

Quality and Amount of Morning and Evening Milk of the Bangladesh Baghabarighat Milk Shed Area Throughout the Year^a

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ABSTRACT : The Baghabarighat Milk Shed Area (BMSA), in Bangladesh belonging to the Bangladesh Milk Producers Cooperative Union Limited (BMPCUL) was selected to study the qualitative and quantitative aspects of dairy milk and to establish a trend throughout the year (July 1995 to June 1996) of milk collected at morning and evening, and daily. The average fat, solids-not-fat (SNF) and total solid (TS) contents of the morning milk were 4.58, 7.75 and 12.33%, respectively, and evening milk contained 5.41, 7.81 and 13.23%. The values for the quality varied ($p < 0.01$) throughout the year without a specific trend. Higher milk collection occurred at morning (52.77%) than evening (47.24%), but total yield of fat from morning milk was lower (48.74%) than evening milk (51.26%) due to a lower fat value (4.58%). Yield of SNF (52.57% morning, 47.37% evening) followed the values of the amount of milk collected due to their similar value at morning (7.75) and evening (7.81). Overall, TS yield was 51 and 49% from morning and evening. There was not a significant ($p > 0.01$) relationship between fat and TS values of morning milk with those of evening milk, but there was a correlation ($p < 0.01$) between milk yield at morning and all other parameters for evening. Solids-not-fat value of morning milk was related with yield and SNF value of milk from evening, but not with fat and TS evening milk. It may be concluded that evening milk contains higher amounts of fat, SNF and TS, but yields were higher at morning, except fat. Milk collected at morning showed a relationship with all the parameters found at evening. (*Asian-Aust. J. Anim. Sci.* 2001, Vol. 14, No. 1 : 92-95)

Key Words : Milk Quality, Morning Milk, Evening Milk, Milk Yield

INTRODUCTION

Cow milk is about 87% water and 13% total solids. Its quality, determined by the contents of solids-not-fat (SNF, principally casein and lactose) and fat, vary according to breed, feed, stage and number of lactation (Gopalkrishnan and Lal, 1994). There is an inverse relationship between milk yield with its protein and fat percentages (Banerjee, 1995). Some scattered information about the quality and quantity of milk regarding breed, period of year and area (Rahman et al., 1995) is available. There may be a relationship between quality and amount of morning and evening milk throughout the year that it is important to identify.

The experiment was conducted to establish trends in milk quality and amount collected at morning and evening throughout the year. The Baghabarighat Milk Shed Area (BMSA), a large part of Bangladesh Milk Producers Cooperative Union Limited (BMPCUL), was selected.

MATERIALS AND METHODS

This experiment was conducted for a period of one year (July 1995 to June 1996) at the BMSA of the BMPCUL (Milk Vita).

Society and their animals

There are 120 active primary societies and every society has on average 90 members. Average number of milking cows was 2.06 per member (Islam, 2000). Breeds were Sahiwal × Sindhi, Sindhi, local undescriptive, and some Holstein-Friesian. Year round average milk yield per day per cow was 1.62 liters (Islam, 2000). An individual farmer of that area rears cows, poultry, and goats along with cultivated crops and vegetables. Pond holders are associated with fish farming. So, every house has an integrated agricultural farm of livestock, fishery and crops depending upon their capacity. Rice straw contributes over 90% of the total dry matter of cow diets (Saadullah, 1985) which also include cereal by-products and natural pastures.

Milk collection and analysis

Whole milk was collected by the plant from the milk producers (10800 heads) of primary Co-operative Societies. Mixed milk samples were taken randomly from the reception vat every day after milk collection at morning and evening. The percent fat of the milk was determined by the Babcock method (Ling, 1945) and solids-not-fat (SNF) according to formula: $SNF (\%) = \text{lactometer reading} / 4 + (1.2 \times \text{fat } \%)$ from Mian

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^a The author gratefully acknowledges the cooperation of BMPCUL (Milk Vita) in allowing access for the collection of information while the author was working as Assistant Manager in BMPCUL. He also acknowledges the Society Organizers and Offices of society division of Baghabarighat Milk Shed Area.

