

# STUDIES ON DEVELOPMENT AND STANDARDIZATION OF APPLE BASUNDI

<sup>1</sup>Vaibhav Raju Bage, <sup>2</sup>Dhavalkumar Nanasaheb Shelar, <sup>3</sup>Rohit Ashok Patil and <sup>4</sup>Akshaya Kumar Sahoo

<sup>1</sup>Assistant Professor, <sup>2</sup>Second Year B. Tech. Student, <sup>3</sup>Second Year B. Tech. Student and <sup>4</sup>Associate Professor and Coordinator

<sup>1</sup>Department of Technology

<sup>1</sup>Shivaji University, Kolhapur, Maharashtra, India

**Abstract:** Fruits and dairy products are essential for human health. Apples are universally consumed. It is a rich source of phytochemicals and minerals. It reduces the risk of cardiovascular disease, stroke and diabetes etc. Basundi is one of the warmth desiccated traditional Indian sweet dairy product in western region of India, generally Maharashtra, Karnataka and Gujarat. Present study was designed to prepare Basundi by using different levels of apple pulp with a view to optimize the process for its manufacture and to study its sensory qualities. The rabri was prepared by using pasteurized full cream milk (buffalo milk, 1 liter of 6.5 Fat), White Cane sugar (60 gm), Almond (30 gm), Pistachios (30 gm), Saffron (10 gm), Cardamom (1 gm) and Nutmeg (0.5 gm) etc. The Basundi was prepared by using different proportions of rabri and apple pulp i.e. 100:0 (AB<sub>0</sub>), 90:10 (AB<sub>1</sub>), 80:20 (AB<sub>2</sub>), 70:30 (AB<sub>3</sub>), 60:40 (AB<sub>4</sub>), 50:50 (AB<sub>5</sub>) and 40:60 (AB<sub>6</sub>) etc. Sensory analysis was performed for each sample by using 9 point hedonic scale. The highest sensory score for color and appearance, flavor, taste, consistency and overall acceptability was 8.1±0.32, 8.2±0.42, 8.3±0.48, 8.2±0.42 and 8.2±0.42 respectively. From the sensory evaluation results we concluded that AB<sub>4</sub> sample was the most acceptable sample for commercial production. The prepared Apple Basundi (AB<sub>4</sub>) contains 62.24±0.04 % moisture, 1.20±0.03 % ash, 7.16±0.18 % crude fat, 6.51±0.16 % crude protein, 22.89±0.41 % carbohydrate, 37.76±0.03 % total solid and 0.17±0.01% acidity etc. Total Phenolic Compound (mg Gallic Acid Equivalent) of the apple basundi (AB<sub>4</sub>) was 1.06 mg GAE. Hence, the prepared apple basundi found to be a rich source of nutrients and total phenolic compound.

**Index Terms:** Apple, Basundi, Sensory Analysis, Proximate Analysis etc.

## I. Introduction

Fruits are essential for human health. The fruits have medicinal as well as aesthetic. Apples are a universally consumed. India is the world's 3rd largest apple producing country after China and the United States [1, 11]. Apples are good source of flavonoids, as well as a variety of other phytochemicals. It may reduce the risk of cardiovascular disease, type II diabetes, asthma and cancer especially lung cancer [4, 6 and 18].

Dairy products are the essential food items in everyday meals as they contain all the required nutrients for a balanced diet. These are rich in proteins and minerals such as calcium, potassium and phosphorus [16, 19]. India is the world's largest producer as well as consumer of milk and milk products [12]. Basundi is one of the warmth desiccated traditional Indian sweet dairy product in western region of India, generally Maharashtra, Karnataka and Gujarat. It can be classified in the condensed milk group along with khoa, rabri and kheer [9, 14, 15 and 17]. It contains all the solids of milk in an appropriate concentration plus sweetener and dry fruits [10].

To promote the dairy and fruit processing, this research work was designed to prepare Basundi by using different levels of apple pulp with a view to optimize the process for its manufacture and to study its sensory qualities. The farmers will be benefitted while getting proper return for their produce.

## II. Materials

### Materials

The raw materials utilized during present investigation like Apple pulp, pasteurized full cream milk (Buffalo), White cane sugar, Almond, Pistachios, Saffron, Cardamom and Nutmeg etc. were procured from local market of Kolhapur, Maharashtra, India.

### Equipments and Machineries

Equipments such as weighing balance, hot air oven, muffle furnace, pH meter and other utensils required was utilized from the Department of Technology, Shivaji University, Kolhapur, Maharashtra, India 416004.

### Chemicals and Glassware's

The chemicals and glassware's required for analysis purpose were taken from the Department of Technology (Food Technology Program), Shivaji University, Kolhapur, Maharashtra, India 416004.

