.64
Avg. daily milk yield (liters)	14.8±0.37	16.3±1.16	14.4±0.68	14.1±0.71
Lactation length (days)	286.40^{a}±1.80	296.20^{b}±3.17	281.40^{a}±4.01	282.80^{a}±2.27
Calving interval (months)	13.8^{a}±0.2	13.8^{a}±0.2	13.8^{a}±037	15.0^{b}±0.45
Post-partum heat period (days)	92.0±2.66	87.4±1.4	89.2±3.13	92.8±2.31

The mean difference is significant at the 0.05 level.

The average number of service per conception of HF 75% × L 25%, HF 75% × SL 25%, HF 75% × JS 25% and HF 50% × SL 50% crossbred cows was 1.7±0.18, 1.85±0.15, 1.75±0.14 and 1.75±0.17, respectively (Table 6). There was no significant ($p>0.05$) difference observed for service per conception among the genotypes. This finding of service per conception of the present study was partially in agreement with the finding of Mondal et al. (2005). He found that service per conception of Sahiwal × Local, Friesian × Local cows were 1.63±0.64, 1.6±0.59, respectively. According to Dinka (2012), number of service per conception is influenced by age of the individual householders, time of insemination, lactation length, proper heat detection and milk yield's which could be probably due to the level of knowledge of owners in managing their dairy cows. A number of other factors which influences service per conception are the quality and quantity of semen used in artificial insemination, improper detection of heat, failure to inseminate at appropriate time, skill of the inseminator and finally health status of the animal. The other related factors are the level of fertility which may be influence by diseases, semen handling techniques and other environmental factors.

Gestation length

During this period, with the development of fetus, the uterus of dam undergoes great anatomical and physiological modifications whereas, the length of gestation is essential to forecast the approximate date of calving. The gestation length of HF 75% × L 25% genotype was 273.60±1.36, 274.20±1.77, 278.00±1.22 and 275.60±1.93 days in Shanewaz, Super, Diamond and Jarip dairy farm, respectively (Table 2). In case of HF 75% × SL 25% genotype, the gestation length was ranged from 275.80 to 281.20 days among the farms (Table 3).

Table 4. Performance of crossbred cows (HF 75% × JS 25%) at different farms level

Parameters	**Dairy farms**			
	Shahnewaz	**Super**	**Daimond**	**Jarip**
	Mean±SE	Mean±SE	Mean±SE	Mean±SE
Age at 1st heat (months)	14.6^{a}±0.51	12.8^{a}±0.37	20.4^{b}±0.93	14.4^{a}±1.69
Service per conception (no.)	1.6±0.24	1.8±0.37	1.8±0.2	1.8±0.37
Gestation length (days)	276.80±1.06	275.60±1.5	279.80±0.97	278.40±3.84
Age at 1st calving (months)	23.6^{a}±0.51	24.0^{a}±0.32	30.6^{b}±1.4	25.4^{a}±1.7
Calf birth Wt(Kg)	11.4^{a}±0.58	15.4^{b}±0.75	14.4^{b}±0.81	15.9^{b}±0.56
Avg. daily milk yield (liters)	7.9^{a}±0.56	15.6^{b}±1.5	13.4^{b}±0.75	16.6^{b}±1.1
Lactation length (days)	245.20^{a}±1.2	293.80^{b}±3.7	288.00^{b}±2.02	287.80^{b}±3.2
Calving interval (months)	14.4±0.24	14.0±0.32	13.8±0.2	13.6±0.51
Post-partum heat period (days)	88.0±2.12	89.8±0.92	92.4±2.14	91.8±1.5

The mean difference is significant at the 0.05 level.

Table 5. Performance of crossbred cows (HF 50% × SL 50%) at different farms level

Parameters	**Dairy farms**			
	Shahnewaz	**Super**	**Diamond**	**Jarip**
	Mean±SE	Mean±SE	Mean±SE	Mean±SE
Age at 1st heat (months)	15.2^{a}±0.86	12.8^{b}±0.37	22.2^{c}±0.58	21.4^{c}±0.51
Service per conception (no.)	1.6±0.24	1.8±0.37	1.6±0.24	2.0±0.55
Gestation length (days)	278.20^{a}±1.9	275.60^{ab}±1.5	278.00^{a}±1.22	271.20^{b}±2.48
Age at 1st calving (months)	24.2^{a}±1.01	24.0^{a}±0.32	32.0^{b}±0.71	31.8^{b}±0.58
Calf birth Wt(Kg)	11.5^{a}±0.63	15.4^{b}±0.75	14.0^{b}±0.71	14.5^{b}±0.5
Avg. daily milk yield (liters)	9.2^{a}±1.32	15.6^{b}±1.5	13.6^{b}±0.93	14.0^{b}±0.71
Lactation length (days)	252.80^{a}±8.59	293.80^{b}±3.69	283.60^{b}±1.86	286.60^{b}±1.91
Calving interval (months)	14.2±0.2	14.0±0.32	14.2±0.37	13.6±0.75
Post-partum heat period (days)	85.2±5.2	91.8±1.74	89.2±1.01	90.0±1.93

The mean difference is significant at the 0.05 level.

