Asian J. Med. Biol. Res. 2017, 3 (3), 330-334; doi: 10.3329/ajmbr.v3i3.34521

Asian Journal of Medical and Biological Research
ISSN 2411-4472 (Print) 2412-5571 (Online)
www.ebupress.com/journal/ajmbr

Article

Evaluation of productive and reproductive performances of local and crossbred cows in Manikgonj district of Bangladesh

Md. Habibur Rahman[1*], Md. Younus Ali[1], Nasrin Sultana Juyena[2] and Farida Yeasmin Bari[2]

[1]Bangladesh Livestock Research Institute, Goat and Sheep Production Research Division, Savar-1341, Bangladesh
[2]Department of Surgery and Obstetrics, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

*Corresponding author: Md. Habibur Rahman, Goat and Sheep Production Research Division, Bangladesh Livestock Research Institute, Savar-1341, Bangladesh. E-mail: ratan.bau67@gmail.com

Received: 07 September 2017/Accepted: 21 September 2017/ Published: 28 September 2017

Abstract: A total of 90 lactating cows from twelve dairy farms were used to conduct this study in order to evaluate the productive and reproductive performance of crossbred and local cows at farmer's level in Manikgong district. All cows were divided into three groups, according to their genetic composition as Local, Local x Friesian and Local x Friesian x Friesian cows. The results showed late sexual maturity (37.41±0.03 months), calving interval (481.86±0.33 days), shortest lactation period (198.46±2.36 days) and lowest average milk production (2.25±0.04 L/day) in local cows. On the contrary, longest lactation period (266.43±1.18 days) and highest average milk production (7.45±0.11 L/day) were observed in LFF cows, whereas early sexual maturity (30.58±0.02 months) was found in Local x Friesian cows. From the above perspective it could be concluded that LFF crossbred cows may be suitable for profitable dairy farming in Bangladesh but herd life and life time productivity is one of the most influential factor for profitable dairy farming. However, further study with larger sample sizes covering more different management systems would be required to describe a better inference in this consideration.

Keywords: performance evaluation; local and crossbred cows

1. Introduction

Livestock is the prominent sector of agriculture and the contribution of this sector in GDP is 3.49% (BER, 2016) and in agricultural GDP is about 14.21% (DLS, 2016). There are about 19.08 million local and 4.19 million crossbred cattle in Bangladesh (Banglapedia, 2014). In Bangladesh cattle are reared by the rural households' not on truly commercial basis but as a component of the mixed farming. The majority of rural households have one or two cows which are usually used for draught and milk purpose. But these local cows which are genetically small in size, slow growers and poor milk producers. The profit of dairy farm depends on the production of more calf and more milk from the dairy cows with optimum fertility management. Calving interval, age at puberty, service per conception, gestation length and birth weight of fetus are most important parameters to measure the farm economy. A farm with 13-15 months calving interval, 24 months for age at puberty, 1.33 services per conception and 5 kg milk per day per cow could be economically profitable (Azizunnesa, 2010). Milk availability per capita is approximately 125.59 ml per day per head in Bangladesh, against the FAO recommendation of 250 ml per day per head as the standard (DLS, 2015-16). Despite highest cattle densities in Bangladesh, the current production of milk is inadequate to meet the requirement of the people of the country. This illustrates how urgent is the need to increase the production of milk. But the pure exotic breed (e.g. Holstein Friesian) is not suitable in context of Bangladesh in terms of environmental condition. It may require low temperature, better feeding and management. The disease prevention capacity is also lower than that of native cattle. On the other hand, the local cattle are well adapted as well as high disease resistance than exotic

pure breed. The crossbred cattle performed better than that of exotic and local cattle in terms of adaptability and production. So, it is necessary to improve local cattle by selective breeding in order to increase the productive and reproductive performance of the cows.

2. Materials and Methods

2.1. Study areas and population

The study was conducted in four upazilas of Manikganj district namely Manikganj Sadar, Saturia, Singair and Shibalayain during September, 2016 to April, 2017. Cows were divided into three genetic groups according to their genetic composition, such as local cows (L, n=30), Local x Friesian (LF, n=30) and Local x Friesian x Friesian (LFF, n=30).

2.2. Management of animals

Crossbred (LF and LFF) were kept in confined outdoor system and both stall and group feeding were practiced. The feed ingredients were wheat bran, rice polish, sesame oil cake, gram, salt, rice straw and green grass. The milking cows were entirely confined into the shed, whether grazing dry cows and heifers. Proper management, vaccination and preventive measures are also taken. On the other hand, the farmers maintained the local dairy cows under traditional management system. They housed the dairy cows in the shed and supplied roughage and concentrate occasionally.

