

Utilization of sapota pulp in the preparation of Shrikhand

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ABSTRACT

The study was conducted at Department of Animal Husbandry and Dairying at Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. An effort was made to produce a novel fermented milk product. Further efforts were made to standardize the optimum level of sapota pulp in the preparation of Shrikhand by sensory evaluation and to study its economics. Shrikhand was prepared from cow milk chakka with constant level of sugar (40 per cent by weight of chakka) blended with varying levels of sapota pulp at the rate of quantity of chakka i.e. 5 % (T₂), 10 % (T₃), 15% (T₄) and 20 % (T₅). Treatment T₃ (93.72) showed highest overall acceptability than other treatments. Fat content of Shrikhand, treatment T₁ (8.05 per cent) showed highest fat content among all the treatments. Total solid content of Shrikhand was highest in T₁ (65.65 per cent) and lowest in T₅ (54.31 per cent). For protein content treatment T₁ (6.15 per cent) was significantly higher than rest of the treatments. Titratable acidity was highest in T₁ (1.86 per cent) and lowest in T₅ (1.69 per cent). For sugar content, treatment T₁ (41.11 per cent) showed highest sugar over rest of the treatments. Cost of production of 1 kg Shrikhand was lowest in T₅ (Rs. 66.96) and highest in T₁ (Rs. 68.80). Increase level of sapota pulp showed slight decrease in cost of production of Shrikhand.

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Key Words : Sapota pulp, Blending, Shrikhand, Chemical composition, Sensory evaluation, Cost of production

INTRODUCTION

Cultured dairy products find a very predominant position in the Indian cultures. These products were traditionally prepared at small scale in each household. Now the commercial production of some of these products has become a big active industry. Around 9 per cent of total milk produced in India is converted into fermented milk product and this sector is showing an annual growth rate of more than 20 per cent per annum (Singh, 2006).

The role of fermented milk products in human nutrition has been well documented. Fermented milk products are rich in proteins, vitamins and minerals. They are reported to be effective in treatment of many diseases like constipation, diarrhea, acidity, gastro-enteritis, gingivitis, tumor genesis, hypercholesterolemia etc. (Patel and Ranz Scheuen, 1997). Fermented milk products like Shrikhand have some advantage over fluid milk because of more keeping quality, digestibility and palatability.

Sapota is considered as energy producing fruit and having high nutritive value. It contains higher percentage of vitamin C. Sapota fruit is rich in carbohydrates and provides good amount of proteins and minerals like calcium, phosphorus and iron. The fruits are tonic, enrich blood,

increase muscular strength, cooling, sedative to the heart and relieve vomiting. Gopalan *et al.* (1977) recorded composition of ripened Sapota fruit as moisture 73.7 per cent, carbohydrate 21.4 per cent, fibre 2.6 per cent, fat 1.1 per cent, protein 0.7 per cent, mineral 0.5 per cent, vitamin C 6 mg, thiamine 0.02 mg, riboflavin 0.03 mg, niacin 0.02 mg and mineral content calcium 28 mg, phosphorus 27 mg and iron 2 mg.

Looking to above diversified benefits of sapota pulp and nutritive value of fermented milk, sapota pulp Shrikhand was prepared from cow milk with various treatment combinations. Recently there has been an increasing trend to fortify the product with fruit pulp or juice. Fruits are considered good source of mineral and vitamins and hence supplementation of Shrikhand with fruit will not only improve its flavour but also its overall nutritional quality and the taste.

METHODOLOGY

Collection of ingredients :

Fresh, clean, whole cow milk was procured from Livestock Instructional Farm of Department of Animal Husbandry and Dairying, Dr. Panjabrao Deshmukh Krishi

Vidyapeeth, Akola. The fresh cow milk was standardized at 4 per cent fat before preparation of chakka. Fully ripened sapota (var. 'Kalipatti') fruits, clean crystalline cane sugar were purchased from local market and used as per requirement.

Extraction of sapota pulp:

Approximately the required amount of sapota fruits was taken. These were washed with clean water. The seed and skin was removed manually. The pulp extracted was converted into homogenous mass with the help of mixer (Jadhav *et al.*, 2000).

Preparation of curd:

Cow milk was heated in water bath maintained at 90°C for 15 min. After heating the milk was cooled to room temperature (30°C). Milk was inoculated with 1 per cent starter culture and incubated at temperature of 30°C for 12 hrs. for setting the curd (De, 2009).

