

Preparation of basundi from buffalo milk blended with custard apple (*Annona squamosa* L.) pulp

D.N. Phalake, S.D. Chavan, R.R. Shelke, S.P. Nage and S.R. Shegokar

In present investigation Basundi was prepared from buffalo milk blended with different levels of custard apple pulp as control with 0% (T₁), 5% (T₂), 10% (T₃), 15 (T₄) and 20 (T₅). The results revealed that, fat, protein, Ash and total solid contents were normally decreased while total sugar was increased with increase in levels of custard apple pulp. For sensory evaluation the results revealed that overall acceptability scores obtained were 7.09, 7.53, 7.96, 7.19, and 6.92 for the treatment T₁, T₂, T₃, T₄ and T₅, respectively. The treatment T₃ scored significantly highest scores for flavour, colour and appearance, consistency and overall acceptability which were found superior amongst all the treatments. The custard apple pulp prepared from all combinations of buffalo milk basundi was found acceptable. The cost of production per kg of custard apple basundi was slightly increased with increase in rate of addition of custard apple pulp percentage. i.e. Rs. 98.18 (T₁), Rs. 104.78 (T₂), Rs. 110.83 (T₃), Rs. 116.4 (T₄) and Rs. 121.53 (T₅).

Key Words : Basundi, Buffalo milk, Custard apple, Chemical analysis, Sensory evaluation, Cost of production

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INTRODUCTION

Basundi is an important indigenous desiccated whole milk product prepared by partial dehydration of the milk with sugar. The dehydration of the milk is done in a karahi on direct fire. In Maharashtra, basundi is mostly served on ceremonial occasions at feasts and festivals. The market value of product depends upon a relative thick creamy consistency, white to light brown colour, sweetish caramel aroma and soft textured flakes uniformly distributed throughout the product mass. Incorporation of fruit and fruit product in the milk products to, render

good flavour, increasing palatability and nutritive value is a very old practice. In today's world, with the advent of new techniques in manufacturing, processing, packaging, transportation and preservation food technologists shows interest in innovating the new combinations of fruit and fruit products with popular milk products (Aneja *et al.*, 2002 and Naik, 2013). The custard apple (*Annona squamosa* L.) is a native of tropical America and was introduced in India by Portuguese. Custard apple is mostly used as desert fruit for its delicious taste and nutritive value. The pulp of custard apple is sweet with slight acidity and has pleasant flavor. The fruit contain 45% edible portion, 100 g of which has a composition of 70.5 g moisture, 23.5 g carbohydrate, 1.6 g protein, 0.4 g fat, 17mg calcium, 47mg p, 1.5mg iron, vitamin C 35.9 g, Thiamine 0.10 g, Riboflavin 0.06 g and Niacin 0.89 g (Bose *et al.*, 1990). Therefore in present investigation the emphasis has given to develop the Basundi from buffalo milk blended with custard apple with main

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objectives to evaluate for its chemical analysis, sensorial quality and cost of production.

METHODOLOGY

The present investigation was carried out in the laboratory of Department of Animal Husbandry and Dairy Science, Dr. PDKV, Akola during the year 2016-2017. During present investigation basundi was prepared from buffalo milk with blending of different levels of custard apple pulp as control with 0% (T₁), 5% (T₂), 10% (T₃), 15 (T₄) and 20 (T₅) with five replications. In all treatment milk used was concentrated upto 1/2 fold and sugar was added @ 5%. The basundi was prepared as per the procedure given by Patel and Upadhyay (2009).

Basundi samples were analyzed for the following parameters.

Chemical analysis:

The moisture was determined as per method cited in (IS 1479) Part – II 1961. Fat content was determined as per Gerbers method described in IS 1224 (part-1) 1958. The protein was determined as per the method prescribed by Indian Standard Institute in I.S.I. Handbook of Food Analysis, Dairy Products, Part I (1980). The sugar content was determined by Lane and Eyon's method as suggested by Ranganna (2002). The titratable Acidity of the finished product was determined as per the procedure described in ISI (SP-18 (Part XI) 1981. The pH of the sample was measured using digital pH meter.

Sensory evaluation:

Sensory evaluation of the basundi sample prepared with varying levels pulp was evaluated by a panel of judges with respect to colour and appearance, flavour, consistency and overall acceptability by using 9 points hedonic scale as prescribed by Pal and Gupta (1985).

Cost structure of production:

Cost structure of beverage was calculated by considering market cost of ingredients used for preparation of beverage.

