

Study on sensory and physio-chemical properties of Shrikhand by using fennel powder

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Abstract- Shrikhand is a sweetened and original milk product of semi-solid consistency with a typical sweet and sour taste. It is made from fermented milk curd. In this study, various herbal products are produced in the dairy industry. Herbs such as fennel seed have been used since ancient times for cleaning the mouth and using home medicine.

Fennel shrikhand can be considered as an herbal shrikhand which tries to diversify the benefits and medicinal properties of shrikhand. It was prepared with the addition of fennel powder. In this study, the final powder is used as 1% fennel powder for T₁, 2% fennel powder for T₂, 3% fennel powder for T₃, 4% fennel powder for T₄. After production of shrikhand, physio-chemical changes were analyzed and sensory evaluation was done from day 1 to day 21 of all treatments. The study showed that there is no change in the T₂ sample and it increases the sensory quality and overall acceptability of the product.

Keywords: Chakka, fennel, shrikhand, Curd, Herbal, Sugar

Introduction

Fermented products are widely consumed worldwide and are considered to be alternatives to alleviate conditions associated to gut problems. It is also have been various nutritional and therapeutic properties. During the fermentation process, micro-organism such as lactic acid bacteria (LAB) transform organic substrates into simple organic end products. Lactic acid bacteria (LAB) play a major role in determining the positive health effect of fermented milk and related products (Hari N Mishra 2013).

Shrikhand is sweetened, indigenous dairy product having semi solid consistency with typical sweetish sour test. It is prepared from lactic acid fermented curd; the curd is partially strained through a muslin cloth to remove the whey and thus produce a solid mass called chakka. Shrikhand is fermented milk product which derive its name from the Sanskrit word "shrikharani" meaning a curd prepared with added sugar and flavoring agents. It is popular in the state of Gujarat, Maharashtra and part of Karnataka.

Shrikhand is also high nutritive, characteristic flavor, taste, palatable nature and possible therapeutic value. It can be recommended as health food for specific patients suffering from obesity and cardiovascular disease due to its low fat and sugar content (Swapna and Chavannavar 2013). Dairy industry is using new concepts like production of sweets with herbal ingredients.

A similar study was undertaken with different levels (10%, 15%, 20% and 25%) of mango pulp. Experimental mango Shrikhand mix was standardized to 6.0 fats, 9.0 solid non fats, 35% sugar and @ 1% culture. Shrikhand samples of different treatments were analysed for fat per cent, lactic acid per cent, protein per cent, moisture, total solids per cent, organoleptic characteristics (flavour and taste, colour and appearance, consistency, overall acceptability) and microbiological characteristics (yeast and mould and coli form count) (S.N.Thakur2013).

Herbal powders were widely used in the dairy products such as source of antioxidants (Shori & Baba, 2011). Fennel (*Foeniciculum vulgare*) is a plant belonging to the Apiaceae family, and thanks to its edible and very fragrant leaves and seeds has a long history of use.

Fortification of dairy products with herbs and spices to utilize functional and medicinal properties has also gained momentum (Paswan, 2021) Fennel seeds contain polyphenols and flavonoids and are used for medicinal purposes and as a flavour component. Fennel is used for diabetes, bronchitis, chronic cough, and kidney stone treatment (Angelov & Boyadzhieva, 2016). Fennel flavoured shrikhand can be considered as herbal shrikhand looking to diversified benefits and medicinal value of fennel.

Materials and methods

Production of fennel shrikhand:

Shrikhand was manufactured by the standard procedure given by Su kumar De (1980), Present investigation was undertaken to prepare shrikhand with fennel powder (*Foeniciculum vulgare*). The material used and methods were adopted were as under.

Fresh standardized milk used for products preparation good quality fennel was purchased from the local market. It was ground into a powder form, then this powder was passed through a fine sieve. Dahi culture was prepared in the departmental laboratory.