Preparation of chakka:

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 (De, 2009).

Preparation of Shrikhand from chakka:

Method of preparation of Shrikhand suggested by Aneja *et al.* (1977) was used with slight modification. Cow milk standardized to 4 per cent fat then it was heated to 71°C for 10 minute. After heating, it was cooled to 30°C and inoculated with 1 per cent starter culture and then allowed incubating for 12–14 hrs, then breaking of coagulum and hanging in muslin cloth for drainage of whey. After expulsion of whey, addition of sugar 40 per cent @ by weight of chakka and sapota pulp as per recommended. The product was placed in plastic coated cups and stored as refrigeration temperature for further evaluation and analysis.

Treatments :

T₁ (Shrikhand without sapota pulp (control).), T₂ (Shrikhand with 5 per cent sapota pulp), T₃ (Shrikhand with 10 per cent sapota pulp), T₄ (Shrikhand with 15 per cent sapota pulp) and T₅ (Shrikhand with 20 per cent sapota pulp).

Analysis of Shrikhand:

Percentage of fat was determined as per the procedure recommended in I.S.I. Hand Book of Food Analysis, Dairy Products (Part I) 1980. The total solid

content in Shrikhand was determined by Gravimetric method as described in IS:1479, Part II (1961). The protein was determined by estimating the per cent nitrogen by micro Kjeldhal method as recommend in IS:1479 (Part II), 1961. The per cent nitrogen was multiplied by 6.38 to find out the protein percentage in Shrikhand. The acidity of milk expressed on per cent lactic acid was determined by the methods described in IS: 1479 (Part I) 1960. Determination of sugar was done as per Lane and Eynon method (1923) with a modification suggested by Ranganna (1986).

Sensory evaluation of Shrikhand:

The 100-point numeric score card as prescribed by Pal and Gupta (1985) was used for sensory evaluation of Shrikhand.,

Cost structure:

Cost structure of Shrikhand was calculated by considering market cost of ingredients used for Shrikhand making.

Design of experiment and statistical analysis:

Data were statistically analyzed under completely randomized design by adopting standard method (Amble, 1975).

OBSERVATIONS AND ASSESSMENT

The results obtained from the present investigation as well as relevant discussion have been presented under following heads :

Chemical composition of sapota blended Shrikhand:

Sapota pulp Shrikhand was subjected to chemical analysis for fat, protein, total solid, total sugar and titratable acidity. The results obtained are presented in Table 1.

Fat :

The perusal of data of Table 1, revealed that adding of sapota pulp had significantly affected the fat content of Shrikhand. It was observed that adding of sapota pulp decreased the fat content of Shrikhand. The declining trend of fat content of Shrikhand can be attributed to the fact that fat content of sapota pulp is lower than cow milk *i.e.* 1.1 per cent only. The fat content was higher in T₁ *i.e.* 8.05. Shrikhand prepared from 100 per cent cow milk without sapota pulp (control). Lowest fat content in Shrikhand (6.30) per cent was observed in treatment T₅ *i.e.* shrikhand prepared from cow milk with 20 per cent sapota pulp. The present results are comparable with the

Table 1 : Effect of different levels of sapota pulp on chemical composition of Shrikhand (per cent)

Treatments (CMC: SP)	Mean values of five replications in per cent				
	Fat	Protein	Total solids	Total sugar content	Titrateable acidity
T ₁ (100:00)	8.05	6.15	60.65	41.11	1.86
T ₂ (95:05)	7.55	5.80	57.76	40.28	1.80
T ₃ (90:10)	7.25	5.50	55.86	39.01	1.74
T ₄ (85:15)	6.80	5.30	54.72	38.15	1.72
T ₅ (80:20)	6.30	5.07	54.32	37.48	1.69
'F' test	Sig.*	Sig.*	Sig.*	Sig.*	Sig.*
S.E. (m)±	0.056	0.077	0.377	0.283	0.007
C.D. (P=0.05)	0.168	0.231	1.133	0.849	0.022

CMC – Cow milk chakka, SP – Sapota pulp

*indicates significance of value at P=0.05

findings of Jadhav *et al.* (2000) who reported that increase in levels of sapota pulp decreased in fat content of milk shake upto 3.41 per cent. Deshpande *et al.* (2005) concluded that in increasing the preparation of mango pulp to Shrikhand there was decrease in fat content of soymilk based Amrakhand. Nigam *et al.* (2009) reported the fat content of papaya pulp Shrikhand as 11.96 to 7.70 *i.e.* decreasing with increasing level of papaya pulp. Gavane (2010) concluded that increasing the proportion of custard apple pulp to Shrikhand, there was decrease in fat content of custard apple Shrikhand.

