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## Preparation of *basundi* blended with sweet potato (*Ipomoea batatas* L.)

PC Deshmukh, BD Patil and DK Kamble

### Abstract

The *basundi* blended with sweet Potato (*Ipomoea batatas*) pulp was prepared and subjected to sensory evaluation to optimize the levels of sweet potato pulp in *basundi* and to investigate sensory quality of *basundi* prepared using sweet potato pulp. The mean sensory score for colour and appearance, flavour, body and texture and overall acceptability ranged from 7.13 to 8.24, 7.27 to 8.05, 7.02 to 8.15 and 7.14 to 8.11, respectively. The treatment combinations T<sub>3</sub> (10 per cent sweet potato and 5 per cent sugar) found sensorily superior over the rest of treatment combinations. The data generated during the course of this investigation was tabulated and analyzed using Completely Randomized Design (CRD) for treatment combination. However, effect of sweet potato and sugar levels and their interaction effect were analysed by Factorial Completely Randomized Design (FCRD). The best quality *basundi* can be prepared by addition of 10% sweet potato pulp and 5% sugar.

**Keywords:** *Basundi*, sweet potato, sensory evaluation

### Introduction

Milk is regarded as one of nature's nearly perfect foods. Milk is an important source of all vital nutrients in the appropriate proportions for human growth and development. Since ancient times, India has produced traditional milk products. These items are important for religious, social, cultural, nutritional, medicinal, economic and other reasons. Dahi, paneer, chakka, shrikhand, makkhan, ghee, khoa and other traditional sweets are among the indigenous milk products.

*Basundi* is a traditional, concentrated and sweetened whole milk product with a sweetish caramel and pleasant aroma, light to medium brown colour, thick body and creamy consistency and soft textured flakes suspended consistently throughout the product. It has all of the milk solids in a proper concentration as well as added sugar and a dry fruit and is served as a delectable sweet meal on its own. It is especially popular in Maharashtra, Gujarat and portions of Karnataka and is typically produced at home by housewives for special occasions such as festivals, weddings and other celebrations and is enjoyed for its rich caramel, pleasant and nutty flavour and thick consistency (Pagote, 2003) <sup>[11]</sup>.

In India for all the classes of people the vegetables like sweet potato, red pumpkin, bottle gourd, elephant foot yam etc. are popular and regular consumed vegetables. Among the different vegetables sweet potato (*Ipomoea batatas*) belongs to family Convolvulaceae which is important in meeting human nutritional needs which includes carbohydrate, vitamin A (Beta carotene). Sweet potato appear to be very beneficial in the diet of diabetics and consumers with an insulin resistance, because they have a low glycemic index (Ludvik *et al.*, 2004; Allen *et al.*, 2010) <sup>[7, 1]</sup>.

According to Mohanraj and Shivshankar (2014) <sup>[8]</sup> *Ipomoea batatas* (L), also known as sweet potato, is an extremely versatile and delicious vegetable that possesses high nutritional value. It is also a valuable plant having anti-cancer, anti-diabetic and anti-inflammatory activities. Sweet potato is considered a valuable source of unique natural products, including some that can be used in the development of medicines against various diseases and in making industrial products.

Hence, considering the medicinal and nutritional value of sweet potato, it is planned to undertake the research work on preparation of *basundi* blended with sweet potato (*Ipomoea batatas*).

### Materials and Methods

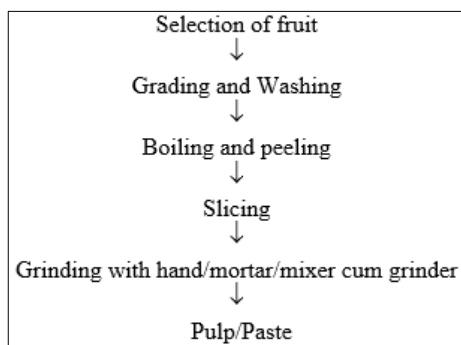
#### Materials

Cow milk was obtained from the RCDP (Research Cum Development Programme) on Cattle

at Mahatma Phule Krishi Vidhyapeth, Rahuri central campus for preparation of *basundi* samples. Sweet potatoes were freshly purchased from the local market, Good quality sugar was procured from local market. The *basundi* samples were prepared in iron *karahi* with 30 cm diameter and 8.5 cm depth and the stainless steel ladle was used for stirring and scraping, The Electronic precision balance was used for weighing samples and ingredients during research work.