The milk was heated to 71°C for 15 seconds, then cooled to 38-40°C. After cooling the milk, a 2% curd culture was inoculated into the milk, then mixed well and incubated at 40°C until the curd solidified. When the curd has settled into a good structure, cut it and hang it on a muslin cloth for 8-10 hours. In this process the whey is drained off and the solid mess thus obtained is called Chakka. It is used as the basis of shrikhand.

Chakka is mixed with 25% sugar and kneaded to mix evenly. The product thus obtained is a control sample of stingray, which does not contain any fennel powder. To prepare fennel shrikhand, Chakka is mixed with sugar and different percentages of fennel powder like 1% fennel powder for T₁, 2% fennel powder for T₂, 3% fennel powder for T₃, and 4% fennel powder for T₄. The final product was filled into paper cups and stored at 6-8°C.

Buffalo skim milk (10% total solids) is heat-treated at 85°C for 30 minutes, and then inoculated to 42°C active YH culture solution at 1.5-2.0% to obtain curd (lactic acid 0.9). The 'chakka', when mixed with the required amount of cream and sugar, turned into a satisfying shrikhand (Patel, R. S., 1985). A study was conducted with kiwifruit (*Actinidia deliciosa*) pulp for chemical composition of kiwifruit pulp added shrikhand. Three levels of kiwi pulp viz. 5% (T₂), 10% (T₃) and 15% (T₄) on weight basis of shrikhand were prepared as 40% sugar by weight of chakka and compare T₂, T₃ and T₄ along with T₁ as control (Bhandage, B. B., 2020).

Table.1 Different treatments used in study

Sr. No.	Added Products	Blending ratios	Treatment symbol
1.	Chakka :Fennel powder	100:0	T ₀
2.	Chakka :Fennel powder	99:1	T ₁
3.	Chakka :Fennel powder	98:2	T ₂
4.	Chakka :Fennel powder	97:3	T ₃
5.	Chakka :Fennel powder	96:4	T ₄

Result and Discussion

Physiochemical parameter of control shrikhand and fennel shrikhand

The study showed physiochemical properties of fennel shrikhand. Total solids in fennel shrikhand can be affected by adding an additional amount. It increased from T₀ 38.8 to treatment T₂ 40.6 and moisture content was decreased as compared to T₀ (61.2) to treatment T₂ (59.4). The fat percentage of fennel shrikhand cannot be changed significantly, ranging between T₀ (8.5) and T₂ (8.4). Adding a large amount of fennel powder showed results on titratable acidity being changed from T₀ (0.135) to T₂ (0.189) and protein can be affected through the adding of fennel powder from treatment T₀ (7.0) to treatment T₂ (10.5). Similar observations were also reported in papaya pulp incorporated Shrikhand (Nigam et al. 2009). The sensory properties of shrikhand blended with banana pulp at 10, 20 and 30% were analysed and the sample with the 20% incorporation of banana pulp showed no significant difference in sensory attributes up to 14 days in comparison with other two samples (Narayanan and Lingam, 2013). The preparation of herbal shrikhand was done by incorporating aqueous extract of basil @ 1%, 2%, 3% and 4%, designated as T₁, T₂, T₃ and T₄, respectively, where T₀ was the control sample without basil extract and was evaluated for different physical-chemical, organoleptic and microbiological parameters (J David, 2015). The shrikhand samples were analyzed for the colour quality and proximate properties which included moisture, ash, protein, fat, carbohydrate and energy content (J Srinivas, 2017). The score of colour & appearance, consistency, flavour & tastes as well as the overall acceptability of different types of Shrikhand were compared (Ojha, Nidhi, et al, 2018).

Titratable Acidity

Treatment T₂ achieved the highest titratable acid percentage recorded for fennel shrikhand, 0.189, followed by T₀ 0.135, T₁ 0.180, T₃ 0.171 and T₄ 0.162. These values demonstrate the significant effect of treatment on percent titratable acid. With increasing apple pulp content, pH values decreased and titratable acidity increased significantly (P < 0.05), but there was no significant difference between GH and A1 (Sahu, 2021).

