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Quality Evaluation of Market Yoghurt /Dahi

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Abstract: This study was planned to evaluate and compare the quality of market yoghurt and dahi. Different samples of plant made yoghurt and dahi available in local markets of Islamabad and Rawalpindi were randomly collected and analyzed for physico- chemical, microbiological and organoleptic properties. Physico-chemical analysis revealed that plant made yoghurt samples were consistent and hardly showed any variation as compared to dahi. Microbiological examination showed that total viable count in yoghurt brands was less than dahi. The coliform count was nil or ignorable in yoghurt brands but dahi contained large number of coliform bacteria. Organoleptically, plant made yoghurt was found more suitable as compared to dahi.

Key words: Physico-chemical, Microbial quality, yoghurt, dahi

Introduction

Yoghurt is perhaps the oldest fermented milk product known and consumed by large segments of our population either as a part of diet or as a refreshing beverage. It is nutritiously balanced food containing almost all the nutrients present in milk but in a more assimilable form. It is believed that yoghurt has valuable therapeutic properties and helps curing gastrointestinal disorders (Athar, 1986).

Yoghurt is derived from Turkish Word "Jugurt" reserved for any fermented food with acidic taste. It involves the use of specific symbiotic/mixed culture of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* (Kon, 1959). However, when culture is undefined, the product is called as dahi and contains mixture of various strains of lactic acid bacteria. Thus the quality of dahi may vary with the type of starter culture used (Masud *et al.,* 1991). Yoghurt has assumed different forms in the market. In Pakistan, two main types are set and stirred yoghurt. Of all the varieties set yoghurt with a rather firm body is most common.

The quality of yoghurt/dahi in local market varies from shop to shop as there is no well described standard for these fermented products. However, meanwhile people are becoming more conscious about the quality of these fermented products. Poor quality milk, unhygienic practices associated with the process involved and the use of "wild type" of starter culture give rise to poor grade dahi having six to twelve hours shelf-life only. The alfresco-vending, loose unpacked availability and hence contamination there upon further deteriorates keeping quality (Aziz, 1985). So to ensure the proper quality of yoghurt/dahi, there should be a complete check on the yoghurt and dahi sold in local markets. In Pakistan, dahi is prepared without any care of quality control and hygienic conditions and contains lot of contaminants, which may be health hazards. At the same time various means and methods are adopted in its preparation so there can be seen a lot of variation among the quality of this product.

A practical approach towards the quality of yoghurt/dahi is to evaluate the different samples of yoghurt and dahi sold in local markets. Research in the field of quality evaluation of market yoghurt/dahi is the basic need to create awareness among common people about the existing situation and protect the consumers' health and rights. Therefore, this study was designed to evaluate market yoghurt and dahi for physico-chemical, microbiological and organoleptic properties.

Materials and Methods

The research work was conducted at the Dairy Technology Laboratory, Animal Sciences Institute, National Agricultural Research Center, Islamabad.

Collection of samples: Twenty five samples of dahi and ten samples each of various brands of yoghurt viz., A, B, C totaling thirty samples were collected randomly from local market under sterilized conditions during the month of October, 2001 to March, 2002 i.e., winter season and analyzed for physico-chemical, microbiological and organoleptic characteristics.

Product analysis

Physico-chemical Analysis

Fat: Fat was determined by Gerber method as described by Pearson (1976).

Total Solids: Total solids were determined by AOAC method No.925.23 (1990)

pH: pH was measured by Electronic digital type Hana pH meter No. H_1 8416 according to method No. 981.12 of AOAC (1990).

Total Titratable Acidity: Acidity was measured by AOAC method No.947.05 (1990).

Volatile Acidity: Total volatile acidity was measured according to Winton and Winton (1945) with following modifications. A 10 gm sample and 200 ml distilled water was added into distillation flask and volatile acid compounds were distilled off at very low heat into conical flask. Then it was titrated against 0.1N NaOH solution and total volatile acidity expressed as ml percent.

