IJFANS

Volume 01, Issue 01, Oct-Dec 2012, www.ijfans.com ISSN: 2319-1775

International Journal of Food And Nutritional Sciences

Official Journal of IIFANS

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IJFANS International Journal of Food And Nutritional Sciences

INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES

ISSN 2319 – 1775 www.ijfans.com
Volume 01, Issue 01, Oct-Dec 2012

RESEARCH PAPER OPEN ACCESS

EFFECT OF LACTIC ACID BACTERIA AND PROBIOTICS ADDED SHRIKHAND: AN INDIGENOUS MILK PRODUCT

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ABSTRACT

The investigation was conducted to study the sensory quality of shrikhand by the addition of probiotics as well as lactic acid bacterial isolates as a starter culture, instead of using curds as a starter culture. The most commonly used probiotics are Lactobacillus acidophilus, Lactobacillus sporogens and Lactobacillus rhamnosus and in combinations like Lactobacillus acidophilus + Lactobacillus sporogens. The different lactic acid bacterial isolates were obtained from cattle milk, buffalo milk and dairy milk also used as starter culture. The Shrikhand samples were tested for organoleptic characteristics of the product. Results revealed that the the highest score was recorded with combinations of probiotics i.e. Lactobacillus acidophilus + Lactobacillus sporogens, and the lowest score was recorded in Lactobacillus rhamnosus in terms of colour, appearance, aroma, texture, taste and overall acceptability of the product and lactic acid bacterial isolates using cattle milk isolates recorded highest score followed by dairy milk and buffalo milk.

INTRODUCTION

The role of fermented milk in human nutrition is well documented and the virtues of these products were known to man even during the ancient days of civilization The medicinal and nutritional properties of various fermented foods have been experienced by several generations. However, the scientific community gave impetus to these beliefs in 1910, when Eli Metchnikoff suggested that man should consume milk fermented with lactobacilli to prolong his life. He postulated the desirable bacteria in the bulgarian milk that could help in suppressing the undesirable and disease causing bacteria in the intestine of human beings. The observation proved

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the way for exploring the potentials of lactic cultures and cultured products in the alleviation of human and animal disorders. The consumer's interest in fermented milk products is gaining momentum due to the development of new food processing techniques, changing social attitudes; scientific evidence of health benefits of certain ingredients [12, 5]. Milk products also serve as the important delivery vehicles for probiotic bacteria. The probiotic bacteria have a long history of association with dairy products. This is because some of the same bacteria that are associated with fermented dairy products also make their homes in different sites on the human body, including the mouth, the gastrointestinal tract etc. Some of these microbes, therefore, can play a dual role in transforming milk into a diverse array of fermented dairy products (Shrikhand, yoghurt, cheese, kefir, etc.), and contributing to the important role of colonizing bacteria. The growing interest of consumers towards therapeutic products has led to incorporation of probiotic cultures in different milk products. The probiotic bacteria used in commercial products today are mainly members of the genera Lactobacillus and Bifidobacterium [3]. Shrikhand is one such milk product which had it's origin in Western India. The popularity of this product is mainly in the states of Gujarat, Maharastra and Northern parts of Karnataka. It is obtained from curd by partial draining of whey, to which sugar, fruits and nuts are added. The product is popular especially in summer and served as a dessert in ceremonial functions. Therefore, the present study was undertaken with the objective to study the effect of lactic acid bacterial isolates and probiotics as starter cultures on the quality of shrikhand by their physico-chemical characteristics.

MATERIAL AND METHODS

Three different types of milk i.e. cattle milk, buffalo milk and the commercially available dairy milk were used in the preparation of shrikhand. The lactic acid bacteria (LAB) was isolated from shrikhand prepared using these different types of milk. Thus, obtained lactic acid bacterial isolates used as starter culture. In similar fashion, the three different commercially available probiotics i.e. Lactobacillus acidophilus, Lactobacillus sporogenes and Lactobacillus rhamnosus are also used as starter culture alone or in combination probiotics. (Figure 1)

Isolation of Lactic Acid Bacteria from Shrikhand

Lactic acid bacteria (LAB) were isolated from shrikhand prepared using cattle milk, buffalo milk and commercially available dairy milk by standard plate count technique using Mann, Rogosa and Sharpe's (MRS) agar medium (4). Lactic acid bacterial colonies i.e. cattle milk (C1, C3 and C4), buffalo milk (B1) and dairy milk (D1, D2 and D4) thus obtained were purified and maintained in MRS broth for further preparation of shrikhand instead of using curd as starter culture.

