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Quality of Yogurt (Dahi) Made in Laboratory and Available in the Market of Mymensingh Town in Bangladesh

¹M. Y. Ali, ²M. A. Islam, ³M. J. Alam and M. N. Islam

Department of Dairy Science, Bangladesh Agricultural University, Mymensingh, Bangladesh

¹Livestock Development Programme, Proshika Dhaka, Bangladesh

²Poultry Research Division, BLRI, Savar, Dhak, Bangladesh

³Department of Animal Science, BAU Mymensingh, Bangladesh

Abstract: Yogurt samples from ten different shops of Mymensingh Town and Laboratory made in 3 batches were analyzed in the Dairy Technology Laboratory, Department of Dairy Science, Bangladesh Agricultural University to monitor the quality. Significant difference in overall score of physical test (smell and taste, body and consistency, colour and texture), chemical (protein, fat, total solids, ash, acidity and PH) and microbiological status was found among different yogurt samples. Laboratory made yogurt was the best in quality. Dayamoy and Anil Gosh were in 2nd and 3rd position in quality of yogurt. This investigation suggested that adulterated milk must be avoided in yogurt preparation and also to follow strict hygienic condition in order to have good quality yogurt.

Key words: Yogurt/ dahi, local markets, laboratory, physical, chemical microbiological test, adulteration

Introduction

Yogurt or dahi is a fermented milk product, which may be made from whole or skim milk. It is very popular and nutritious dish in Bangladesh. Consumer can take it without having any harmful effect. It is easily digested and vital for health because of its high protein and fat content, lactose, minerals specially Ca and P content, important vitamins and lactic acid (Robison, 1981; Laxminarayana, 1952).

Yogurt or dahi may be plain or flavored with sugar cane (Sweet) fruit juices or jame with pure culture of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* in a ratio of 1:1 for quality yogurt / dahi. Adding sugar and mango juice enrich the quality of yogurt (Shakeel *et al.*, 1994).

Though yogurt or dahi are similar dairy products but there are some discrepancy between them. Dahi is prepared using mixed culture of *Streptococcus lactis*, *Lactobacillus bulgaricus*, *Streptococcus thermophilus*, *Streptococcus citrophilus* and *Lactobacillus planetarium* etc.

An evidence indicated that live and active bacteria in yogurt enhanced specific or non-specific immune mechanisms which protected against pathogens microbes and viruses. That is why it may protect against heart disease and cancer (Dairy Industries International, September, 1991). A number of sweet yogurt or dahi are being prepared in different areas of Mymensingh town. But there is no standard to make quality yogurt. That is why, they make yogurt in their own way. So, the present study was undertaken to monitor the quality of yogurt available in different shops of Mymensingh as representative town and standard yogurt prepared in the Dairy Technology Laboratory of Bangladesh Agricultural University.

Materials and Methods

The experiment was carried out in the Dairy Technology Laboratory, Dept. of Dairy Science, Bangladesh Agricultural University, Mymensingh, Bangladesh for the period of June to August 1997.

Preparation of yogurt in the laboratory: Yogurt sample was prepared in the Laboratory under strict hygienic conditions as per the procedure of Rangappa and Achaya (1974). Whole milk was collected from the BAU Dairy Farm and standardized adjusting 3.5% fat and 8.5% SNF. Milk was boiled and stirred for 30 minutes from the boiling point. Boiled milk was cooled down to near 42°C and inoculated with 2% cultures collected from local market. Inoculated warm milk (42°C) was poured into several pre-boiled water washed plastic cups and kept at an incubation

temperature of 37°C until complete coagulation. After 8-12 hours of complete coagulation yogurt samples were stored in the refrigerator at 5°C until used.

Collection of market yogurt: Yogurt samples from ten different sweet-meat shops Mymensingh Town and BAU Kamal-Ranjit Market namely Mamoni (M₁), Krishana Cabin (M₂), Joyguro (M₃), Kamal-Ranjit Market (M₄), Bhai Bhai Restaurant (M₅), Jabbar (M₆), Dayamoy (M₇), Anil Ghosh (M₈), Ma Monoroma (M₉) and Sudir Ghosh (M₁₀) in 3 batches of market and Laboratory made (C-control) having 150-200g in each sample were collected.

