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Short Communication

STUDIES ON SHELF-LIFE OF DEVELOPED STRAWBERRY PULP BASED SHRIKHAND INCORPORATED WITH SOY MILK AT REFRIGERATION (4±1 ºC) TEMPERATURE

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SUMMARY

The study was conducted to evaluate the shelf life of developed soy milk (20%) incorporated strawberry pulp (15%) based shrikhand. A constant level of sugar (40%) was used in both control and treated products. The Standard plate counts (SPC), Psychrotrophic Counts (PC) and Yeast and Mould Counts (YMC) were slightly higher in control as compared to soy milk incorporated product and their counts increased proportionately with increased storage period. SPC (log cfu/g) in control was noticed statistically higher than soy milk added shrikhand till 10th day, but on 15th day of storage SPC in both the samples was not within the limits. PC was detected on 5th day and YMC was detected on 10th day of storage in both the products. However, all the sensory characteristics decreased with the progress of storage period in both the products but were found organoleptically well acceptable till 10th day. It is concluded that developed soy milk incorporated (20%) strawberry pulp based shrikhand was within the safety limits microbiologically and well acceptable organoleptically up to 10 days of refrigeration (4±1 ºC) storage.

Keywords: Shelf-life, Shrikhand, Soy milk, Strawberry pulp

Shrikhand is one of the important fermented milk products which derives its name from the Sanskrit word "Shikharani" meaning a curd prepared with added sugar, flavouring agents (Saffron), fruits and nuts. It is prepared by fermentation of milk with known strain of lactic acid bacteria, which are excellent ambassadors for an often maligned microbial world and also found in our digestive system. Lactic acid bacteria decrease serum cholesterol levels, increase vitamin B content in the product (Grill *et al.*, 2000).

It is a common practice of using fruits pulp in preparation of various dairy products like ice cream, yoghurt and shrikhand to enhance flavor (Gupta *et al.*, 2018).With less availability and high cost of animal milk, the scientists have been making attempts to switch over to the utilization of plant proteins. Soy milk has about the same amount of protein (though not the same amino acid profile) as cow's milk (Akinnuli and Olabanji, 2013) and its alkaline nature increases alkalinity of the blood which is very important for health. Soybean protein is cheap and contains vitamin A, B complex, phosphorus and lecithin, thus, can be used for cure of nerve diseases (Gupta and Patel, 1984). It has been reported that addition of vegetable proteins may enhance the storage life of shrikhand (Borate *et al.*, 2011). Hence, the study was conducted to evaluate the shelf life of soy milk blended strawberry based developed shrikhand.

Soybean, powdered sugar and strawberry 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 of companies.

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The strawberry pulp was prepared with standard methods in hygienic conditions and pasteurization was done at 76 ºC 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 (Deshpande *et al.*, 2008) and packed in glass bottles and was stored at 4±1 ºC till it was used (Gandhi and Jain, 1977).

Strawberry pulp (15%) and sugar (40%) was added individually to control samples and shrikhand was prepared as per the standardized method suggested by Thakur *et al.* (2014). In addition to control formulation, treated product was prepared by replacing standardized milk with soy milk (20%) and stored at refrigeration (4±1 ºC) temperature. Sensory analysis was performed with nine- point hedonic scale based on the methodology described by Harry and Hildegarde (1998) and method of American Public Health Association (1984) was followed to evaluate the microbiological status of the products at regular interval of 5 days.

Data obtained were subjected to one-way ANOVA followed by Duncan's Multiple Range Test by using SPSS software (Snedecor and Cochran, 1994).

The Standard Plate Counts (SPS) of control and

Table 1

Microbiological evaluation of soy milk blended strawberry pulp based shrikhand stored at refrigeration (4±1 ºC) temperature

Treatments	Storage days			
	0	5	10	15
		Standard plate count		
Control	1.75^{aB} ±0.09	2.98^{bB} ±0.04	5.00^{cB} ±0.02	5.89^{dB} ±0.03
Treatment	1.60^{aA} ±0.07	2.73^{bA} ±0.03	4.84^{cA} ±0.02	5.58^{dA} ±0.07
		Yeast and mould count		
Control	ND	ND	ND	2.37^{B}±0.63
Treatment	ND	ND	ND	2.12^{A}±0.42
		Psychrotropic Count		
Control	ND	1.30^{a}± 0.07	1.66^{b}±0.03	1.86^{c}±0.02
Treatment	ND	1.26^{a}±0.21	1.62^{b}±0.04	1.84^{c}±0.04

