

## Utilization of Jack Fruit Juice in the Manufacture of Yogurt

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**Abstract:** Yogurt samples were prepared by adding 0.5, 10 and 15% jack fruit juice with milk. The quality of prepared yogurt was measured by some organoleptic, chemical and microbiological tests. Smell and taste; body and consistency; color and texture score of yogurt improved due to the addition of jack fruit juice. Addition of jack fruit juice increased the total solids content but decreased the protein, fat and ash content. Yeast cells were higher in jackfruit yogurt (JFY) than plain yogurt. From this study it was suggested that yogurt could be prepared successfully by adding different proportions of jack fruit juice with milk and among of them 5% jack fruit juice yogurt showed little better performance.

**Key words:** Yogurt, jack fruit juice, milk, Bangladesh

### Introduction

Yogurt is one of the fasted growing cultured dairy products through out the world. It got some curative characters also. It was found that this can lower the blood cholesterol level (Mann and Spoerry, 1974). Similarly it helps to control some intestinal disorders like constipation, dysentery etc. (Shahani and Chandan, 1979).

In Bangladesh yogurt is made from whole milk or, sometimes by mixing skim milk powder with whole milk. Generally culture from previous stock is added at the rate of 1.5 to 2.5 % depending on the season of the year. But in western countries a wide variety of yogurt is available. Most common yogurt in those countries is plain yogurt, natural yogurt, flavored yogurt, fruit yogurt, yogurt with nuts, yogurt with pieces of fruits etc. Unfortunately no attempt has been made in our country to prepare yogurt with the addition of fruit juice, fruit pieces or nuts. India has taken so many steps to popularize this product and they are preparing yogurt by using different types of seasonal fruits (Desai *et al.*, 1994). In Bangladesh a wide variety of seasonal fruits are available. It is possible to prepare yogurt by adding seasonal fruits. Mustafa (1997) prepared fruit yogurt in Bangladesh by using different types of fruit juices with milk.

Jack fruit is very popular and cheap national fruit. A huge amount of jackfruit undergoes spoilage during peak production time. So, it will be a great idea if we can prepare yogurt by adding jackfruit juice with milk, if we can do this successfully it will open a new door in dairy business. Hence, the experiment was under taken to prepare yogurt by adding different proportions of jack fruit juice with milk.

### Materials and Methods

Fresh milk was collected from Bangladesh Agricultural University Dairy Farm for yogurt preparation. During each trial quality of milk used for this purposes was evaluated by several physical and chemical tests in the Dairy Technology Laboratory of the Department of Dairy Science. The parameters used to judge the initial quality of milk samples was specific gravity, fat, protein, total solids, acidity and pH value. Specific gravity of milk samples were determined by using Quevenne Lactometer, fat was determined by Babcock method using the procedure of Aggarwala and Sharma (1961). Total solids content was determined by oven drying method as per A.O.A.C. (1980). Protein was determined by formal titration method (Bennenberg *et al.*, 1949). The collected milk was heated to boiling until reduce about 15-20% of original

volume. Jack fruit juice (JFJ) was incorporated at 0.5, 10 and 15% level with milk samples. Thus four different types of yogurt samples were prepared in this experiment and the samples were designated as A (Milk + 0%JFJ), B (Milk + 5%JFJ), C (Milk + 10%JFJ) and D (Milk + 15%JFJ). Juice was added before incorporation with culture as suggested by Gandhi *et al.* (1977). Boiled milk was cooled to about 38-40°C and inoculated with desirable proportion of culture (2%), which was collected from local market. Sugar was added at the rate of 8%. After inoculation samples were incubated at about 37°C until complete coagulation. After coagulation yogurt sample were taken out from the incubator and were kept in refrigeration until further experimental work. The prepared yogurt samples were subjected to physical (smell and taste, body and consistency, color and texture) and chemical (total solid, protein, fat and ash content) and microbiological evaluations (presence of gram positive rods and cocci and yeast cells). Jack fruit juice was also analyzed in the laboratory to know the moisture, total solids, fat, protein and ash content. A.O.A.C. (1982). The yogurt was evaluated for sensory quality by a team of experienced judges. Microbiological parameters were determined by gram staining method as per APHA (1967). All experimental materials were completely homogenous and statistical analysis was done as per Steel and Torrie (1984) by using Completely Randomize Design. Analysis of variance test was done to find out statically differences between the treatments. LSD value was also calculated to see the difference within the means.