Viscosity: Viscosity of the yoghurt/dahi samples was measured in terms of relative and apparent viscosity i.e. consistency using an improvised consistometer, as described by the Cole- Parmer (2000). This meter works on the principle of measuring resistance to flow under gravitational force. A known quantity (15 grams) of uniformly and consistently stirred sample was allowed to flow under its own weight for 15 seconds. The distance covered by moving edge of each sample was noted and compared with the standard yoghurt (prepared in the laboratory by addition of 0.5 percent gelatin and 2 percent starter culture in pasteurized milk and then incubation at 42 °C). The ratio between the distance traveled by the sample and the standard yoghurt was reciprocated and then converted into percentage of viscosity by multiplying with 100.

Syneresis: Syneresis was measured according to Peri *et al.* (1985).

Microbiological Analysis: The microbiological analysis of samples was carried out for total viable count and coliform count by method as described by Resubal (1977).

Organoleptic Evaluation: All the samples were evaluated for sensory characteristics and overall acceptability by a panel of judges selected from Dairy Technology Lab., NARC, Islamabad using nine point hedonic scale as described by Larmond (1977).

Statistical Analysis: The data obtained was statistically analyzed according to Steel and Torrie (1980).

Results and Discussion

The research was carried out to study the quality of dahi and plant produced various yoghurt brands available in the local markets of twin city Islamabad/ Rawalpindi. Twenty five samples of dahi and ten samples each of various brands of yoghurt viz., A, B and C totaling thirty samples were collected randomly from the local markets under stringent hygienic conditions during the month of October, 2001 to March, 2002 i.e. winter season and were analyzed for physico-chemical, microbiological and organoleptic characteristics.

Physico-chemical analysis

Fat: The fat content of dahi and three brands of yoghurt i.e. A, B and C are shown in Table 1. The average fat content of dahi was 3.75 with a standard deviation of 0.76. The average fat content of brand A yoghurt was 3.5 with standard deviation of 0.02. These results are in accordance with the findings of Athar (1986) who reported 3.5 percent fat in typical plain yoghurt. The average fat content of brand B and C was 2.99 and 2.94 with standard deviation of 0.02 and 0.04, respectively. The results observed confirmed the findings of Hofi *et al.* (1978).

There was hardly any variation in fat content of different samples of plant made yoghurt probably because of good manufacturing practices i.e. hygiene, quality control and standardization of raw milk. But in case of dahi making the starting material i.e. milk is used without quality control or standardization resulting in compositional variation from sample to sample similarly as milk composition vary from day to day or batch to batch.

Total Solids: The total solids content of dahi and three brands of yoghurt i.e. A,B and C are shown in Table 1. The average total solids content of dahi was 13.38 with standard deviation of 1.34. These results are in line with findings of Hofi *et al.* (1978). The average total solids content of A, B and C was 14.96, 12.93 and 15.73 with standard deviation of 0.02, 0.05 and 0.18, respectively. The results are in accordance with the findings of Athar (1986). These results are totally different from those reported by Sarkar *et al.* (1996).

There was hardly any variation in total solids of different samples of plant made yoghurt brands most probably because of standardization of raw milk and quality control measures taken to ensure consistency of end product. But in case of dahi milk is used without subjecting to standardization leading to much variation as observed in total solids content of market dahi samples.

Solid- Not-Fat (SNF): The SNF content of dahi and three brands of yoghurt i.e. A, B and C are shown in Table 1. The average SNF content of dahi was 9.64 with standard deviation of 1.19. Where as the average SNF content of yoghurt A, B and C was 11.47, 9.94 and 12.78 with standard deviation of 0.01, 0.04 and 0.14, respectively. These results are in agreement with the findings of Richter *et al.* (1980).

There was found no significant variation in SNF content of different samples of plant made yoghurt because raw milk is standardized to a fixed SNF content in order to ensure consistency of end product. But in case of dahi raw milk is used without subjecting to standardization. Hence more variation was observed in SNF content of dahi samples.