Mean±SE, with different small letter superscript in a row and capital letter superscript in a column differ significantly ($p<0.05$).
Control:100% Std milk +15% strawberry pulp; Treatment: 80% Std milk+20% soy milk + 15% strawberry pulp.

treated samples increased as the storage period increased (Table 1). Similar trend of increase in SPC in shrikand as the storage period increased was reported by Kumar *et al.* (2011). Overall, SPC of control was significantly ($p<0.05$) higher than soy milk treated products from 0 to 10th day of storage period at refrigeration (4±1 ºC), but on 15th day of storage SPC in both the samples was not within the safety limits. According to Prevention of Food Adulteration Act (1954, 2009), the total plate count should not be more than 50,000/gram for shrikhand (FSSAI, 2010). The lower SPC in soy milk incorporated shrikhand are also in agreement with the results of Borate *et al.* (2011) who reported lower average SPC in shrikhand prepared from buffalo milk blended with soy milk as compared to control.

The yeast and mould (YMC) in both control and soy milk incorporated samples were not detected (ND) from 0 to 10th day, but there was detection of YMC in both treated and control samples on 15th day of storage with higher counts in control as compared to soy milk treated shrikhand. The YMC was significantly ($p<0.05$) lower in soy milk treated as compared to control samples on the last day of storage. These results are in accordance with the reports of Borate *et al.* (2011).

The Psychrotrophic count (PC) in control and treated products was not detected at 0 day, but after that, there was a significant ($p<0.05$) increment in PC of both control and treated samples till 15th day of storage. Para (2015) also reported increased psychrotropic count of flavoured shrikhand with increase in storage period. There was no significant ($p>0.05$) difference between PC of control and developed shrikhand throughout the storage (4±1 ºC) period. However, the products were within the safety limits up to 10 days of refrigeration (4±1 ºC) storage (Deshpande *et al.*, 2008).

Table 2

Sensory score of soy milk blended strawberry pulp based shrikhand stored at refrigeration (4±1 ºC) temperature

Treatments	Storage days		
	0	5	10
	Colour and appearance		
Control	8.16^{cB}±0.16	7.83^{bB}±0.11	7.16^{aB}±0.14
Treatment	8.08^{aA}±0.14	7.66^{bA}± 0.13	6.83^{cA}± 0.11
	Flavour		
Control	8.08^{cB}±0.08	7.50^{bB}±0.15	7.22^{aB}±0.11
Treatment	7.91^{aA}±0.14	7.30^{bA}± 0.11	7.09^{cA}±0.08
	Body and texture		
Control	8.17^{cB}±0.17	7.50^{bB}± 0.11	7.25^{aB}±0.14
Treatment	8.00^{cA}±0.10	7.42^{bA}± 0.13	7.14^{aA}±0.12
	Sweetness		
Control	8.16^{cB}±0.16	7.50^{bB}±0.15	7.18^{aB}±0.11
Treatment	7.91^{cA}±0.14	7.33^{bA}±0.11	7.00^{aA}±0.12
	Overall acceptability		
Control	8.08^{cB}±0.25	7.50^{bB}±0.11	7.08^{aB}±0.08
Treatment	7.83^{cA}±0.16	7.42^{bA}±0.83	7.00^{aA}±0.10

Mean±SE, with different small letter superscript in a row and capital letter superscript in a column differ significantly ($p<0.05$).
Control: 100% Std milk +15% strawberry pulp; Treatment: 80% Std milk+20% soy milk+15% strawberry pulp

The sensory scores for colour and appearance, flavour, body and texture, sweetness and overall acceptable of control and treated samples decreased significantly($p<0.05$) as the storage period increased (Table 2). It might be due to increase in acidity of the products during storage (Borate *et al.*, 2011). Several workers (Nigam *et al.*, 2009; Kumar *et al.*, 2011) also

reported the decrease in sweetness and other sensory attributes during the storage period of shrikhand.

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*. (2008). However, both the products were well acceptable up to 10 days of refrigeration storage.

It is concluded that developed soya milk incorporated (20%) strawberry pulp (15%) based shrikhand was within the safety limits microbiologically up to 10 days. The scores for all the sensory characters of control was higher than that of soy milk incorporated shrikhand throughout the storage period, but both the products were well acceptable organoleptically up to 10 days of refrigeration (4±1 ºC) storage.

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