

## PHYSICO-CHEMICAL ANALYSIS OF LOW CALORIE HIGH PROTEIN SHRIKHAND PREPARED USING STEVIA LEAF POWDER

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### ABSTRACT

In the present study the textural properties of shrikhand along with the chemical properties were investigated. Based on the preliminary trial sugar was substituted with different ratios of stevia powder. Shrikhand prepared with *Stevia* powder showed a significant ( $P \leq 0.05$ ) increase in the proximate composition of shrikhand. The textural parameters decreased with decrease in the amount of sugar significantly ( $P \leq 0.05$ ).

**Keywords:** Shrikhand, Stevia powder, Nutritive value, texture

### INTRODUCTION

India has a very rich variety of fermented foods prepared from milk, cereals, pulses vegetables, fruits and fish. Milk and milk products like curd, buttermilk lassi and Shrikhand is a traditional indigenous fermented semi soft, sweetened whole milk product prepared using Chakka (strained dahi) (Nadaf *et al.*, 2012). Dairy products are likely to remain important dietary components because of their nutritional value, flavor and texture. There will continue to be a demand for traditional, high quality dairy products, despite increasing competition from non- dairy based products (Rathore *et al.*, 2007)

Shrikhand is a semi soft, sweetish sour, whole milk product prepared from lactic fermented curd. The curd (dahi) is partially strained through a cloth to remove the whey and thus produce a solid mass called chakka (the basic ingredient for Shrikhand). This chakka is mixed with the required amount of sugar, etc., to yield Shrikhand. *Shrikhand* is a delicious and delightful dessert of western India. It is made with *chakka* (strained *dahi*/curd) which is finely mixed with sugar and flavouring agents. It has the nutritive goodness of fermented milk products. Like *dahi*, it is very refreshing particularly during summer months. It is popular because of its characteristics flavour, taste, palatable nature and possible therapeutic value.

The different sources of milk (Cow or Buffalo) can change the total fat, calcium and phosphorus content in the srikhand. Also, the process of fermentation to prepare curd will differ with respect to time and microorganism used. These parameters can change the total acidity of the product. It is also expected that the preparation of chakka by removing whey and incorporation of sugar will affect the moisture content and total solid mass of the srikhand. Shrikhand is inseparable dish in a regular diet of Indians. In all these milk-based products, the biochemical change is the production of lactic acid from lactose by lactic acid bacteria (LAB) like Lactococci, Leuconostocs, Streptococci and Lactobacilli. Shrikhand is a very popular and delicious product liked by many Indian and does consume it regularly during various occasions due to its pleasant taste and aroma. Shrikhand is prepared on small scale in a highly unorganized manner, which has great impact on microbiological characteristics of shrikhand. Wide variations in the organoleptical, microbiological and chemical qualities of shrikhand have been reported (Sarkar and Mishra, 1997) due to its variation in techniques of production.

Further taste and the appearance of the product can be improved by adding sugar and other ingredients like nuts, colors etc. It may be considered the western equivalent to quarg yogurt (Sarkar, 2008) This low fat fermented product play an important role in synthesis of vitamin B complex in human body and in the prevention of stomachic diseases (Sonawane *et al.*, 2007) and is recommended as health food for specific patients suffering from obesity and cardiovascular disease (Kumar *et al.*, 2008). Because of the change in the economic status and food habit of consumers the other varieties of Shrikhand such as fruit Shrikhand are also in great Demand (Singh, 2007). Recently attempt has been made to improve the nutritive and sensory characters of Shrikhand by adding ashwagandha Powder (Ladge *et al.*, 2011) and apple pulp with celosia powder (Kumar *et al.*, 2011), papaya pulp (Nigam *et al.*, 2009), cocoa powder and papaya pulp (Vagdalkar *et al.*, 2002), strawberry pulp (Sonawane *et al.*, 2007), mango pulp (Bardale *et al.*, 1986) etc. In addition with this Shrikhand is often prepared by adding saffron to enhance its color and appearance and flavor.