Moisture percentage

This study showed that the highest amount of fennel powder mixed in treatment T₄ resulted in the lowest moisture content. Treatment T₀ achieved the highest moisture score with fennel shrikhand, recording 61.2, followed by T₁ 60.4, T₂ 59.6 T₃ 59.4 and T₄ 58.8.

Total solid percentage

Treatment T₂ and T₃ obtained the highest value for total solid percentage in the fennel shrikhand recorded of 40.6, followed by T₀ 38.81, T₁ 39.6 and T₄ 37.8. These values indicate a significant effect of treatment on the total solid percentage. Determination of total solid by .Sodium Hydroxide Method, (IS 12333: 1997).

Fat percentage

The highest volume for fat percentage in fennel shrikhand 8.5 was obtained from the treatment T₀ followed by T₁ 8.4, T₂ 8.2, T₃ 8.1 and T₄ 7.9. These are values indicating significant effects of treatment. Determination of Fat (by Acid Digestion Method) (IS 2785 -1979).

Protein percentage

The highest value for the protein percentage in the fennel Shrikhand 9.5 was obtained from the treatment T₂ and T₁ followed by T₀ 7.0, T₃ 8.75, T₄ 8.75. Different treatments are indicate the different value of protein percentage.

Sensory evaluation

The acceptability of the final products was measured in terms of sensory attributes such as colour and appearance, body texture, flavour and taste, and overall taste acceptability using a 9-point hedonic scale with different individuals. The sample of shrikhand were subjected to the organoleptic evaluation by a panel of five of five semi trained judges. Evaluation was done on a 9-points hedonic scale (IS:6273-2, 1971). Sensory evaluation of control and functional shrikhands formulated with pomegranate peel extract was performed using a 9-point hedonic scale (Amerine et al., 1965).

Colour and Appearance

From table 2, the highest score for colour and appearance of fennel shrikhand, 7.75, was obtained from the T₂ and T₂ on the day of production, followed by T₀ 7.26, T₃ 7.12, and T₄ 6.50. A gradual increase in the colour and appearance score was observed till 21 days. T₁ was acceptable from day 1 with 7.75 followed by 7.85 on day 7, 7.50 on day 14 and 7.87 on day 21. The colour is important as it improves the visual appeal of the food product to which it is added (Meena, 2013).

Body and Texture

From table 3, it is shown that there is no difference in body and texture characteristic of all treatments. Treatment T2 got the highest score for body and texture from day 1 (7.87) to day 21(7.79). It was discovered that increasing the amount of fennel powder used in different treatments can alter the body and texture of the shrikhand. Treatment T4 with 4 % of fennel powder got the lowest score of 6.75 on the 21st day.

Flavour and Taste

From table 4, the flavour value increased from 8.25 to 8.37 from day 1 to day 21 for treatment T2. Treatments T3 and T4 got the maximum scores for flavour and taste, 7.00 and 6.42, respectively, which was less than Treatment T2. The flavour and taste of all treatments were continuously increased during the storage. It was observed in the flavour and taste that treatment T2 was acceptable for up to 21 days.

Overall Acceptability

From Table 5, the highest value for overall acceptability of fennel shrikhand 7.75, was obtained from treatment T2 on day 1, followed by 8.00 on day 7, 8.00 on day 14, and 8.37 on day 21. This study shows that T2 treatment with 2 % of fennel powder is the best combination of chakka and fennel powder of all treatments. As compared with treatment T1, T1 got a lower score for overall acceptability. T3, and T4 show the over-flavour of fennel in Shrikhand.