### Results and Discussion

**Chemical quality of milk and jack fruit juice:** Average specific gravity of milk sample was  $1.028 \pm 0.0019$  which is within the normal range of specific gravity of milk (1.025-1.035, Eckles *et al.*, 1951). Average fat, SNF, TS and protein content of milk samples were  $3.93 \pm 1.17$ ,  $7.82 \pm 0.12$ ,  $11.75 \pm 0.99$  and  $3.27 \pm 0.53$  % respectively. All the above-mentioned parameters of milk samples were also within normal range. Acidity ( $0.17 \pm 0.01$  percent) and pH value of milk samples were also within normal range ( $6.5 \pm 0.25$ ). The result of chemical composition of milk agrees with several works (Islam, 1984 and Nahar, 2000).

Analysis of JFJ showed that average moisture, total solids, protein, fat and ash content of the sample were  $83.18 \pm 4.71$ ,  $16.51 \pm 0.42$ ,  $1.75 \pm 0.04$ ,  $1.80 \pm 0.12$  and  $0.56 \pm 0.02$  % respectively (Table 1). The result of chemical composition of JFJ agrees with the report of Mondal & Amin (1990).

Table 1: Chemical qualities of milk and jack fruit juice sample

Constituent	Moisture (%)	Total Solid (%)	SNF (%)	Fat (%)	Protein (%)	Ash (%)	Acidity (%)	pH	Specific gravity
Milk	88.25±1.21	11.75±0.99	7.82±0.12	3.93±1.17	3.27±0.53	ND	0.17±0.01	6.5±0.26	1.028±.001
Jack fruit juice	83.18±4.71	16.51±0.42	ND	1.8±0.12	1.75±0.04	0.56±0.02		ND	ND

ND= Not done

Table 2: Comparison of average physical qualities of different type of prepared yogurt.

Constituent	A	B	C	D	SED value	Level of significant
Smell and taste(50)	37.75±8.54	40.75±11.35	40.0±9.13	41.75±6.25	4.95	NS
Body and consistency (30)	23.00±3.85	24.00±7.12	22.75±4.57	23.25±3.50	3.80	NS
Color and texture (20)	16.25±1.50	17.75±2.63	17.00±2.16	16.75±1.50	1.86	NS

NS= Not significant

Table 3: Comparison of average chemical composition of different type of prepared yogurt.

Constituent	A	B	C	D	SED value	Level of Significant
Total solids (%)	25±2.16	29.75±1.75	34.75±1.75	43.50±3.11	1.58	**
Protein (%)	3.89±0.15	3.70±0.04	3.62±0.06	3.58±0.04	0.03	**
Fat(%)	4.26±0.38	3.75±0.53	3.72±0.57	3.70±0.84	0.42	**
Ash (%)	0.825±0.06	0.711±0.44	0.690±0.024	0.687±0.042	0.03	**
Acidity(%)	0.94±0.25	1.00±0.11	0.95±0.06	0.99±0.15	0.11	NS
pH	4.47±0.45	4.42±0.23	4.45±0.17	4.42±0.23	0.17	NS

\*\*Significant at 1% level, \* Not significant

Table 4: Comparison of microbiological condition of different type of prepared yogurt.

Constituent	A	B	C	D	SED value	Level of significant
Gram positive rods (%)	65.75±4.78	61.75±3.30	64.00±3.91	49.75±4.11	2.87	**
Gram positive cocci (%)	33.25±2.75	37.5±2.38	33.75±4.11	41.75±3.09	2.22	**
Yeast(%)	1.75±0.95	2.75±1.70	3.75±2.5	4.5±1.29	1.21	**

\*\*Significant at 1% level

**Physical quality of jack fruit yogurt:** The physical scores for smell and taste, body and consistency, color and texture of different types of yogurt are given (Table 2). Average smell and taste score of yogurt A, B, C and D were 37.75 ± 8.54, 40.75 ± 11.35, 40.00 ± 9.13 and 41.75 ± 6.25 respectively. Highest and lowest smell and taste score were recorded for D and A type yogurt samples. Statistically there was no significant different ( $P > 0.05$ ) within the smell and taste score of different yogurt samples. Although difference was not significant but it was observed that addition of JFJ increased the smell and taste score. Mustafa (1997) and Keating and White (1991) also reported similar results.

