

Effect on Lactose and Sucrose Content of Srikhand Preparation from Chakka and Different Types of Fruit Pulp

Dr. Manoj Kumar¹ and Dr. Aditya Kumar²

¹Department of Animal Husbandry, Chandra Shekhar Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh, INDIA.

²Department of Animal Husbandry and Dairying, Janta College, Bakewar, Etawah-206124 (U.P.), Chhatrapati Shahu Ji Maharaj University, Kanpur-208024, Uttar Pradesh, INDIA.

²Corresponding Author: dr.adityadev@gmail.com



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ABSTRACT

Srikhand is a traditional fermented dairy product prepared from *chakka*, obtained by draining whey from curd, and is widely appreciated for its taste, nutritional value, and digestibility. The present study was undertaken to evaluate the effect of incorporating different types of fruit pulp on the lactose and sucrose content during the preparation of srikhand. Chakka was prepared from standardized milk and blended with a fixed proportion of sugar, followed by the addition of selected fruit pulps such as mango, banana, strawberry, and pineapple at varying levels. The lactose content of chakka and fruit-based srikhand samples was analyzed to assess changes resulting from fermentation and fruit incorporation, while sucrose content was determined to study the impact of added sugar and natural sugars present in fruit pulps.

Keywords- Srikhand, Chakka, Lactose Content, Sucrose Content, Fruit Pulp Incorporation.

I. INTRODUCTION

Fermented milk products also known as cultured dairy products are dairy foods that have been fermented with lactic acid bacteria such as *Lactobacilli*, *Lactococcus* and *Leuconostoc*. Fermentation process not only increases the shelf life of the product but also adds taste and improves the digestibility of milk. Fermented milk represents an excellent source of nutrients such as calcium, protein, phosphorus and riboflavin. During fermentation of milk, lactic acid and other organic acids are produced and these increase the absorption of iron. If it is consumed at meal times, the acids are likely to have positive effect on the absorption of iron from other foods.

There are several varieties of fermented milk prepared according to local traditional practices and known under various names such as Shrikhand, Acidophilus milk, Bulgarian milk, Cultured milk, Dahi, Leben, Kefir, Kumiss, Yoghurt etc. (Laxminarayan and Shankar, 1980)

Shrikhand is an indigenous semi-soft, sweetish-sour, whole milk delicious and healthful dessert, particularly in western part of India and prepared from lactic fermented curd. It is made with *chakka* (strained yoghurt/curd) which is finely mixed with sugar and flavouring agents. It has the nutritive goodness of fermented milk products. Like *dahi* (curd), it is very refreshing particularly during summer months. It is popular because of its characteristics flavour, taste, palatable nature and possible therapeutic value (Nigam, et al., 2009).

Shrikhand has very high nutritive, characteristics flavour, taste, palatable nature and possible therapeutic value whether it is prepared from curd or yoghurt. *Shrikhand* is very refreshing Indian fermented dairy dessert particularly during summer months which improves the digestive system by strengthening immune system. Keeping all the above mentioned nutritional benefits in the mind we can say that *shrikhand* is the health food.

II. MATERIALS AND METHOD

The present investigation was carried out in the Department of Animal Husbandry and dairying, Chandra Shekhar azad University of Agriculture and Technology, Kanpur. Buffalo milk samples werw obtained from University Dairy at Kanpur Campus. Milk samples were standardized.

Materials

Milk: Fresh buffalo milk having 6.0 percent milk fat and 9.0 percent SNF was used for this research project.

Fruits: Fruits of three types were used in this study which are the under.

Mango: Ripen mango (*Mangifera indica* var. Dasher) was obtained from local market.

Papaya: Ripen papaya (*Carica papaya* var. Pusa delicious) was obtained from local market.

Banana: Ripen banana (*Musa Paradisica* var. Dwarf carendish) was obtained from local market.

Sugar: White ground cane sugar of commercial grade was used as a sweetening agent, which was obtain from open market of Kanpur city. It was ensured that the sugar was free from dust, dirt and other foreign impuities.

Starter culture: Pure active culture of lactococcus lactis subsp. lactis obtained from Dairy Microbiology Division, National Dairy Research Institute, Karnal. Bacterial culture was propagated in sterilized skim milk to prevent strain compatibility.