Sensory evaluation

Shrikhand prepared using cattle milk, buffalo milk and dairy milk by adding curd, lactic acid bacterial isolates and probiotics as stater culture were evaluated by a selected panel of 10 members, which was based mainly on the appearance, colour, aroma,

taste and overall acceptability of the product.

Sample presentation for Sensory evaluation

Prior to tasting, each sample was coded and placed in a random manner, different shrikhand samples were placed along with water (to rinse the mouth) in the laboratory, and panelists were instructed to evaluate each sample by blind tasting as per the standard score card for organoleptic evaluation.

RESULTS AND DISCUSSION

Sensory evaluation of shrikhand prepared using curd as starter culture

The mean ranks of shrikhand prepared using cattle milk, buffalo milk and dairy milk with respect to appearance, aroma, texture, taste and overall acceptability are given in (Table 1).

Results revealed that highest score was recorded in shrikhand prepared using cattle milk (4.60 out of 5.00) and the lowest score was recorded in Shrikhand prepared using dairy milk (4.30 out of 5.00) in terms of colour, appearance, aroma, texture, taste and overall acceptability of the product. The shrikhand prepared using cattle milk recorded highest score, may be due to the graininess and curdiness and also due to the addition of sugar acting as a sweetening agent and the lowest score was recorded in dairy milk and buffalo milk due to the its non palatability, coarse, grainy, lumpy, curdy and dull look. The results obtained from the present investigation are in concurrence with the findings of Salunke et al. (2006). The overall acceptability of shrikhand prepared using cattle milk recorded highest scores, this might be due to its semi-solid consistency and a characteristic firmness and pliability contributing to its suitability for consumption and the lowest scores were found in buffalo milk due to its coarse texture and graininess. Similar results were reported by Rameshwar (2006).

Sensory evaluation of shrikhand prepared using lactic acid bacterial isolates as starter culture

Shrikhand prepared using cattle milk, buffalo milk and dairy milk with addition of lactic acid bacterial (LAB) isolates i.e. B1 (Lactic acid bacteria isolated from buffalo milk), D1, D2 & D4 (Lactic acid bacteria isolated from dairy milk) and C1, C3& C4 (Lactic acid bacteria isolated from cattle milk) as a starter are given in (Table 2). The Shrikhand samples prepared using lactic acid bacterial isolates were tested for organoleptic characteristics of the product. Results revealed that, the highest score was recorded with LAB isolates i.e. C1, C3 & C4 obtained from cattle milk (3.80, 3.80 and 3.90 out of 5.00), followed by lactic acid bacterial isolates obtained by buffalo milk i.e. B1 (3.20 out of 5.00) in terms of colour, appearance, aroma, texture, taste and overall acceptability of the product. Similar observation were recorded by Rameshwar (2006), who also reported that the shrikhand has a typical semi solid consistency showing a characteristic firmness and pliability contributing to its suitability for consumption with puri and bread. Similar results were obtained by Salunke et al. (2006), Jain et al. (2003) and Patel and Chakraborty (1985) who reported that varying levels of fat, moisture and sugar had the least effect on colour but had a profound effect on appearance, flavour, body and textural properties of shrikhand.

Similar findings were also reported by Rao et al. (2000) that the lactic acid bacteria employed in the manufacture of fermented product altered the sensory characteristics and thereby improved the nutritive as well as commercial value of raw milk.

