

Article

Production and compositional studies of milk in local Pabna cows of Bangladesh

Md. Azharul Islam Talukder¹, Md. Shahjahan^{2*}, Md. Rezwanul Habib¹, Md. Salahuddin², Seikh Masudur Rahman², Md. Yousuf Ali², Sirazum Munira², Md. Abu Haris Miah², Md. Mostain Billah², Shahidur Rahman² and Abul Kashem Fazlul Haque Bhuiyan³

¹Bangladesh Livestock Research Institute, Savar, Dhaka-1341, Bangladesh

²Bangladesh Livestock Research Institute Regional Station, Baghabari, Sirajganj-6770, Bangladesh

³Department of Animal Breeding and Genetics, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

*Corresponding author: Md. Shahjahan, BLRI Regional Station, Baghabari, Shahjadpur, Sirajganj, Bangladesh.
E-mail: sajubau@gmail.com

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Abstract: The Pabna is one of the potential local cattle breeds in Bangladesh regarding milk production and its nutritive quality. The aim of the study was to know the effect of lactation length, parity and management on production performance and nutritional/physiochemical composition of the milk of local Pabna cows. Besides the regular milking, 15 days' interval test day milking was recorded from 12 local Pabna cows with different lactation period (up to fifth month of calving) from BLRI Regional Station, Baghabari during January-September, 2018. In addition, 12 and 16 milk samples (200 ml/sample) were collected from the cows raised at BLRI Regional Station and the community of Dairy Development Research Project at Bera, Pabna district during June, 2018, respectively. Data were analyzed in an ANOVA of Completely Randomized Design and independent sample *t*-test, respectively, using SAS version 9.1.3 (SAS Institute Inc., Cary, NC, USA) including Tukey's HSD *post hoc* test to separate means. The average daily milk yield was significantly ($p<0.05$) higher during the first month (4.62 L) of lactation and the lowest value recorded at 5th month (3.50 L). Among the test days milking better yield observed at 15 days (4.79 L) of experimental lactation period ($p<0.05$). The effect of lactation stages and parity number had no significant variations ($p>0.05$) on nutrient compositions of local Pabna cows' milk in both on-station and community. However, the overall characteristics of milk between on-station and community had significant differences on the composition of total solids ($p<0.001$), SNF ($p<0.001$), fat ($p<0.01$), and protein ($p<0.05$) where the highest values found as 14.81, 8.65, 6.17 and 3.53% at on-station, respectively. The first month of lactation observed as best milk producing period among the five months and the management system had positive association with milk composition of local Pabna cows.

Keywords: lactation; parity; management; test day milking

1. Introduction

Milk is an ideal food which contains all the essential nutrients for physiological functions including carbohydrates, proteins, fats, vitamins, minerals in significant amount than any other food items of human being. Among the native cattle varieties local Pabna cows are more promising in milk production in Bangladesh (Bhuiyan *et al.*, 2007). The study of Czerniewicz *et al.* (2006) revealed that physiochemical analysis is an important tool to scrutinize the quality of milk encompassing chemical composition, physical properties, microbiological and nutritive values. Several studies (Udo *et al.*, 1990; Hoque *et al.*, 1999; Yeasmin *et al.*, 2017; Rahman *et al.*, 2014) have conducted on milk yield and its compositions in Pabna cattle or their crosses but in-depth study based on lactation period, parity number and a comparative management system has not conducted

yet. Thus this study was planned to clarify the production and compositional studies of milk in local Pabna cows of Bangladesh.

2. Materials and Methods

2.1. Sources of data

The milk production was recorded from 12 local Pabna cows at the 6th day of parturition and daily milk yield was considered for total five months' of lactation including 15 days' interval test day milking to provide special emphasize (excluding first five days). A total of 12 and 16 milk samples were collected from the cows raised at BLRI Regional Station and Dairy Development Research Project (DDRP) community at Bera, Pabna district (Source Trace System, Massachusetts, USA), respectively, for compositional studies during June, 2018.