2.3. Parameters studied

The productive and reproductive traits which were considered.

2.3.1. Productive traits

Birth weight

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

Mature body weight

Mature body weight of the calves was measured in the morning before the animals were fed with the help of digital balance. It was also measured in kg.

Lactation period

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

Average milk yield

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

2.3.2. 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

The period of intra-uterine development of embryo and fetus was considered as gestation length. It was calculated as the interval from fertile service to 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.

2.4. Statistical Analysis

Statistical analyses of all the parameters were analyzed using Statistical Analysis System (SAS) software (SAS Institute Inc., 2009) version 9.1.3. To see the significant differences among the mean values, Duncan's multiple range test (DMRT) was performed.

3. Results and Discussion

The study was conducted to see the productive and reproductive performances of Local (L), Local x Friesian (LF) and Local x Friesian x Friesian (LFF) cows of rural areas in Manikgonj district. Results on productive and reproductive performances of local and crossbred cows were summarized in Tables 1 and 2.

Table 1. Productive performance of local and crossbred cows at Manikgonj district.

Traits	Local	Local x Friesian	Local x Friesian x Friesian	Level of sig.
Birth weight (kg)	14.30^{c}±0.06	16.74^{b}±0.38	19.06^{a}±0.28	**
Mature body weight (kg)	197.33^{c}± 1.63	282.56^{b}± 2.82	295.16^{a}±2.62	**
Lactation period (days)	198.46^{c}±2.36	232.20^{b}±1.16	266.43^{a}±1.18	**
Daily milk yield (kg)	2.25^{c}±0.04	5.62^{b}±0.11	7.45^{a}±0.11	**

**=significant (P<0.01). Means with different superscripts within each row differed significantly (P<0.01).

Table 2. Reproductive performance of local and crossbred cows at Manikgonj district.

Traits	Local	Local x Friesian	Local x Friesian x Friesian	Level of sig.
Age at sexual maturity (month)	37.41^{a}±0.03	30.58^{c}±0.02	31.10^{b}±0.06	**
Service per conception (no.)	1.36±0.08	1.40±0.09	1.32±0.08	NS
Gestation period (days)	279.20±0.68	277.10±0.49	276.46±0.67	NS
Age at first calving (month)	45.56^{a}±0.24	41.04^{b}±0.08	41.04^{b}±0.08	*
Calving interval (days)	481.86^{a}±0.33	437.23^{b}±1.11	437.76^{b}±1.22	*
Post-partum heat period (days)	103.36^{c}±0.29	117.06^{a}±0.22	112.80^{b}±0.24	*

*=significant (P<0.05), **=significant (P<0.01), NS=Non significant (P>0.05). Means with different superscripts within each row differed significantly (P<0.01).

3.1. Birth weight (kg)

In this study the birth weight of LFF, LF and L were 19.06±0.28, 16.74±0.38 and 14.30±0.06 Kg, respectively. The variation in the birth weight among breeds were also statistically significant (P<0.05). Islam *et al*. (2009) reported that the birth weight of Local, Local x Friesian were 17.0±0.4 and 22.5±0.3 Kg, respectively which is slightly differ with the results of this study.

3.2. Mature body weight (kg)

The mature body weight of LFF, LF and L were 295.16±2.62, 282.56±2.82 and 197.33±1.63
Kg, respectively and significant (P<0.05) variation was observed in this study. These values were lower than that observed by Khan *et al.* (2000) who found mature body weight 235 kg, 340 kg and 395 kg in Local, Local x Friesian and Local x Friesian x Friesian, respectively. This variation might be resulted from diet, environment and management system followed in this selected areas.

3.3. Lactation period

The Lactation periodof L, LF and LFF were 198.46±2.36, 232.2±1.16 and 266.43±1.18 days, respectively and the variation were statistically significant (P<0.05). Abdel and Alemam (2008) in Holstein-Friesian in Sudan, Sandhu *et al*. (2011) in Holstein-Friesian cattle in Pakistan, Utrera *et al.* (2013) in Holstein cows in México, Niraj *et al.* (2014) in HF crossbred in Ethiopia and M'hamdi *et al.* (2010) in Holstein cows in Tunisian observed an average lactation length of 322, 314, 358, 325 and 309 days, respectively, which were higher than results of the present study. The management practice of dairy cattle in Bangladesh might be to differ in those countries. As a result lactation length varies from those previous studies.

