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## Soy milk and fruit based shrikhand: A novel fermented milk product

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### Abstract

Indian fermented milk products utilize 7 percent of total milk produced and mainly include three products i.e. dahi, shrikhand (sweetened concentrated curd) and lassi which may be considered the western equivalent to yogurt, quarg and stirred yogurt, respectively. These products play an important role in synthesis of vitamin B complex in human body and in the prevention of stomachic diseases, because several lactic organisms produce natural antibiotics. With the restricted availability and high cost of animal milk, the scientists have been making attempts to switch over to the utilization of plant proteins. Fermentation of soy milk improves the flavour, enhances the nutritional quality of food, increases the digestibility, eliminates the anti-nutritional factors, prolongs shelf life, adds therapeutic value and is relatively economic compared to dairy milk products. Soy milk based fruit juice beverage would offer several distinct nutritional advantages over the plain fruit beverage to the consumer. Fruits pulp is added to soy milk to enhance its vitamin A, C and mineral contents and it also provides sweetness and masks the beany flavor of soy milk to some extent. Various workers have tried pulp of various fruits in the preparation of shrikhand. Hence, to explore the possibility of the use of soy milk in fruits pulp based shrikhand have been reviewed to produce a novel fermented milk product.

**Keywords:** Milk, Fermentation, Soy milk, fruits pulp, shrikhand

### Introduction

India's market potential and current growth rate of traditional dairy products is unparalleled and all set to boom further under the technology of mass production. An estimated 50 to 55 percent of the milk produced in India is converted into a variety of traditional milk products, using processes such as coagulation, desiccation and fermentation. Fermented milk products constitute a vital component of the human diet in many regions of the world [1]. In Indian sub-continent such products are also classified as "indigenous milk products" like dahi (curd), lassi, shrikhand etc. which are prominent in human diet. These products have enjoyed reputation for their nutritional and therapeutic value from the time immemorial [2].

Shrikhand is one of the important fermented milk products which derive its name from the Sanskrit word "Shikharani" meaning a curd prepared with added sugar, flavouring agents (Saffron), fruits and nuts. It is the indigenous fermented milk product prepared by the fermentation of milk by using known strain of lactic acid bacteria. Shrikhand is popular dessert and forms part of a delicious supplement on religious functions, particularly in the state of Maharashtra, Gujarat, Karnataka and some parts of South India [2]. Fermented milk products have been well recognized to have anticholesterolemic and anticarcinogenic properties [3]. The organized sector of dairy industry is yet to accept shrikhand as a commercial product. Since manufacturing of shrikhand does not need special equipment and it seems to be the only economical product for small quantity surplus milk at house level, it has bright chances to be produced on large scale on industry basis.

Soybean is nutritious and used to prepare soy milk based fermented food products. Fermentation of soy milk improves the flavour, enhances the nutritional quality of food increase the digestibility, eliminates the antinutritional factors, prolongs product shelf life, adds therapeutic value and is relatively economic compared to dairy milk products [4]. Soy milk due to be any off-flavour is usually not accepted by most consumers [5]. Hence, efforts were made to incorporate fruits pulp in shrikhand to enhance its acceptability [6]. This indigenous fermented milk product contains high percentage of casein and large amount of sugar therefore; it is a heavy dish for digestion.

Shrikhand is traditionally made at home in western India [1] and sugar is added as an additive to enhance taste and does not have any preservative effect but other natural additives like dried

Fruits are added to enhance flavor. It is a common practice of using fruits in preparation of various dairy products like ice cream, yoghurt and shrikhand [6].

Soy milk based fruit juice beverage would offer several distinct nutritional advantages over the plain fruit beverage to the consumer. It also provides sweetness and masks the beany flavor of soy milk to some extent [7]. Various workers have tried pulp of various fruits in the preparation of shrikhand [8].

#### Preparation of Shrikhand by incorporating soy milk

Shrikhand was prepared from different blends of soy milk and dairy milk [9]. The consumer acceptability of the product decreased with increased soy milk supplementation. In an another experiment, shrikhand was prepared by blending soy milk with buffalo milk at different levels and reported that with increasing level of soymilk alone decreased the overall acceptability of the product [10]. Amrakhand (Soy-amarkhand) is a sweetened cultured dairy product made from curd of soymilk, dairy milk and mango pulp and is being produced and sold at commercial scale [5]. Sensory evaluation of amrakhand revealed that the product with 50 % soymilk was acceptable which was not much affected by the content of mango pulp, though the products with 30 and 40 % mango pulp indicated higher acceptability.