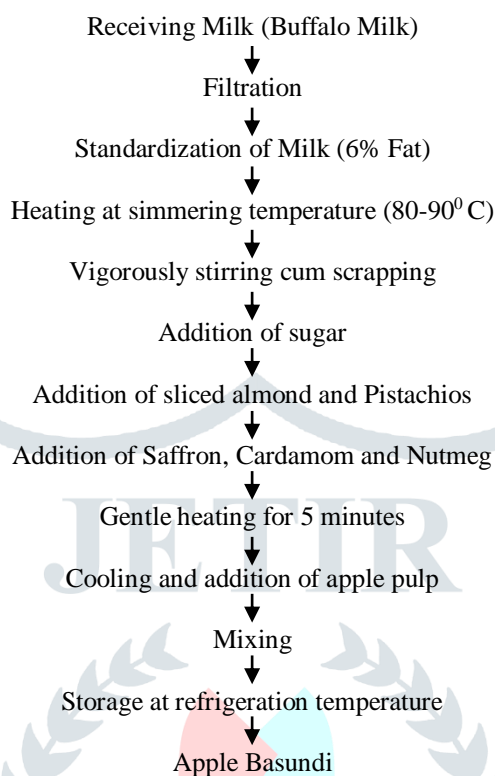
## III. Methods

### Preparation of apple basundi

The Apple basundi samples were prepared as per the methods given by Gite *et al* (2017), Bhutkar *et al* (2015) and De (1980) with slight modification as shown in fig 1[3,5 and 9]. Formulation of developed rabri used to prepare Apple basundi as shown in table 1. Experimental trials were conducted to decide the levels of addition of apple pulp in the basundi. These trails are presented in table 2.

**Table 1:** Formulation of developed rabri used to prepare Apple basundi

Sr. No.	1	2	3	4	5	6	7
<b>Ingredients</b>	Pasteurized Full Cream Milk(liter)	White Cane Sugar (g)	Almond (g)	Pistachios (g)	Saffron (g)	Cardamom (g)	Nutmeg (g)
<b>Proportion</b>	1	60	30	30	30	1	1

**Fig 1:** Flow sheet for preparation of apple basundi**Table 2:** Formulation of apple basundi to standardize the level of apple pulp

Sample Code		(AB <sub>0</sub> )	(AB <sub>1</sub> )	(AB <sub>2</sub> )	(AB <sub>3</sub> )	(AB <sub>4</sub> )	(AB <sub>5</sub> )	(AB <sub>6</sub> )
<b>Ingredients</b>	<b>Rabri (%)</b>	100	90	80	70	60	50	40
	<b>Apple Pulp (%)</b>	0	10	20	30	40	50	60

#### Proximate composition of apple basundi

Chemical constituents like moisture, protein, fat, carbohydrate, fat, ash of control basundi and apple basundi were determined by AOAC, 1990[2].

#### Total Phenolic Compound

The total phenolic compound of the final product was analyzed from Food Hygiene and Health Laboratory, Pune.

#### Sensory evaluation of basundi

Basundi with different blends of apple pulp was evaluated for sensory characteristics like appearance and color, flavor, taste, consistency and overall acceptability by 10 semi trained panel members comprised of academic staff members of the Department of Technology, Shivaji University, Kolhapur. Judgment was made through rating of product on 9 a point Hedonic Scale with corresponding descriptive terms ranging from 9 'like extremely' to 1 'dislike extremely'.

## IV. Results and Discussion

#### Sensory evaluation of apple basundi

Organoleptic characteristics were crucial in judging the suitability of product as consumer point of view in order to study the effect addition of different levels of apple pulp in rabri i.e., 0, 10, 20, 30, 40, 50 and 60% level. The result had presented in table: 3.

Appearance and flavor are considered as one of the important consumer quality judging parameters in selection of any dairy products. Alluring color of product is a must have in expeditious moving consumer goods to appeal consumer for consumption. Data from table: 3 revealed that sample AB<sub>4</sub> had the highest score for color and appearance i.e. (8.1±0.32). With gradual increase in level of apple pulp, color and appearance found to decrease hence sample AB<sub>0</sub> and AB<sub>6</sub> scored (7.8±0.79 and 7.9±0.57). In dairy products flavor being a combination of taste, smell and mouth feel, has large number of factors it. Sample AB<sub>4</sub> obtained highest score for flavor i.e. (8.2±0.42) while sample AB<sub>0</sub> had lowest score for flavor i.e.

(7.9±0.74). The sample AB<sub>3</sub> and AB<sub>4</sub> obtained maximum score for taste (8.3±0.48) where as sample AB<sub>0</sub> obtained fewer score for taste (7.9±0.74).

