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Upasana Ratnakaran
Assistant Professor,
Department of Animal Science
and Dairy Science, Goa College
of Agriculture, Ela Farm, Old
Goa, Goa University, India

Sanjana Rao
M.Sc. Research Scholar,
Department of Genetics and
Plant Breeding, School of
Agricultural Sciences, G.D.
Goenka University, Gurugram,
Haryana, India

Gourish Karanjalker
Assistant Professor,
Department of Horticulture,
Goa College of Agriculture, Ela
Farm, Old Goa, Goa
University, India

Rachana A Kolambkar
Assistant Professor,
Department of Agricultural
Economics, Goa College of
Agriculture, Ela Farm, Old
Goa, Goa University, India

Corresponding Author:
Upasana Ratnakaran
Assistant Professor,
Department of Animal Science
and Dairy Science, Goa College
of Agriculture, Ela Farm, Old
Goa, Goa University, India

Studies on the physico-chemical properties and sensory evaluation of Shrikhand prepared by using chickoo fruit pulp

Upasana Ratnakaran, Sanjana Rao, Gourish Karanjalker and Rachana A Kolambkar

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Abstract

The research work was conducted in the Department of Animal Science and Dairy Science, Goa College of Agriculture, Ela Farm, Old Goa. The preparation of Shrikhand was done by using cow milk chakka with different proportions of chickoo pulp. The sugar levels were kept constant at 40% weight of chakka. The chickoo pulp in different treatments were added at 10% (T₁), 15% (T₂), 20% (T₃) and 25% (T₄) respectively corresponding to the weight of chakka. The prepared samples were then subjected for physico-chemical analysis i.e. moisture, acidity, total solids, pH, fat and protein along with its control treatment (T₀). A significant difference was found within control and treatment groups on the above parameters on addition of chickoo fruit pulp into the shrikhand blend. An organoleptic analysis for attributes like colour, appearance, flavour, taste, body and texture and overall acceptability were judged using 9 point hedonic scale by trained panellist. It was observed that as the addition of chickoo pulp increased in the chakka mixture, there was an increase in the acidity, moisture and pH, while, there was a decrease in the fat, protein and total solid contents. With regard to the sensory evaluation, it was observed that the overall acceptability score for treatment T₁, T₂, T₃ and T₄ was 7.81, 8.01, 8.42 and 8.30, respectively and it was concluded that the treatment with 20% chickoo fruit pulp mixed shrikhand scored the maximum in most of the attributes and found to be highly acceptable.

Keywords: Shrikhand, chickoo fruit pulp, physico-chemical properties, sensory evaluation

Introduction

Shrikhand is a semi-soft, sweetest sour whole milk product that is prepared from lactic acid fermented curd. Shrikhand is prepared from chakka (strained curd) which is then mixed with sugar and flavouring agents. It is one of the milk product that is relished by most of the people in India. This dish is normally prepared during the festive seasons especially in Maharashtra, Gujarat, Karnataka and some parts of South India. Being a fermented product, they have many nutritional benefits and therapeutic properties due to which they are also one among the products that is preferred by consumers on demand basis.

Fruits play an important role in the diet of human beings as they are rich in energy, contain vital minerals and vitamins. Chickoo, also known as Sapota belong to the family Sapotaceae. Chickoo is one of the major fruit crop grown in India. It has very high nutritional value and health benefits. The nutrient value of sapota fruit (in 100 g) includes 0.4 g of protein, 1.1 g of fat, 20 g of carbohydrate, 5.3 g of total dietary fibre. It is also rich in various minerals and vitamins. The chickoo fruit has anti-viral, anti-bacterial, anti-tumour, anti-inflammatory, and hepatoprotective properties. Hence, taking into consideration the health benefits of Shrikhand and chickoo fruit, a research work was conducted to know the overall effect on the nutritional quality, taste and acceptance of chickoo pulp blended shrikhand.

Materials and Methods

Fully ripened Chickoo fruits, cane sugar and cow milk standardised with 6.0% fat and 9% SNF was procured from the local market. The research work was carried out in the laboratory of Animal Science and Dairy Science Department of Goa College of Agriculture, Ela Farm, Old Goa.

