

## Research Article

# Studies on shelf life of developed mango pulp based shrikhand incorporated with soy milk at refrigeration ( $4\pm 1^{\circ}\text{C}$ ) temperature

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## Abstract

The study was conducted to evaluate the shelf life of developed soy milk (20%) incorporated mango pulp (25%) based shrikhand. A constant level of sugar (40%) was used in both control and treated products. Initially, standard plate (SPC) counts ( $\log \text{cfu/g}$ ) in control and soy milk added shrikhand was noticed statistically similar from 0 to 10<sup>th</sup> day, but on 15<sup>th</sup> day of storage SPC in control was significantly ( $p\leq 0.05$ ) higher than treated product. Yeast and mould Counts (YMC) and Psychrotrophic Counts (PC) were not detected initially but PC was detected on 5<sup>th</sup> day and YMC was detected on 10<sup>th</sup> day of storage in both the products. The SPC, YMC and PC were slightly higher in control as compared to soy milk incorporated mango pulp based shrikhand and their counts increased as the storage period increased proportionately. The scores for colour and appearance, flavour, body and texture, sweetness and over all acceptability were found higher in control as compared to soy milk incorporated mango pulp based shrikhand throughout the storage period.

However, all the sensory characteristics decreased as the storage period increased in both the products and were found organoleptically well acceptable till 10<sup>th</sup> day of storage. It is concluded that developed soy milk incorporated (20%) mango pulp based shrikhand was within the safety limits microbiologically and well acceptable organoleptically up to 10 days of refrigeration ( $4\pm 1^{\circ}\text{C}$ ) storage.

**Keywords:** Soy milk, mango pulp, shrikhand, refrigeration, shelf life

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## Introduction

Shrikhand is one of the important fermented milk products which derive its name from the Sanskrit word "Shikharani" meaning a curd prepared with added sugar, flavouring agents (Saffron), fruits and nuts. It is prepared by the fermentation of milk by using known strain of lactic acid bacteria, which are widespread in nature and are also found in our digestive system. These lactic acid bacteria are best known for their role in the preparation of fermented dairy products and are excellent ambassadors for an often maligned microbial world. They are not only of major economic significance, but are also of value in maintaining and promoting human health. Lactic acid bacteria decrease serum cholesterol levels, increase vitamin B content in the product [1].

Other natural additives like dried fruits are added to the shrikhand to enhance flavor. It is a common practice of using fruits pulp in preparation of various dairy products like ice cream, yoghurt and shrikhand [2].

With the restricted availability and high cost of animal milk, the scientists have been making attempts to switch over to the utilization of plant proteins. The protein from soybean is cheap and of good quality. It also contains a good amount of vitamin A and B complex and minerals. Apart from the nutritional values, soybean has many medical values. It stimulates the growth and has numerous therapeutic values. Soy milk has about the same amount of protein (though not the same amino acid profile) as cow's milk [3]. Soymilk proteins are alkaline in nature and increase alkalinity of the blood which is very important from the health point of view. It is good source of phosphorus and lecithin thus; it can be used for cure of nerve diseases [4].

It has been reported that addition of vegetable proteins may enhanced the storage life of shrikhand [5]. Hence, the study was conducted to evaluate the shelf life of soy milk blended developed shrikhand.

## Materials and Methods

Soy bean, powdered sugar and mango fruits were procured from local market. Standardized milk having 4.5% fat and 8.5% SNF was purchased from experimental dairy plant, department of Livestock Products Technology, COVS, LUVAS, Hisar and the mixed starter culture NCDC-263 (*Streptococcus thermophilus* and *Lactobacillus bulgaricus*) was procured from National Collection of Dairy Cultures, NDRI, Karnal. Chemicals used in the investigation were of

analytical grade and procured through local suppliers from respective companies. Plate Count Agar, Violet Red Bile Agar, Potato Dextrose Agar, Bacteriological agar were procured from Hi-media.

The mango pulp was prepared with standard methods in hygienic conditions and pasteurization was done at 76 °C for 1 min. The pulp was packaged in polythene bags and sealed aseptically and shifted to cold room for storage till it was used for enhancing the flavour and acceptability of product.

Soy milk was prepared in the College of Engineering, CCS, HAU hisar as per standard procedures [6] and packed in glass bottles and was stored at 4±1 °C till it was used [7].

Treated product was prepared by replacing standardized milk with soy milk (20%), and mango pulp (25%) and sugar (40%) was added individually to both control and treated samples as per the standardized method suggested by Thakur *et al.* [8]. Shrikhand was prepared as per the method suggested by Sonawane *et al.* [2] and stored at refrigeration (4±1 °C) temperature.

Sensory analysis was performed with nine point hedonic scale based on the methodology described by Harry and Hildegard [9] at regular interval of 5 days, and method of APHA [10] was followed to evaluate the microbiological status of the products.

Data obtained were subjected to one way ANOVA followed by Duncans Multiple Range Test by using SPSS software [11].

## Results and Discussion

### Microbiological evaluation

The Standard Plate Counts (SPS) of control and treated samples increased as the storage period increased (**Table 1**). Overall no significant ( $p \leq 0.05$ ) difference was noticed in SPC of control and developed shrikhsnd from 0 to 10<sup>th</sup> day of storage, but on 15<sup>th</sup> day of storage, SPC in control was significantly ( $p \leq 0.05$ ) higher than treated product. The similar trend of increase in SPC in shrikhand as the storage period increased was also reported by Kumar *et al.* [12]. The lower SPC in soy milk incorporated shrikhand are also in agreement with the results of Borate *et al.* [5], who reported lower average SPC in shrikhand prepared from buffalo milk blended with soy milk as compared to control. Deshpande *et al.* [6] suggested that higher SPC was not responsible for the product shelf life because they reported about 17 per cent population of lactic acid bacteria out of total population.