All the samples were packed separately in small size plastic pots and stored in the refrigerator at 5°C until judging.

The following tests were made on 33 samples (11x3):

Physical tests (sensory and organoleptic evaluation): All yogurt samples were judged to evaluate the smell and taste, body and consistency, colour and texture and there by the overall of physical score of the samples by a panel of some aged expert judges.

Chemical analysis: Acidity, protein and fat % were determined as per procedure of Aggarwala and Sharma, (1961), and total solid and Ash as per methods of AOAC (1982). pH value was measured with the help of pH meter-215 (Ciba Corning Diagnostics Ltd. Sudbury, Suffolk, England Co. 106 XD).

Microbiological tests: Yogurt samples were tested by gram staining method for counting the gram positive rod, cocci and yeast's.

Statistical analysis: Data were analyzed using computer MSTAT package programme. The differences among shops means were compared by Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984)

Results and Discussion

Physical tests (organoleptic evaluation): The significant differences were not found for smell and taste, colour and texture score of different sweetmeat shops and laboratory made yogurt or dahi ($P > 0.05$) (Table 1).

But the score of body and consistency and over all score of different yogurt samples differed significantly. The highest score body and consistency was found in Laboratory made Yogurt (26.66) and the lowest in Kamal-Ranjit Market yogurt (18.33). As per overall score of the organoleptic panel taste, different

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Table 1: Average score of various sensory or organoleptic properties of yogurt collected from different sweetmeat shops and prepared in the laboratory

Physical parameters	Mamoni $\bar{x} \pm SE$	Krishna Cabin $\bar{x} \pm SD$	Joyguro $\bar{x} \pm SD$	Kamal Ranjit market $\bar{x} \pm SD$	Bhai Bahi Restaurant $\bar{x} \pm SD$	Jabbar $\bar{x} \pm SD$	Dayamoy $\bar{x} \pm SD$	Anil Ghosh $\bar{x} \pm SD$	Ma Monorama $\bar{x} \pm SD$	Sudir Ghosh $\bar{x} \pm SD$	Laboratory $\bar{x} \pm SD$	SED Value	Level of significance
Smell and Taste (50)	32.33± 6.81	36.66± 5.77	32.33± 6.66	29.0± 6.64	35.0± 5.0	36.33± 1.53	40.0± 2.0	37.0± 2.65	29.33± 1.15	34.33± 3.61	39.0± 6.56	4.35	NS
Body and Consistency (30)	22.33± 4.04	23.66± 3.21	20.66± 1.15	18.33± 1.53	25.33± 0.58	24.0± 2.0	24.0± 1.73	23.66± 3.21	21.66± 2.89	25.00± 1.00	26.66± 3.06	2.00	*
Colour and Texture (20)	13.66± 3.21	15.00± 2.00	13.0± 2.65	13.66± 0.85	15.33± 1.53	14.33± 1.53	13.33± 4.16	16.33± 1.53	13.0± 1.0	12.33± 2.52	16.0± 4.58	2.12	NS
Overall Score	68.32± 1.75	75.32± 1.01	65.99± 2.25	60.99± 1.50	75.66± 1.0	74.66± 1.0	77.33± 0.5	76.99± 2.1	63.99± 3.25	71.66± 2.3	81.66± 2.48	1.60	**
\bar{x}	=	Mean,											
SD	=	Standard deviation,											
**	=	P< 0.01,											
*	=	P< 0.05,											
NS	=	P> 0.05											

Table 2: Comparison of average chemical composition of dahi collected from different sweetmeat shops and prepared in the laboratory (Chemical Test).