There was no significant difference observed for gestation length in the farms. The average gestation length of all considering genotypes was statistically non-significant ($p>0.05$) (Table 6). There were no significant variations in the gestation period; however, a slight variation was detected among the different dairy breeds and crossbred. This variation may be ascribed to the maternal i.e. age, nutritional status and body conditions of the dam and the fetal factors- i.e., sex of the fetus, twinning and hormonal functions of the fetus (Islam et al., 2006). Variation in gestation length within the species may be contributed mainly by maternal and fetal factors. The maternal factors include age of the dam, nutritional status and body condition of the dam. Fetal factors include the sex of the fetus, twinning and hormonal functions of the fetus. Environment such as season, feeding, and management also contribute to some extent (Hafez and Hafez, 2013).

Age at 1st calving

The average age at 1st calving of HF 75% × L 25% genotype in Shahnewaz, Super dairy, diamond and Jarip farm was 33.40±0.50, 32.60±0.75, 33.40±0.92 and 33.20±0.80 months, respectively (Table 2). Similarly, in Shahnewaz, Super dairy, diamond and Jarip farm the average age at 1st calving of HF 75% × SL 25% genotype, HF 75% × JS 25% genotype and HF 50% × SL 50% genotype was 33.4±0.6, 33.2±0.66, 32.0±0.63 and 34.0±0.63 months (Table 3); 23.6a±0.51, 24.0a±0.32, 30.6b±1.4 and 25.4a±1.7 months (Table 4); 24.2a±1.01, 24.0a±0.32, 32.0b±0.71 and 31.8b±0.58 months (Table 5), respectively. The genotype of HF 75% × JS 25% and HF 50% × SL 50% showed significantly highest age at 1st calving in Diamond dairy farm as compare to other farms (Table 4 and 5). Considering the genotype combination, the average age at 1st calving of HF 75% × L 25%, HF 75% × SL 25%, HF 75% × JS 25% and HF 50% × SL 50% crossbred cows was 33.15a±0.33, 33.15a±0.33, 25.90b±0.82 and 28.0c±0.95 months, respectively (Table 6). The genotype of HF 75% × JS 25% showed the lowest age at 1st calving which was significantly differed ($p<0.05$) with other genotypes. This result was supported by Hafez (1987) who found age at first calving ranging from 24 to 36 months. Islam (1999) found that age at first calving of Friesian crossbred, Sahiwal crossbred and local crosses were 36.3±3.48, 37.3±3.01, 40.1±3.54 months, respectively which may differ from the present study due to management and environmental factors. Age at first calving is an important economic trait of cattle having bearing on life time production, generation interval and genetic gain. Early age at first calving may increase profit, reduce generation interval and help in enhancing genetic gain per unit time. However, too early age at first calving may be detrimental for growth, development and overall productivity of an animal.

Calves birth weight

The birth weight of calf is an important factor in its subsequent growth and development for beef production or milk production of the dam. The genotype of HF 75% × L 25% gave the highest

Table 6. The overall performance different genotypes at farm level

Parameters	Genotypes			
	HF 75% × L 25%	HF 75% × SL 25%	HF 75% × JS 5%	HF 50% × SL 50%
	Mean±SE	Mean±SE	Mean±SE	Mean±SE
Age at 1st heat (months)	23.9^{a}±0.38	23.6^{a}±0.4	15.5^{b}±0.81	17.9^{c}±0.96
Service per conception (no.)	1.7±0.18	1.85±0.15	1.75±0.14	1.75±0.17
Gestation length (days)	275.35±0.83	278.80±0.92	277.65±1.07	275.75±1.07
Age at 1st calving (months)	33.15^{a}±0.33	33.15^{a}±0.33	25.90^{b}±0.82	28.0^{c}±0.95
Calf birth wt (Kg)	12.74^{a}±0.45	13.95^{a}±0.41	14.27^{b}±0.51	13.85^{a}±0.45
Avg. daily milk yield (liters)	11.5^{a}±0.87	14.9b±0.41	13.40^{b}±0.9	13.10^{b}±0.76
Lactation length (days)	277.05^{a}±1.4	286.70^{b}±1.89	278.70^{a}±4.64	280.40^{ab}±4.23
Calving interval (months)	13.90±.18	14.10±0.19	13.95±0.17	14.0±0.22
Post-partum heat period (days)	91.15±1.73	90.35±1.23	90.50±0.9	89.10±1.5

