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Sensory Evaluation of Misti Dahi Prepared from Blending of Soymilk with Buffalo Milk

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Abstract

A study was conducted to evaluate the effect of soy milk on sensory attributes of dahi, which was prepared by using soy milk and milk combinations in various ratios, viz. 100% buffalo milk (A_1), 50% buffalo milk + 25% soy milk (A_2), 50% buffalo milk + 50% soy milk (A_3) and 25% buffalo milk + 25% soy milk (A_4) were tested. In each batch, four levels of sugar was added i.e., B_1 (10%), B_2 (12%), B_3 (14%) and B_4 (16%). After adding of sugar, the each batch was inoculated with starter culture *Lactococcuslactis* subsp. lactis with 2% inoculum (C_1), *Lactococcus lactis* subsp *cremoris* with 2% inoculums (C_2) and *Bifidobacteriumbifidum* 2% inoculums (C_3). These were further divided in two batches and each batch was allowed to incubate at 30°C (D_1) and 37°C (D_2) temperature. After that the storage studied were carried out on fresh product (E_1- 0 days storage), after 7 days storage (E_2) and after 14 days storage (E_3). These samples are stored at 5°C at refrigeration temperature. In sensory attributes the scores of flavor, body and texture, color and appearance and sweetness were determined. The evaluation process replicated thrice. Statistically factorial CRD are applied for analysis of the data. The best sensory quality of *Misti Dahi was* obtained from 100% buffalo milk with 12% sugar by the use of 2% inoculums with *Lactococcus lactis* subsp. *lactics* culture at 37°C incubation temperature and freshly prepared (0 day storage period), while 75% buffalo milk + 25% soy milk also at par in respect of sensory qualities of *Misti Dahi.*

Keywords: Flavour, Misti Dahi, Sensory Quality, Storage Period and Sweetness

1. Introduction

Milk and milk products are important food for vegetarians as these are the only source of animal protein to them. Being perishable by nature it gets spoiled easily if not stored properly or converted into other products. Since time immemorial a significant proportion of milk has been used for preparing a wide variety of dairy delicacies. An estimated 50-55 per cent of milk produced in India is converted into a variety of traditional milk products, using processes such as coagulation, desiccation and fermentation. It is likely that fermentation initially arose spontaneously from indigenous micro flora in milk fortunately the bacteria were *lactococci* and *lactobacilli* which typically suppress spoilage and pathogenic organisms effectively.

Fermentation process not only increases the shelf life of the product but also adds to taste and improves the digestibility of milk. Fermented milk represents an excellent source of nutrients such as calcium, protein, phosphorus and riboflavin. If during fermentation of milk, lactic acid and other organic acids are produced and these increase the absorption of iron. It is consumed at meal times, the acids are likely to have positive effect on the absorption of iron from other foods. Dahi is the most popular and oldest fermented milk product of our country, prepared and utilized in various forms in almost all homes. It is an indispensable item of our Indian diet

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and quite analogous to yoghurt. It is consumed either as a part of the daily diet or as a refreshing beverage. About 7 per cent of the total annual milk produced in India is utilized for making dahi for direct consumption and 14% among the products[1].

Misti Dahi is a popular traditional sweetened fermented milk product. The eastern parts of India, especially in West Bengal, Assam, Bihar and Orissa the sweetened variety of *dahi* known as *Misti Dahi,* Lal *Dahi* of *Payodhi*is quite popular. Soy milk offers outstanding health benefits. It provide complete protein, high quality fibre, low glycolic index, therefore it can be included in diabetic diet also and has higher concentration of omega 3 fatty acids which has the ability to lower the risk of heart disease and even cancer.

There is a great potential for commercialization of spiced RTS beverages as natural health drinks from major and under exploited fruits not only in domestic but also at the export front. The present study portrays the nutrient content of spiced pineapple ready-to-serve beverages during fresh period. The pineapple RTS beverages were processed with extracts of ginger, green chillies, pepper, cardamom and nutmeg. The combined spices extracts such as ginger + pepper, ginger + cardamom and ginger + nutmeg were blended with pineapple juice and prepared the RTS beverages[2]. Pinni is milk based composite sweet having dark brown colour, granular in texture. The product is rich source of nutrients derived from milk solids as well as goodness of gram flour, wheat flour, dry fruits etc according to the variants. Pinni is one of the important composite dairy based sweets popular in northern part of India, particularly in Punjab and Haryana region despite the fact that it is a common and most popular traditional dairy product, scanty or no scientific information is available about it[3]. Therefore, the use of soy milk for making *Misti Dahi* becomes requirement of the day as it will not only increase the availability of fluid milk for consumption but it will also increase the nutritive value of *Misti Dahi* prepared from blending of soy milk with buffalo milk is the subject matter of this manuscript.