Sample	Titrateable acidity (%)	Moisture	Total solid	Fat	Protein (%)
T ₀	0.135	61.2	38.8	8.5	7.00
T ₁	0.180	60.4	39.6	8.4	9.50
T ₂	0.189	59.6	40.4	8.2	9.50
T ₃	0.171	59.4	40.6	8.1	8.75
T ₄	0.162	58.8	41.1	7.9	8.75

Table.1 Physiochemical parameter of control shrikhand and fennel shrikhand

Sample	Day-1	Day-7	Day-14	Day-21
T ₀	7.26	7.37	7.25	7.50
T ₁	7.75	7.85	7.50	7.87
T ₂	7.75	7.57	7.12	7.62
T ₃	7.12	6.71	6.87	7.12
T ₄	6.50	6.57	6.37	6.87
Mean	7.28	7.21	7.02	7.40

Table.2 Colour and Appearance

Sample	Day-1	Day-7	Day-14	Day-21
T ₀	7.25	7.14	7.37	7.50
T ₁	7.87	7.42	7.50	7.75
T ₂	7.87	7.85	7.57	7.79
T ₃	7.00	7.57	7.37	7.25
T ₄	7.00	7.14	6.71	6.75
Mean	7.40	7.42	7.30	7.41

Table.3 Body and Texture

Sample	Day-1	Day-7	Day-14	Day-21
T ₀	6.87	6.00	6.57	7.00
T ₁	7.12	7.00	7.42	7.87
T ₂	8.25	8.57	8.12	8.37
T ₃	6.62	7.00	6.87	6.37
T ₄	6.25	6.42	6.37	6.12
Mean	7.02	6.99	7.07	7.15

Table.4 Flavour and Taste

Sample	Day-1	Day-7	Day-14	Day-21
T ₀	7.00	6.28	6.72	7.12
T ₁	7.62	7.14	7.87	8.12
T ₂	7.75	8.00	8.00	8.37
T ₃	6.37	7.00	7.12	7.37
T ₄	5.75	6.57	6.37	6.50
Mean	6.99	6.99	7.22	7.49