The mean difference is significant at the 0.05 level.

calves birth weight in Diamond and Jarip farm (14.00±0.71 and 13.96±0.94 kg, respectively) as compare to Shazewaz and Super dairy farm (Table 2) which was significantly different ($p<0.05$). On the other hand, HF 75% × SL 25% genotype delivered significant lower calves birth weight in Diamond and Jarip farm (Table 2).Among the different types of cows highest birth was recorded in case of Friesian × Jersey and the lowest was recorded in case of Friesian × Local. Khan (1990) found that the average birth weight of calves for Jersey, Sahiwal and Sindhi crossbred calves were 17.1±0.17, 17.8±0.18, 17.9±0.17 kg, respectively. These results are similar to the present study. Various factors such as sex of calf, farm, period of fodder availability, parity, and calving season affects the birth weight of cattle calves. The average calves birth weight of HF 75% × L 25%, HF 75% × SL 25%, HF 75% × JS 25% and HF 50% × SL 50% crossbred cows was 12.74±0.45, 13.95±0.41, 14.27±0.51 and 13.85±0.45 kg respectively (Table 6) at the breed level. Statistical analysis showed that there was a significant difference ($p<0.05$) within the birth weight of calves of different dairy cows both in genotype and farm level.

Milk yield

The average daily milk production of HF 75% × L 25% genotype was higher in Diamond and Jarip farm 13.60±0.92 and 13.60±1.86 litre, respectively (Table 2) which was significantly different with Shahnewaz farm . Similarly, in Shahnewaz, Super dairy, diamond and Jarip farm the average daily milk production of HF 75% × SL 25% genotype, HF 75% × JS 25% genotype and HF 50% × SL 50% genotype was 14.8±0.37, 16.3±1.16, 14.4±0.68 and 14.1±0.71 (Table 3); 7.9±0.56, 15.6±1.5, 13.4±0.75 and 16.6±1.1 (Table 4); 9.2±1.32, 15.6±1.5, 13.6±0.93 and14.0±0.71 (Table 5), respectively. Comparatively lower milk production was observed in Shahnewaz dairy farm. Considering the genotype, the average daily milk production of HF 75% × L 25%, HF 75% × SL 25%, HF 75% × JS 25% and HF 50% × SL 50% crossbred cows was 11.5±0.87, 14.9±0.41, 13.40±0.9 and 13.10±0.76 litres, respectively (Table 6). The milk yield of HF 75% × L 25% differs significantly ($p<0.05$) with threedifferent crossbred cows. The highest milk production was recorded in Friesian × Jersey and the lowest in Friesian × Local. These results are partially agreed with the findings of Sultana et al. (2001). She found that Friesian cross, Jersey cross, Sahiwal cross were 7.20 ± 1.07, 6.70 ± 0.86, 4.86 ± 0.85 and 4.05 ± 0.54 liters, respectively. Rokonuzzaman (2006) found the average milk yield of Holstein Friesian cross, Sahiwal cross and Sindhi cross cows were 8.39 ± 2.01, 4.63 ± 0.96 and 4.35 ± 1.12 liters, respectively. Besides these, Sarder et al. (1997) reported that the average milk yields (liter/day) for Holstein-Friesian cross and Sahiwal cross cows were 7.2 ± 2.6 and 5.8 ± 2.2, respectively. The milk production of cows is significantly affected by various factors such as breed, age of cow at calving, season of calving, and parity of dam. As well, the variation in the milk production of cows may vary due to genetic, environment and their interaction.

Lactation length

Lactation length is an important production trait as it influences the total milk yield. The average daily lactation length of HF 75% × L 25%, HF 75% × SL 25%, HF 75% × JS 25% and HF 50% × SL 50% crossbred cows was 277.05±1.4, 286.70±1.89, 278.70±4.64 and 280.40a±4.23 days, respectively (Table 6) at the breed level. The average daily lactation length of HF 75% × L 25% genotype in Shahnewaz, Super dairy, diamond and Jarip farm was 275.40±1.60, 273.20±3.69, 279.60±1.28 and 280.00±4.06 days, respectively (Table 2). Similarly, in Shahnewaz, Super dairy, diamond and Jarip farm the average daily lactation length of HF 75% × SL 25% genotype, HF 75% ×JS25% genotype and HF50% × SL50% genotype was 286.40±1.80, 296.20±3.17, 281.40±4.01 and 282.80±2.27 days (Table 3); 245.20±1.2, 293.80±3.7, 288.00±2.02 and 287.80±3.2 days (Table 4); 252.80±8.59, 293.80±3.69, 283.60±1.86 and 286.60±1.91days (Table 5), respectively. The lactation length differs significantly ($p<0.05$) among four different crossbred cows. The lowest lactation length was found in Friesian × Local and the highest in Friesian × Jersey. There was significance ($P<0.05$) difference among the lactation length. The result of present study is an agreement to the finding of Mondal et al. (2005). He found

that lactation length of Friesian × Local and Sahiwal × Local cows 250 ± 38.6, 245±10.6 days, respectively. Hasan (1995) found that average lactation period of Jersey cross, Holstein cross, Sahiwal cross, Sindhi cross were 286 ± 40.2, 272 ± 55.3, 262 ± 51.5 and 255 ± 61.5 days, respectively. The results of the present study consistent with the findings of Hasan (1995).