Packaging materials: Polystyrene cups of 100g capacity were used for packing of shrikhand.

Manufacturing procedure of chakka and shrikhand

Shrikhand was prepared using traditional method (Bhattacharya et al.1973; Rangappa and Acharya, 1974; Upadhyay and Dave, 1977; De, 1980 using mixed culture and various fruits pulp.

Standardization of milk

Raw buffalo milk (3liter) was standardized to 6.0 percent fat and 9.0 percent SNF every time.

Preparation of curd/dahi

Standardized milk was heated in a double jacketed vat with slow agitation up to a temperature of 85°C for 30 min. Then it was cooled to 30°C and inoculated with starter culture at the ratio of 1.5 percent. It was incubated at 30°C for 16 hrs, so as to get curd with pH 4.55-4.50 and with a pleasant diacetyl aroma.

Preparation of chakka

Firmly set curd (dahi) was emptied in muslin cloth (2 layers) bags and transferred in hoop and pressure applied continuously so as to facilitate faster whey drainage. Total time was required 3-3.5 hrs. for whey drainage from the curd. The solid mass thus obtained called chakka, is base material for shrikhand.

Yield of chakka

1.0 kg chakka obtained from 3 litre buffalo milk.

Preparation of shrikhand from chakka

The chakka (1.0 kg) obtained from 3 litre buffalo milk was divided into four parts and each part

blended with various fruits [Mango (F1), Papaya (F2) and Banana (F3)] pulp at the rate of 0, 20, 30 and 40 percent W/W of the chakka as when as required. The fruits were washed and sanitized in chlorinated water (100 ppm chlorine), peeled and de-seeded and ground by planetary mixy before blended in chakka. The ground sugar and fruits pulp was mixed well in a planetary mixy for the manufacture of shrikhand processing steps involved in the production of fruits pulp blend shrikhand are shown in flow diagram.

III. PLAN OF WORK

Preparation of shrikhand

Shrikhand was prepared by modified method (Srivastava, 1986).

Type of milk

Buffalo milk with 6 percent fat and 9 percent SNF.

Starter culture

Starter culture used lactococcus lactis subsp. lactis

Level of addition of starter culture

1.5 percent by V/V of milk

- **Incubation period and temperature:** 5 hours at 37°C
- **Level of addition of sugar:** 40 percent sugar by weight of the total mass (Chakka + fruit pulp).
- **Types of fruits to be added: 3**
 - Mango
 - Banana
 - Papaya
- **Levels of addition of fruits pulp: 4**
 - 0% by weight of chakka (Control)
 - 20% by weight of chakka
 - 30% by weight of chakka
 - 40% weight of chakka
- **Packaging:** Final product was packaged in polystyrene cups.
- **Storage condition:** At refrigeration (5°C).
- **Storage intervals:** 50, 7, 14, 21, 28 Days.

IV. RESULTS

1. Lactose Content:

The result of investigation are as follows:

Effect of different types of fruits (A) on fruit pulp based shrikhand:

The mean lactose percentage of fruit pulp based shrikhand by three different types of fruits has been given in Table 1. The average values for lactose percentage were 3.428, 3.444 and 3.446 in A1, A2 and A3, respectively. The mean maximum (4.446) and the minimum (3.428) liking percentage were observed in case of fruit pulp based shrikhand prepared by using mango and papaya pulp, respectively. These results were found to be statistically non- significant (P>0.05).

Effect of different level of addition of fruit pulp (B) in fruit pulp based shrikhanda:

The mean lactose percentage different level of addition of fruit pulp (B) in fruit pulp based shrikhanda has been given in Table 1. The average values for lactose percentage were 4.433, 3.542, 3.086 and 2.696 in B1, B2, B3 and B4, respectively. The mean maximum percentage (4.433) was found in 0% addition of pulp in chakka while the minimum (2.696) liking percentage was observed in case of 40% addition of fruit pulp in chakka. The differences in lactose percentage were found to be significant ($P < 0.05$, $CD = 0.125$) due to different level of addition of fruit pulp (B) in fruit pulp based shrikhanda. All the variables were significantly differed from each other.