## Methods

### Preparation of Sweet Potato Pulp/Paste



**Fig 1:** Flow diagram for preparation of sweet potato pulp/paste

The cow milk *basundi* samples were prepared with 2, 4, 6, 8,

10, 12, 14 and 16 per cent sweet potato pulp and 4, 5 and 6 per cent sugar levels. The prepared samples of *basundi* were subjected to sensory evaluation.

The samples of *basundi* containing 2, 4 and 6 per cent sweet potato pulp showed less influence and with 15 and 16 per cent sweet potato pulp it showed much thicker consistency and more sweetness as compared to other levels of sweet potato viz. 8, 10 and 12 percent and among sugar levels 4 per cent level of sugar shows less influence on the *basundi* samples which was not much liked by judges.

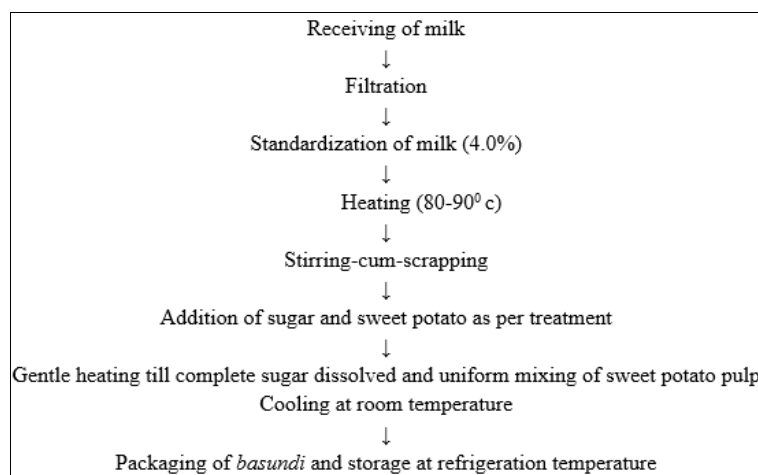
### Treatment Combination for Experimental Trials

The experiment was laid down with 7 treatment combinations and 3 replications. The entire data of the experiment has been properly tabulated, analyzed and interpreted

T <sub>0</sub> (Control)	<i>Basundi</i> + 5% Sugar + 0% sweet potato
T <sub>1</sub> (P <sub>1</sub> S <sub>1</sub> )	<i>Basundi</i> + 5% Sugar + 8% sweet potato
T <sub>2</sub> (P <sub>1</sub> S <sub>2</sub> )	<i>Basundi</i> + 6% Sugar + 8% sweet potato
T <sub>3</sub> (P <sub>2</sub> S <sub>1</sub> )	<i>Basundi</i> + 5% Sugar + 10% sweet potato
T <sub>4</sub> (P <sub>2</sub> S <sub>2</sub> )	<i>Basundi</i> + 6% Sugar + 10% sweet potato
T <sub>5</sub> (P <sub>3</sub> S <sub>1</sub> )	<i>Basundi</i> + 5% Sugar + 12% sweet potato
T <sub>6</sub> (P <sub>3</sub> S <sub>2</sub> )	<i>Basundi</i> + 6% Sugar + 12% sweet potato

## Methodology

The *Basundi* will be prepared by method suggested by Mukhekar, (2015) [9] with slight modifications



**Fig 1:** Flow diagram for preparation of *basundi* with sweet potato

## Sensory Evaluation

The samples of *basundi* were subjected to sensory evaluation. The judges were provided with evaluation cards (Appendix-P) for numerical scoring on a 9 point hedonic scale as per IS: 6273 (Part- II) 1971 [6].

In order to get accurate results of organoleptic quality of *basundi*, scoring guide in respect of colour and appearance, body and texture, flavour, overall acceptability was explained to the judges before evaluation of sample.

## Statistical design

The data generated during the course of this investigation was tabulated and analysed using Completely Randomized Design (CRD) to compare control with other treatments. However, effect of sweet potato paste and sugar levels and their interaction effect was analysed by Factorial Completely Randomized Design (FCRD) with three replications (Snedecor and Corchan, 1994) [14].