Received July 8, 2000; Accepted October 10, 2000

(1986). Total solids was calculated as the sum of fat and SNF percent.

Experiment and data analysis

Milk collected from 1st to 8th, 9th to 16th, 17th to 24th and the remaining days of each month were measured, and sampled morning, evening and daily for fat, SNF and TS determinations. The values were calculated to obtain 4 mean values (Replication) for a month. These mean values were further averaged to obtain daily averages per month (Treatment) for different parameters. Analyses of variance were for a completely randomized design and significant differences among the treatment means were identified by Duncan's New Multiple Range Test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Fat value

The fat percent varied throughout the year from 4.40 (October) to 4.89 (June) for morning, and 5.10 (April) to 5.69 (January) for evening and their mean values were 4.58 and 5.41, respectively, and over the year their mean (table 1 and figure 1). There was no specific trend through the year. Probably two factors contributed to the variation between morning and evening milk: (i) due to the effect of intra-gland pressure on milk and fat secretion, milk produced during a long interval has a lower test at morning; (ii) due to exercise, which has a tendency to increase the level of milk fat at evening. So, the evening milk of

cows has a slightly higher fat test than that obtained from morning milking (Banerjee, 1995). Fat value per day showed no trend and varied ($p < 0.01$) from 4.80 to 5.12% in different months, and the mean value was 4.96. Total fat yield was 48.74% from morning milk and 51.26% from evening milk over the year (table 1).

Solids-not-fat

Variations ($p < 0.01$) observed throughout the year in SNF value for morning (7.61 to 7.94) and evening

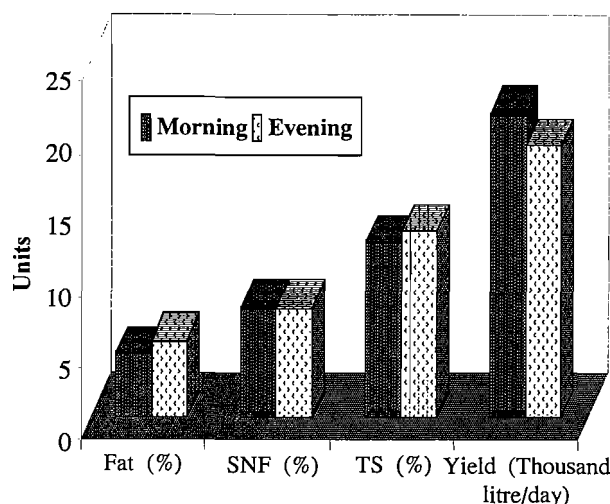


Figure 1. Quality (fat, SNF and TS percent) and amount (thousand litre/day) of morning and evening milks throughout the year

Table 1. Quality of morning and evening milk of Baghabarighat Milk Shed area throughout the year