Effect of different storage periods (C) on fruit pulp based shrikhanda:

The mean lactose percentage of fruit pulp based shrikhanda, stored on the refrigerated temperatures for five different storage periods have been presented in Table 1. The average lactose percentage values were 3.468, 3.456, 3.440, 3.425 and 3.407 in C1, C2, C3, C4 and C5, respectively. The mean maximum percentage (3.468) was found at 0 day, while the minimum (3.407) liking percentage were observed in case of fruit pulp based shrikhanda stored for 28 days at the temperatures of 5 °C of refrigeration. The differences in lactose percentage were found to be non-significant ($P > 0.05$).

Effect of different types of fruit pulp (A) and different level of addition of fruit pulp (B) in fruit pulp based shrikhanda:

The maximum lactose percentage (4.434) was noticed in A1xB1 while the minimum lactose percentage (2.652) was found in A1xB4. The highest lactose percentage was found in sample which contains 0% of fruit pulp while minimum percentage was in sample that contains 40% mango pulp. These results were found to be statistically non-significant ($P > 0.05$).

Effect of different types of fruit pulp (A) and different storage periods (C) on fruit pulp based shrikhanda:

The maximum lactose percentage (3.475) was noticed in A2xC1 and A3xC1 while the minimum lactose percentage (3.398) was found in A1xC5. The highest lactose percentage was found in sample of banana papaya pulp based shrikhanda stored at fresh day while, minimum percentage was in sample that contains mango pulp stored for 28 days. The differences in lactose percentage were found to be non-significant ($P > 0.05$).

Effect of different addition of fruit pulp (B) and different storage periods (C) on fruit pulp based shrikhanda:

The maximum lactose percentage (4.460) was noticed in B1xC1 while the minimum lactose percentage (2.660) was found in B4xC5. The highest lactose percentage was found in sample of 0% fruit pulp addition based shrikhanda stored at 0 day while minimum

percentage was in sample that contains 40% fruit pulp and stored for 28 days. The differences in lactose percentage were found to be non-significant ($P > 0.05$). The overall interaction effect of different types of fruit pulp (A), various levels of fruit pulp addition (B) and different storage periods (C) used for preparation and storage of fruit pulp based shrikhanda:

Overall interaction of AxBxC, the mean value for lactose percentage has been presented in Table No. 4.8.2. It was observed that the combination of A1xB1xC1, A2xB1xC1 and A3xB1xC5 got maximum lactose percentage (4.460) whereas the least lactose percentage (2.620) found in A1xB4xC5 combination. The analysis of variance for fruit pulp based shrikhanda, it was observed that main effect of B was found to be significant while, remaining main effect, first order interactions and second order interaction were recorded to be non-significant.

2. Sucrose Content:

The result of investigation in the respect of sucrose attributes on account of various treatments have given in table 2. The mean sucrose percentage of fruit pulp based shrikhanda by three different types of fruits has been given in Table 4.9.1. The average values for sucrose percentage were 42.235, 41.504 and 40.457 in A1, A2 and A3, respectively. The mean maximum (42.235) and the minimum (40.457) liking percentage were observed in case of fruit pulp based shrikhanda prepared by using mango and papaya pulp, respectively. The differences in sucrose percentage were found to be significant ($P < 0.05$, $CD = 0.108$) due to different level of addition of fruit pulp (B) in fruit pulp based shrikhanda. All the variables were significantly differed from each other.

Effect of different level of addition of fruit pulp (B) in fruit pulp based shrikhanda:

The mean sucrose percentage different level of addition of fruit pulp (B) in fruit pulp based shrikhanda has been given in Table 2. The average values for sucrose percentage were 40.068, 41.221, 41.847 and 42.459 in B1, B2, B3 and B4, respectively. The mean maximum percentage (42.459) was found in 40% addition of pulp in chakka while the minimum (40.068) liking percentage was observed in case of 0% addition of fruit pulp in chakka. The differences in sucrose percentage were found to be significant ($P < 0.05$, $CD = 0.125$) due to different level of addition of fruit pulp (B) in fruit pulp based shrikhanda. All the variables were significantly differed from each other.

Effect of different storage periods (C) on fruit pulp based Shrikhanda:

The mean sucrose percentage of fruit pulp based shrikhanda, stored on the refrigerated temperatures for five different storage periods have been presented in Table 2. The average sucrose percentage values were 41.339, 41.374, 41.400, 41.428 and 41.453 in C1, C2, C3, C4 and C5, respectively. The mean maximum percentage (41.453) was found at 28 day, while the

minimum (41.339) liking percentage were observed in case of fruit pulp based shrikhand stored for 0 day at the temperatures of 5 0 C of refrigeration. These results were found to be statistically non-significant ($P > 0.05$).

