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To study the shelf life of *Tulsi* (*Ocimum tenuiflorum*) enriched herbal *Shrikhand*

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Abstract

At the time of rapid urbanization, everyone has less time for health related activity, so they are in immediate need of some product which not only satisfied their appetite but also affect their health in positive way. The present study was carried out to estimate the fitness of blending *Tulsi* leaves extract into *Shrikhand* keeping in mind the need of burgeoning middle class. *Tulsi* leaves extract @ 0.7%, 0.9% and 1.1% with 40% cane sugar (by weight of *Chakka*), was mixed for production of *Shrikhand*. The samples were stored at 10 °C and sensory and microbial qualities judged at regular interval. *Shrikhand* prepared by addition of 0.9% *Tulsi* leaves extract (T₂) was superior in organoleptic parameter followed by T₃, T₁ and T₀ respectively. The treated product was acceptable up to 50 days of storage under refrigerated temperature. From present study we can conclude that addition of *Tulsi* not only improves the keeping quality of the product but also its medicinal properties. That make the optimize product healthy with better keeping quality.

Keywords: *Shrikhand*, *Tulsi*, *Chakka*, organoleptic, burgeoning

Introduction

The increasing demand from consumers for dairy products with ‘functional’ properties is a key factor driving value sales growth in developed markets. Present day consumers prefer foods that promote good health and prevent diseases. Since time immemorial, a significant proportion of milk has been used in India for preparing a wide variety of dairy delicacies, an unending array of sweets and other specialties from different regions of the country. In the process, the basic limitation of milk and its perishable nature has been tastefully overcome. Its processing aims are to extend the shelf-life of milk, while converting it into mouth-watering tit-bits. Thus, diverse methods to prepare as well as preserve milk products have been developed.

The *Shrikhand* word is derived from the Sanskrit root ‘shrikha rani’ meaning good nourishing food having high protein and calorific value. *Shrikhand* as a semi-soft, sweetish sour, whole milk product prepared from lactis fermented curd, the curd is partially strained through a muslin cloth to remove the whey and thus produce a solid mass called *Chakka* (the basis ingredient for *Shrikhand*). This *Chakka* is mixed with the required amount of sugar to yield *Shrikhand*. The dish is very popular in Gujarat, Maharashtra and Karnataka. *Shrikhand* originated in Persia.

According to Bureau of Indian Standard (BIS) and under the Prevention of food adulteration (PFA) rule, *Shrikhand* means the product obtained from *Chakka* to which milk fat is added. The keeping quality of *Shrikhand* largely depends upon its initial micro flora like yeast, mould and other micro organism. Under ambient condition (30 °C) it trends to spoil within 2-3 days. Under refrigerated condition (5 °C) it can be kept for 40 days without deterioration. So in order to increase the milk availability during lean Periods (summer months) the *Shrikhand* preparation is best under Indian condition. It may contain fruits, nuts, sugar, cardamom, saffron and other spices it shall confirm to the following specifications which could be obvious from the table.

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PFA/BIS standards for Shrikhand

Constituents	BIS	PFA
Total Solids (% by mass), minimum	58.0	58.0
Milk fat (in dry matter% by mass) minimum	8.5	8.5
Milk protein (in dry matter,% by mass) Minimum	10.5	10.5
Titrate acidity (% lactic acid) maximum	1.4	1.4
Sucrose (in dry matter,% mass) maximum	72.5	72.5
Total ash (in dry matter,% by mass) maximum	0.9	0.9
Coliform count, F.F.U./gm. Maximum		10.0
Yeast and mould count /gm maximum		50.0

Tulsi plants are considered as one of the most important source of medicine and drugs of today and many secondary metabolites and essential oils come from medicinal plants (Singh *et al.*, 2010) [5]. On one hand the use of medicinal plants proved to be economical and effective and on the other hand they are easily available and safe to use (Atal and Kapoor, 1989 [6]. *Tulsi* is very much important as medicinal plant as it help in many ways to improve our health like Cures fever, beats diabetes, protects the heart, beats stress, dissolves kidney stone, beats cancer, helps to quit smoking, keeps your skin healthy and glowing, heals respiratory condition etc.

Materials and Methods

The experiment study was conducted in the Department Laboratory, Department of Animal Husbandry & Dairying , Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P.), India. The objective of the present study is to increase the functional value of *Shrikhand* by incorporation of *Tulsi* (medicinal herb) that makes it more useful which would help the organized sector to undertake commercial production and marketing of Herbal *Shrikhand*.

Method of *Tulsi* leaf Extraction: *Tulsi* leaves were boiled in water upto the 1/4th of the initial volume, then the remaining portion were dried in vaccum drier.