Table.5 Overall Acceptability

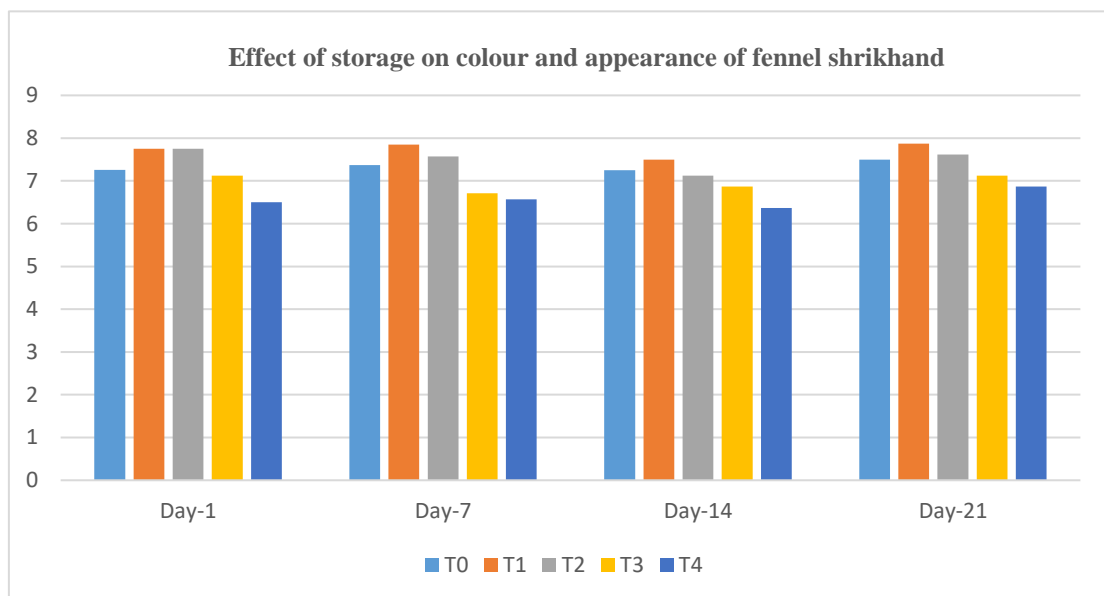


Fig.1 Effect of storage on colour and appearance of fennel shrikhand

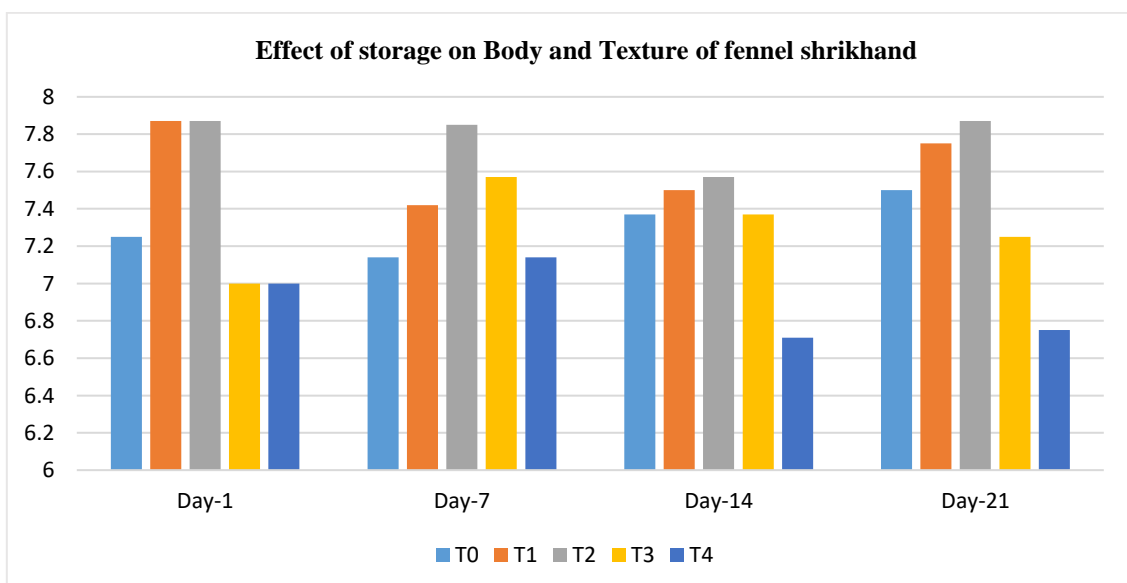


Fig.2 Effect of storage on Body and Texture of fennel shrikhand

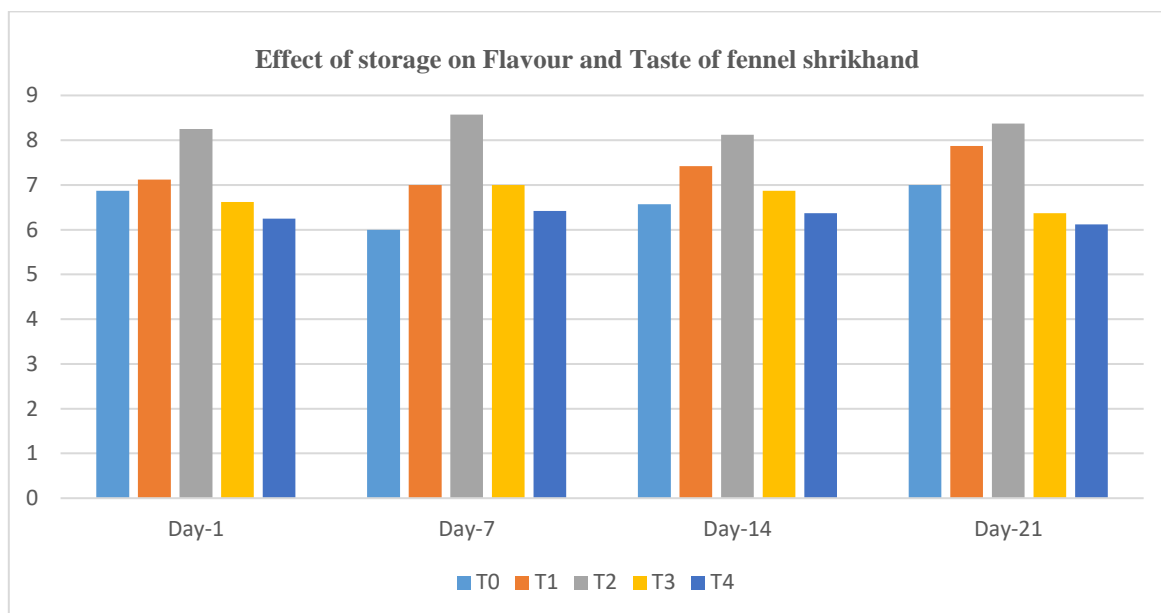


Fig.3 Effect of storage on Flavour and Taste of fennel shrikhand

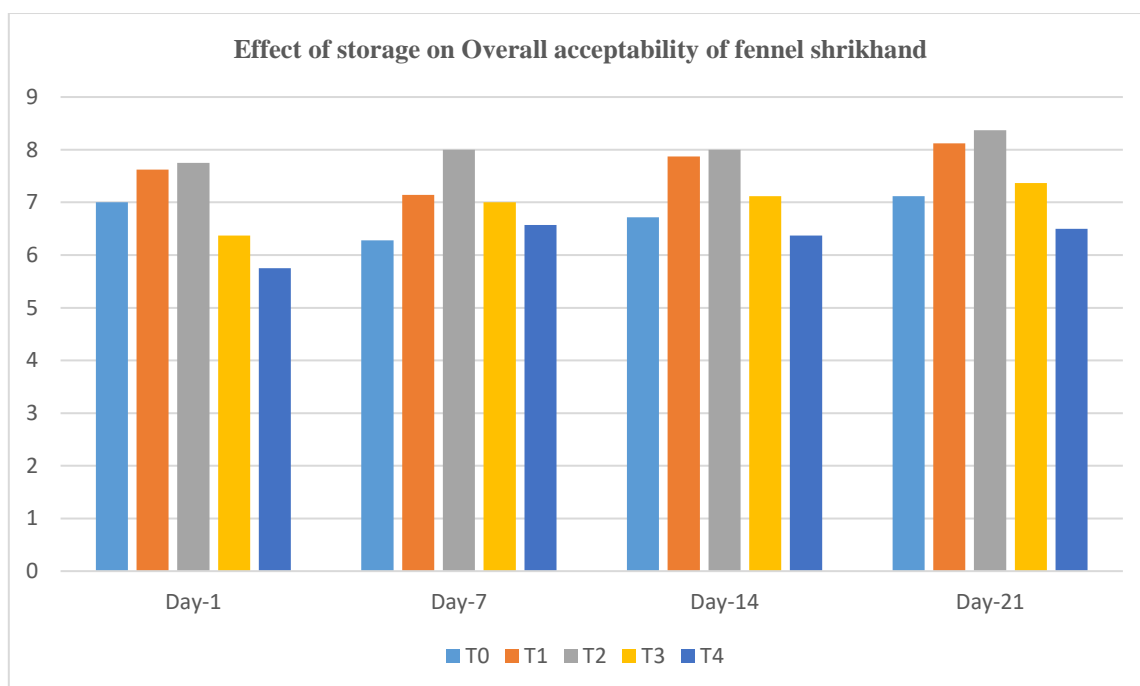


Fig. 4 Effect of storage on Overall acceptability of fennel shrikhand

Conclusion

In this study, analysis of sensory and chemical properties showed that the fennel shrikhand prepared by using 2 % of fennel powder, i.e., treatment T₂ outlaid the better organoleptic properties like colour and appearance, body and texture, flavour and taste, and overall acceptability followed by T₁. With 1% of fennel powder. Physicochemical properties of fennel shrikhand can be affected by fennel powder. The addition of more fennel T₄ (4% of fennel powder) can increase the total solids in fennel shrikhand and it decreases the fat percentage and moisture content in fennel shrikhand as compared to T₀ control shrikhand. T₀ control shrikhand show the lowest value of titratable acidity, total solids, and protein. As per the studies of review of literatures, this is first work with fennel in shrikhand.

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