## Results and Discussion

### Sensory Quality/ Evaluation of *Basundi*

#### Colour and Appearance

Sensory score of *basundi* samples of different treatment combinations are depicted in Table 1

**Table 1:** Effect of treatment combinations on sensory score of *basundi* samples

Treatment	Colour and appearance	Flavour	Body and texture	Overall acceptability
T <sub>0</sub> (control)	7.26 <sup>c</sup>	7.48 <sup>b</sup>	7.56 <sup>b</sup>	7.68 <sup>b</sup>
T <sub>1</sub> (P <sub>1</sub> S <sub>1</sub> )	7.64 <sup>b</sup>	7.72 <sup>b</sup>	7.77 <sup>a</sup>	7.71 <sup>b</sup>
T <sub>2</sub> (P <sub>1</sub> S <sub>2</sub> )	7.82 <sup>b</sup>	7.65 <sup>b</sup>	7.88 <sup>a</sup>	7.79 <sup>b</sup>
T <sub>3</sub> (P <sub>2</sub> S <sub>1</sub> )	8.24 <sup>a</sup>	8.05 <sup>a</sup>	8.03 <sup>a</sup>	8.11 <sup>a</sup>
T <sub>4</sub> (P <sub>2</sub> S <sub>2</sub> )	8.14 <sup>a</sup>	7.85 <sup>a</sup>	8.15 <sup>a</sup>	8.05 <sup>a</sup>
T <sub>5</sub> (P <sub>3</sub> S <sub>1</sub> )	7.27 <sup>c</sup>	7.42 <sup>c</sup>	7.13 <sup>c</sup>	7.27 <sup>c</sup>
T <sub>6</sub> (P <sub>3</sub> S <sub>2</sub> )	7.13 <sup>c</sup>	7.27 <sup>c</sup>	7.02 <sup>c</sup>	7.14 <sup>c</sup>
S.E <sub>±</sub>	0.08	0.13	0.13	0.09
CD at 5%	0.25	0.41	0.41	0.27

### Colour and appearance

The colour and appearance of *basundi* samples of different treatment combinations are depicted in Table 1.

It was revealed that, the score for colour and appearance of *basundi* samples prepared under different treatments ranged from 7.13 to 8.24 (Table 1). Treatment T<sub>3</sub> had highest score among rest of the treatment combinations. Treatment combinations, T<sub>1</sub> and T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>, T<sub>5</sub> and T<sub>6</sub> were at par with each other.

The colour and appearance score for the *basundi* blended with 10 per cent sweet potato pulp and 5 per cent sugar was significantly superior over all the treatments and was at par with treatment T<sub>4</sub>. The excess level of sweet potato pulp decreases the colour and appearance score of *basundi*. From the results it was observed that *basundi* blended with 10 per cent of sweet potato pulp showed whitish colour with clear appearance which was liked very much by the judges. The decline in the score may be due to the effect of dull colour at higher level of sweet potato pulp which was not liked by the judges as compared to (T<sub>3</sub> and T<sub>4</sub>).

Naik *et al.* (2013) <sup>[10]</sup> reported the colour and appearance of jackfruit pulp *basundi* ranked between like very much to like extremely 7.95 to 8.25. Gaikwad *et al.* (2016) <sup>[5]</sup> reported the colour and appearance of date fruit *basundi* ranked between like very much to like extremely 6.15 to 8.88.

**Table 2:** Effect of levels of sweet potato, sugar and their interactions on colour and appearance score of *basundi* samples

Treatments	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	Score
S <sub>1</sub>	7.64	8.24	7.27	7.72
S <sub>2</sub>	7.82	8.14	7.13	7.69
Score	7.73	8.19	7.20	7.71
	P	S	P x S	
SE	0.06	0.04	0.08	
CD at 5%	0.18	NS	NS	

From the results given in Table 2, it was observed that, sweet potato levels had significant ( $P < 0.05$ ) effect on colour and appearance of *basundi* samples. The sweet potato level P<sub>2</sub> (10% sweet potato pulp) showed significantly higher score (8.19) than P<sub>1</sub> (7.73) and P<sub>3</sub> (7.20). As the sweet potato levels increased from 8 per cent to 12 per cent the colour and appearance of *basundi* samples changes, however the score for sweet potato pulp levels upto 10 per cent increased and beyond 10 per cent the score of the product declined. It might be due to the higher sweet potato levels the original colour and appearance of *basundi* is masked. Sugar levels had non significant effect on colour and appearance of *basundi* samples. The interaction effect of sweet potato and sugar had non-significant effect on colour and appearance of *basundi* samples.