The body and consistency score for yogurt A, B, C and D samples were 23.0 ± 3.85, 24.0 ± 7.12, 22.75 ± 4.57 and 23.25 ± 3.50 respectively. Statistically there was no significant difference within the body and consistency score of yogurt samples. The result of body and consistency agrees with the findings of Desai *et al.* (1994) and Mustafa (1997). Both the workers found that body and consistency of yogurt improved due to the addition of fruit juice.

Average color and texture score of A, B, C and D type yogurt samples were 16.25 ± 1.50, 17.75 ± 2.63, 17.00 ± 2.16 and 16.75 ± 1.50 respectively. Statistical analyses showed that there was no significant difference within the color and texture score of yogurt samples. The result of color and texture score agrees with the findings of Mustafa (1997).

**Chemical quality of yogurt:** The data in respect of chemical quality of yogurt samples are presented in Table 3. Average total solids content of A, B, C and D type yogurt samples were 25.0 ± 2.16, 29.97 ± 1.75, 34.75 ± 1.71 and 43.50 ± 3.11 % respectively. Addition of JFJ significantly ( $p < 0.01$ ) increased the total solids content of yogurt sample. On the other hand fat, protein and ash content of yogurt samples decreased due to the addition of JFJ with milk. JFJ contain more total solids than milk and for this reason addition of JFJ increased the

total solids content of yogurt samples. Similarly JFJ had lower amount of fat, protein and ash. For this reason addition of JFJ decreased the fat, protein and ash content of yogurt. The result of total solids, fat, protein and ash content of yogurt samples agrees with the findings of Desai *et al.* (1994) and Mustafa (1997).

The average acidity content of yogurt A, B, C and D samples were 0.94 ± 0.25, 1.00 ± 0.11, 0.95 ± 0.06 and 0.99 ± 0.15 % respectively. Statistical analysis showed that the differences between the acidity of different yogurt samples did not differ significantly. Addition of JFJ increased the acidity percentage slightly. This was due to quick fermentation nature of JFJ. Mustafa, (1997) and Desai *et al.* (1994) reported that fruit juice initiates quick fermentation in yogurt and for this reason acidity of yogurt increased due to the addition of Jack fruit juice. Similar type of result was seen for pH value of dahi samples. pH value decreased little due to the addition of JFJ with whole milk for making yogurt. The result agrees with the work of Nilufar (1999) who found that due to addition of mango juice acidity of yogurt increased and pH value decreased correspondingly.

**Microbiological parameters:** Percentage of gram-positive rods, gram-positive cocci and yeasts are presented in Table 4. Percentage of gram-positive rods and cocci of sample A, B, C and D were 65.75 ± 4.78, 33.25 ± 2.75, 61.75 ± 3.30, 37.5 ± 2.38, 64.0 ± 3.91, 33.75 ± 4.11 and 49.75 ± 4.11, 41.75 ± 3.09 respectively. Statistical analysis showed that significant ( $P < 0.01$ ) difference existed within the gram-positive rods and cocci content of different yogurt samples. The ratio of gram positive rods and cocci in sample A, B, C and D were 1:1.97, 1:1.64, 1:1.89 and 1:1.19 respectively. It was reported that majority of rods and cocci in yogurt are *Lactobacillus bulgaricus* and *Streptococcus thermophilus* (Bracquart, 1981). Proper ratio of rods and cocci are generally important for preparing cultured dairy products to ensure

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better quality (Devis *et al.*, 1971, Driessen *et al.*, 1982). Persic (1991) showed that ratio of cocci and rods in good quality yogurt samples were 1:1 to 1:2.7. From another experiment Mustafa (1997) found similar results.

Yeast cells of yogurt sample A, B, C and D were  $1.75 \pm 0.95$ ,  $2.75 \pm 1.70$ ,  $3.75 \pm 2.5$  and  $4.5 \pm 1.29$  % respectively. Statistical differences within the yeast content of different yogurt samples were significant ( $P < 0.01$ ). Dastum (1956), Hendricks and Deconick (1964) reported that yogurt should not contain yeast cells. Yeast cells found in the present yogurt samples must be due to contamination. Addition of JFJ increased the yeast content of yogurt samples. Similar type of result was obtained by Mustafa (1997).

From the overall analysis of the result it is clear that good quality yogurt could be prepared by adding jack fruit juice with milk. This new product will help to utilize seasonal fruit to some extent. Jackfruit juice could be preserved in frozen condition and possible to use throughout the year for yogurt preparation. Although it is very difficult to arrive at a suitable decision about the appropriate level of JFJ to be used for making yogurt from this single piece of work but it appears that 5% level of JFJ showed better performance.

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