Month	Fat (%)			SNF (%)		
	Morning	Evening	Daily	Morning	Evening	Daily
Jul. 95	4.71 ^{de}	5.45 ^{cdef}	5.06 ^{cd}	7.70 ^b	7.84 ^{cd}	7.77 ^c
Aug. 95	4.65 ^{cd}	5.51 ^{ef}	4.97 ^{bc}	7.61 ^a	7.78 ^{abc}	7.78 ^c
Sep. 95	4.46 ^a	5.42 ^{cde}	4.89 ^{ab}	7.70 ^b	7.74 ^{ab}	7.72 ^{ab}
Oct. 95	4.40 ^a	5.45 ^{cdef}	4.87 ^{ab}	7.74 ^{bc}	7.78 ^{abc}	7.76 ^{cd}
Nov. 95	4.41 ^a	5.50 ^{def}	4.95 ^{bc}	7.74 ^{bc}	7.81 ^{bc}	7.80 ^{de}
Dec. 95	4.45 ^a	5.60 ^f	5.12 ^d	7.77 ^{bc}	7.80 ^{bc}	7.83 ^{de}
Jan. 96	4.51 ^{ab}	5.69 ^e	4.88 ^{ab}	7.80 ^{cd}	7.91 ^{de}	7.84 ^{de}
Feb. 96	4.52 ^{abc}	5.44 ^{cdef}	4.93 ^b	7.94 ^e	8.00 ^e	7.96 ^f
Mar. 96	4.64 ^{bcd}	5.33 ^{bcd}	4.95 ^{bc}	7.86 ^{de}	7.92 ^e	7.88 ^e
Apr. 96	4.53 ^{abc}	5.10 ^a	4.80 ^a	7.70 ^b	7.75 ^{ab}	7.72 ^{ab}
May. 96	4.82 ^{ef}	5.17 ^{ab}	4.99 ^{bc}	7.72 ^{bc}	7.72 ^a	7.72 ^{ab}
Jun. 96	4.89 ^f	5.29 ^{bc}	5.12 ^d	7.69 ^{ab}	7.72 ^a	7.70 ^a
Mean	4.58	5.41	4.96	7.75	7.81	7.79
Yield (%)	48.74	51.26	100.00	52.57	47.37	100.00
Level of sig.	**	**	**	**	**	**
LSD	0.13	0.17	0.12	0.08	0.07	0.05

^{a,b,c} Means with different superscript in the same row differ significantly ($p < 0.01$).

LSD Least significant differences between two means.

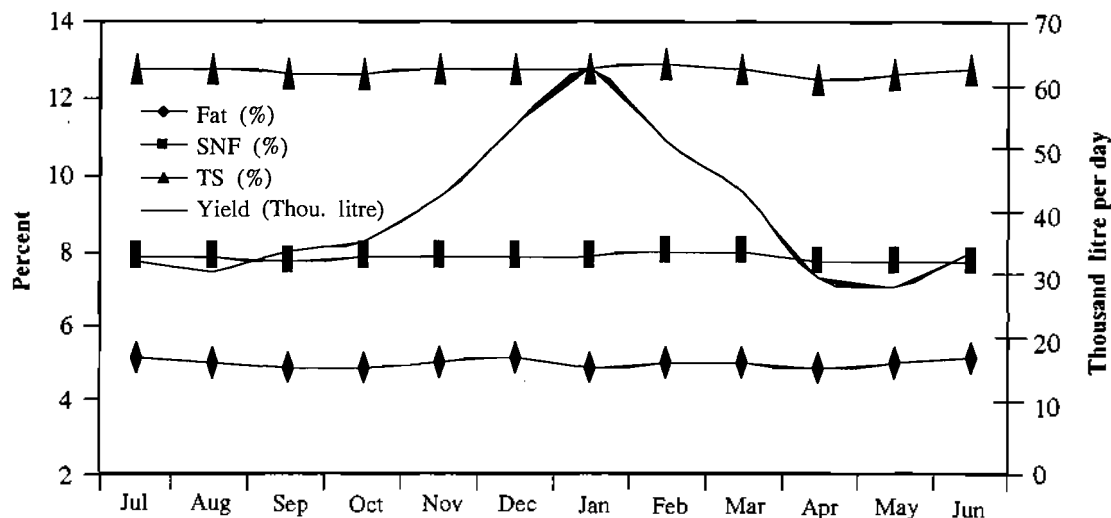


Figure 2. Qualitative and quantitative trend of dairy milk throughout the year

(7.72 to 8.00) milk (table 1) did not follow any trend (figure 2), like daily SNF value which also varied ($p < 0.01$), from 7.70 to 7.96%, throughout the year. Climatic changes may have an effect. Mean values over the year were similar for morning, evening and daily, 7.75, 7.81, and 7.79 percent respectively (table 1). Yields of total SNF from morning (52.57%) and evening (47.37%) followed the amount of milk collected (52.77% morning and 47.24% evening) due to their similar concentrations at morning (7.75) and

evening (7.81) over the year.