3.4. Average milk production

There was significant (P<0.05) variation in average milk yield of L (2.25±0.04 L), LF (5.62± 0.11 L) and LFF (7.46±0.11 L) cows. Molee *et al.* (2011) in Thailand reported a daily milk yield of 11.84 kg in <80% HF crossbred cows which higher than the result of the present study. Mohamed-Khair *et al.* (2007) reported daily milk yield of 50%, and 75% HF crossbred cows were 9.77±0.30 and 10.17±0.49 liters, respectively which are also higher than the result of the present study. This divergence was mainly brought about by increasing the Friesian gene level on the progeny. 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.

3.5. Age at sexual maturity

Qureshi *et al.* (2002) reported that age at sexual maturity of the cows ranged from 14 to 37 months with a mean of 24.8±0.05 months which is significantly differ from the finding of present study where late sexual maturity found (37.41±0.03 months) in local cows, early sexual maturity (31.10±0.06 months) in LFF and (30.58±0.02 months) LF, respectively. Various factors such as nutrition, hormonal imbalance, disease and seasons could affect age of sexual maturity in cows.

3.6. Age at first calving

Local cows obtained first calves at 45.56±0.24 months of age and value differed significantly ($P<0.05$) with that of LFF 41.04±0.08 and LF 41.04±0.08 months, respectively cows. Siddiquee *et al.* (2014) who reported that overall age at first calving was 40.00±0.17 months in HF crossbred cows but in 50% and 75% HF crossbred cows were 37.30±0.30 and 44.99±0.32 months, respectively. Omar *et al.* (2007) stated, age of first calving 37.6±1.1 and 32.6±2.3 months in L and LF. Islam *et al.* (2009) found age of first calving 40.5±4.5 and 34.1±3.8 months in L and LF respectively. These results also disagree with the outcome of this perusal.

3.7. Number of services per conception

The average service per conception of LFF, LF and L cows were 1.32±0.08, 1.40±0.09 and 1.36±0.08, respectively. The results of this study were lower than over all mean value for service per conception 2.30 for Holstein-Friesian in Sudan reported by Abdel and Alemam (2008), 2.05±1.47 reported by Alewya (2014) in Holstein Friesian dairy cows in Ethiopia, 2.55±1.7 reported by M'Hamdi *et al.* (2010) in Tunisian Holstein cows, and 2.1 reported by Hammoud *et al.* (2010) in Friesian cows in Egypt and Ngodigna *et al.* (2009; 2.0±1.0) in Holstein Friesian xBunaji crossbreed cows in Nigeria. Service per conception is influenced by breed, body weight, nutrition, semen quality, time of insemination, skill of the AI worker, and finally health status of the animal. It may be due to the difference in quality and quantity of the semen used during artificial insemination, lack of proper heat detection and time of insemination of the cows as well as lower husbandry practices.

3.8. Gestation period

The lengths of gestation period recorded in this study were 276.46±0.67, 277.10±0.49 and 279.20±0.68 days in LFF, LF and L, respectively. Islam *et al.* (2009) reported that the gestation period of local and Local x Friesian were 277±3.3 and 275±4.0 days. Kabir and Kisku (2013) who found the gestation period of 277.0±5.2 and 279.3±4.5 days under the genotypes of LF and LFF, respectively. These results collaborate with the results of this study.

3.9. Post-partum first heat

The time of postpartum first heat is considered as an important economic reproductive trait for profitable dairy farming. The averages days for post-partum first heat of Local x Friesian x Friesian, Local x Friesian and Local cows were 112.80±0.24, 117.06±0.22 and 103.36±0.29 days, respectively. Belay *et al.* (2012) found 125 days of post-partum heat period for Friesian x zebu cattle which is concur with the output of this study. The time of post-partum breeding delays up to 60 to 85 days after parturition, when the uterus under goes recovery and preparation for the next conception (Hafez, 1993). Apart from genetics, nutrition and management system might influence the post-partum heat period.

3.10. Calving interval

The average calving interval of Local x Friesian x Friesian, Local x Friesian and Local cows were 437.76±1.22, 437.23±1.11 and 481.86±0.33 days respectively. The result of this study agrees with the range reported by the Azizunnesa *et al*. (2010) for RCC (14.0 to 14.84 months, i.e 420 to 445 days). Calving interval may vary due to the effect of genetic, nutritional, environmental and managemental condition.

4. Conclusions

Local x Friesian x Friesian crossbred cows could be profitable for dairy farming as it has shortest calving interval, longest lactation period and highest average milk production per day.

Acknowledgements
The authors thanks goes to the farmer for their support during this experimental period.

Conflict of interest
None to declare.

References
Abdel RIMK and TA Alemam, 2008. Reproductive and productive performance of Holstein-Friesian cattle under tropical conditions with special reference to Sudan- a review. Agric. Rev., 29: 68-73.