2. Materials and Methods

The experiment was conducted during two consecutive years 2012 and 2014 at Department of Animal Husbandry and Dairying, C.S. Azad University of Agriculture and Technology, Kanpur – 208002. The sensory evaluation of *Misti Dahi* was the main objective of the experiment. Fresh clean buffalo milk was obtained from the University Dairy of C.S. Azad University of Agriculture and Technology Kanpur. It was strained through two fold clean muslin cloth to remove extraneous matter Raw milk was pre heated to 40-50°C and separated in centrifugal separator, Model No. 104 manufactured by De level separator company *Pongalkepsic*. The separated milk, thus obtained was used for standardization of milk. The soybean kernels were obtained from vegetable Research Farm, Kalyanpur, C.S. Azad University of Agriculture and Technology, Kanpur-208024. The kernels were soaked in tap water (1: 3 w/v) for 14-16 hours at room temperature (22-30°C). The hydrates were rubbed between the palms to dehull manually followed by rinsing with water to separate hulls. Remove off flavor and to inactivate *hypoxygenase* enzyme, the dehulled kernels were dipped in hot water (95°C) with 0.1% sodium chloride for 30 minutes. After that the kernels were grinded in a mixer for 3 minutes using hot water (95°C) to extract maximum solids. The kernels to water ratio was kept 1:9 (w/v) for grounding. The slurry thus obtained was filtered through a double layered muslin cloth. The soy milk thus obtained was boiled for 5 minutes and was further used for blending with buffalo's milk.

For preparation of *Misti Dahi,* 8 liters of pure buffalo milk and 4 liter 800 ml soy milk was boiled for 3 to 5 minutes and cooled to 10°C. Buffalo milk was taken and four combination of buffalo milk with soy milk were made i.e., 100% buffalo milk (control – A_1) 75% buffalo milk, 50% buffalo milk and 25% buffalo milk with 25% soymilk (A_2) 50% soymilk (A_3) and 75% soymilk (A_4) respectively. In each batch four levels of sugar was added i.e., 10% (B_1) 12% (B_2) 14% (B_3) and 15% (B_4). The each batch was inoculated with starter culture *Lactococcuslactis subsp. cremoris* (C_2) and *Bifidobacteriumbifidum* with 20% inoculums. They were distributed in 100 ml capacity of plastic cups. These plastic cups were further divided in two batches. Each batch was allowed to incubates at 30°C (D_1) and 37°C (D_2) temperature. The prepared *Misti Dahi* was stored at refrigeration temperature. Storage studies were carried out on fresh product (E_1) and after days 7 (E_2) and 14 days (E_3) interval period.

The sensory evaluation of *Misti Dahi,* prepared by using different type of milk, starter cultures and levels of inoculation, temperature and incubation periods, was done organoleptically. The flavor, body and texture color

and appearance and sweetness were evaluated by panel of judges comprising of five most experienced members from Animal Husbandry and Dairying Department of University. The *Misti Dahi* was evaluated on nine point hedonic scale. The scores were compiled and average score was estimated for attributes of samples. The samples were rated under the score of 8-9 (excellent), 7-8 (very good), 6-7 (good), 5-6 (fair) and < 5 (poor) for quality attributes. Statistical analysis (ANOVA) was done according to the procedure described by[4].

3. Results and Discussion

3.1 Effect of Different Treatment on Flour of Misti Dahi

The results displayed highly significant differences in the flavor of different category of *Misti Dahi* prepared from various types' milk. The highest mean value of *Misti Dahi* flavor was noted in A_1 (6.50) treatment followed by A_2 (6.12). The least value of *Misti Dahi* flavor was computed under A_4 (5.47). It was observed that the sugar levels significantly differ to the flavor of *Misti Dahi.* The highest score was found in B_2 (6.23) over the B_1 (6.05), B_3 (5.89) and B_4 (5.71), which showed significant superiority over other tested levels of sugar. The highly significant differences were noticed among the different type of starter culture with 2% inoculums. The highest value was found under C_2 (6.56) treatment followed by C_1 (6.21) and C_3 (5.14). The mean score of two incubation temperature were observed as 5.85 and 6.08 at D_1 and D_2 treatments, respectively. This was significantly differed from each other the average values of flavor of *Misti Dahi* affected by different storage periods. The significant highest score in E_1 (6.48) followed by E_2 (6.02) and E_3 (5.4). Under interaction effect it was observed that out of all 288 combinations of A, B, C, D and E the highly significant differences were noticed. The combination of 100% pure buffalo milk, 12% sugar level, *Lactococuslactis* subsp *cremois* culture, 37°C incubation temperature and 0 day storage (A_1 B_2 C_2 D_2 E_1) showed the maximum liking score (8.20) for *Misti Dahi,* while the minimums (3.90) was recorded in case of *Misti Dahi* prepared from the combination of 25% buffalo milk, 75% soymilk, 16% sugar level, *Bifidobacteriumbifidum* culture, 30°C incubation temperature and 14 days storage period (A_4 B_4 C_4 D_1 E_3).