Effect of different types of fruit pulp (A) and different level of addition of fruit pulp (B) in fruit pulp based shrikhand:

From Table 2, the maximum sucrose percentage (43.970) was noticed in A1xB4 while the minimum sucrose percentage (40.068) was found in A1xB1, A2xB1 and A3xB1. The highest sucrose percentage was found in sample which contains 40% of fruit pulp while minimum percentage was in sample that contains 0% mango pulp. The differences in sucrose percentage were found to be significant ($P < 0.05$, $CD = 0.217$) due to different level of addition of fruit pulp (B) in fruit pulp based shrikhand. All the variables were significantly differed from each other.

The effect of different types of fruit pulp (A) and different storage periods (C) on fruit pulp based shrikhand, the maximum sucrose percentage (42.303) was noticed in A1xC5 while the minimum sucrose percentage (40.405) was found in A3xC1. The highest sucrose percentage was found in sample of mango pulp based shrikhand stored at 28 days while minimum percentage was in sample that contains papaya pulp stored for 0 day. The differences in sucrose percentage were found to be non-significant ($P > 0.05$).

The effect of different addition of fruit pulp (B) and different storage periods (C) on fruit pulp based shrikhand, the maximum sucrose percentage (42.510) was noticed in B4xC5 while the minimum sucrose percentage (40.000) was found in B1xC1. The highest sucrose percentage was found in sample of 40% fruit pulp addition based shrikhand stored at 28 days while minimum percentage was in sample that contains 0% fruit pulp and stored for fresh day. The differences in sucrose percentage were found to be non-significant ($P > 0.05$).

The overall interaction effect of different types of fruit pulp (A), various levels of fruit pulp addition (B) and different storage periods (C) used for preparation and storage of fruit pulp based shrikhand. It was observed that the combination of A1xB3xC5 got maximum sucrose percentage (43.900) whereas the least sucrose percentage (40.000) found in A1xB1xC1, A2xB1xC1 and A3xB1xC1 combination.

From the analysis of variance, it was observed that main effect A, B, C and AxB was found to be significant while remaining first order interactions and second order interaction were recorded to be non-significant.

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Table 1 Average lactose percentage of fruit pulp based shrikhand as affected by different type of fruits (A) , fruit pulp level (B) & storage period (C).

Treatments	B1	B2	B3	B4	C1	C2	C3	C4	C5	Mean
A1	4.434	3.534	3.090	2.652	3.455	3.443	3.428	3.415	3.398	3.428
A2	4.432	3.546	3.080	2.718	3.475	3.463	3.445	3.428	3.410	3.444
A3	4.432	3.546	3.088	2.718	3.475	3.463	3.448	3.433	3.413	3.446
B1					4.460	4.450	4.430	4.420	4.403	4.433
B2					3.567	3.557	3.547	3.527	3.513	3.542
B3					3.120	3.100	3.087	3.073	3.050	3.086
B4					2.727	2.717	2.697	2.680	2.660	2.696
Mean	4.433	3.542	3.086	2.696	3.468	3.456	3.440	3.425	3.407	

Table 2 Average sucrose of fruit pulp based shrikhand as affected by different type of fruits (A) , fruit pulp level (B) & storage period (C).

Treatments	B1	B2	B3	B4	C1	C2	C3	C4	C5	Mean
A1	40.068	41.888	43.014	43.970	42.163	42.205	42.238	42.268	42.303	42.235
A2	40.068	41.354	41.948	42.646	41.450	41.480	41.503	41.535	41.555	41.504
A3	40.068	40.420	40.580	40.760	40.405	40.438	40.460	40.483	40.500	40.457
B1					40.000	40.050	40.070	40.100	40.120	40.068
B2					41.153	41.193	41.230	41.253	41.273	41.221
B3					41.797	41.820	41.840	41.873	41.907	41.847
B4					42.407	42.433	42.460	42.483	42.510	42.459
Mean	40.068	41.221	41.847	42.459	41.339	41.374	41.400	41.428	41.453	