Total solids

Total solids content (percent) in morning milk varied (table 2) from 12.14 (in October) to 12.58 (in June), and for evening milk varied from 12.85 (in April) to 13.69 (in January) without following any trend, like daily TS values (varied from 12.60 to 12.89). Mean values for the whole year were 12.33, 13.23 and 12.75 for morning, evening and daily,

Table 2. Total solid and yield (thousand litre/day) of morning and evening milk of Baghabarighat Milk Shed area throughout the year

Months	Total solid (%)			Milk yield		
	Morning	Evening	Daily	Morning	Evening	Daily
Jul. 95	12.41 ^{cd}	13.30 ^{cd}	12.83 ^{cde}	18.24 ^{ab}	15.14 ^a	33.37 ^{abc}
Aug. 95	12.26 ^{abc}	13.29 ^{cd}	12.80 ^{cde}	16.23 ^{ab}	15.02 ^a	31.24 ^{ab}
Sep. 95	12.16 ^{ab}	13.20 ^{bc}	12.60 ^{ab}	17.40 ^{ab}	16.84 ^{ab}	34.24 ^{abc}
Oct. 95	12.14 ^a	13.24 ^{cd}	12.60 ^{ab}	18.15 ^{ab}	18.06 ^{ab}	36.21 ^{abc}
Nov. 95	12.16 ^{ab}	13.31 ^{cd}	12.74 ^{cd}	21.57 ^{abc}	21.60 ^{bc}	43.17 ^{bcd}
Dec. 95	12.22 ^{ab}	13.40 ^{cde}	12.84 ^{cde}	29.38 ^{cd}	24.97 ^{cd}	54.35 ^{de}
Jan. 96	12.31 ^{bc}	13.69 ^e	12.85 ^{de}	35.74 ^d	27.00 ^d	62.74 ^e
Feb. 96	12.40 ^{cd}	13.44 ^{de}	12.89 ^e	28.52 ^{cd}	23.44 ^{cd}	51.95 ^{de}
Mar. 96	12.49 ^{de}	13.24 ^{cd}	12.83 ^{cde}	23.33 ^{bc}	20.38 ^{bc}	43.72 ^{cd}
Apr. 96	12.23 ^{ab}	12.85 ^a	12.52 ^a	15.64 ^{ab}	14.98 ^a	30.62 ^a
May. 96	12.54 ^{de}	12.88 ^a	12.71 ^{bc}	14.54 ^a	14.85 ^a	29.39 ^a
Jun. 96	12.58 ^{de}	13.00 ^{ab}	12.78 ^{cde}	17.65 ^{ab}	17.25 ^{ab}	34.90 ^{abc}
Mean	12.33	13.23	12.75	21.37	19.13	40.49
Yield (%)	50.97	49.03	100.00	52.77	47.24	100.00
Level of sig.	**	**	**	**	**	**
LSD	0.15	0.20	0.13	7.87	4.87	12.12

^{a,b,c} Means with different superscript in the same row differ significantly ($p < 0.01$).

^{LSD} Least significant differences between two means.

respectively. Higher TS values observed for evening milk were influenced by higher values for fat in evening milk (5.41) than morning milk (4.58). Total solids obtained were 50.99 and 49.03% at morning and evening milk which contained 12.33 and 13.23% TS respectively. The corresponding yield values were reversed due to higher milk collection at morning (52.77%).

Milk collection

Milk collection (thousand liter/day) varied ($p < 0.01$) from 14.54 (May) to 35.74 (January) for morning, and 14.85 (May) to 23.44 (Feb.) for evening (table 2). A similar pattern was observed for daily collection, lower (29.39) for May and higher (62.74) for January. In every case collection followed a similar trend (figure 2). Overall, the morning collection, 21.37 thousand liters/d, accounted for 52.8% of the daily total and the evening, 19.13 thousand liters/d, for 47.2%. This difference is not as great as that found by Mian (1986) who reported that when the interval between evening and morning milkings was 14 h the morning yield was greater than the evening by 40-50%. There is a tendency to sell morning milk in the market, where price is invariant with composition, rather than to BMPCUL which pays according to fat content.