### Material and Method

#### Preparation of Shrikhand

Shrikhand was manufactured from cow milk standardized at 4% fat and 8.5% Solid not fat. Milk was heated at 85° C for 30 minutes. It was then cooled down at 28° C and inoculated by the starter culture at the rate of 1.5% and incubated at 28- 30° C for 10-12 hours until a firm coagulum was formed. Coagulum was then crushed and was transferred to a muslin cloth and pressed for expulsion of whey for 4-6 hours. The semi solid mass left after drainage of whey is called chakka, which form the base for shrikhand. Sugar or Sugar replacers and cardmon was then added to the chakka and kneaded properly. As this study aims at using Stevia as a sweetener so Stevia was incorporated as a sugar replacer in different ratio. Based on the preliminary trials Stevia powder was finalized for shrikhand preparation. The product so formed was analyzed to get the best proportion of sugar and stevia.

#### Analysis of the product

#### Chemical Analysis

Shrikhand was analysed for the following compounds- Moisture, Fat, Protein, Ash, Fiber. Moisture was determined by AOAC (2000) method. Fat content in the sample was estimated Soxhlet extraction method (AOAC, 2000). The protein content was determined by Micro-Kjeldahl's process as described in AOAC (2000). Ash content

was determined by the method described in AOAC (2000). The crude fiber content in various samples was determined AACC

#### Texture Profile Analysis (TPA test) for shrikhand

Standardization of milk (4%fat, 8.5% SNF)

Pasteurized

Cooling

Inoculation

Incubation

Coagulation

Drainage of Whey

Chakka formation

Addition of sugar or sugar replacers and Cardamom

Kneading

Shrikhand formation

Packaging and Storage

TPA measures parameters such as gumminess, cohesiveness, adhesiveness and firmness/hardness.

- The peak force during the first compression cycle is defined as hardness or firmness.
- The ratio of the positive force areas under the first and second compressions is defined as cohesiveness.
- Adhesiveness is the negative force area of the first bite representing the effort needed to pull the compressing plunger away from the sample. Adhesiveness is an important parameter for food products: it allows one to predict the degree of adhesion of food to the teeth.

- Gumminess is derived by calculating from the measured parameters and is defined as the product of hardness x cohesiveness. In the original description of TPA it is the energy required to disintegrate a semi solid food to a state of readiness for swallowing.

A cylindrical probe was used to compare the sample. The instrument was operated at pre test speed = 1.0 mm/s; test speed = 1.0 mm/s; post test speed = 10 mm/s; distance = 10 mm, trigger force = 5.0 g. All measurement were carried out in a controlled room at 25°C.

#### Result and Discussion

##### Analysis of Shrikhand

##### Chemical Analysis

The result showing the effect of sugar replacement on chemical properties of Shrikhand is presented in Table 1.

From the results it can be revealed that a proportionate increase in moisture, fat, protein, ash and fiber was observed. The increase in moisture was significant ( $P \leq 0.05$ ) with replacement of sugar with *Stevia* leaf powder. It may be attributed to the decrease in amount of sugar and fat. amount of moisture ranged from 49.16 to 56.72%. Similar results for shrikhand with 100% sugar were 49.27% and 50.47% observed by Sonawane et al., 2007, Kumar et al., 2011 respectively. The result observed by Nadaf et al., 2012 (41.30%) was different from the present investigation. The disparities may be due to the difference in time for whey separation for hung curd production.

The amount of fat content increased significantly ( $P \leq 0.05$ ) with decrease in the amount of sugar and increase in the amount of *Stevia* Leaf Powder. A fat may be due to the decrease in amount of sugar content in shrikhand and use of *Stevia* as sweetener. The range of fat was 7.43 to 8.56. Results for 100% sugar reported are 8.03%, 9.30% and 11.16% observed by Nadaf et al., 2012, Nigam et al., 2009 and Kumar et al., 2011 respectively. The disparities may be due to the different milk used for curd production

It can be depicted from the results of present investigation that the amount of protein showed a significant increase ( $P \leq 0.05$ ) with replacement of sugar by *Stevia* leaf extract. It may be due to the decrease in sugar as well as the increase in *Stevia* extract. The values range from 3.81 to 4.48%. Results for protein in 100% sugar