Organoleptic evalution of shrikhand prepared using probiotics as a starter culture

The most commonly used probiotics are Lactobacillus acidophilus, Lactobacillus sporogenes and Lactobacillus rhamnosus alone and in combinations with Lactobacillus acidophilus + Lactobacillus sporogenes. The Shrikhand samples were tested for organoleptic characteristics of the product are given in (Table 3, 4, 5 and 6). Results revealed that the Shrikhand prepared using probiotics as starter culture, the highest score was recorded with combinations of probiotics i.e. Lactobacillus acidophilus + Lactobacillus sporogenes in cattle milk followed by dairy milk and buffalo milk (4.40, 3.80 and 3.60 out of 5.00) and the in terms of colour, appearance, aroma, texture, taste and overall acceptability of the product and the lowest score was recorded in Shrikhand prepared using Lactobacillus rhamnosus in cattle milk followed by dairy milk and buffalo milk (2.60, 1.90 and 1.60 out of 5.00) in terms of colour, appearance, aroma, texture, taste and overall acceptability of the product. These results are in conformation with the findings of Bajad et al. (2006); Nalawade, 1998 and Desai and Gupta (1986).

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Figure 1: Flow diagram illustrating the preparation of shrikhand

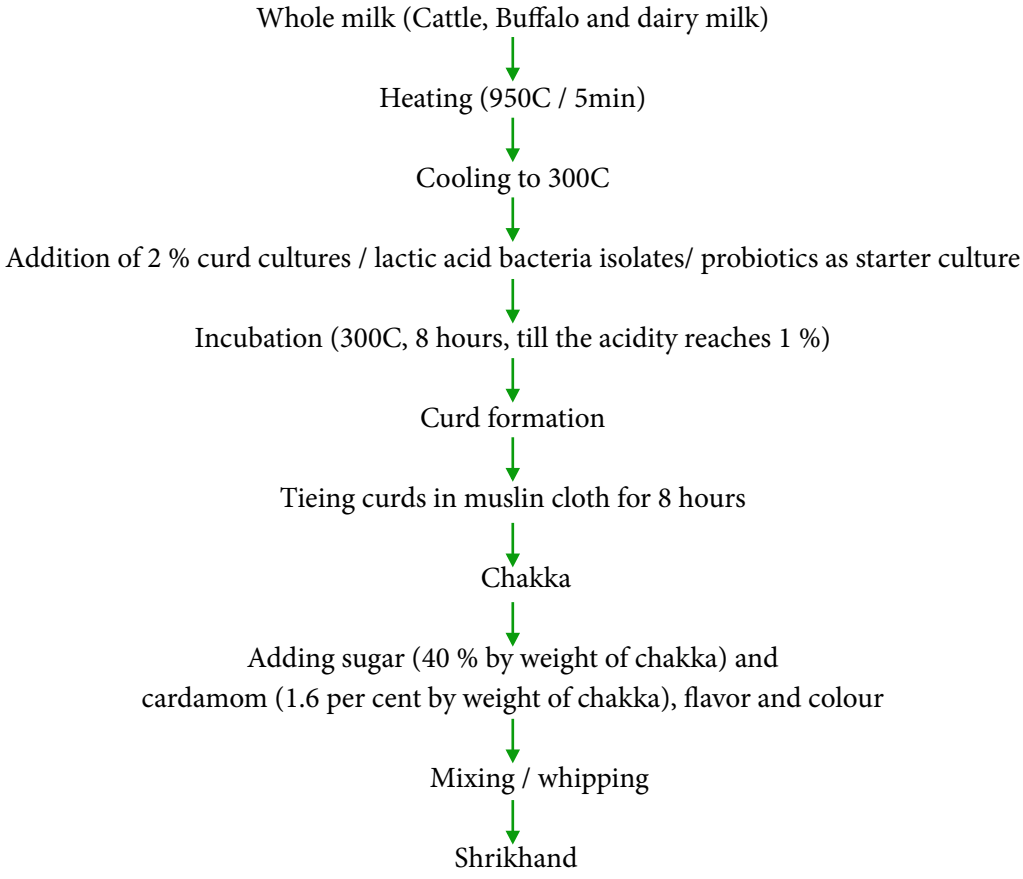

Table 1: Sensory evaluation of shrikhand prepared using curd as starter culture

Milk samples	Appear-ance	*Aroma*	Texture	Taste	Overall
Cattle milk	4.8	4.8	4.8	4.7	4.6
Buffalo milk	4.7	4.6	4.6	4.5	4.4
Dairy milk	4.7	4.4	4.6	4.6	4.3

