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MILK PRODUCTION PERFORMANCES OF CROSSBRED CATTLE AT THE VILLAGES OF JAMALPUR DISTRICT IN BANGLADESH

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ABSTRACT

Data on body measurements like BL (body length), CG (chest girth), WH (wither height) TM (test day milk production), PM (peak milk production), LP (lactation period), CFDC (cost for concentrate feed before test day milk production per cow), GGU (green grass used before test day milk production per cow) and husbandry practices, were collected from a total of 100 dairy cattle at the villages of Islampur upazila under the district of Jamalpur in Bangladesh from January to February 2017. Collected data were analyzed using SPSS software. The highest BL, CG, WH, CFDC and GGU were 175.71±0.42 cm, 161.74±0.24 cm,123.82±0.11 cm 125.54±0.24 bdt/cow/day and 27.29±0.89 kg/cow/day, respectively. The highest amounts of TM, PM and LP were 9.36±0.60 liter/cow, 13.11±0.54 liter/cow and 247.14±1.47 days/cow, respectively. BL, CG and WH increased with increased of the age of crossbred cattle up to 150 months of old. Similarly, CFDC and GGU increased with the increased of the age of crossbred cattle up to 150 months of old. Farmers in the study area were not interested to keep breeding bulls for breeding purpose but they were using artificial insemination system to inseminate their cows and aware about production performance record of the inseminating bull. Farmers took health services from milk vita and sold milk to the same. They believed that dairy cattle rearing a profitable livelihood. TM, PM and LP increased with the increased of the age of crossbred cattle up to 150 months of old. However, increase of CFDC will increase TM, LP and PM but increase of GGU will increase only LP. On the other hand increase of CG will increase TM and increase of BL will increase LP and PM.

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INTRODUCTION

Livestock is a vital component of agriculture and contributing about 3.10% to gross domestic products (GDP) and this is also contributing more than 6% of total foreign exchange earnings in Bangladesh (BER, 2015). Per capita meat and milk requirement are 120 gm/day and 250 ml/day, respectively but in Bangladesh, per capita availability of meat and milk are 102 gm/day and 120 ml/day, respectively (BER, 2013), while, here in Bangladesh annual production of milk is 3.46 million tons only but total annual requirement is 13.32 million tons (MT) of milk (BER, 2012). In Bangladesh, introduced exotic breeds like Holstein-Friesian, Jersy, Sahiwal, Hariana, Sindhi, Australian, Sahiwal-Friesian and improved varieties like: Pabna Cattle, Red Chittagong, Munshiganj Cattle, North Bengal Grey Cattle etc. are available. About 3.53 million milking cows, 2.61 million dry cows (cows without milk) out of total cattle population (23.4 million) in Bangladesh, while 2.13 million draught cattle, and 4.20 million improved cattle were also reported among these 23.4 million cattle (Banglapedia, 2014). Crossbred animals under Bangladesh condition contributes about 24% of the 6.9 million breedable cows and heifers (Huque et al*.,* 2011) and Friesian x Local crossbred cows's milk production performance considerably improved over the decades (Bhuiyan, 2011). To improve genetic merit of the dairy animals, among the various mating systems crossbreeding of local non-descript cattle with exotic breeds of high genetic potential, is considered to be a rapid and effective method (Usman *et al*., 2012). Progeny tested bulls for dairy development in the country are in progress to add proven bull in dairy cattle industry (Bhuiyan et al., 2015). Sex, season of birth and genotype did not affect the traits like, birth weight, three-month, six-month, weaning weight and average daily gain of calves significantly (Rahman *et al*., 2015). Through supplementation of straw-based diets with vigna hay, feed intake, nutrient digestibility and live weight gain of indigenous cattle were improved, in Bangladesh (Hossain et al., 2015).