Preliminary trials

The preliminary trials were conducted with 6 levels of *Tulsi* extract viz., 0.5, 0.7, 0.9, 1.1, 1.3 and 1.5 per cent by weight of *Chakka*. Sugar percentage was kept constant at 40 per cent by weight of *Chakka*. Sugar was added after addition of *Tulsi* extract. It was observed that 0.5 per cent level of *Tulsi* extract did not give noticeable change in taste. The higher levels viz., 1.3 and 1.5 per cent gave much-pronounced *Tulsi* flavor i.e. undesirable flavour and taste. So these levels viz., 0.5, 1.3 and 1.5 per cent extract were rejected. It was observed that *Tulsi* extract with 0.7, 0.9 and 1.1% of *Chakka* was quite acceptable on the basis of sensory parameters. The levels of *Tulsi* 0.7, 0.9, and 1.1 per cent were selected for further investigation.

Details of treatment

Treatment	<i>Tulsi</i> extract
T ₀ (control)	0.0
T ₁	0.7
T ₂	0.9
T ₃	1.1

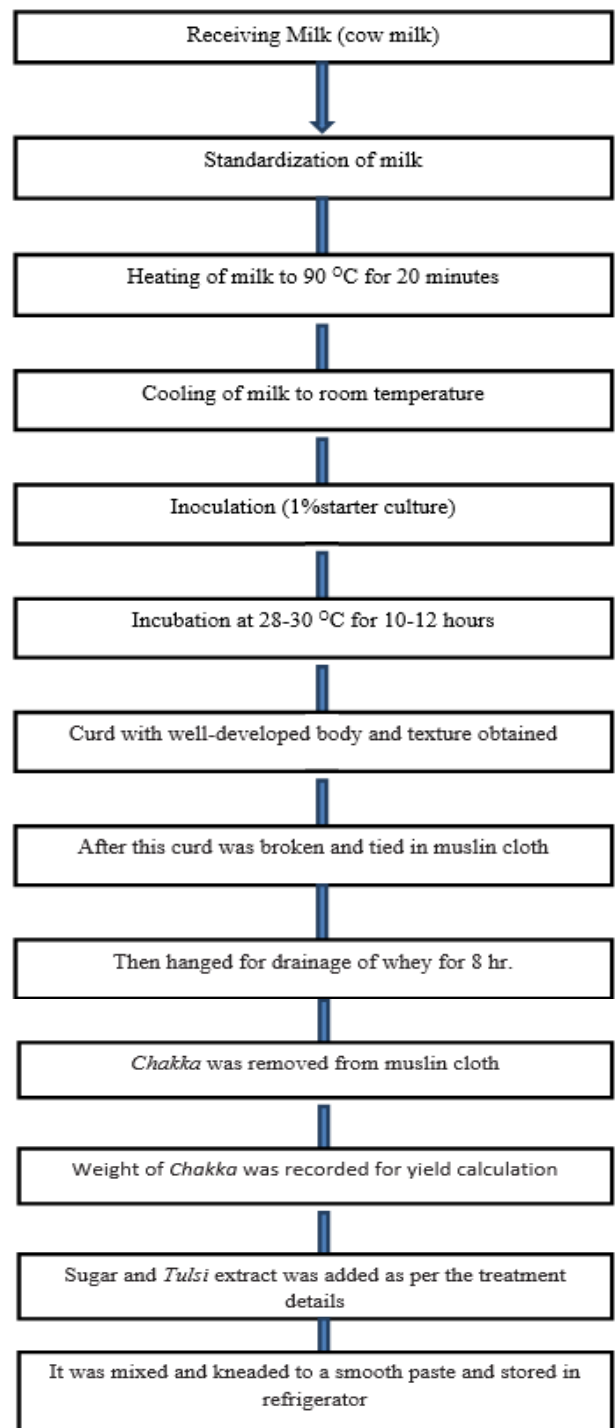
Manufacturing of Shrikhand

Shrikhand was manufactured by the standard procedure given by De (1980) [1] with slight modification. The lot of standardized cow milk (4.5% fat) was heated to 90 °C for 20 min and then cooled at 30 °C. It was inoculated with starter culture (LF 40) at the rate of 1 per cent and incubated at 30 °C

for 12hr. Curd with well-developed body and texture obtained after incubation was broken and tied in muslin cloth. It was then placed in hanging position for draining of whey for 8 hr. *Chakka* was removed from muslin cloth, weight of *Chakka* and whey was recorded for calculation of yield. *Chakka* was stored under refrigeration until taken for analysis and preparation of *Shrikhand*.