*Each value is an average of 10 replications (10 persons)
*Scale: 5- Liked extremely; 4-Liked; 3-Neither liked nor disliked; 2-Disliked; 1-Disliked extremely

Table 2: Sensory evaluation of shrikhand prepared using lactic acid bacterial isolates as starter culture

Treat-ments	Appear-ance	*Aroma*	Texture	Taste	Overall accept-ability
C1	3.8	3.8	3.9	3.7	3.8
C3	3.8	3.8	3.7	3.8	3.8
C4	3.8	3.9	3.3	3.8	3.9
B1	3.6	3.4	3.6	3.6	3.2
D4	3.8	3.5	3.3	3.5	3.5
D2	3.7	3.5	3.2	3.5	3.7
D1	3.7	3.7	3.6	3.6	3.6

LAB: Lactic acid bacteria
*Each value is an average of 10 replications (10 persons)
*Scale: 5- Liked extremely; 4-Liked; 3-Neither liked nor disliked; 2-Disliked; 1-Disliked extremely
B1 : Lactic acid bacteria isolated from buffalo milk.
D1, D2 & D4 : Lactic acid bacteria isolated from dairy milk
C1, C3& C4 : Lactic acid bacteria isolated from cattle milk

Table 3: Sensory evaluation of probiotic (*Lactobacillus sporogenes*) added shrikhand.

Milk Samples	Appearance	*Aroma*	Texture	Taste	Overall acceptability
Cattle milk	3.9	3.8	3.7	3.8	3.8
Dairy milk	3.6	3.6	3.6	3.7	3.6
Buffalo milk	3.5	3.5	3.5	3.6	3.6

*Each value is an average of 10 replications (10 persons)
*Scale: 5- Liked extremely; 4-Liked; 3-Neither liked nor disliked; 2-Disliked; 1-Disliked extremely.

Table 4: Sensory evaluation of probiotic (*Lactobacillus acidophilus*) added shrikhand

Milk Samples	Appearance	*Aroma*	Texture	Taste	Overall acceptability
Cattle milk	4.2	4.3	4.0	4.2	4.2
Dairy milk	3.9	4.0	3.7	3.7	3.7
Buffalo milk	3.7	3.6	3.8	3.5	3.8

*Each value is an average of 10 replications (10 persons)
*Scale: 5- Liked extremely; 4-Liked; 3-Neither liked nor disliked; 2-Disliked; 1-Disliked extremely.

Table 5: Sensory evaluation of probiotic (*Lactobacillus rhamnosus*) added shrikhand

Milk Samples	Appearance	*Aroma*	Texture	Taste	Overall acceptability
Cattle milk	2.6	2.7	2.4	2.4	2.6
Dairy milk	2.5	2.1	2.3	2.0	1.9
Buffalo milk	2.0	1.7	1.6	2.0	1.6

*Each value is an average of 10 replications (10 persons)
*Scale: 5- Liked extremely; 4-Liked; 3-Neither liked nor disliked; 2-Disliked; 1-Disliked extremely

Table 6: Organoleptic evaluation of probiotic (*Lactobacillus sporogenes*+ *Lactobacillus acidophilus*) added shrikhand.

Milk Samples	Appearance	*Aroma*	Texture	Taste	Overall acceptability
Cattle milk	4.6	4.5	4.3	4.5	4.4
Dairy milk	4.2	4.0	4.2	3.8	3.8
Buffalo milk	3.7	3.6	3.6	3.6	3.6

*Each value is an average of 10 replications (10 persons)
*Scale: 5- Liked extremely; 4-Liked; 3-Neither liked nor disliked; 2-Disliked; 1-Disliked extremely.