3.2 Effect of Different Treatments on Body and Texture of Misti Dahi

Perusal of results make it clear that the significantly highest value of body and texture of *Misti Dahi* was recorded in A_1 (7.04) followed by A_2 (6.71), A_3 (6.32) and A_4 (6.03). Thus, all the treatments were found significantly differ from each other. The levels of sugar were also noted significantly differ. The highest score was recorded in B_2 (6.78) followed by A_1 (6.64), B_3 (6.43) and B_4 (6.24). All the sugar levels were significantly different from each other. The average values of body and texture of *Misti Dahi* also affected by different starter culture with 2% inoculums. The average values of these three levels were recorded as 6.97, 6.54 and 6.07 at C_1, C_2 and C_3 respectively. This indicates that body and texture score of *Misti Dahi* varied significantly from one level of culture to another. The significant differences were noticed among the different incubation temperatures. The highest score recorded under D_2 (6.71) treatment which was significantly superior to D_1 (6.3 4). The average scores of body and texture of *Misti Dahi* under storage periods were computed as 7.02, 6.57 and 5.98 at E_1, E_2 and E_3 treatments, respectively, which were significantly differ from each other (Table1).

It is clear from the treatment combinations of A, B, C, D and E that that the highly significant differences were noticed among the different interaction between A x B x C x D x E. The combination of 100% pure buffalo milk, 12% sugar level, *Lactococcuslactis subsp. Lactis*culture 37°C incubation temperature and 0 day storage period (A_1 B_2 C_1 D_2 E_1) showed the maximum liking score (8.30), while the minimum liking score (4.55) of *Misti Dahi* was observed from combination of 25% buffalo milk with 75% soymilk, 16% sugar level, *Bifidobacteriumbifidum* culture, 30°C incubation temperature and 14 days storage period (A_4 B_4 C_3 D_1 E_3).

3.3 Effect of Different Treatments on Color and Appearance of Misti Dahi

The data showed highly significant difference among the different type *Misti Dahi* prepared from the different type milk. The highest score of color and appearance was noted in A_1(7.04), while lowest was computed in A_4 (6.33). The highest score of color and appearance in *Misti Dahi* under sugar combination was found in B_2 (6.68) followed by

B_1 (6.60) treatment. Treatment B_4 of sugar combination showed the least score of color and appearance in *Misti Dahi*. Highly significant differences were noticed among the different types of starter cultures with 20% inoculums used for preparation of *Misti Dahi*. It was observed that the color and appearance score of *Misti Dahi* varied from significantly from one level of culture to another. It was highest under C_1 (6.99) treatment and lowest under C_3 (6.04) treatment. The highly significant differences were noticed among the different incubation temperatures on color and appearance of *Misti Dahi*. The highest score was noted in D_2 (6.67) and lowest was found under D_1 (6.35). The average score of color and appearance of *Misti Dahi* were affected by different storage periods. The highest score of color and appearance of *Misti Dahi* was noted in E_1 (6.97), which were significantly superior over the other two tested treatment (Table 1).

The interaction effect of 288 combinations of A x B x C x D x E showed the significant difference in color and appearance of *Misti Dahi*. The combination of 100% pure buffalo milk, 12% sugar level, *Lactococcuslactis* subsp. lactis culture, 37°C incubation temperature and 0 day storage period (A_1 B_2 C_1 D_2 E_1) showed the maximum liking score (8.15) but A_1 B_2 C_1 D_2 E_1 score was statistically at par to A_1 B_2 C_1 D_1 E_1 and A_1 B_2 C_2 D_2 E_1 treatments, both treatments maintained the score by 8.10. The minimum liking score (4.35) of color and appearance of *Misti Dahi* was observed from combination of 25% buffalo milk with 75% soymilk, 16% sugar level, *Bifidobacteriumbifidum* culture, 30°C incubation temperature and 14 days storage period (A_4 B_4 C_3 D_1 E_3).