Total solid :

It was observed that the total solid in control sample (T₁) *i.e.* Shrikhand prepared without sapota pulp was highest than prepared from Shrikhand blended with sapota pulp. There was decrease in total solids content of sapota pulp Shrikhand with increase in level of sapota pulp in the blend. The declining trend of total solid content of Shrikhand can be attributed to the fact that sapota pulp containing more moisture *i.e.* 73.15 per cent as compare to total solid *i.e.* 26.85 per cent. Nigam *et al.* (2009) reported 61.26 to 49.63 per cent total solid in papaya blended Shrikhand for 20 per cent papaya pulp.

Protein :

It was observed from Table 1 that, the protein content of sapota pulp Shrikhand of different treatment combinations ranged from 6.15 (T₁) to 5.07 (T₅), whereas again decreasing trend in protein values of blended sapota was due to low level of protein in sapota *i.e.* 0.7 per cent. The critical difference was calculated and treatment differences were tested at 5 per cent level of significant. The findings of the present investigation are in closed agreement with Nigam *et al.* (2009) who found similar results *i.e.* decrease in protein content in papaya pulp shrikhand *i.e.* 6.73 to 3.38 per cent.

Total sugar :

Total sugar content of sapota blended Shrikhand ranged from 41.11 to 37.48 per cent. The sugar content was highest in treatment T₁ (41.11) and lowest in T₅ (37.48). There was significant difference in between treatment T₂ and T₃ for sugar content. It was observed that as the proportion of sapota pulp in the blend increased there was decrease in sugar content of sapota blended Shrikhand, This might be due to less sugar content in sapota pulp and rate of sugar addition was on the basis of weight of chakka only in Shrikhand. The results are comparable with the findings of Nigam *et al.* (2009) who reported similar results with present research findings that sugar content of product was decreased from 40.14 to 32.11 for 20 per cent papaya pulp.

Titralable acidity:

Table 1 shows that treatment T₁ has highest acidity as compared to rest of the treatments. Similarly treatments T₃ and T₄ were found at par with each other. It was observed that acidity of sapota pulp Shrikhand was slightly decreased due to incorporation of sapota pulp in blend. Nigam *et al.* (2009) showed the decreasing trend of acidity with increase level of papaya pulp *i.e.* 2.61 to 1.04.

Sensory evaluation of Shrikhand blended with sapota pulp:

The data pertaining to sensory score at different treatments are depicted in Table 2.

Colour :

Data presented in Table 2 in respect of colour of Shrikhand indicated that highest mean score (8.75) out of 10 was observed for the treatment T₃ with 10 per cent sapota pulp and lowest score for 7.27 for control. Statistically treatment T₃ was superior over rest of the treatments. Similarly, treatment T₅ was superior over T₁, T₂, and T₄. Labade (2009) reported that colour of pineapple

Table 2 : Sensory evaluation of Shrikhand blended with sapota pulp

Treatments (CMC : SP)	Mean values of scores obtained for five replications(Score/Marks)				
	Colour (10)	Appearance (10)	Flavour (45)	Body and texture (35)	Overall acceptability(100)
T ₁ (100:00)	7.27	8.15	41.47	30.50	87.92
T ₂ (95:05)	7.75	8.50	39.50	31.83	87.57
T ₃ (90:10)	8.75	9.07	43.25	33.65	93.72
T ₄ (85:15)	8.35	8.67	37.00	30.50	84.52
T ₅ (80:20)	8.42	7.25	27.75	26.50	69.92
'F' test	Sig.*	Sig.*	Sig.*	Sig.*	Sig.*
S.E. (m)±	0.228	0.295	0.909	0.757	1.380
C.D. (P=0.05)	0.686	0.887	2.727	2.271	4.140

(CMC – Cow milk chakka, SP – Sapota pulp *indicates significance of value at P=0.05

blended Lassi has highest mean score 8.24 out of 10 was observed for the treatment T₂ with 5 per cent pineapple pulp.