Table 1: Physico-chemical analysis (Mean±SD) of dahi and yoghurt samples collected from local markets of Rawalpindi/Islamabad

Product	Fat	Total Solids%	SNF%	PH	Titratable Acidity%	Volatile Acidity Ml%	Viscosity %	Syneresis %
Dahi	3.75 ± 0.76	13.38 ± 1.34	9.64 ± 1.19	4.54 ± 0.24	1.16 ± 0.32	0.83 ± 0.23	46.04 ± 31.90	36.8 ± 8.84
Yoghurt								
A	3.50 ± 0.02	14.96 ± 0.02	11.47 ± 0.01	4.55 ± 0.02	0.89 ± 0.02	0.62 ± 0.02	91.9 ± 4.84	25.4 ± 0.81
B	2.99 ± 0.02	12.93 ± 0.05	9.94 ± 0.04	4.57 ± 0.03	0.87 ± 0.04	0.61 ± 0.03	59.0 ± 2.98	29.64 ± 0.52
C	2.94 ± 0.04	15.73 ± 0.18	12.78 ± 0.14	4.35 ± 0.03	1.13 ± 0.05	0.85 ± 0.04	116.2 ± 11.27	22.8 ± 0.92

Table 2: Microbiological analysis (Mean±SD) of dahi and yoghurt samples collected from local markets of Rawalpindi/Islamabad

Product	Total Viable Count *(10^7)	Coliform Count *(10^3)
Dahi	7.34 ± 1.57	4.39 ± 1.08
Yoghurt		
A	5.61 ± 0.06	0
B	3.31 ± 0.09	0.71 ± 0.96
C	6.34 ± 0.04	3.39 ± 0.5

pH: The pH of dahi and three brands of yoghurt i.e., A, B and C are summarized in Table 1. The average pH of dahi was 4.54 with standard deviation of 0.34. Where as the mean pH values of A, B and C brand were 4.55, 4.57 and 4.35 with standard deviation of 0.02, 0.03 and 0.03, respectively. These results are in line with the findings of Salji *et al.* (1985) and Varnam and Sutherland (1994) There was found no significant variation in pH of different samples of plant made yoghurt as compared to dahi because yoghurt is incubated for specific time and temperature to attain desired pH, which is about 4.6 i.e. isoelectric point of casein. In case of dahi proper fermentation conditions are not fully controlled, hence a large variation of pH in the end product is obvious. A decrease in pH with time interval of storage is naturally expected (Ahmad, 1994).

Total Titratable Acidity: The total titratable acidity of dahi and three brands of yoghurt i.e. A, B and C are shown in Table 1. The average acidity of dahi was 1.16 with standard deviation of 0.32. The average acidity of three brands of yoghurt A, B and C were 0.89, 0.87 and 1.13 with standard deviation of 0.02, 0.04 and 0.05, respectively. These results are in accordance with the findings of Davis and Mclachlan (1974).

There was less variation in acidity of different samples of plant made yoghurt as compared to dahi due to controlled incubation and postproduction handling and controlled storage at 4 °C, so acidity remains same throughout all seasons. While in case of dahi uncontrolled incubation and postproduction handling and storage cause increase in acidity during summer and subsequent decrease during winter season.

Volatile Acidity: The volatile acidity of dahi and three brands of yoghurt i.e. A, B and C are shown in Table 1. The average volatile acidity of dahi was 0.83 with standard deviation of 0.23. Where as the mean values of volatile acidity of yoghurt A, B and C were 0.62, 0.61 and 0.85 with standard deviation of 0.02, 0.03 and 0.04, respectively. These results are not agreement with Hofi *et al.* (1978).

There was found no significant variation in volatile acidity of different samples of plant made yoghurt as compared to dahi because defined starter culture is used and controlled postproduction storage prevents the production of excessive acidity. As acidity is strongly correlated with volatile acidity so production of excessive volatile acidity is also inhibited. In case of dahi undefined starter culture containing different species of lactogenic bacteria including *E. coli* results in the production of more acidity and ultimately more volatile acidity. Also due to unchecked post production storage large variation in volatile acidity is naturally there.

Viscosity: The viscosity of dahi and three brands of yoghurt i.e. A, B and C are shown in Table 1. The average viscosity of dahi was 46.04 with standard deviation of 31.90. The average viscosity of yoghurt A, B and C was 91.9, 59 and 116.2 with standard deviation of 4.84, 2.98 and 11.27, respectively.