A number of researches have been conducted to evaluate reproductive and productive performances of crossbreds dairy cows under relatively controlled condition at research centers, government owned farms and in some urban and peri-urban dairy areas but, there are a few of such works conducted in rural areas especially under the small holder dairy farming areas. Moreover, research work addressing body measurements to relate milk production performances is scanty. So, the present study was designed and conducted to learn the correlation between milk production traits and body measurements of Friesian × local crossbred cattle under village condition in Bangladesh.

METHODOLOGY

Data on body measurements like BL, CG and BH; milk production performances like TM, PM and LP; feeds like CFDC and GGU and husbandry practices, were collected from a total of 100 dairy cattle at 28 small scale dairy cattle farms from eight villages of Islampur upazila under the district of Jamalpur in Bangladesh from January to February 2017. Data were collected using a pre-structured questionnaire by door to door visit from randomly selected farms in the study zone. Age range of cows was 28 to 150 months. All cows were divided into three age groups, where age group (CA) one belongs to age range from 28 months to 50 months, CA two belongs to age range from above 50 to 72 months while CA three includes cows of age range from above 72 to 150 months. Pedigree of crossbred cattle genotypes were like below (Table A).

The design of the study was unbalanced factorial in nature, because the observation numbers of different traits were unequal. The recorded data were stored on to the excel spread sheet and edited for further analyses. Then data were analyzed for having means through compare means menu, to obtain the relationship among the traits TM, PM, LP, BL, CG, WH, CFDC, GGU, CA and Calves ages, Pearson's correlation coefficient were used through correlate menu, and Duncan's Multiple Range Test (DMRT) were used for performing mean comparisons using the Statistical Package for the Social Sciences version 14.0 (SPSS, 2005).

Table A. Dam and sire genotype of enumerated cows were as follows

Dam genotypes	**Frequency**
Local	7
Local ×Friesian=Friesian crossbred 1	50
Friesian crossbred 1×Friesian crossbred 1=Frisian crossbred 2	39
Friesian crossbred 1×Friesian crossbred 2=Frisian crossbred 3	4
Total number of cows	100
Sire genotypes	**Frequency**
Local ×Friesian=Friesian crossbred 1	7
Friesian crossbred 1×Friesian crossbred 1=Frisian crossbred 2	87
Friesian crossbred 1×Friesian crossbred 2=Frisian crossbred 3	4
Friesian crossbred 2×Friesian crossbred 3=Frisian crossbred 4	2
Total number of cows	100

Body measurements were taken while animals were standing in a structure where it could not move around and keep calm. Body Length (BL) – was the distance from middle point between two horns in the centre of head to beneath the tail where anus open. Chest Girth (CG) – was measured as the minimal circumference around the body immediately behind the front shoulder, and Wither Height (WH) – was distance from the ground beneath the animal to the top of the withers directly above the centre of shoulder,

RESULTS

Body measurements

Body measurements varied significantly among the age groups of crossbred dairy cows (Table 1). BL significantly varied among the CA and the highest BL were documented for CA3 (175.71±0.42 cm) and these were followed by CA1 and CA2. But BL did not vary significantly between CA1 and CA2. CG significantly varied among the CA and the highest CG were documented for CA3 (161.74±0.24 cm) and these were followed by CA2 and CA1.

Table 1. Body measurements of enumerated cows at different ages

CA	**BL**	**CG**	**WH**
1	158.51^{b}±0.33 (37)	146.91^{c}±1.07 (37)	114.57^{c}±0.11 (37)
2	158.06^{b}±0.53 (35)	152.18^{b}±0.64 (35)	115.97^{b}± 0.60 (35)
3	175.71^{a}±0.42 (28)	161.74^{a}±0.24 (28)	123.82^{a}±0.11 (28)
LS	***	**	**
Overall mean	163.17±0.04 (100)	152.90±0.54 (100)	117.65± 0.07 (100)

Note: BL-body length in cm, CG-Chest Girth in cm, WH-wither height in cm, CA 1- 28 months to 50 months, CA 2- above 50 to 72 months and CA 3-bove 72 to 150 months. LS=Level of significance, NS= Not Significant (P>0.05), *significance at 1.1 to 5%, **significance at 0.1 to 1%, ***significance at lower than 0.1% and ^{abc}Means with the different superscripts differed significantly within the column (P<0.05).