2.2. Management system

Calves were separated from their mother during night to morning (9 pm-8 am) and also morning to afternoon (10.00 am- 4.00 pm). Usually before milking, the udder was washed by using warm water and dried with damp cloth. The cows had the same parity (2nd) and similar feeding regime (dry matter basis with 2.5% of body weight using concentrate, straw and/or green grass).

2.3. Physicochemical analyses of milk

To determine the nutritional composition of milk, all collected milk samples (200 ml) were shifted by ice box until analyzed at laboratory using Lactoscan MMC50 (Nova Zagora, Bulgaria).

2.4. Data analysis

Data on milk production and nutritional composition were statistically analysed in an ANOVA of Completely Randomized Design and independent sample *t*-test, respectively, by SAS version 9.1.3 (SAS Institute Inc., Cary, NC, USA) including Tukey's HSD *post hoc* test to separate means.

3. Results and Discussion

The average daily milk yield was significantly ($p < 0.05$) higher during the first month (4.62 L) of lactation and the lowest daily milk yield found at 5th month (3.50 L). However, daily milk yield of Pabna cows raised at BLRI Research Station did not vary significantly ($p > 0.05$) during 3rd and 4th months of lactation period (Table 1). Among the test days' milking (Figure 1) better yield was observed at 15 days (4.79 L) of experimental lactation period ($p < 0.05$). Average milk yield of local Pabna cattle from this study was 4.07 kg for first five-month experimental period which is lower from the findings of Rahman *et al.* (2014) mentioning 6.46 L at BLRI, Savar and 6 L at Pabna regions but agreed with the findings of Yeasmin *et al.* (2017) for Pabna cows. Considering other local cows the findings of Mostari *et al.* (2007) and Habib (2001) stated the average daily milk yield of RCC was 2.24 kg and 2.55 kg, respectively, under farm condition which were lower than the present findings. The overall results are indicating the genetic potentiality of Pabna cows on milk yield including breed effects. The effect of lactation stages (up to three or above months) had no significant variations ($p > 0.05$) on nutrient compositions of local Pabna cows' milk (Table 2). Based on the effects of parity number and lactation stages of cows, similar trends ($p > 0.05$) were also found in the milk collected from community cows (Table 3). The findings of Yeasmin *et al.* (2017) revealed 9.67% SNF, 4.01% fat, 3.65% protein, 4.95% lactose and 0.65% ash in the milk of local Pabna cows which were comparatively higher in our study. According to other local cows, the RCC produced lower amount of milk but their milk contained a higher percentage of fat (about 6 %) which was almost similar to present findings for Pabna cows' milk. The overall characteristics of milk considering management system between on-station and community had significant differences on the composition of total solids ($p < 0.001$), SNF ($p < 0.001$), fat ($p < 0.01$), and protein ($p < 0.05$) where the highest values were 14.81, 8.65, 6.17 and 3.53% at on-station cows' milk, respectively (Table 4). Rahman *et al.* (2014) observed 9.94% SNF, 5.05% fat and 3.78% protein from local cows where the values were 9.76, 4.64 and 3.70% from BLRI, Savar, and 9.75, 4.07 and 3.70% from the local Pabna cows from the rural areas at Pabna district of Bangladesh.

Table 1. Effect of lactation period on daily milk yield of local Pabna cows at BLRI RS on-station.

Lactation period (month)	n	LSM±SE (litre)	Min	Max	P value
First	390	4.62±0.04 ^a	2.79	10.85	0.000
Second	360	4.14±0.04 ^b	2.57	6.51	
Third	300	3.86±0.05 ^c	2.33	5.68	
Fourth	270	3.72±0.05 ^c	2.44	5.43	
Fifth	150	3.50±0.07 ^d	2.33	4.98	
Overall	1470	4.07±0.02	2.33	10.85	

Mean values bearing different letters (a, b, c or d) in each row are significantly different ($p < 0.05$)

Table 2. Effect of parity and lactation stages on milk characteristics of local Pabna cows at on-station.