Relationship between different parameters

Amount of milk collection at morning was correlated ($p < 0.01$) with the amount of collection at evening and also correlated with the values for the fat, SNF and TS% in evening milk (table 3). Values for fat and TS at morning had no relation ($p > 0.01$) to the

yield and other qualitative parameters of evening milk. Solids-not-fat in morning milk was related to the yield and SNF value of evening milk but there was not a significant relationship with the fat and TS. There was a tendency for SNF and TS to increase with increase of yield (table 4) but yield had no effect on fat value. Fat and SNF were positively related to TS. Solids-not-fat value had no effect on fat value of milk throughout the year.

CONCLUSION

No specific trend was followed by the fat, SNF and TS values throughout the year in respect of milk collected at morning, evening or the daily production. The values were low in morning milk. The TS value was highly influenced by the value for fat because of the large variation observed for this parameter. We found a higher yield of SNF and TS with morning milk due to its greater volume but not a higher yield of fat due to the low fat percentage.

ACKNOWLEDGEMENTS

The author gratefully acknowledges the cooperation of BMPCUL (Milk Vita) in allowing access for the collection of information while the author was working as Assistant Manager in BUMPCUL. He also acknowledges the Society Organizers and Officers of society division of BMSA.

REFERENCES

- Banerjee, G. C. 1995. A Textbook of Animal Husbandry (7th Edn.). Mohan Primlini for Oxford and IBH Publishing Co. Pvt. Ltd., 66 Janpath, New Delhi 110 001.
- Gopalakrishnan, C. A. and G. M. M. Lal. 1994. Livestock and Poultry Enterprises for Rural Development (1st Edn.) Vikash Publishing House Pvt. Ltd. 576, Masjid Road, Jangpura, New Delhi-14.
- Islam, K. M. S. 2000. Milk production profile in Baghabarighat Milk shed area of Bangladesh. Pakistan Journal of Biological Sciences. (In press).
- Ling, E. R. 1945. A Textbook of Dairy Chemistry. Vol 2. Chapman and Hall Ltd, London.
- Mian, M. A. H. 1986. Dugdha Bijnan. (First Edn.). Bangla Academy, Dhaka, Bangladesh.
- Rahman, A. K. M. M., M. M. Zaman, S. M. I. Husain and M. A. S. Khan. 1995. Physical and chemical qualities of milk collected from different plants of Milk Vita. Bangladesh J. of Anim. Sci. 24(1-2):119-125.
- Saadullah, M. 1995. Supplementing ammoniated rice straw for native cattle in Bangladesh. Paper presented in the workshop on the relevance of crop residues in ruminant ration, Chonkaen, Thailand.
- Steel, R. G. D. and J. H. Torrie. 1980. Principles and Procedures of Statistics. McGraw Hill Book Comp, Inc. London.

Table 3. Correlation of yield and quality between morning and evening milks

Evening	Morning			
	Collection	Fat	SNF	TS
Collection	0.965**	-0.490 ^{NS}	0.685*	-0.153 ^{NS}
Fat	0.709**	-0.478 ^{NS}	0.167 ^{NS}	-0.400 ^{NS}
SNF	0.726**	-0.267 ^{NS}	0.841**	0.113 ^{NS}
TS	0.839**	-0.481 ^{NS}	-0.481 ^{NS}	-0.280 ^{NS}

^{NS} Not significant; * $p < 0.05$; ** $p < 0.01$.

Table 4. Correlation between yield and quality of milk throughout the year

Parameter	Fat	SNF	TS	Yield
Fat	1	-	-	-
SNF	-0.042 ^{NS}	1	-	-
TS	0.577*	0.685*	1	-
Yield	0.034 ^{NS}	0.732**	0.599*	1

^{NS} Not significant; * $p < 0.05$; ** $p < 0.01$.