WH significantly varied among the CA and the highest WH were documented for CA3 (123.82±0.11 cm) and these were followed by CA2 and CA1.

Feeds and feeding of dairy cattle

The highest amount (125.54±0.24 bdt/cow/day) of cost for concentrate feed purchase before the test day milk production per cow (CFDC) was spent in age group 3 and these were followed by age group 2 and 1 (Table 2).

Table 2. Used concentrate feed and green grass for test day milk production.

CA	CFDC	GGU
1	97.30^{c}±0.83 (37)	14.76^{c}±1.73 (37)
2	99.14^{b}±0.43 (35)	15^{b} (35)
3	125.54^{a}±0.24 (28)	27.29^{a}±0.89 (28)
LS	*	***
Overall mean	105.85±4.85	18.35±0.95

Note: CFDC-concentrate feed cost in BDT for test day milk production, GGU-green grass (kg) used for test day milk production per cow, CA 1- 28 months to 50 months,CA 2- above 50 to 72 months and CA3-above 72 to 150 months.*significance at 1.1 to 5%, **significance at 0.1 to 1%,***significance at lower than 0.1% and ^{abc}Means with the different superscripts differed significantly within the column (P<0.05).

The highest amounts (27.29±0.89 kg/cow/day) of green grass were used before test day milk production per cow (GGU) in age group 3 and these were followed by age group 2 and 1.

Husbandry practices of crossbred dairy cattle

Male caves from all dairy cows were kept to sale for meat purpose and all cows were inseminated by AI workers. Most of the farmers (89.29%) collected information about milk production performances of inseminating bull's dam and sib before insemination (Table 3).

Table 3. Husbandry practices followed by the farmers

Traits	Opinion	
Male calf of cows use for	kept for sale for meat purpose	28 (100%)
	kept for breeding purpose	0
Insemination system	Use herd bull	0
	Artificial Insemination by AI worker	28 (100%)
Do you know milk production performance of inseminating bull's dam and sib before insemination of your cows?	Yes	25 (89.29%)
	No	3 (10.71%)
Do you use vaccine regularly for your cows	Yes	28 (100%)
	No	0
Do you use anthelmintics regularly for your cows	Yes	28 (100%)
	No	0
Receive health services from	Milk vita	27 (96.43%)
	Govt. Livestock Development Center	1 (3.57%)
Milk sale place	Milk vita collection center	25 (89.29%)
	Village and upazila market	3 (10.71%)
Is dairy cow husbandry a profitable livelihood?	Yes	28 (100%)
	No	0

However nearly all (96.43%) cattle farmers received health services for their cattle from Milk vita and the sold their cow's milk to Milk vita. All farmers used to vaccinate and administered anthelmintics regularly to their dairy cattle and they were in an opinion that dairy cattle husbandry is a profitable livelihood.

Peak milk production period

Most of the cows (87.00%) gave peak milk at her second month of a whole lactation period (Table 4).

Table 4. Peak milk production month

Traits	Number of lactating cows	
Peak milk production in a whole lactation period	First month	9 (9.00%)
	Second month	87 (87.00%)
	Third month	4 (4.00%)

Milk production performances

The highest amounts of TM (9.36±0.60 liter/cow) were recorded for the cows with age group 3 and these were followed by age group 1 and 2 (Table 5). The highest amounts of PM (13.11±0.54 liter/cow) were recorded for the cows with age group 3 and these were followed by age group 1 and 2.