#### Preparation of Shrikhand by incorporating different fruit pulps

Shrikhand was prepared by incorporating papaya pulp at 20 percent level in chakka to increase the nutritional quality and overall acceptability [11]. Strawberry pulp and sugar were used for preparation of shrikhand [7]. Efforts were made to standardize the optimum level of sapota pulp for the preparation of a novel fermented shrikhand from cow milk chakka with constant level of sugar (40 percent by weight of chakka) blended with 15% levels of sapota pulp at the rate of quantity of chakka on the basis of sensory evaluation [12].

Lakshmi *et al.* [13] developed value added shrikhand with jamun by blending jamun fruit a neglected / under-utilized fruit. The product was prepared by blending chakka: sugar (60:40) and quantity of sugar for the optimum sweetness of product was found at 35 percent. A uniqueness of the product worth mentioning here is the product does not added with any of the artificial synthetic colours and flavour. Utilizing jamun fruit in shrikhand has reduced (the total sugar requirement by almost 15 percent to that of normal shrikhand. Further it also increased total volume of the product produced and in turn increased profitability. They concluded that jamun fruit can be effectively utilized in the preparation of fruit based shrikhand.

Shrikhand was prepared with constant level of sugar (40 percent by weight of chakka) and 20 percent level of Papaya pulp [14]. They reported that chemical composition of shrikhand was affected by papaya pulp. The moisture and ash percentage were significantly lowest in control shrikhand, while highest in shrikhand prepared with 20 percent papaya pulp. Sensory evaluation of shrikhand prepared with 20 percent papaya pulp showed significantly higher score for flavour, body and texture, colour and appearance and overall acceptability as compared to control shrikhand.

Para *et al.* [15] studied the effect of orange pulp and chiku pulp in combination (1:1) on the quality attributes of shrikhand. On the basis of various sensory parameters, shrikhand containing 14% pulp combination was selected as optimum.

Efforts were made by Bhojar *et al.* [16] to incorporate the nutritional value of banana in shrikhand and prepare the value

added fermented dairy product. The Before blending, unripe banana was cooked at 90 °C for 5 minute and prepare paste which improves sensory quality of shrikhand. It was found that blending of 20 percent unripe banana in shrikhand produces a good and more acceptable quality shrikhand. Shrikhand from dahi with a constant level of sugar (40%) and supplemented with banana pulp at 20 percent level were prepared by Narayanan and Lingam [17] and Vagdalkar *et al.* [18] used different levels of cocoa powder and papaya pulp, separately.

Shrikhand was also prepared successfully by the fermentation of buffalo milk Chakka mixed with other ingredients and ashwagandha root extract for manufacturing of ashwagandha root extract modulated shrikhand [19]. Since this medicinal plant has immunomodulatory properties, they called their product as 'immunomodulatory shrikhand'. Sensory and textural parameters were analyzed in the manufactured sample and were observed that it varies significantly and quite acceptable by the semi-trained panels. Kumar *et al.* [20] conducted study to evaluate the effect of apple pulp on the quality characteristics of shrikhand containing 20 percent apple pulp and dried *Celosia argentea* flower.

Cow milk chakka was used for preparation of shrikhand with constant level of sugar (40%) blended with varying levels of custard apple pulp [8]. The superior quality shrikhand was prepared with 10 percent custard apple pulp and cost of production can also be reduced if manufactured on large scale.

Thakur *et al.* [21] conducted a study with different levels of mango pulp and concluded that the shrikhand prepared with 25% mango pulp, was highly acceptable in terms of flavor, taste and overall quality as compared to other treatment combinations.

#### Yoghurt starter culture in shrikhand

Devshete *et al.* [22] prepared shrikhand from buffalo milk using dahi and yoghurt culture and observed that shrikhand prepared using yoghurt culture was comparable or equally good to shrikhand prepared using dahi culture. This indicated that good quality shrikhand can be prepared using yoghurt culture. The main advantage of yoghurt shrikhand is that it contains viable cells of yoghurt bacteria which provide therapeutic benefit to the consumer.

Patel and Chakraborty [23] worked on reduction of curd-forming period in Shrikhand manufacturing process and found that Yoghurt culture (YH) was the most desirable as it produced satisfactory curd within 4 h thus reducing the curd setting time from 8-10h to 4 h.