Statistical analysis:

The data obtained in the present investigation was statistically analyzed by Completely Randomized Design (CRD) as per suggested by Panse and Sukhatme (1989).

OBSERVATIONS AND ASSESSMENT

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

Chemical composition of buffalo milk and custard apple pulp:

The data regarding average chemical composition of buffalo milk and custard apple pulp are presented in Table 1.

It is revealed from Table 1 that the average chemical composition of buffalo milk was within the limits of legal standards for buffalo milk in Maharashtra state as prescribed by PFA rules, cited by De (2008). Chemical composition of custard apple pulp was in the range of standards similar to the results of Venkatraman (1965) and Patil *et al.* (2011).

Physico-chemical analysis of basundi:

The results in respect of physico-chemical analysis of basundi prepared from buffalo milk blended with custard apple pulp are tabulated in Table 2.

Fat content in basundi:

The perusal of data revealed that the variation in the fat content of basundi due to different levels of custard

Table 1 : Average chemical composition of buffalo milk and custard apple pulp

Sr. No.	Constituent (%)	Buffalo milk	Custard apple pulp
1.	Moisture	84.14	73.14
2.	Total solid	15.86	26.86
3.	Fat	6.82	0.57
4.	Protein	3.57	1.89
5.	Ash	0.78	0.75
6.	Acidity	0.15	0.33
7.	Carbohydrates (Lactose/Total sugar)	4.3	18
8.	pH	6.8	6.3

apple pulp was found to be significant. The fat content decreased significantly with the increase in the level of custard apple pulp. The obvious reason is that as the level of custard apple pulp increased, there was reduction in the amount of basundi on added percentage basis. Secondly, due to very low fat content of custard apple pulp (0.57 %), its addition reduced the fat of the final product. Naik (2013) recorded same observations regarding the fat content in basundi blended with Jackfruit pulp.

Protein content of basundi:

Protein content of basundi was highly significant due to addition of custard apple pulp. It was decreased with the increase in the level of custard apple pulp which may be due to its very low protein content (1.89 %). The mean protein content of treatment T₁, T₂, T₃, T₄ and T₅ was 9.51, 9.20, 8.91, 8.61 and 8.41 per cent protein content at 5, 10, 15 and 20 per cent addition of custard apple pulp, respectively. Similar results were also recorded by Naik (2013).

Total sugar content of basundi:

The perusal of data from Table 2, it revealed that the increase in the level of custard apple pulp resulted in gradual increase in total sugar of basundi. This increase might be due to the fact that as the level of custard apple pulp increased. The findings of present investigation are in accordance with the values reported in Aneja *et al.* (2002), Pathode (2003) and Naik (2013) for total sugar content of basundi blended with different fruits.

Total solids content of basundi:

The total solids content of basundi shows significant decrease with the increase in level of custard apple pulp.

This was obviously due to very low total solids content of custard apple pulp as given in (26 %). The observations of this study are in agreement with the observations recorded by Patel and Upadhyay (2001), Patel and Upadhyay (2003 a and b), Aneja *et al.* (2002) and Naik (2013), who observed same trends of total solids content of basundi with the range 42.57 to 47.35 per cent.

Ash content of basundi:

Ash content of basundi was highly significant due to addition of custard apple pulp. It was decreased with the increase in the level of custard apple pulp. The values for ash content of present studies are well comparable with values mentioned by Patel and Upadhyay (2001) for basundi sold in selected cities of Gujarat. The results of present investigation corroborate well with the values reported by Aneja *et al.* (2002) and Naik (2013) in respect to ash content in basundi blended with different fruit pulp.

Sensory evaluation of basundi :

Treatment wise basundi samples were subjected to sensory evaluation for colour and appearance, body and texture, flavour, taste and overall acceptability attributes by a panel of expert judges using 9 point hedonic scale and the data obtained was statistically analyzed, tabulated and presented in Table 3.

Colour and appearance :

The Table 3 indicates that the mean score for colour and appearance of the custard apple basundi treatment T₃ scored highest score followed by T₄, T₅, T₂ and T₁. The significant differences were observed between the treatments for colour and appearance score. These results are in agreement with the results of Naik (2013) and Thaware (2016).