Parameters	Parity number (Mean±SE)		t test	Lactation stage (Mean±SE)		t-test
	≤2 parity (n=12)	> 2 parity (n=0)		≤3 months (n=9)	>3 months (n=3)	
Total solid (%)	14.81±0.19	-	-	14.85±0.24	14.70±0.37	0.756
SNF (%)	8.65±0.08	-	-	8.68±0.09	8.55±0.16	0.512
Fat (%)	6.17±0.16	-	-	6.17±0.20	6.15±0.26	0.958
Protein (%)	3.53±0.11	-	-	3.51±0.10	3.59±0.38	0.768
Lactose (%)	4.45±0.09	-	-	4.49±0.10	4.30±0.18	0.365
Ash (%)	0.68±0.01	-	-	0.68±0.02	0.67±0.04	0.829
Specific gravity	1.027±0.001	-	-	1.027±0.001	1.026±0.001	0.382
pH	6.72±0.01	-	-	6.71±0.02	6.73±0.01	0.720
Conductivity	4.04±0.04	-	-	4.09±0.03	4.13±0.03	0.504

Table 3. Effect of parity and lactation stages on milk compositional characteristics from local Pabna cattle at community.

Parameters	Parity number (Mean±SE)		t-test	Lactation stage (Mean±SE)		t-test
	≤2 parity (n=10)	> 2 parity (n=6)		≤3 months (n=5)	>3 months (n=11)	
Total solid (%)	13.91±0.51	12.97±0.35	0.211	13.55±0.66	13.55±0.44	1.00
SNF (%)	7.88±0.18	8.05±0.10	0.493	7.80±0.27	7.99±0.13	0.487
Fat (%)	6.04±0.51	4.92±0.39	0.150	5.75±0.68	5.56±0.46	0.822
Protein (%)	3.10±0.07	3.15±0.04	0.515	3.07±0.09	3.13±0.05	0.507
Lactose (%)	4.15±0.10	4.25±0.06	0.472	4.11±0.15	4.22±0.07	0.481
Ash (%)	0.63±0.02	0.64±0.01	0.546	0.62±0.02	0.64±0.01	0.433
Specific gravity	1.025±0.001	1.027±0.001	0.228	1.025±0.001	1.025±0.001	0.607
pH	6.81±0.06	6.77±0.09	0.669	6.80±0.07	6.80±0.07	0.987
Conductivity	4.13±0.03	4.14±0.12	0.863	4.17±0.07	4.11±0.02	0.272

Table 4. The overall milk compositional characteristics of local Pabna cows (≤2 parity) raised under on-station and community.

Parameters	Management systems (Mean±SE)		t-test
	On-station (n=12)	Community (n=10)	
Total solid (%)	14.81±0.19	12.97±0.19	0.000
SNF (%)	8.65±0.08	8.05±0.10	0.000
Fat (%)	6.17±0.16	4.92±0.39	0.003
Protein (%)	3.53±0.11	3.15±0.04	0.034
Lactose (%)	4.45±0.09	4.25±0.06	0.162
Ash (%)	0.68±0.01	0.64±0.01	0.099
Specific gravity	1.027±0.001	1.027±0.001	0.702
pH	6.72±0.01	6.77±0.10	0.438
Conductivity	4.10±0.02	4.14±0.05	0.411

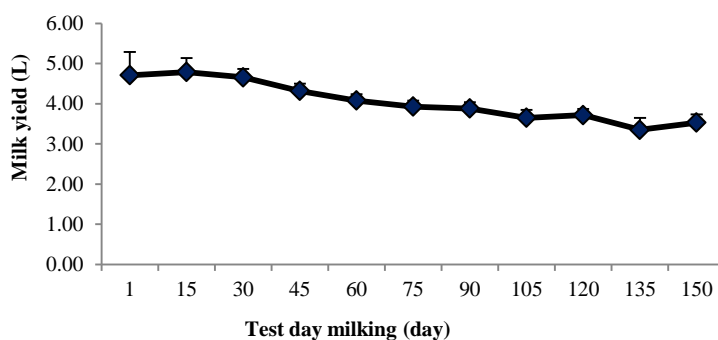


Figure 1. Milk yield of local Pabna cows in different test days of lactation.

4. Conclusions

It is concluded that first month of lactation was the best milk producing period among the five months and the management system had positive association with milk composition of local Pabna cows.

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Conflict of interest

None to declare.

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