Appearance :

It is observed from Table 2, that the highest mean score (9.07) out of 10 in respect of the appearance of Shrikhand was observed in T₃ treatment, while lowest 7.25 for the treatment T₅. Statistically treatment T₃ was superior over rest of the treatments. Similarly, treatment T₁ and T₂, T₂ and T₄, T₂ and T₃, T₃ and T₄ were at par with each other. The results are in agreement with those obtained by Gavane (2010) who reported that average score of appearance attributes of Shrikhand was highest in T₂ (9.9) *i.e.* 10 per cent custard apple pulp.

Flavour:

From Table 2, the treatment T₃ was significantly superior over T₁, T₂, T₄ and T₅ treatments. It was observed that 10 per cent sapota pulp blended Shrikhand gave rich flavour. The lowest score was noticed for Shrikhand prepared with 80 per cent cow milk chakka and 20 per cent sapota pulp (T₅). These above results are comparable

with the findings of Deshpande *et al.* (2005) who observed highest score of 7.97 for mango pulp soya Amrakhand which improved the flavour of Shrikhand over control. Gavane (2010) reported the highest score for T₂ (40.15) treatment *i.e.* Shrikhand prepared with 10 per cent custard apple pulp.

Body and texture :

It was observed from Table 2 that, Treatment T₃ was superior over T₁, T₂, T₄ and T₅. It the body and texture of shrikhand was significantly affected due to blending of sapota pulp. The highest score was in T₃ (33.65), the lowest being recorded for T₅ (26.50).

Overall acceptability :

From Table 2, it was observed that the overall acceptability of sapota blended Shrikhand for various treatments varied between 69.92 to 93.72. The highest score of 93.72 was observed for T₃ treatment and the lowest score was observed as 69.92 for T₅ treatment. Shrikhand with 10 per cent sapota pulp was significantly superior in respect of overall acceptability score over all the treatments.

Table 3 : Cost of production of sapota blended Shrikhand

Sr. No.	Particulars	Treatments				
		T ₁	T ₂	T ₃	T ₄	T ₅
1.	Quantity of milk used in lit cow milk (1 lit. = 250 g chakka)	2.4	2.28	2.16	2.04	1.92
2.	Cost of milk required as per treatment cost of milk Rs. 20 / lit.	48	45.60	43.20	40.80	38.40
3.	Sapota pulp required as per treatment (g)	0	30	60	90	120
4.	Cost of required amount of sapota pulp (Cost of sapota pulp Rs. 86/- kg)	0	2.58	5.16	7.74	10.32
5.	Sugar required as per treatment	400	380	360	340	320
6.	Cost of sugar Rs. 32 /- kg	12.80	12.16	11.52	10.88	10.24
7.	Cost of starter culture (Rs. 40/- lit)	1	1	1	1	1
8.	Cost of processing (<i>i.e.</i> utensils, heating medium, cooling, blending, electric etc.)	5	5	5	5	5
9.	Miscellaneous cost (Rs.)	2	2	2	2	2
10.	Total cost of production/kg (Rs.)	68.80	68.34	67.88	67.42	66.96

Cost of production of sapota blended Shrikhand:

Cost of sapota blended Shrikhand was worked out and is presented in Table 3. While estimating the cost of finished product, the cost of the ingredients used in the preparation of sapota blended Shrikhand rated as per prevailing market price.

From Table 3, it was observed that, cost of production of sapota blended Shrikhand (per kg) for Treatment T₁, T₂, T₃, T₄ and T₅ was 68.80, 68.34, 67.88, 67.42 and 66.96, respectively. Blending of cow milk chakka with sapota pulp proportionally reduced the cost of production. The cost of production of blended Shrikhand can be lowered further if the same is manufactured on large scale. This difference was due to addition of sapota pulp, which was available at lower cost. Lowest cost of production was observed in case of treatment T₅ (66.96). However, the best treatment selected by judges was T₃ (where in addition of 10 per cent sapota pulp to Shrikhand was done) and the cost of production of Shrikhand in this treatment was found to be Rs. 67.88/-.

Conclusion:

Excellent quality Shrikhand can be prepared by using 10 per cent sapota pulp. There was significant decrease in fat, protein, total solid, total sugar content and titratable acidity of Shrikhand with the increasing level of sapota pulp. Blending cow milk with sapota pulp can also reduce the cost of production. The sapota blended shrikhand is a good product having therapeutic and nutritional benefits.

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