Table 1 Chemical Analysis of fresh Shrikhand

Level of sugar replacement	Proportion of Sugar (gm): <i>Stevia</i> leaf powder (gm)	Moisture	Fat	Protein	Ash	Fiber
0%	250:0	49.16 <sup>e</sup>	7.43 <sup>e</sup>	3.81 <sup>e</sup>	0.59 <sup>e</sup>	0.00 <sup>e</sup>
10%	225:1.25	50.84 <sup>d</sup>	7.68 <sup>d</sup>	4.04 <sup>d</sup>	0.61 <sup>d</sup>	0.14 <sup>d</sup>
20%	200:2.50	52.67 <sup>c</sup>	7.94 <sup>c</sup>	4.17 <sup>c</sup>	0.63 <sup>c</sup>	0.27 <sup>c</sup>
30%	175:3.75	54.63 <sup>b</sup>	8.23 <sup>b</sup>	4.32 <sup>b</sup>	0.64 <sup>b</sup>	0.42 <sup>b</sup>
40%	150:5.00	56.72 <sup>a</sup>	8.56 <sup>a</sup>	4.48 <sup>a</sup>	0.66 <sup>a</sup>	0.55 <sup>a</sup>
	CD at 5% Level	0.01	0.01	0.01	0.01	0.04

Any two means, in a column not followed by same letters differ significantly at 5% level

shrikhand reported are 5.70%, 6.25% and 10.40% observed by Nigam et al., 2009, Kumar et al., 2011 and Nadaf et al., 2012 respectively. The disparities may be due to the different milk used for curd production

The results of present investigation show that the ash content increase significantly ( $P \leq 0.05$ ) with decrease in sugar content. The values range from 0.59 to 0.66%. Results for ash in control shrikhand reported are 0.40%, 0.59% and 0.71% observed by Nadaf et al., 2012, Kumar et al., 2011 and Nigam et al., 2009, respectively. The disparities may be due to the different milk used for curd production It was noticed from the result of present investigation that there was no fiber content in shrikhand prepared with 100% sugar. However the samples prepared with replacing

sugar with *Stevia* powder increased the amount of fiber. The variation in the amount of fiber in different samples was significant. The values range from 0 to 0.55%.

##### Texture Properties

The textural profile parameters, namely hardness, adhesiveness, cohesiveness and gumminess were measured using TPA and are given in Table 2. Shrikhand prepared with 100% sugar was more firm (66.1g) and had a better adhesiveness than the treated *Stevia* sample. The decrease in hardness, adhesiveness and gumminess were correlated to an increase in compactness on microstructure of shrikhand prepared using *Stevia*. This may be due to the fact that *Stevia* leaf powder increased the moisture content and the less

amount of sugar used decreased the consistency hence loosening the binding capacity of the shrikhand. There was a significant ( $P \leq 0.05$ )

difference in the textural properties of shrikhand on increasing the amount of *Stevia* leaf powder.

**Table 2 Texture profile of Shrikhand**

proportion of <i>stevia</i> extract	Firmness	consistency	Cohesiveness	adhesive force
0	66.1 <sup>a</sup>	48.487 <sup>a</sup>	36.67 <sup>a</sup>	34.2 <sup>a</sup>
10	65.1 <sup>b</sup>	46.099 <sup>b</sup>	34.73 <sup>b</sup>	31.3 <sup>b</sup>
20	64.1 <sup>c</sup>	43.738 <sup>c</sup>	32.7 <sup>c</sup>	28.6 <sup>c</sup>
30	63.2 <sup>d</sup>	41.378 <sup>d</sup>	30.65 <sup>d</sup>	25.8 <sup>d</sup>
40	62.2 <sup>e</sup>	39.019 <sup>e</sup>	28.65 <sup>e</sup>	23 <sup>e</sup>
CD at 5% Level	0.11	0.0012	0.073	0.08

Any two means, in a column not followed by same letters differ significantly at 5% level

## CONCLUSION

From the above investigation it can be easily concluded that stevia leaves powder can be successfully used to replace sugar upto 30% for shrikhand formation. Use of stevia enhances the nutritional value yet maintaining the quality of shrikhand.

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