The *Chakka* was divided into 4 portions and *Shrikhand* was prepared by adding sugar and *Tulsi* extract as per the treatment details. It was mixed and kneaded to a smooth paste and stored in refrigerator for organoleptic, chemical and microbiological analysis. Separate samples were drawn for respective analysis. The flow diagram for preparation of herbal *Shrikhand* has been shown in figure below:

Process of Shrikhand preparation



Flow diagram for Herbal Shrikhand preparation

Organoleptic evaluation: The samples of *Shrikhand* were subjected to the organoleptic evaluation by a panel of five semi-trained judges. Evaluation was done on a 9-point Hedonic scale (IS: 6273, Part II, 1971)

Microbiological quality:

1. Standard Plate Count: As per Standard Plate Count method described in IS 5402.
2. Yeast and mould: Determined as per Manual of Dairy Bacteriology ICAR, 1982.
3. Coli form: Determined as per Manual of Dairy Bacteriology ICAR, 1982.
4. Lactic acid bacteria: Determined as per Manual of Dairy Bacteriology ICAR, 1982.

Statistical analysis: Completely randomized block design (CRD) was used Snedecor and Cochran, (1994) [8].

Results and Discussion

Effect on Colour and appearance of Herbal *Shrikhand* during storage

The colour and appearance score varied from 7.25 to 7.56 on the day of production for all the *Shrikhand* samples treated differently. A gradual increase in the colour and appearance score was observed in sample T₂ during 0 to 15th day of storage but it decreased after 15th day and sample T₀ and T₁ was unacceptable on 37th and 45th day respectively. T₂ scored more than rest of all samples on 15th day of storage.

Storage period (in days)									
Treatment	00	07	15	22	30	37	45	52	60
T ₀	7.25	7.43	7.32	6.46	5.64	5.23	-	-	-
T ₁	7.37	7.56	7.46	7.29	6.40	5.99	5.64	-	-
T ₂	7.56	7.95	7.98	7.64	7.30	7.15	6.53	6.11	-
T ₃	7.49	7.78	7.75	7.48	7.07	6.14	6.37	6.20	-
Mean	7.42	7.68	7.63	7.22	6.60	6.33	4.63	3.08	-
SE+	0.07	0.12	0.08	0.08	0.08	0.06	0.11	0.15	-
CD at 5%	N.S.	0.38	0.25	0.26	0.25	0.20	0.33	0.46	-

(- indicate spoiled sample)

Effect on Flavour of Herbal *Shrikhand* during storage

The mean flavour values increased up to 15th day and there after slowly decreased continuously during storage period. The flavour did not show significant difference among the treatments but during storage, study highly significant effect was observed. A gradual deterioration was observed in the flavour score during storage and both the samples T₀ and T₁

were acceptable up to 37th and 45th day respectively. Treatment T₂ and T₃ remained acceptable up to 52nd day when it was classed between “liked moderately” However, the T₂ and T₃ were at par with each other and significantly inferior. T₂ had highest flavor score 8.11 on 15th days over other all treatments given.

Storage period (in days)									
Treatment	00	07	15	22	30	37	45	52	60
T ₀	7.63	7.79	7.73	6.75	5.58	5.17	-	-	-
T ₁	7.72	7.80	7.85	7.68	7.04	6.63	6.17	-	-
T ₂	7.92	8.05	8.11	7.96	7.55	7.45	6.97	6.53	-
T ₃	7.83	8.01	8.06	7.87	7.37	7.28	6.63	6.31	-
Mean	7.77	7.91	7.94	7.57	6.88	6.63	4.94	3.21	-
SE+	0.03	0.02	0.02	0.08	0.30	0.10	0.09	0.05	-
CD at 5%	0.10	0.13	0.11	0.33	0.26	0.18	0.42	0.25	-

Effect of *Tulsi* extract on body and texture of *Shrikhand* during storage

Body and texture shows that there was no appreciable difference in body and texture characteristics of *Shrikhand*

within treatments. The body and texture score of fresh samples ranged from 7.65 to 8.00. Highly significant reduction in body and texture score was observed with advancement of storage period.

Storage period (in days)									
Treatment	00	07	15	22	30	37	45	52	60
T ₀	7.65	7.73	7.64	6.84	5.67	5.25	-	-	-
T ₁	7.85	7.93	7.97	7.70	7.04	6.50	5.81	0.0	-
T ₂	8.00	8.06	8.11	7.82	7.35	7.16	6.84	6.43	-
T ₃	7.89	7.94	7.99	7.68	7.24	7.11	6.60	6.35	-
Mean	7.85	7.91	7.93	7.51	6.82	6.50	4.81	3.19	-
SE+	0.03	0.04	0.30	0.11	0.08	0.06	0.14	0.08	-
CD at 5%	0.10	0.13	0.11	0.33	0.26	0.18	0.42	0.25	-

Effect of *Tulsi* extract on microbial quality during storage

Microbial quality of *Shrikhand* stored at 7 °C Standard plate count (SPC) *Shrikhand* samples under different treatments preserved at 7 °C showed variation in microbiological quality during storage. The difference in SPC due to experimental treatments was least significant on all the days of storage. On day one, control sample T₀ had highest microbial load (27.32

X 10⁶cfu/g) than rest of the treatment. It was followed by *Tulsi* treated T₁ (25 X 10⁶cfu/g). T₂ and T₃ samples showed least microbial load than T₀ and T₁ due to level of *Tulsi*. Treated samples showed decreasing microbial load up to 15th day of storage but after that microbial load increased slowly and samples started to deteriorate.