There was less variation in viscosity of different samples of plant made yoghurt as compared to dahi because stabilizer is usually used at the rate of about 0.5 percent; hence the yoghurt was consistently viscous. Large variation in viscosity of dahi samples may be due to fluctuation in the quality of raw material i.e. milk and non-adherence to good manufacturing practices (GMP).

Syneresis: The syneresis of dahi and three brands of yoghurt i.e. A, B and C is shown in Table 1. The average syneresis of dahi was 36.8 with standard deviation of 8.84. Where as the mean values of syneresis of yoghurt A, B and C was 25.4, 29.64 and 22.8 with standard deviation of 0.81, 0.52 and 0.92, respectively.

There was less variation in syneresis of different samples of plant made yoghurt as compared to dahi due to presence of stabilizer used in manufacture of yoghurt, which binds and holds water from escaping out. Dahi contains no stabilizer so syneresis is more pronounced but some samples of dahi gave little syneresis comparable to yoghurt. It was due to presence of more total solids. Secondly homogenization in case of

Table 3: Organoleptic evaluation (Mean±SD) of dahi and yoghurt samples collected from local markets of Rawalpindi/Islamabad.

Product	Colour	Taste	Flavour	Overall Acceptability
Dahi	6.78 ± 1.40	4.57 ± 1.50	4.28 ± 1.48	4.37 ± 1.41
Yoghurt				
A	9.0 ± 0.00	8.40 ± 0.41	8.20 ± 0.64	8.23 ± 0.55
B	8.9 ± 0.13	7.85 ± 0.41	7.30 ± 0.44	7.53 ± 0.56
C	7.7 ± 0.37	7.10 ± 0.43	6.75 ± 0.31	7.13 ± 0.32

plant made yoghurt further helps in minimizing syneresis.

Microbiological analysis

Total Viable Count: The total viable count of dahi and three brands of yoghurt i.e. A, B and C is shown in Table 2. The mean values of total viable count of dahi and yoghurt A, B and C was 7.34 x 10^7 cfu per ml, 5.61 x 10^7 cfu per ml, 3.31 x 10^7 cfu per ml and 6.34 x 10^7 cfu per ml with standard deviation of 1.57, 0.06, 0.09 and 0.04 respectively . These results are in line with the findings of Davis and Mclachlan (1974).

There was no significant variation in total viable count of different samples of plant made yoghurt as compared to dahi because defined starter culture is used (Kon, 1959) under proper conditions of fermentation for manufacture of yoghurt. But in case of dahi undefined wild starter culture is used in improper ratio and amount. It also contains heterogeneous mixture of lactic acid bacteria (Masud *et al.*, 1991) so total viable count as well as variation, was more in dahi samples.

Coliform Count: The coliform count of dahi and three brands of yoghurt i.e. A, B and C is shown in Table 2. The average coliform count of dahi and three brands of yoghurt A, B and C was 4.39 x 10^3 cfu per ml, 0 per ml, 0.71 x 10^3 cfu per ml and 3.39 x 10^3 cfu per ml with standard deviation of 1.08, 0, 0.96 and 0.5, respectively. In most of yoghurt samples coliform bacteria were absent due to pasteurization of pre-mix prior to its incubation and some samples of yoghurt contained less count of coliform. It might be probably due to contamination at storage and display/sale outlet. Similar results have been reported by Lopez *et al.* (1997) who reported low number of coliforms in yoghurt samples. Also brands in completely sealed containers had the best microbiological quality (Ibrahim *et al.*, 1989). But in case of dahi coliforms were present in all samples, which reflects highly poor hygienic conditions and improper sanitation during manufacturing of dahi.

Organoleptic evaluation: The organoleptic evaluation of dahi and three brands of yoghurt i.e. A, B and C is shown in Table 3. The mean values of over-all acceptability score of dahi and three brands of yoghurt were 4.37, 8.23, 7.53 and 7.13 with standard deviation of 1.41,0.55, 0.56 and 0.32, respectively. These results are different from those reported by Sarkar *et al.* (1996).

There was no significant variation observed in overall acceptability of A, B and C brands of yoghurt as compared to dahi.

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