Methodology

Preparation of Chickoo pulp

The chickoo fruit was washed with clean water and dried. The skin and seeds were removed. They were made into slices and put in the mixer to get a homogenous pulp in the mixer. This pulp was further studied for its moisture content, carbohydrate, total sugar, protein and fat content was estimated by the standard AOAC (1990) [1] methodology. The titratable acidity of sapota fruit pulp was determined as per the procedure by Ranganna, 1986. The total soluble solids (TSS) of chickoo pulp was determined by using an handheld Refractometer at atmospheric temperature. The equipment was calibrated with distilled water and the TSS of the chickoo juice was determined in °Brix. The experiment was replicated three times. The pH of chickoo pulp was measured using digital pH meter.

Preparation of curd, chakka and shrikhand:

The standardized cow milk was heated to 85 °C for 30 minutes, and cooled to 25 °C. The milk was then inoculated by lactic starter culture at the rate of 2% and incubated at 25 °C for 10-12 hours to form a firm coagulum (curd). The curd so obtained was tied in muslin cloth. The chakka were obtained after draining the whey. The chakka was used as base material for preparation of Shrikhand. The chakka obtained was mixed with 40% sugar and chickoo fruit pulp was added in the following concentrations 10%, 15% & 20% and 25% as per the weight of chakka to obtain the final product-chickoo fruit pulp Shrikhand.

Treatments are as follows

T₀: Shrikhand without chickoo fruit pulp (control)
T₁: Shrikhand with 10 percent chickoo fruit pulp
T₂: Shrikhand with 15 percent chickoo fruit pulp
T₃: Shrikhand with 20 percent chickoo fruit pulp
T₄: Shrikhand with 25 percent chickoo fruit pulp

The chickoo fruit pulp shrikhand obtained in various treatments were analysed for fat, protein, acidity, sugar, total soluble solids and moisture according to the standard procedure described by AOAC (1990) [1]. For each fruit pulp, standardization trials were repeated for four times and mean score was worked out.

Sensory evaluation

The sensory evaluation of chickoo fruit pulp Shrikhand samples were carried out by a trained panel of six judges of the institute by using 9-point hedonic scale described by Gupta (1976) [6]. The parameters such as colour, appearance, flavour, taste, body and texture (consistency) and overall acceptability were included in the study. The score of various treatments of the above parameters were pooled and a mean score for each parameter was worked out.

Results and Discussion

a. Physio-Chemical Properties of Chickoo Pulp

The average values of the physico-chemical properties of the chickoo pulp obtained in the study is shown in Table 1.

Table 1: Physico-chemical properties of the Chickoo pulp

No.	Parameters	Average value obtained
1	Moisture (%)	76.50
2	Acidity (%)	0.22
3	Total soluble solids (°Brix)	23.50
4	pH value	5.74
5	Protein content (%)	0.65
6	Fat content (%)	0.76
7	Carbohydrate content (%)	20.2
8	Total sugar%	16.5

i. Moisture content

The moisture content of the chickoo pulp content was in agreement with the results obtained by Jadhav, 2018 [8] and Powar *et al.* 2022 [14].

ii. Titratable acidity

The average titratable acidity of fresh chickoo pulp obtained in the current study was 0.22%, which is within the range (0.2-0.25) obtained by Powar *et al.* 2022 [14] and Pawar *et al.* 2011 [13].

iii. Total soluble solids

With regard to the TSS level, the value obtained was slightly higher than Hiremath and Rokhade (2012) [7], who obtained 21.6°B and in agreement with the results obtained by Naktee (2013) [11] and Gaikwad (2016) [4]. The variation in the values might be due to the stage of maturity of the chickoo fruit.

iv. pH

The average pH value of the chickoo pulp was 5.74 which is similar to the result obtained by Powar *et al.* 2022 [14] and within the range obtained by Gupta 1976 [6].

v. Protein content

The protein content reported in various studies ranged from 0.6-0.8%. The results in the current study was slightly less than the reports obtained by Ganjyal *et al.*, 2003 [5] but in agreement with Jadhav, 2018 [8].

vi. Fat content

The fat content obtained in the present study was within the range obtained by Jadhav, 2018 [8] and Powar *et al.*, 2018 [14], but lower than the values obtained by Ganjyal *et al.*, 2003 [5].

vii. Carbohydrate and total sugar content

The carbohydrate content was within the range stated by Jadhav, 2018 [8] and the total sugar contents was in agreement with Pawar *et al.*, 2011 [13]. On the contrary, the results were dissimilar with Rao *et al* 1971 [16].