Alewya H, 2014. Comparative study of reproductive and productive performance of Holstein Friesian dairy cows at Holeta Bull Dam Station and Genesis Farms.MSc Thesis, Department of Animal Production Studies, Addis Ababa University.

Azizunnesa, BC Sutradhar, M Hasanuzzaman, OF Miazi, M Aktaruzzaman and MO Faruk, 2010. Study on the productive and reproductive performances of Red Chittagong cows at rural areas in Chittagong. Univ. J. Zoo. Raj, 28: 27-31.

Banglapedia, 2014.http://www.banglapedia.org/HT/L_0133.htm

Belay D, K Yisehak and GPJ Janssen, 2012. Productive and reproductive performance of Zebu x Holstein-Friesian crossbred dairy cows in Jimma Town, Oromia, Ethiopia. Global Vet., 8: 67-72.

BER, 2016. Finance Division, Ministry of Finance, Government of the People's Republic of Bangladesh.

DLS, 2016.Department of Livestock Service, Ministry of Fisheries and Livestock, Government of the People's Republic of Bangladesh.

Hafez ESE, 1993. Reproduction in Farm Animals, 6thedition, Lea &Febiger, Philadelphia. pp. 165-166.

Hammoud MH, SZ El-Zarkouny and EZM Oudah, 2010.Effect of sire, age at first calving, season and year of calving and parity on reproductive performance of Friesian cows under semi-arid conditions in Egypt. Arch. Zoo. Tech., 13: 60-82.

Islam S, S Sultana, M Rokonuzzaman and MR Hassan, 2009.Productive and reproductive performance of crossbred and indigenous dairy cows under smallholder farming system. J. Bang. Agri. Univ., 7: 69–72.

Kabir F and JJ Kisku, 2013. Reproductive performance of different crossbred cows of Bangladesh. Afri. J. Agri. Res., 8: 723-726.

Khan MKI, KS Huque, AG Miah and MJ Khatun, 2000. Study on the performances of Red Chittagong cows under different production system. Pak. J. Bio. Sci., 3: 313-319.

M'hamdi N, M Bouallegue, S Frouja, Y Ressaissi, SK Brar and MB Hamouda, 2010. Effects of environmental factors on milk yield, lactation length and dry period in Tunisian Holstein Cows. pp. 153-164.

Mohamed-Khair AA, TB Ahmed, LA Musa and KJ Peters, 2007. Milk production and reproduction traits of different grades of Zebu x Friesian crossbreds under semi-arid conditions. Arch. FuerTierz. Dumm., 50: 240-249.

Molee AB, P Bundasak, Kuadsantiat and P Mernkrathoke, 2011. Suitable percentage of Holstein in crossbred dairy cattle in climate change situation. J. Anim. Vet. Adv., 10: 828-831.

Ngodigha EM, E Etokeren and O Mgbere, 2009. Evaluation of age at first calving and number of service per conception traits on milk yield potentials of Holstein Frisian x Bunaji crossbred cows. Res. J. Anim. Sci., 3: 6-9.

Niraj K, E Alemayehu, T Abreha and AY Hailelule, 2014. Productive performance of indigenous and Holstein-Friesian crossbred dairy cows in Gondar, Ethiopia. Vet. World, 7**:** 177-181.

Omar FM, ME Hossain and MM Hassan, 2007.Productive and reproductive performance of crossbred and indigenous dairy cows under rural conditions in Comilla, Bangladesh. Univ. J. Zoo. Raj., 26: 67-70.

Qureshi MS, JM Khan, RA Chaudhury, K Ashraf and BD Khan, 2002. Improvement in economic traits of local cattle through crossbreeding with Holstein Friesian semen. Pak. Vet. J., 2: 21-21.

Sandhu ZS, MS Tariq, MH Balochand, MA Qaimkhani, 2011. Performance analysis of Holstein-Friesian cattle in intensive managementat Dairy Farm Quetta, Balochistan, Pakistan. Pak. J. Soc. Sci., 9: 128-133.

SAS, 2009.SAS/STAT 9.3 User's Guide.SAS Institute Inc. Cary. NC.USA

Siddiquee NU, MA Wadud, MSA Bhuiyan, AKMA Rahman, MR Amin and AKFH Bhuiyan, 2014. Suitability of temperate and tropical crossbred dairy cattle under peri-urban production system in Bangladesh. Pak Pub. Gro., 1: 26-36.

Utrera ÁR, RCC Robles and JRG Rodríguez, 2013.Effects of breed, calving season and parity on milk yield, body weight and efficiency of dairy cows under subtropical conditions. Int. J. Anim. Vet. Adv., 5: 226-232.