Table 2 : Chemical composition of basundi prepared from buffalo milk blended with custard apple pulp (%)

Treatments	Chemical composition (%)				
	Fat	Protein	Total sugar	Total solids	Ash
T ₁	12.96	9.51	14.02	47.54	1.36
T ₂	12.53	9.20	14.14	47.84	1.28
T ₃	12.05	8.91	14.28	46.00	1.24
T ₄	11.90	8.61	14.39	45.52	1.00
T ₅	11.77	8.41	14.57	43.66	0.98
'F' test	Sig	Sig	Sig	Sig	Sig
S.E. ±	0.15	0.11	0.02	0.71	0.014
C.D. (P=0.05)	0.45	0.33	0.06	2.13	0.042

Flavour :

Treatment T₃ (7.99) was significantly superior among the rest of the treatments. It was observed from above findings that as the percentage of custard apple pulp increased in the blend, the flavor score of the product also increased upto the level of 10% custard apple pulp in the basundi. This might be due to pleasant flavour of custard apple pulp which of preferably enhanced its flavour of custard apple basundi. Naik (2013) and Patel and Upadhyay (2003a and b) reported same trends which is supports the present observations.

Consistency:

From the average figures for consistency it is observed that the higher score was obtained by the basundi with (T₃) 10 per cent custard apple pulp (7.87) followed by the basundi with (T₂) 5 per cent custard apple pulp (7.59). At higher level of custard apple pulp consistency was found to be the thick which was not liked by the judges. Lowest score possessed by the basundi with (T₅) 20 per cent and (T₄) 15 per cent custard apple pulp (6.27 and 6.52, respectively) which may be due to the thick consistency. The observations noted by Naik (2013) and

Patel and Upadhyay (2003a) are in agreement with present trends.

Overall acceptability :

On the basis of results we can affirmatively state that amongst the different levels of custard apple, T₃ (10 % custard apple) treatment was found to be more acceptable by the judges *i.e.* good quality basundi was obtained with addition of 10 per cent custard apple pulp. Same trends were also reported by Aneja *et al.* (2002); Pathode (2003); Naik (2013) and Thaware (2016).

Cost structure of basundi:

The data pertaining to the cost of production of basundi prepared by blending with different levels of custard apple pulp is presented in Table 4. While estimating the cost of the finished product, the cost of the ingredients used in the preparation of custard apple basundi was rated as per the prevailing (2016 to 2017) market price. It was recorded that cost of production was slightly increase in rate of addition of custard apple pulp but this can be compensated with value addition in terms of taste, acceptability and nutritional status of end product. This

Table 3 : Sensory evaluation of basundi prepared from buffalo milk blended with custard pulp

Treatments	Mean values of scores obtained for five replications (out of 9 Marks)			
	Colour and appearance	Flavour	Body and Texture/ Consistency	Overall acceptability
T ₁	6.56	6.8	6.79	7.09
T ₂	6.79	7.00	7.59	7.53
T ₃	8.20	7.99	7.87	7.96
T ₄	7.19	6.79	6.52	7.19
T ₅	6.59	6.40	6.27	6.92
'F' test	Sig.	Sig.	Sig.	Sig.
S.E. ±	0.12	0.08	0.14	0.10
C.D. (P=0.05)	0.37	0.25	0.41	0.31

Table 4 : Effect of different levels of custard apple on cost of basundi prepared from buffalo milk blended with custard apple

Item	T ₁		T ₂		T ₃		T ₄		T ₅	
	Qty (g)	Value Rs.	Qty (g)	Value Rs.	Qty (g)	Value Rs.	Qty (g)	Value Rs.	Qty (g)	Value Rs.
Milk Rs. 37/litr	1	37	1	37	1	37	1	37	1	37
Concentrated milk	500	-	500	-	500	-	500	-	500	-
Custard apple pulp @ Rs. 250/kg	-	-	25	6.25	50	12.50	75	18.75	100	25
Sugar 5% by wt of basundi @ Rs.40/kg	50	2	50	2	50	2	50	2	50	2
Other (electricity, fuel, etc.)	-	15	-	15	-	15	-	15	-	15
Total	550	54	575	60.25	600	66.5	625	72.75	650	79
Cost in Rs. for 1 kg custard apple basundi	-	98.18	-	104.78	-	110.83	-	116.4	-	121.53

results were in agreement with the results of Dubal (2009); Tayade (2010) and Thaware (2016).

Conclusion :

From the results of present investigation it is concluded that, the custard apple basundi prepared from 90 per cent buffalo milk plain basundi and 10 per cent custard apple pulp (T₃) was most acceptable and recorded highest score for overall acceptability. It was observed that fat, protein, ash total solid contain were decreases with increase in rate of addition of custard apple pulp and vice versa , while total sugar increase with increase in rate of addition of custard apple pulp. Cost of production was slightly increase with increase in rate of addition of custard apple pulp.

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