Table 5. Milk production performances at different ages

Cow age groups	TM	PM	LP
1	8.50±0.30 (18)	11.27^{b}±1.49 (37)	221.22^{b}±0.00 (37)
2	7.64±2.79 (22)	11.11^{b}±0.76 (35)	212.89^{b}±0.08 (35)
3	9.36±0.60 (25)	13.11^{a}±0.54 (28)	247.14^{a}±1.47 (28)
LS	NS	*	**
overall	8.54±1.39 (65)	11.73±1.11(100)	223.86±0.68(100)

Note: TM-test day milk production per cow in liter, LP-lactation period in days, PM-peak milk production per cow per day in liter, age group 1- 28 months to 50 months, age group 2- above 50 to 72 months and age group 3-bove 72 to 150 months.

The longest LP (247.14±1.47 days/cow) were recorded for the cows with age group 3 and these were followed by age group 1 and 2.

Correlation of TM with Calves age

Correlation between TM and calves ages (Table 6) was not significant and this was at minimal level (0.046).

Table 6. Correlation between calves age and TM

Parameter	Number	TM	Calves age (1 to 9 months)
TM	25	1	.046
Calves age (1 to 9 months)	25	.046	1

Note: Correlation is not significant at above 0.05 levels (2-tailed).

Correlation of milk production parameters with body measurements and feed consumption

TM was strongly and positively correlated (Table 7) with CG (medium level; 0.606) and CFDC (medium level; 0.620). LP was strongly and positively correlated with BL (lower level; 0.227), CFDC (lower level; 0.393), GGU (lower level; 0.232) and CA (lower level; 0.218).

Table 7. Correlations among milk production parameters with other traits

Parameters	N	CG	WH	CFDC	GGU	TM	LP	PM	CA
BL	100	0.457**	0.666**	0.078	0.237*	0.205	0.227*	0.201*	0.373**
CG	100		0.625**	0.046	0.305**	0.606**	0.153	0.167	0.343**
WH	100			0.020	0.301**	0.182	0.104	0.078	0.337**
CFDC	100				-0.016	0.620**	0.393**	0.616**	0.178
GGU	100					-0.057	0.232*	.073	0.420**
TM	65						0.234	0.715**	0.117
LP	100							0.516**	0.218*
PM	100								0.225*

Note: N-number of observations, BL-body length in cm CG-body circumference in cm, WH-body height in cm, CFDC-concentrate feed cost for test day milk production, GGU-green grass used for test day milk production, TM-test day milk production per cow in liter, LP-lactation period in days, PM-peak milk production per cow per day in liter, and CA-cow age in months. ** Correlation is significant at the 0.01 level (2-tailed), *Correlation is significant at the 0.05 level (2-tailed).

PM was strongly and positively correlated with BL (lower level; 0.201), CFDC (medium level; 0. 0.616) and CA (lower level; 0.225).

DISCUSSIONS

Body measurements of crossbred cows

BL significantly varied among the CA and the highest BL were found for CA3 and these were followed by CA1 and CA2. BL did not vary significantly between CA1 and CA2. But the distance from point of shoulders to the ischium of Brown Swiss (136.88±1.97 cm), Holstein (146.37±0.95 cm) and Crossbred (140.15±1.26 cm) were lower than present findings (Ozkaya and Bosket, 2008).CG significantly varied among the CA and the highest CG were documented for CA3and these were followed by CA2 and CA1 and the same were lower than Brown Swiss (180.25±3.38 cm), Holstein (189.36±1.73 cm) and Crossbred cattle (181.59±.66 cm) (Ozkaya and Bozkurt, 2008). WH significantly varied among the CA and the highest WH were observed for CA3 and these were followed by CA2 and CA1 and were in line with Ozkaya and Bozkurt (2008) who found, WH of Brown Swiss (123.45±1.40 cm), Holstein (132,60b± 0.66 cm) and Crossbred (127.95±1.14 cm). Body measurements like BL, CG and WH varied significantly among the age groups of crossbred dairy cows. Above discussions might be suggested that BL, CG and WH increased with increased of the age of crossbred cattle up to 150 months of old.