Physical Parameters	Mamoni $\bar{x} \pm SE$	Krishna Cabin $\bar{x} \pm SD$	Joyguro $\bar{x} \pm SD$	Kamal Ranjit market $\bar{x} \pm SD$	Bhai Bahi Restaurant $\bar{x} \pm SD$	Jabbar $\bar{x} \pm SD$	Dayamoy $\bar{x} \pm SD$	Anil Ghosh $\bar{x} \pm SD$	Ma Monorama $\bar{x} \pm SD$	Sudir Ghosh $\bar{x} \pm SD$	Laboratory $\bar{x} \pm SD$	SED Value	Level of significance
Fat %	0.967± 0.15	1.16± 0.15	1.9± 0.10	1.03± 0.06	2.0± 0.10	1.9± 0.10	2.3± 0.15	2.2± 0.20	1.73± 0.21	2.03± 0.06	4.3± 0.10	0.18	**
Protein %	4.6± 0.10	3.98± 0.24	4.48± 0.19	4.36± 0.21	4.15± 0.18	4.51± 0.28	4.60± 0.10	4.16± 0.15	4.13± 0.06	4.33± 0.21	4.44± 0.06	0.24	**
Total solids %	29.08± 1.66	26.90± 2.12	31.63± 1.02	25.16± 2.25	35.25± 1.57	28.60± 1.85	36.03± 1.52	37.66± 2.57	39.43± 3.55	30.43± 1.75	29.06± 0.90	1.64	**
Ash %	1.21± 0.10	1.5± 0.10	1.43± 0.08	1.33± 0.05	1.17± 0.09	0.93± 0.15	1.03± 0.21	1.2± 0.10	1.32± 0.08	1.15± 0.13	1.17± 0.10	0.093	**
pH	4.79± 0.01	4.84± 0.01	4.69± 0.02	4.6± 0.01	5.06± 0.07	4.69± 0.01	4.67± 0.02	4.89± 0.01	4.61± 0.01	4.71± 0.01	4.79± 0.01	0.025	**
Acidity %	0.67± 0.01	0.637± 0.03	0.727± 0.03	0.86± 0.07	0.600± 0.08	0.757± 0.02	0.757± 0.02	0.643± 0.03	0.847± 0.13	0.827± 0.03	0.783± 0.07	0.03	**
\bar{x}	=	Mean,											
SD	=	Standard deviation,											
**	=	P< 0.01											

Table 3: Comparison of average microbiological status of dahi collected from different sweetmeat shops and prepared in the laboratory (Microbiological Test)

Micro-biological Parameters	Mamoni $\bar{x} \pm SD$	Krishna Cabin $\bar{x} \pm SD$	Joyguro $\bar{x} \pm SD$	Kamal Ranjit market $\bar{x} \pm SD$	Bhai Bahi Restaurant $\bar{x} \pm SD$	Jabbar $\bar{x} \pm SD$	Dayamoy $\bar{x} \pm SD$	Anil Ghosh $\bar{x} \pm SD$	Ma Monorama $\bar{x} \pm SD$	Sudir Ghosh $\bar{x} \pm SD$	Laboratory $\bar{x} \pm SD$	SED $\bar{x} \pm SD$	Level of significance
Gram positive cocci %	52.00± 2	65.66± 5.13	80.66± 4.04	26.33± 4.72	57.66± 2.51	83.33± 3.05	48.66± 3.51	50.33± 1.52	41.3± 3.60	37.33± 2.08	47.66± 2.51	2.73	**
Gram positive rod %	44.66± 3.05	22.00± 2.00	16.00± 3.00	42.33± 3.51	42.66± 2.08	17.33± 3.05	46.00± 2.00	47.66± 2.51	55.33± 2.51	59.33± 1.15	48.66± 3.51	2.18	**
Yeast %	7.33± 1.52	10.00± 2.00	4.00± 1.00	2.00± 1.00	8.00± 1.00	5.00± 1.00	9.00± 1.00	6.00± 1.00	10.00± 1.00	5.33± 1.52	2.66± 1.52	1.30	**
\bar{x}	=	Mean,											
SD	=	Standard deviation,											
**	=	P< 0.01											

sweetmeat shops for quality yogurt were in position sequentially Laboratory, Dayamoy, Anil Ghosh, Bhai Bhai Restaurant, Krishna Cabin, Jabbar Sudir Ghosh, Mamoni, Joyguro, Ma Monoroma and Kamal-Ranjit market respectively.