**Table 1** Microbiological evaluation of soy milk blended mango pulp based shrikhand stored at refrigeration (4±1°C) temperature (n=18)

Treatments	Storage days			
	0	5	10	15
<b>Standard plate count</b>				
Control	2.45 <sup>a</sup> ±0.28	3.37 <sup>b</sup> ±0.03	5.01 <sup>c</sup> ±0.30	5.57 <sup>dB</sup> ±0.69
Treatment	2.42 <sup>a</sup> ±0.04	3.30 <sup>b</sup> ±0.47	4.98 <sup>c</sup> ±0.04	5.49 <sup>dA</sup> ±0.14
<b>Yeast and mould count</b>				
Control	ND	ND	1.00 <sup>aB</sup> ±0.03	2.45 <sup>bB</sup> ±0.50
Treatment	ND	ND	0.50 <sup>aA</sup> ±0.22	2.15 <sup>bA</sup> ±0.06
<b>Psychotropic Count</b>				
Control	ND	1.24 <sup>a</sup> ±0.07	1.64 <sup>b</sup> ±0.03	1.86 <sup>c</sup> ±0.01
Treatment	ND	1.20 <sup>a</sup> ±0.02	1.60 <sup>b</sup> ±0.06	1.82 <sup>c</sup> ±0.04
Mean±SE, with different small letter superscript in a row and capital letter superscript in a coloum differ significantly ( $p \leq 0.05$ ). Control: 100% Std milk +25% mango pulp, Treatment: 80% Std milk+20% soy milk + 25% mango pulp.				

The yeast and mould (YMC) in both control and soy milk incorporated samples were not detected (ND) from 0 to 5<sup>th</sup> day, but there was detection of YMC in both treated and control samples on 10<sup>th</sup> day of storage with higher counts in control as compared to soy milk treated shrikhand, and it increased with the increase in storage period. The YMC was significantly lower in soy milk treated as compared to control samples till the end of storage. These results are in accordance with the reports of Borate *et al.* [5].

The Psychotropic count (PC) in control and treated products was not detected at 0 day, but after that, there was a significant increment in PC of both control and treated samples till 15<sup>th</sup> day of storage. Para [13] also reported increased psychotropic count of flavoured shrikhand with increase in storage period. There was no significant difference between PC of control and developed shrikhand throughout the storage (4±1 °C) period. However, the products were within the safety limits up to 10 days of refrigeration (4±1 °C) storage [6].

### Sensory evaluation

The sensory scores for colour and appearance, flavour, body and texture, sweetness and overall acceptable of control and treated samples decreased significantly as the storage period increased (**Table 2**). It might be due to increase in acidity of the products during storage [2, 5]. Several workers [12, 14] also reported the decrease in sweetness and other sensory attributes during the storage period of shrikhand.

**Table 2** Sensory score of soy milk blended mango pulp based shrikhand stored at refrigeration ( $4\pm 1^\circ\text{C}$ ) temperature (n=18)

Treatments	Storage days		
	0	5	10
<b>Colour and appearance</b>			
Control	8.33 <sup>cb</sup> ±0.21	7.75 <sup>bb</sup> ±0.16	7.25 <sup>ab</sup> ±0.11
Treatment	8.00 <sup>ca</sup> ±0.00	7.50 <sup>ba</sup> ±0.13	6.75 <sup>ca</sup> ±0.11
<b>Flavour</b>			
Control	8.25 <sup>cb</sup> ±0.21	7.66 <sup>bb</sup> ±0.14	7.34 <sup>ab</sup> ±0.12
Treatment	8.16 <sup>ca</sup> ±0.16	7.42 <sup>ba</sup> ±0.08	7.17 <sup>ca</sup> ±0.11
<b>Body and texture</b>			
Control	8.33 <sup>cb</sup> ±0.21	7.75 <sup>bb</sup> ±0.11	7.17 <sup>ab</sup> ±0.10
Treatment	8.08 <sup>ca</sup> ±0.08	7.67 <sup>ba</sup> ±0.09	7.05 <sup>ca</sup> ±0.05
<b>Sweetness</b>			
Control	8.08 <sup>cb</sup> ±0.14	7.67 <sup>bb</sup> ±0.13	7.09 <sup>ab</sup> ±0.12
Treatment	8.00 <sup>ca</sup> ±0.12	7.50 <sup>ba</sup> ±0.11	7.02 <sup>ca</sup> ±0.10
<b>Overall acceptability</b>			
Control	8.33 <sup>cb</sup> ±0.21	7.75 <sup>bb</sup> ±0.11	7.25 <sup>ab</sup> ±0.10
Treatment	8.08 <sup>ca</sup> ±0.14	7.67 <sup>ba</sup> ±0.09	7.08 <sup>ca</sup> ±0.08

Mean±SE, with different small letter superscript in a row and capital letter superscript in a column differ significantly ( $p\leq 0.05$ ). Control: 100% Std milk +25% mango pulp, Treatment: 80% Std milk+20% soy milk + 25% mango pulp.

The scores for all the sensory characters (colour and appearance, flavour, body and texture, sweetness and overall acceptable) of control was higher than that of soy milk incorporated shrikhand throughout the storage period. The lower sensory scores in soy milk incorporated shrikhand are in agreement with the results of Deshpande *et al.* [6]. However, both the products were well acceptable up to 10 days of refrigeration storage.

### Conclusion

It is concluded that developed soya milk incorporated (20%) mango pulp (25%) based shrikhand was within the safety limits microbiologically and well acceptable organoleptically up to 10 days of refrigeration ( $4\pm 1^\circ\text{C}$ ) storage.

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