Feeds and feeding of dairy cattle

The highest amount of cost for concentrates feed purchase before test day milk production per cow (CFDC) was spent in age group 3 and these were followed by age group 2 and 1. Similarly, the highest amounts of green grass were used before test day milk production per cow (GGU) in age group 3 and these were followed by age group 2 and 1. On the other hand, Sanh *et al*. (2002) reported, body weight gain, milk yield and milk protein were increased as the ratio of concentrate feed was increased in the diet but milk fat was decreased. Above discussions might be indicative that CFDC and GGU increased with the increased of the age of crossbred cattle up to 150 months of old.

Husbandry practices of crossbred dairy cattle

Male caves from all dairy cows were kept to sale for meat purpose and all cows were inseminated by AI workers. Most of the farmers collected information about milk production performances of inseminating bull's dam and sib before insemination. However nearly all cattle farmers received health services for their cattle from Milk vita and they sold their cow's milk to Milk vita. On the contrary Islam *et al.* (2016) reported that farmers were not knowledgeable about modern health management and natural mating system was the main way of

insemination at rural villages of Chapai Nawabganj district in Bangladesh. However, all farmers at present study area, used to vaccinate and administered anthelmintics regularly to their dairy cattle and they were in an opinion that dairy cattle rearing is a profitable livelihood. The above discussions might be suggested that farmers in the study area were not interested to keep breeding bulls for breeding purpose but they were using AI system to inseminate their cows and aware about production performance record of the inseminating bull. Farmers took health services from milk vita and sold milk to the milk vita. They believed that dairy cattle rearing a profitable livelihood.

Milk production performances

Most of the cows gave peak milk at her second month of a whole lactation period. The highest amounts of TM were recorded for the cows with age group 3 and these were followed by age group 1 and 2 and the same was lower than Hossain *et al.* (2016), who observed, daily milk yield in crossbred was 15.90±0.72 liter/cow. Similarly, the highest amounts of PM were recorded for the cows with age group 3 and these were followed by age group 1 and 2 but peak milk production was in line with Sarder *et al*. (2007) in Bangladesh (11.63±2.90 liter/day/cow). Moreover, the longest LP were recorded for the cows with age group 3 and these were followed by age group 1 and 2 and were in line with Islam *et al.* (2017) who found the longest Lactation Period in days (219.88±0.47) under body weight group 2. Above discussions might be indicative that TM, PM and LP increased with the increased of the age of crossbred cattle up to 150 months of old.

Correlation among the traits

Correlation between TM and calves ages was not significant. TM was strongly and positively correlated with CG and CFDC which might be indicative that the increase of CG and CFDC will affect the TM positively. LP was strongly and positively correlated with BL, CFDC, GGU and CA and this might be suggested that increase of BL, CFDC, GGU and CA will positively affect the LP. PM was strongly and positively correlated with BL, CFDC and CA and which might be pointed that increase of BL, CFDC and CA will positively affect the PM. However in a different study, Positive correlation of test day milk production with cost involved to feed the cow with concentrate feed on the day before test milk production (0.794) and green grass used the day before test milk production (0.453) were estimated (Islam *et al.*, 2017). So the above discussions might be indicative that, increase of CFDC will increase TM, LP and PM but increase of GGU will increase only LP. On the other hand increase of CG will increase TM and increase of BL will increase LP and PM. Similarly, increase of CA will increase LP and PM.

CONCLUSIONS

BL, CG and WH increased with increased of the age of crossbred cattle up to 150 months. Similarly, CFDC and GGU increased with the increased of the age of crossbred cattle up to 150 months. Farmers in the study area were not interested to keep breeding bulls for breeding purpose but they were using artificial insemination system to inseminate their cows and aware about production performance record of the inseminating bull. Farmers took health services from milk vita and sold milk to the same. They believed that dairy cattle rearing a profitable livelihood. TM, PM and LP increased with the increased of the age of crossbred cattle up to 150 months. However, increase of CFDC will increase TM, LP and PM but increase of GGU will increase only LP. On the other hand increase of CG will increase TM and increase of BL will increase LP and PM.

COMPETING INTEREST

There is no conflict of interest.

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