



Studies on microbial changes of *Shrikhand* prepared from safflower milk

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ABSTRACT : *Shrikhand* was prepared from buffalo milk blended with 50 per cent safflower milk and studied for shelf-life. The SPC count was declined from 98×10^3 to 45×10^3 and 38×10^3 cfu/g for *Shrikhand* stored at -10 and 5 °C temperature, respectively on 7th day while the SPC count of *Shrikhand* stored at 30 °C increased to 180×10^3 cfu/g in 24 hrs. As the storage temperature increased, the SPC count increased. The yeast and mould count of *Shrikhand* stored at 30 °C was 65×10^2 cfu/g on first day and increased to 275×10^2 on 2nd day making the product unacceptable. The yeast and mould count was increased during storage. Coliform micro-organism was absent in fresh and stored *Shrikhand*. The *Shrikhand* stored at -10 °C was acceptable upto 56 days. The overall acceptability score of *Shrikhand* stored at 5 °C for 0, 7, 14, 21, 28, 35, 42, 49 and 56 days storage was 8.30, 8.22, 8.17, 7.95, 7.75, 7.52, 7.35, 6.37 and 5.20, respectively. *Shrikhand* at 5 °C could be stored upto 49 days afterward it showed little off flavour and little mouldy growth on the surface. *Shrikhand* stored at 30 °C was acceptable on first day only.

KEY WORDS : Safflower milk, Sensory evaluation, SPC, Yeast, Mould

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INTRODUCTION

Shelf-life refers to the time it retains its edible qualities after production. *Shrikhand* has a higher keeping quality than *Dahi* or yoghurt due to higher sugar content. The keeping quality of *Shrikhand* largely depends on the method of preparation and initial microflora like yeast, moulds and other contaminants. The product also undergoes acidification during storage which may lead to off flavour in the product. Despite containing as high as about 50 per cent sugar in *Shrikhand*, the product is known to develop off flavour and colour during the storage.

Shrikhand was prepared from buffalo milk blended with 50 per cent safflower milk and studied for shelf-life. The advantage of using safflower milk is that its cost of production

is less. Moreover, safflower milk contains no cholesterol, the fat is rich in polyunsaturated fatty acids, which helps in lowering the blood cholesterol (Kumar *et al.*, 1993).

Fermented milk products contain less number of contaminants, when fresh, it is the post production contamination during storage that needs vigorous checking. The contaminants result into a considerable increase in population of spoilage organisms, thereby lowering the keeping quality of the product. The most common contaminants of milk and milk products are yeast, moulds and *E. coli*. Their presence in the product beyond the standards specified is undesirable causing spoilage of the product.

The microbiological changes brought about by micro-organisms and their enzymes during storage have influence on the keeping quality and acceptability of fermented milk product. Also the storage temperature has influence on the keeping quality of fermented milk product. Even at low temperature also, the contaminants can grow but their rate of multiplication is slow. The micro-organisms bring about deterioration in the product leading to unacceptability of the product.

So, an attempt was made to study the effect of

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temperature on microbial changes and acceptability of *Shrikhand* prepared from safflower milk.

MATERIAL AND METHODS

Buffalo milk required for study was procured from University Dairy Farm. Pure safflower seed for preparation of safflower milk was obtained from university central farm. Ampule of freeze dried culture L.F. 40 culture was obtained from Division of Dairy Microbiology, NDRI, Karnal and used for preparation of *Shrikhand*.

Preparation of safflower milk:

The safflower milk was prepared as per the method given by Maske (1997). Two hundred grams of safflower seeds were weighed and washed with hot water and grinded in domestic mixer with little amount of water and filtered through muslin cloth (seed;water ratio 1:5) so as to have consistency as that of cow milk. For better heat stability and taste, sodium hexameta phosphate @ 0.2 per cent, common salt @ 0.05 per cent and sugar @ 0.2 per cent were added to enhance its acceptability. The milk so obtained was then boiled. The milk so obtained had creamy colour, nutty flavour, sweet taste and consistency as that of cow milk.

The standard method given by De (1982) was followed for preparation of *Shrikhand* and safflower milk blend was used at the rate of 50 per cent. The *Shrikhand* was stored at -10, 5 and 30°C to study the microbial and organoleptic changes during storage. The product was evaluated for its sensory quality by 5 trained panels of judges using 9 point hedonic scale as described by Amerine *et al.* (1967). The observations were recorded at an interval of 7 days. The standard plate count of the product was determined as per procedure described by ISI (1962), yeast and mould count by APHA (1976) using Potato dextrose agar and coliform count by BIS (1968). The results obtained during the course of investigation were subjected to the statistical analysis by using Completely Randomized Design as described by Corxton *et al.* (1975). In all five trials were conducted.

RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

Total microbial load (SPC):

The SPC count on first day was 98×10^3 cfu/g (Table 1). The SPC count declined from 98×10^3 to 45×10^3 and 38×10^3 cfu/g for *Shrikhand* stored at -10 and 5°C temperature, respectively on 7th day. The SPC count of *Shrikhand* stored at 30°C was increased for 98×10^3 to 180×10^3 cfu/g in 24 hrs. It was observed the product was acceptable upto 56 days when stored at -10 and 5°C. The observation indicated that as the storage temperature increased the SPC count also increased.