Storage period (in days)									
Treatment	00	07	15	22	30	37	45	52	60
T ₀	27.32	15.17	5.82	6.20	6.94	6.96	7.00	8.00	9.00
T ₁	25.00	15.30	5.50	5.80	6.50	6.80	6.80	7.00	8.00
T ₂	24.00	15.20	5.40	5.60	6.40	6.20	6.50	6.00	7.00
T ₃	23.00	15.00	5.40	5.50	6.20	6.00	6.30	7.00	8.00

Effect on Coli form count of Herbal *Shrikhand* during storage

The coli form counts in product were in the range of (0 to 5 cfu/g), which is below the standard prescribed by BIS Karthikeyan (1993) [9] noted similar finding for *Shrikhand*. It is evident that the coliform are adversely affected during

storage of *Shrikhand*. A gradual decrease in counts of *E. Coli* during storage and their absence at 22nd day indicates their inhibition by lactic acid. Decrease in coli form count of Herbal *Shrikhand* during storage was reported by Sarkar et al. (1996) [7].

Storage period (in days)									
Treatment	00	07	15	22	30	37	45	52	60
T ₀	3.00	2.00	1.00	ND	ND	ND	ND	ND	ND
T ₁	4.00	2.00	1.00	ND	ND	ND	ND	ND	ND
T ₂	3.00	1.00	1.00	ND	ND	ND	ND	ND	ND
T ₃	5.00	2.00	1.00	ND	ND	ND	ND	ND	ND

Effect on Yeast and mould of Herbal *Shrikhand* during storage

Presence of congenial condition such as developed acidity and sufficient moisture in *Shrikhand* might have supported the growth of yeast and mould when samples were spoiled. On

30th day minimum YMC (10cfu/g, 8 cfu/g and 10 cfu/g) was found for T₁, T₂ and T₃ respectively, whereas control samples showed higher YMC count. The observations are in agreement with Prajapati et al. (1993) [10].

Storage period(in days)									
Treatment	00	07	15	22	30	37	45	52	60
T ₀	54.00	40.00	31.00	35.00	43.00	65.00	82.00	86.00	98.00
T ₁	46.00	26.00	19.00	13.00	10.00	17.00	22.00	30.00	40.00
T ₂	44.00	19.00	15.00	10.00	8.00	13.00	18.00	24.00	35.00
T ₃	40.00	34.00	20.00	15.00	10.00	16.00	20.00	29.00	38.00

Effect on Lactic acid bacteria of Herbal *Shrikhand* during storage

It is suggested that for getting maximum therapeutic value, the fermented milk product should contain population of viable cell more than 10⁶cfu/ml at the time of consumption. Keeping this in view, the products were studied for viable cell counts. From the, it may be seen that T₀ sample carried higher

viable Lactobacilli count (2.5 X 10⁶ to 23.6X 10⁶cfu/g) than T₁, T₂ and T₃. All *Shrikhand* samples showed the required beneficial viable Lactobacilli count in product when fresh and showed increasing trend at refrigerated temperature during storage up to 37 days without marked change from 45 to 60 days. The present investigation is in confirmation with Sarkar et al. (1996) [7].

Storage period (in days)									
Treatment	00	07	15	22	30	37	45	52	60
T ₀	2.5	4.5	14.5	17.5	19.3	22.3	23.5	23.6	23.6
T ₁	2.4	4.3	13.5	16.5	17.5	22.1	22.4	22.6	22.9
T ₂	2.3	4.2	12.3	15.7	17.5	20.0	21.2	21.5	21.7
T ₃	2.4	4.0	10.5	13.3	16.7	19.0	19.3	19.6	20.1

Conclusion

Current trends and changing consumer needs indicate a great opportunity for innovation in development of herbal and plant based new value added dairy products. The food and dairy industry is gearing up to bring natural remedies which are safe and effective as herbal products are gaining popularity in world market due to good therapeutic potential, no side effect and presence of health beneficial active pharmacological substances. *Shrikhandis* a nutritious dairy desert, which nourishes as it refreshes, has attracted people of all ages, throughout the world.

From the above study it can be concluded that addition of *Tulsi* @ 0.9% with 40% sugar (of weight of Chakka increases the shelf-life of optimized product by improving the microbial quality. Apart from the earlier mentioned point it also helps to improve the organoleptic property of the finished product.

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