The colour and appearance score of *basundi* was significantly influenced by the level of sweet potato pulp which is in agreement with the studies of Patel and upadhyay (2003a) <sup>[12]</sup>. The effect of level of sugar on colour and appearance score was observed by Patel and upadhyay (2003b) <sup>[13]</sup>, they concluded that the sugar level had non significant effect on colour and appearance score of *basundi*.

### Flavour

The effect of different treatment combinations on flavour score of *basundi* is depicted in Table 1.

It was revealed that, the score for flavour of fresh *basundi* samples under different treatments combinations ranged from

7.27 to 8.05. Treatment T<sub>3</sub> had highest flavour score than the rest of treatment combinations. Treatment T<sub>0</sub>, T<sub>1</sub> and T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>, T<sub>5</sub> and T<sub>6</sub> were at par with each other.

The maximum score 8.05 was received to *basundi* prepared with 10 per cent of sweet potato pulp and 5 per cent of sugar and minimum score 7.27 to the sample treatment prepared with 12 per cent of sweet potato pulp and 6 per cent of sugar. The addition of sweet potato pulp in *basundi* was improved flavour score in *basundi* samples, but declined in T<sub>5</sub> and T<sub>6</sub>. The declined in flavour score might be due to excess increase in sweetness of *basundi* samples as sweet potato contains high amount of starch and carbohydrate due to which as the level of sweet potato increase the sweetness of *basundi* samples increases and was disliked by judges.

Naik *et al.* (2013) <sup>[10]</sup> reported the flavour of jackfruit pulp *basundi* ranked between like very much to like extremely 7.75 to 8.25. Mukhekar (2015) <sup>[9]</sup> also reported that the flavour score for different treatment ranged between 7.50 (T<sub>5</sub>) to 8.40 (T<sub>3</sub>). The maximum score 8.40 was received to *basundi* prepared with 7.5 per cent of kesar mango.

**Table 3:** Effect of levels of sweet potato, sugar and their interactions on flavour score of *basundi* samples

Treatments	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	Score
S <sub>1</sub>	7.72	8.05	7.42	7.73
S <sub>2</sub>	7.65	7.85	7.27	7.59
Score	7.69	7.95	7.35	7.66
	P	S	P x S	
SE	0.08	0.07	0.12	
CD at 5%	0.27	NS	NS	

From Table 3, it was observed that, sweet potato levels had significant ( $P < 0.05$ ) effect on flavour content of *basundi* samples. The pulp level P<sub>2</sub> (10% sweet potato pulp) showed significantly higher flavour score (7.95) than P<sub>1</sub> (7.68) and P<sub>3</sub> (7.35). Sugar levels had non significant effect on flavour score of *basundi* samples. The interaction effect was also non significant on flavour score of *basundi* samples.

The flavour score of *basundi* was significantly influenced by the level of sweet potato pulp. These results are in close agreement with the results of Patel and Upadhyay (2003a) <sup>[12]</sup>, who studied the sensory quality of *basundi* and they observed the flavour of *basundi* 36.40, 36.55 (out of 45) in the *basundi* in which sugar was added at the level of 5, 6 and 7 per cent, respectively. The results are also in accordance with the reports of Patel and Upadhyay (2003b) <sup>[13]</sup> and Gaikwad and Hembade (2011) <sup>[4]</sup>.

### Body and texture

The body and texture of *basundi* samples of different treatment combinations are depicted in Table 1.

It was revealed that, different treatments combinations had significant ( $P < 0.05$ ) effect on body and texture of *basundi* samples. The sensory score for body and texture under different treatment combinations ranged from 7.02 to 8.15. Treatment T<sub>4</sub> had maximum score for body and texture and treatment T<sub>6</sub> had lower score than other treatment combinations. Treatment combinations T<sub>1</sub> and T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>, T<sub>5</sub> and T<sub>6</sub> were at par with each other. Body and texture score of *basundi* samples showed declined trend from treatment T<sub>4</sub>. The treatment combinations T<sub>5</sub> and T<sub>6</sub> had strong, thick and sticky body due to the high stickiness of sweet potato pulp, as the level of sweet potato increased, firmness of product increases.