b. Physico-chemical properties of Chickoo Fruit Pulp Shrikhand

The observations with regard to the physico-chemical properties for moisture, acidity, total solids, pH, protein and fat of Chickoo Fruit Pulp Shrikhand has been shown in Table 2:

Table 2: Physico-chemical properties of the Chickoo fruit Pulp Shrikhand

No.	Parameters	Mean values of five replications in percent					S.E.	CD at 5%
		T ₀	T ₁	T ₂	T ₃	T ₄		
1	Moisture	40.5 ^a	42.3 ^b	43.6 ^c	44.2 ^d	45.1 ^e	±0.41	0.956
2	Acidity	1.83 ^a	1.80 ^b	1.78 ^c	1.76 ^d	1.73 ^e	±0.01	0.278
3	Total Solids	59.5 ^a	57.7 ^b	56.4 ^c	55.8 ^d	54.9 ^e	±0.41	0.987
4	pH	4.60 ^a	4.64 ^b	4.78 ^c	4.80 ^d	4.83 ^e	±0.04	0.137
5	Protein	6.5 ^a	6.0 ^b	5.8 ^c	5.5 ^d	5.3 ^e	±0.19	0.321
6	Fat	8.02 ^a	7.52 ^b	6.84 ^c	6.58 ^d	6.36 ^e	±0.28	0.847

The values with different superscript row wise differ significantly at 5% level of significance.

i. Moisture content of chickoo fruit pulp added shrikhand

It was observed that the mean moisture content of the product was found to be 40.5, 42.3, 43.6, 44.2 and 45.1 percent for the treatments T₀, T₁, T₂, T₃ and T₄, respectively. An increasing trend in the moisture content was observed from T₀ to T₄ and all the treatments were found to be significantly different from each other. The treatment T₄ had significantly higher moisture content due to the presence of higher amount of chickoo pulp.

The above results were similar to that of Sharma *et al.* 2017^[19], who found that an increasing trend in the moisture content was seen when the levels of chickoo pulp increased. Sameem *et al.* 2018^[17], also reported that the moisture content in shrikhand also increased with increased levels of dragon fruit pulp.

ii. Titratable acidity of chickoo fruit pulp added shrikhand

It was observed that as the quantity of chickoo pulp increased the acidity of the final product showed decreasing trend in the acidity levels. All treatments were significantly different from

each other. The results recorded in the present investigation for titratable acidity were comparable with the results observed by the following research workers. Nigam *et al.* 2009^[12] and Shambharkar *et al.* 2011^[18] observed a decreasing trend in the acidity levels with increasing level of papaya pulp and sapota pulp respectively. On the contrary, David, 2015^[2] and Kushwaha and Shukla, 2019^[10], observed that the acidity levels increased with increased levels of Basil extract and kiwi fruit pulp in the shrikhand blend respectively. This difference in the acidity levels may be attributed to the chemical nature of the desired fruit for the preparation of shrikhand.

iii. Total solid content of chickoo fruit pulp added shrikhand

From Table 2, it can be observed that total solid content was highest in the control and the levels were decreasing with increasing levels of chickoo pulp concentration. All the treatments were found to be significantly different from each other. The present results were in agreement with Sameem *et al.* 2018^[17] (on dragon fruit pulp shrikhand), Kushwaha and Shukla, 2019^[10] (kiwi fruit pulp shrikhand) and Nigam *et al.* 2009^[12] (papaya pulp shrikhand). It is also

found that the moisture content directly influenced the total solid percent, hence an increase in moisture content of the product decreased the total solid content.

iv. pH content of chickoo fruit pulp added shrikhand

With regard to the pH value, it can be found that the pH increased with the increase in the concentration of chickoo pulp addition in the shrikhand mixture. A similar trend was also seen by Kolape *et al.* (2010)^[9] in the control and treatments groups as 4.38 (T₁), 4.47 (T₂), 4.55 (T₃) and 4.63 (T₄), respectively in the papaya pulp mixed shrikhand. This difference may be attributed to the sweet nature of the chickoo fruit that balanced the acidic nature of shrikhand.