Despite there was no significant difference for smell and taste scores of different yogurt samples, Laboratory yogurt was the best (40.0) for smell and taste, and the lowest was Kamal-Ranjit market yogurt (29.0).

The variations among different yogurt samples could be attributed to different types of milk, starter cultures and manufacturing process, reported by some authors. Pette and Lolkema (1950) found that yogurt aroma and most of the flavour, body of yogurt were developed by *Lactobacillus bulgaricus*. Another experiment reported that milk stored too long before seeding often give rise to broken curd of poor taste (Rangappa and Achaya, 1974). It is found that use of gelatin at 0.2-0.3% level not only improve the quality of yogurt but also control the problem, of whey off. The curd tension of skim milk was higher than that of corresponding whole milk, observed by Hill (1931). Highly significant difference among different yogurt samples was also found by Ghosh and Rajorshia (1987) and Sarkar *et al.* (1996).

Chemical composition: Statistically significant differences ($P < 0.01$) were found for fat, protein, total solids, ash, acidity % and pH value among the yogurt from different sources (Table 2). The highest fat % was found in Laboratory made yogurt (4.3%) and the lowest in Mamoni Yogurt (0.97). Ma Monoroma yogurt contained the highest percentage of total solids (39.43), 2nd in the Dayamoy (36.03) and the lowest in Kamal-Ranjit Market Yogurt (25.16%). pH and acidity were oppositely co-related. The highest % was found in Kamal-Ranjit Market and the lowest in Krishna Cabin and Anil Ghosh.

Variation in chemical composition of different yogurt samples may be attributed to different types of milk, cultures, addition of different concentration of sugar (Ghosh and Rajorshia, 1987) or extent of concentration of milk during heat treatment (Ray and Srinivasan, 1972). Fat content of yogurt ranged between 0.8 to 4.4% with an average of 1.95% whereas Sarkar *et al.* (1996) found 1.1 to 11.5% with an average protein content of 4.33% which was consistent with Rahman (1998) and Desai *et al.* (1994). The present investigation showed the total solid range of 25.16 to 39.43% which was in agreement with the findings of Ghosh and Rajorshia (1987) and Adeyl (1998) but different from Sarkar *et al.* (1996). They found the range of 29.5 to 52.30%. Acidity varied from 0.63 to 0.88% due to the production of lactic acid by microorganisms, supported by Ghosh and Rajorshia (1987) who found the acidity range of 0.73 to 0.90%.

Microbiological status: Significant difference ($P < 0.01$) was found for gram positive cocci, rod and yeasts among the yogurt samples from different sources (Table 3). The highest and the lowest cocci were found in Jabbar and Kamal-Ranjit Market, where as the highest and lowest gram positive rod were in Sudir Ghosh and Joyguro Yogurt respectively. The highest and lowest Yeast were counted is Krishna Cabin and Laboratory made yogurt respectively. The ratio of Cocci and rod in most of the samples was 1:1 to 1:2 which was supported by Persic (1991) and Mostafa (1997), who found the ratio of 1.1 : 1.27. Yeast may get enter in yogurt from utensils, human hands, atmosphere and starter culture during handling, and repeated transfer, as reported by Mohanan *et al.* (1985). The present investigation do not exceed the range of yeast counts those reported for misti-yogurt of Calcutta by Ghosh and Rajorshia (1987).

The finding of this study revealed that the Laboratory made yogurt might be superior to different Market made yogurt. However, Dayamoy and Anil Gosh were in 2nd and 3rd position for quality yogurt preparation. The wide variation was found among

the market yogurt, due to disorganized, lack of awareness to maintain hygienic and nutrition condition of yogurt. Therefore, to make the quality yogurt, every shop is suggested to adopt proper hygienic condition as well as must be avoided in adulteration of milk. So, more studies are needed to establish a standard for yogurt making in Bangladesh.

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