This result are in agreement with the result obtained from Bellakhdar *et al.* (1991) <sup>[2]</sup>, who reported that higher concentration of fig, the laxative property of it, would be resulted in thickness of *basundi*. Mukhekar (2015) <sup>[9]</sup> reported that the body and texture score for different treatment ranged between 7.50 (T<sub>5</sub>) to 8.00 (T<sub>3</sub>). The maximum score 8.00 was received to *basundi* prepared with 7.5 per cent of kesar mango.

**Table 4:** Effect of levels of sweet potato, sugar and their interactions on body and texture score of *basundi* samples

Treatments	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	Score
S <sub>1</sub>	7.77	8.03	7.13	7.64
S <sub>2</sub>	7.88	8.15	7.02	7.68
Score	7.83	8.09	7.08	7.66
	P	S	P × S	
SE	0.10	0.09	0.14	
CD at 5%	0.31	NS	NS	

From the table 4. it is seen that, sweet potato levels had significant ( $P < 0.05$ ) effect on the body and texture of *basundi* samples. The sweet potato level P<sub>2</sub> (10%) showed significantly higher body and texture score (8.09) than P<sub>1</sub> (7.83) and P<sub>3</sub> (7.08). Sugar levels had non significant effect on body and texture score of *basundi* samples. The interaction effect of sweet potato levels and sugar levels showed non significant effect on the body and texture of *basundi* samples. The results are comparable with the reports of Gaikwad and Hembade (2010) <sup>[3]</sup>, Patel and Upadhyay (2003a) <sup>[12]</sup>.

### Overall acceptability

The overall acceptability of *basundi* samples of different treatment combinations are depicted in Table.1.

It was revealed that, different treatments combinations had significant ( $P < 0.05$ ) effect on the overall acceptability of *basundi* samples. The treatment combination T<sub>3</sub> (P<sub>2</sub>S<sub>1</sub>) with 10 per cent of sweet potato and 5 per cent sugar had significantly higher overall acceptability score (8.11) over the rest of treatment combinations and which was the most acceptable treatment combination. However, treatment T<sub>0</sub>, T<sub>1</sub> and T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>, T<sub>5</sub> and T<sub>6</sub> were at par with each other. The treatment combination T<sub>3</sub> had good natural flavor, smooth texture and desired body with attractive colour and appearance.

Mukhekar (2015) <sup>[9]</sup> reported the overall acceptability of kesar mango pulp *basundi* ranked between 7.40 to 8.33. The maximum score 8.33 was received to *basundi* prepared with 7.5 per cent of kesar mango. Naik *et al.* (2013) also reported that the general acceptability of jackfruit pulp *basundi* ranged from very much to extremely liked 7.65 to 8.20.

**Table 5:** Effect of levels of sweet potato, sugar and their interactions on overall acceptability score of *basundi* samples

Treatments	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	Score
S <sub>1</sub>	7.71	8.11	7.27	7.70
S <sub>2</sub>	7.79	8.05	7.14	7.66
Score	7.75	8.08	7.21	7.68
	P	S	P × S	
SE	0.05	0.04	0.07	
CD at 5%	0.15	NS	NS	

From the Table 5 it was seen that, sweet potato pulp levels had significant ( $P < 0.05$ ) effect on the overall acceptability of the *basundi* samples. The pulp level P<sub>2</sub> (10 per cent sweet

potato) showed significantly higher score (8.08) and pulp level P<sub>3</sub> (12 per cent pulp) received lowest score (7.22). Sugar levels had non significant effect on overall acceptability of *basundi* samples. The interaction effect of pulp levels and sugar levels was non significant on overall acceptability of *basundi* samples.

### Conclusion

Sweet potato levels 8, 10 and 12 per cent and sugar levels 5 and 6 per cent were optimized for preparation of *basundi*. The better acceptable sweet potato *basundi* could be prepared by 10 per cent pulp and 5 per cent sugar.

It was further observed that treatment combination T<sub>3</sub> (P<sub>2</sub>S<sub>1</sub>) of fresh *basundi* containing 10 per cent sweet potato pulp and 5 per cent sugar was sensorily superior with overall acceptability score (8.11) over all the other treatments studied.

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