v. Protein content of chickoo fruit pulp added shrikhand

In the current study, the protein content of product gradually decreased significantly from T₀ to T₄, with significant difference between groups. The results obtained were in agreement with other research workers who found the same trend in dragon fruit pulp shrikhand (Sameem *et al.* 2018)^[17], sapota pulp shrikhand (Shambharkar *et al.* 2011)^[18], wood apple pulp shrikhand (Singh and Kumar 2017)^[20] and papaya pulp shrikhand (Nigam *et al.* 2019)^[12]. These results may be due to the lower concentration of protein content in the selected fruit.

vi. Fat content of chickoo fruit pulp added shrikhand

It can be revealed from the table that adding of chickoo pulp had significantly affected the fat content of Shrikhand mixture. The fat content had significantly reduced between treatments as the concentration of chickoo pulp had increased. A similar form of observation was also seen by various researchers when they added different fruit pulps to shrikhand. Deshpande *et al.* 2005^[3], found that the fat content in soy milk based Amarkhand decreased fat content when the mango pulp concentration had increased. A study by Nigam *et al.* 2009^[12] and Shambharkar *et al.* 2011^[18] also observed the reduction in fat values when fruit pulp prepared with custard apple and sapota pulp were mixed shrikhand respectively.

c. Sensory evaluation of chickoo fruit pulp added shrikhand

The data pertaining to the sensory average score of different treatments is shown in Table 3.

Table 3: Sensory evaluation of the Chickoo fruit Pulp Shrikhand

Parameter	Mean values of different parameters in treatments					S.E±	CD @ 5%
	T ₀	T ₁	T ₂	T ₃	T ₄		
Colour	7.46 ^a	7.52 ^b	7.78 ^c	7.85 ^d	7.90 ^d	0.035	0.202
Appearance	7.43 ^a	7.52 ^b	7.69 ^c	7.78 ^d	7.80 ^d	0.029	0.078
Flavour	7.56 ^a	7.67 ^b	7.89 ^c	8.12 ^d	8.23 ^d	0.050	0.082
Taste	7.23 ^a	7.39 ^b	7.58 ^c	7.60 ^d	7.87 ^d	0.043	0.067
Body and texture	7.28 ^a	7.35 ^b	7.64 ^c	7.87 ^d	7.72 ^e	0.045	0.060
Acceptability	7.66 ^a	7.81 ^b	8.01 ^c	8.42 ^d	8.30 ^e	0.056	0.218

The values with different superscript row wise differ significantly at 5% level of significance.

i. Colour and Appearance

Based on the results of the judging panellists, it was found that all the treatments were significantly different from each other with respect to colour and appearance. However, a non-significant difference was seen between T₃ and T₄.

ii. Flavour and Taste

The highest mean flavour obtained by different chickoo fruit pulp shrikhand combination was in the following sequence T₄ (8.23), T₃ (8.12), T₂ (7.89), T₁ (7.67) and T₀ (7.56). However, differences in these values were significant between the groups as shown in Table 3. With regard to the taste, a non-significant result was obtained between T₃ and T₄ but these treatments were found to be significantly different among the remaining groups.

iii. Body and texture (Consistency)

The highest mean consistency was in the following sequence T₃ (7.87), followed by T₄ (7.72), T₂ (7.64), T₁ (7.35) and T₀ (7.28). However, all the treatments were significantly different from each other.

iv. Overall acceptability

The highest mean overall acceptability obtained by chickoo fruit pulp added shrikhand was in T₃ (8.42), followed by T₄ (8.30), T₂ (8.01), T₁ (7.81) and T₀ (7.66) that differed significantly between each treatment groups.

Conclusion

From the present study, it can be concluded that the chickoo fruit pulp can be utilized for preparation shrikhand as a novel product that can increase the palatability and nutritional importance of shrikhand. It was observed that as the addition of chickoo fruit pulp increased in the chakka mixture, there was an increase in the acidity, moisture content, pH value. On the other hand, a decrease in trend was observed in the fat, protein and total solid content of the shrikhand. With regard to the sensory evaluation, it was observed that the overall acceptability score for treatment T₁, T₂, T₃ and T₄ was 7.81, 8.01, 8.42 and 8.30, respectively. T₃ was more acceptable than T₁, T₂, and T₄. Hence, it can be concluded that the blending of 20 percent Chickoo fruit pulp to the preparation of shrikhand was fairly acceptable, a may be recommended as a novel product in the market.

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