#### Titration acidity and pH of shrikhand

The acidity in the fresh Shrikhand prepared from buffalo milk blended with soymilk was less than Shirkhand prepared from buffalo milk alone [10]. David [24] prepared herbal shrikhand by incorporating aqueous basil extract and reported higher percent titrable acidity and pH vales in Herbal Shrikhand as compared to control. A study to evaluate the effect of orange pulp and chiku pulp in combination (1:1) on the quality attributes of Shrikhand was conducted and reported that acidity increased significantly ( $p < 0.05$ ) with increasing level of pulp combination [15]. There was also found a significant increase in acidity at each higher level of strawberry pulp [6]. The increase in titrable acidity and pH of fruit pulps added shrikhand might be due to higher acidity of pulps than control sample.

In contrary, acidity of sapota pulp shrikhand was slightly decreased due to incorporation of sapota pulp in blend <sup>[12]</sup>. The decreasing trend of acidity with increasing level of papaya pulp <sup>[11]</sup> and mango pulp <sup>[21]</sup> was also reported.

### Proximate composition of shrikhand

The fruit based shrikhand was having an average composition of 62.62 percent total solids, 9.65 percent protein, 8.56 percent fat, 43.61 percent carbohydrate and 0.80 percent ash. A wide variation on the composition of shrikhand has been reported by various workers. Mehta <sup>[25]</sup> performed study on the proximate analysis of branded shrikhand, particularly with respect to values of fat, protein and mineral contents. It was found that Aarey and Amul brand shrikhand is popular and has good nutritional qualities.

The total solids content of shrikhand was significantly ( $P < 0.01$ ) increased due to blending of banana pulp <sup>[17]</sup> and custard apple pulp <sup>[8]</sup> at different levels. But the total solids content in soy- amrakhand decreased with increasing levels of soymilk proportions <sup>[26]</sup>.

The fat, protein, lactose, sucrose, ash and total solid contents significantly decreased with increase in the level of papaya pulp and sapota pulp in shrikhand <sup>[11]</sup>. This may be due low amount of above discussed proximate parameters in the papaya pulp and sapota pulp. Similarly, Kumar *et al.* <sup>[20]</sup> found that with incorporation of apple pulp in preparation of shrikhand, the protein, fat and ash content decreases significantly ( $P \leq 0.05$ ) with increase in amount of pulp. The probable reason is due lower protein, fat and ash content of apple pulp in comparison to the chakka, but higher moisture content of pulp in comparison to the chakka significantly increased the moisture content of developed shrikhand.increases.

The fat and total solids of buffalo milk blended soy milk shrikhand were lower than shrikhand prepared from buffalo milk, and protein and moisture content of buffalo milk and soymilk blended shrikhand are higher than control <sup>[10]</sup>. It was due to more affinity to retain moisture of soy protein, so other parameter proportionately decreases.

### Storage and keeping quality of Shrikhand

However, shrikhand made from buffalo milk blended with soymilk (9:1) <sup>[10]</sup> and 20% papaya pulp <sup>[11]</sup> can be stored at refrigeration temperature for 15 days, but shrikhand containing 20% apple pulp and dried *Celosia argentea* flower packed in polystyrene cups was acceptable for a period of three weeks <sup>[20]</sup> and blending of chakka, sugar and jamun fruit pulp further increased the shelf life of functional shrikhand up to 25 days <sup>[13]</sup> at refrigerated ( $4 \pm 1$  °C) temperature.

Karche *et al.* <sup>[27]</sup> reported that cow milk shrikhand blended with sapota pulp spoiled within 4 days when stored at room temperature, while it was acceptable up to 8 days when stored at refrigeration temperature ( $4 \pm 1$  °C). A study was carried out to assess the suitability of adding ashwagandha powder into shrikhand <sup>[28]</sup> and samples were stored at 7 °C. The treated product was acceptable up to 52 days of storage under refrigerated temperature organolaptically and microbiologically.

### Conclusions

Fermented milk products play an important role in synthesis of vitamin B complex in human body and in the prevention of stomachic diseases, because several lactic organisms produce natural antibiotics. Due high cost of animal milk, the

scientists have been making attempts to switch over to the utilization of plant proteins. Fermentation of soy milk improves the flavour, enhances the nutritional quality of food, increases the digestibility, eliminates the anti-nutritional factors, prolongs shelf life, adds therapeutic value and is relatively economic compared to dairy milk products. Fruits pulp is added to soy milk to enhance its vitamin A, C and mineral contents and it also provides sweetness and masks the beany flavor of soy milk to some extent. Soy milk based fruit juice beverage would offer several distinct nutritional advantages over the plain fruit beverage to the consumer.

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