Calving interval

The average calving interval of HF 75% × L 25%, HF 75% × SL 25%, HF 75% × JS 25% and HF 50% × SL 50% crossbred cows was 13.90±.18, 14.10±0.19, 13.95±0.17 and 14.0±0.22 months, respectively (Table 6) at the breed level. The average calving interval of HF 75% × L 25% genotype in Shahnewaz, Super dairy, diamond and Jarip farm was 14.00±0.31, 14.00±0.31, 14.20±0.37 and 13.40±0.40 months, respectively (Table 2). Similarly, in Shahnewaz, Super dairy, diamond and Jarip farm the average calving interval of HF 75% × SL 25% genotype, HF 75% × JS 25% genotype and HF 50% × SL 50% genotype was 13.8a±0.2, 13.8a±0.2, 13.8a±037 and 15.0b±0.45 months (Table 3); 14.4±0.24, 14.0±0.32, 13.8±0.2 and 13.6±0.51 months (Table 4); 14.2±0.2, 14.0±0.32, 14.2±0.37 and 13.6±0.75 months (Table 5), respectively. There was no significant ($p>0.05$) difference among the calving interval in genotype and farm level. These results coincide with the findings of Mondal (2005) found that the means calving interval of Jersey cross, Sahiwal cross and Friesian cross cows was 16.71±0.10, 14.83±0.19 and 13.81±0.14 days, respectively. The differences could be attributed to differences in management practices and agro-ecology of the respective areas. Calving interval of different breeds might be influenced by genetic, environmental, feeding and managemental effects (Mamun el al., 2015). The differences in calving interval observed in the present study may be due to different environment, feeding, management and also due to irregularity in estrous.

Post-partum heat period

The average calving interval of HF 75% × L 25%, HF 75% × SL 25%, HF 75% ×JS25% and HF50% × SL50% crossbred cows was 91.15±1.73, 90.35±1.23, 90.50±0.9 and 89.10±1.5 months, respectively (Table 6) at the breed level. The average calving interval of HF 75% × L 25% genotype in Shahnewaz, Super dairy, diamond and Jarip farm was 84.00a±0.44, 86.20a±2.00, 99.20b±2.45 and 95.20b±2.72 months, respectively (Table 2). Similarly, in Shahnewaz, Super dairy, diamond and Jarip farm the average calving interval of HF 75% × SL 25% genotype, HF 75% ×JS25% genotype and HF50% × SL50% genotype was 92.0±2.66, 87.4±1.4, 89.2±3.13 and 92.8±2.31 months (Table 3); 88.0±2.12, 89.8±0.92, 92.4±2.14 and 91.8±1.5 months (Table 4); 85.2±5.2, 91.8±1.74, 89.2±1.01 and 90.0±1.93 months (Table 5), respectively. There was significant ($p<0.05$) difference among the post-partum heat period. These results are partially similar to Miazi et al. (2007). They found that local, Sahiwal × Local, Friesian × Local and Jersey × Local was 102±8.7, 95.0±25.0, 90.0±13.42 and 92.92±7.16 days, respectively. Mazid et al. (1995) found that average post-partum heat period for local, Friesian × Local was 120.04±7.84 and 117.24±7.29 days, respectively. Hafez (1987) suggested that the postpartum breeding delayed up to 60 to 70 days after parturition, when the uterus under goes recovery and preparation for the next conception. The length of the postpartum interval is influenced by nutrition, body condition, age, genetics and presence of the calf. As postpartum heat period is a reproductive trait not directed by additive type of gene action, the management and disease factors might add to a greater than the hereditary causes. Breed, exotic inheritance level in crossbred cows, the environment along with nutrition and management, might bring about variation of results.

4. CONCLUSION

Genetic merit plays a role in productive and reproductive variation in genotype and farm level. This study exhibited that Friesian ×Jersey cross-bred is a potential animal and its productive and reproductive performances were better for milk production, lactation length, calf birth wt. and age at 1st heat. Although the calving interval and service per conception was better in Friesian × Sahiwal (50%) and post-partum heat period and age at 1st calving in

Friesian × Local but no significant difference. Considering the other four traits performance of Friesian × Jersey is better than any other crossbreds of this study. This crossbred could be reared in commercial dairy farming condition for a better return.

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