3.4 Effect of Different Treatments on Sweetness Score of *Misti Dahi*

The highly significant differences in sweetness were found among the different types *Misti Dahi* prepared from pure buffalo milk and mixture with soymilk in buffalo milk the highest score was found in A_1 (6.92) and lowest and recorded under treatment A_4 (5.73). The score of other two treatments was computed between these two limits. The average score of different levels of sugar were observed as 6.47, 6.58, 6.25 and 6.05 in B_1, B_2, B_2 and B_4 treatments,

Table 1. Average score of flavor, sugar level, 2% inoculums, body and texture color appearance and sweetness of Misti Dahi under main effect of different treatments

Treatments	Flavor	Body and texture	Color and appearance	Sweetness
Pure buffalo milk (A_1)	6.50	7.04	7.04	6.92
75% buffalo milk + 25% soymilk (A_1)	6.12	6.71	6.71	6.55
50% buffalo milk + 50% soymilk (A_3)	5.79	6.32	6.33	6.14
25% buffalo milk + 75% soymilk (A_4)	5.47	6.03	5.96	5.73
10% sugar level (B_1)	6.05	6.64	6.60	6.47
12% sugar level (B_2)	6.23	6.78	6.68	6.58
14% sugar level (B_3)	5.89	6.43	6.42	6.25
16% sugar level (B_4)	5.71	6.24	6.22	6.05
Lactococcuslactus subsp. lactis 2% inoculum (C_1)	6.21	6.97	6.99	6.81
Lactococcuslactus subsp. cremoris with 2% inoculum (C_2)	6.56	6.54	6.49	6.29
Bifido bacterium bifidum with 2% inoculum (C_2)	5.14	6.07	6.04	5.92
30°C incubation temperature (D_3)	5.85	6.34	6.35	6.17
37°C incubation temperature (D_2)	6.08	6.71	6.67	6.51
0 day storage period (E_1)	6.48	7.02	6.97	6.80
7 day storage period (E_2)	6.02	6.57	6.48	6.39
14 day storage period (E_3)	5.41	5.90	6.08	5.82
C.D. 5% A	0.01	0.01	0.01	0.01
C.D. 5% B	0.01	0.01	0.01	0.01
C.D. 5% C	0.01	0.01	0.01	0.01
C.D. 5% D	0.01	0.01	0.01	0.01
C.D. 5% E	0.01	0.01	0.01	0.01

respectively. The above data indicate that the highest sweetness was available in *Misti Dahi* under B_2 treatment and lowest sweetness recorded in B_4 treatment. The significant difference in the score of starter cultures with 2% inoculums was observed. The highest score was found in C_1 (6.81) treatment and lowest score recorded under C_3 (5.92). Significant differences were recorded among the different incubation temperature. The treatment D_2 (6.51) showed the highest score and least averaged in D_4 (6.17). The results displayed significant different among the different storage period. The highest value in E_1 (6.80) treatment and lowest score was computed under E_3 (5.82) treatment (Table 1).

The interaction effect of different treatment combination was computed. Out of all 288 combination of A, B, C, D and E factors, the combination of 100% pure buffalo milk, 12% sugar level, *Lactococcuslactis* subsp. lactus culture, 37°C incubation temperature and 0 day storage period (A_1 B_2 C_1 D_2 E_1) showed the maximum liking score (8.10), while the minimum liking score (4.10) of *Misti Dahi* was recorded from the combination of 25% buffalo milk with 75% soymilk, 16% sugar level, *Bifidopacteriumbifidum* culture, 30°C incubation temperature and 14 days storage period (A_4 B_4 C_3 D_1 E_1).

On the basis of sensory evaluation it was observed that all the parameters like flavor, body and texture, color and appearance and sweetness described with the increased levels of soymilk. Similar findings were also observed[5,6]. The study of[7] also indicated that the blended soymilk with buffalo milk for the preparation of *Misti Dahi* decrease all the sensory qualities but 25% soymilk + 75% buffalo milk cured was at par with the curd from 100% buffalo milk and superior over other blends. The decrease in sensory evaluations with the increase of soymilk may be due to the reduction in fat percentage and total solids along with pungent smell of the soymilk.

4. Conclusion

A novel type *Misti Dahi* has been prepared by the combination of 100% pure buffalo milk, 12% sugar level, *Lactococcuslactis* subsp. *Lactis* culture, 37°C incubation temperature and 0 day storage period.

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