Table 1: Total Microbial load (SPC) of ($\times 10^3$ cfu/g) *shrikhand* during storage

Storage period (days)	Storage temperature		
	- 10 °C	5 °C	30 °C
0	98	98	98
7	45	38	180 (on 2 nd day)
14	53	59	--
21	69	75	--
28	86	98	--
35	94	121	--
42	123	145	--
49	143	168	--
56	164	189	--
63	178	--	--

Yeast and mould count:

Yeast and mould get entry into milk product either during preparation of product or post production contamination through handling. The yeast and mould of fresh *Shrikhand* was 65×10^2 cfu/g (Table 2). The yeast and mould count decreased upto 7 days during storage at -10 and 5°C temperature but it increased after 7 days. Whereas the yeast and mould count of *Shrikhand* stored at 30°C was 65×10^2 cfu/g on first day and it increased to 275×10^2 cfu/g on 2nd day making the product unacceptable.

Table 2: Yeast and mould count of *shrikhand* during storage ($\times 10^2$ cfu/g)

Storage period (days)	Storage temperature		
	- 10 °C	5 °C	30 °C
0	65	65	65
7	28	36	275 (on 2 nd day)
14	40	58	--
21	64	81	--
28	85	105	--
35	109	130	--
42	130	156	--
49	152	179	--
56	174	231	--
63	210	--	--

Coliform count:

Fermented milk products are not suitable for the growth of Coliform because of low pH and acidity of fermented milk inhibits the growth of these micro-organisms. It was observed that Coliforms were absent in fresh as well as all samples of *Shrikhand* stored at -10, 5 and 30°C.

Organoleptic changes in *Shrikhand* stored at -10°C:

The sensory score of fresh *Shrikhand* stored at -10°C

(Table 3) for colour and appearance, flavour, taste, body and texture and overall acceptability was 8.5, 8.3, 8.3, 8.1 and 8.30, respectively. The overall acceptability score remained unchanged upto 7 days and decreased gradually afterward. On 56th day the overall acceptability score declined to 6.60 and the product can be graded in between like slightly to like moderately. On 63rd day it was observed that there was slight mouldy growth on the *Shrikhand* surface with off flavour and unaccepted taste. The *Shrikhand* remained acceptable upto 56th day when stored at - 10°C temperature.

Organoleptic changes in *Shrikhand* stored at 5°C:

The overall acceptability score of *Shrikhand* stored at 5°C (Table 4) for 0, 7, 14, 21, 28, 35, 42, 49 and 56 days storage was 8.30, 8.22, 8.17, 7.95, 7.75, 7.52, 7.35, 6.37 and 5.20, respectively.

The overall acceptability score of *Shrikhand* upto 14 days of storage was graded in between like very much to like extremely. On the 49th day, the overall acceptability score was 6.37 and the product graded as like slightly to like moderately. After 49th day of storage, the sensory score fell to less than 6.0 to all parameters. A slight mouldy growth was observed on the surface of *Shrikhand* with off flavour.

Organoleptic changes in *Shrikhand* stored at 30°C:

The sensory score of *Shrikhand* stored at 30°C (Table 5) for colour and appearance, flavour, taste, body and texture and overall acceptability was 5.5, 5.0, 5.3, 4.9 and 5.17 on 2nd day. After 24 hrs of storage the *Shrikhand* became unacceptable for consumption having off flavour and little rancid taste.

The results obtained at in the present investigation are in

Table 3: Organoleptic changes in *shrikhand* stored at - 10 °C

Storage period (days)	Colour and appearance	Flavour	Body and texture	Taste	Overall acceptability
0	8.5	8.3	8.3	8.1	8.30
7	8.4	8.3	8.3	8.2	8.30
14	8.1	8.2	8.3	8.3	8.22
21	7.9	8.2	8.3	8.1	8.12
28	7.9	8.1	8.0	7.9	8.02
35	7.8	8.1	7.6	7.8	7.82
42	7.6	7.5	7.7	7.4	7.55
49	7.5	7.5	7.3	7.0	7.32
56	7.2	6.9	6.3	6.0	6.60
63	5.8	5.5	5.9	5.8	5.75
Mean	7.67	7.67	7.60	7.47	7.60
C.D. at 5 %	0.33	0.35	0.34	0.29	0.61

Table 4: Organoleptic changes in *shrikhand* stored at 5 °C

Storage period (days)	Colour and appearance	Flavour	Body and texture	Taste	Overall acceptability
0	8.5	8.3	8.3	8.1	8.30
7	8.3	8.2	8.3	8.1	8.22
14	8.1	8.2	8.1	8.3	8.17
21	7.9	8.1	7.9	7.9	7.95
28	7.7	7.8	7.8	7.7	7.75
35	7.5	7.6	7.6	7.4	7.52
42	7.3	7.5	7.4	7.2	7.35
49	6.5	6.3	6.4	6.3	6.37
56	5.2	5.1	5.2	5.3	5.20
Mean	7.17	7.23	7.22	7.18	7.18
C.D. at 5 %	0.34	0.26	0.23	0.24	0.21

Table 5: Organoleptic changes in *shrikhand* stored at 30 °C

Storage period (days)	Colour and appearance	Flavour	Body and texture	Taste	Overall acceptability
0	8.5	8.3	8.3	8.1	8.30
2	5.5	5.0	5.3	4.9	5.17

accordance with the results reported by Sharma and Zariwala (1980) and Upadhyay *et al.* (1985).

Conclusion:

The SPC, yeast and mould count increased during storage. Coliform organisms were absent in *Shrikhand*. The organoleptic score of *Shrikhand* decreased during storage at different temperatures. The microbial changes during storage of *Shrikhand* were because of continued activities of micro-organisms or their enzymes released in the product. The metabolic changes were faster at higher temperature of storage and lower at low temperature of storage. *Shrikhand* stored at -10, 5 and 30°C temperature was acceptable upto 56, 49 and 2 days, respectively.

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