When basundi fortified with more than 40 % of apple pulp then taste score of basundi decreases. The sample AB<sub>4</sub> founded good consistency with obtaining highest score for consistency i.e. (8.2±0.42), while sample AB<sub>0</sub> obtained fewer score about (7.8±0.63). The sample AB<sub>4</sub> obtained higher score for overall acceptability (8.2±0.42) as compared to control and other sample. However among other treatments AB<sub>4</sub> was better and was mostly acceptable. Gaikwad *et al.*, (2015) reported the sensory scores for flavor, body and texture and color and appearance and sensorial characterization of Ujani basundi and basundi are 8.29±0.86, 8.32±0.86, 8.64±0.93 and 8±0.93, 8.1±1.43, 7.9±1.43 respectively for Ujani basundi and basundi [7].

**Table 3:** Sensory evaluation of apple basundi

Sample Code	Appearance and Color	Flavor	Taste	Consistency	Overall Acceptability
(AB <sub>0</sub> ) Control	7.8±0.79	7.9±0.74	7.9±0.74	7.8±0.63	7.9±0.74
(AB <sub>1</sub> )	7.8±0.92	8.0±0.67	8.0±0.67	7.9±0.57	8.0±0.47
(AB <sub>2</sub> )	7.9±0.88	8.1±0.57	8.2±0.63	8.0±0.47	8.1±0.57
(AB <sub>3</sub> )	8.0±0.47	8.1±0.32	8.3±0.48	8.1±0.32	8.1±0.32
(AB <sub>4</sub> )	8.1±0.32	8.2±0.42	8.3±0.48	8.2±0.42	8.2±0.42
(AB <sub>5</sub> )	8.0±0.47	8.1±0.57	8.1±0.32	8.0±0.00	8.1±0.32
(AB <sub>6</sub> )	7.9±0.57	8.0±0.00	8.0±0.47	7.9±0.00	8.0±0.00

[\*Note: AB<sub>0</sub> = Basundi (100%): Apple Pulp (0%); AB<sub>1</sub> = Basundi (90%): Apple Pulp (10%);

AB<sub>2</sub> = Basundi (80%): Apple Pulp (20%); AB<sub>3</sub> = Basundi (70%): Apple Pulp (30%);

AB<sub>4</sub> = Basundi (60%): Apple Pulp (40%); AB<sub>5</sub> = Basundi (50%): Apple Pulp (50%)

AB<sub>6</sub> = Basundi (40%): Apple Pulp (60%)]

#### Proximate composition of apple basundi

The chemical composition of apple basundi was studied with respects to moisture, ash, crude fat, crude protein, carbohydrate, total solids and acidity. The results are presented in table: 4. It was observed that the moisture content of basundi blended with 40 % apple is 62.24±0.04%. This might be due to the high moisture content in the apple pulp. The results in this investigation had compared with the results reported by Gite *et al.*, 2017 and Gaikwad and Hembade, 2011. Gite *et al* had reported the moisture content of control basundi was 49.93% [8, 9].

Fat content and protein content of apple basundi (AB<sub>4</sub>) were 7.16±0.18% and 6.51±0.16% respectively which was lower than the control basundi sample. As the apple pulp level increases the fat and protein level was decreases. This might be due to low fat and protein content in apple pulp. The protein content of apple basundi (AB<sub>4</sub>) had compared with the protein content of basundi (7.7%) reported by Patel and Upadhyay, 2001[13]. The final apple basundi contain 1.2±0.03% of ash, 37.76±0.03% of total solid and 22.89±0.41% of carbohydrates. The acidity of apple basundi was 0.17±0.01%. This was low as compared with the values reported by Gaikwad *et al* (2016) in the research of Fiber Fortified Basundi Using Date Fruit. Total Phenolic Compound (mg Gallic Acid Equivalent) of the apple basundi (AB<sub>4</sub>) was 1.06 mg GAE.

**Table 4:** Proximate composition of apple basundi

Parameter	AB <sub>0</sub> (Control)	AB <sub>4</sub>
Moisture (%)	51.04±0.02	62.24±0.04
Protein (%)	8.20±0.11	6.51±0.16
Crude Fat (%)	10.80±0.15	7.16±0.18
Total Solid (%)	49.02±0.04	37.76±0.03
Carbohydrate (%)	28.88±0.29	22.89±0.41
Ash (%)	1.08±0.01	1.20±0.03
Acidity (%)	0.28±0.06	0.17±0.01
Total Phenolic Compound [mg Gallic Acid Equivalent (GAE)]	-	1.06

[\* Each value is average of three determinations.]

#### V. Conclusion

Thus in light of scientific data of the present investigation, it can be concluded that the basundi blended with 40% of apple pulp (AB<sub>4</sub>) shows the highest sensory score for each sensory attributes. Hence apple basundi gives superior taste, flavour and overall acceptability than control basundi (AB<sub>0</sub>). It is also found to be more nutritious.

#### VI. Acknowledgement

I render my sincere and profound gratitude to Prof. (Dr.) Jaydeep S. Bagi for his immense support for this project work. Also my sincere thank to Dr. A. K. Sahoo for his continuous guide, accompany and tenacity to transform this whole particular into a grand success diligently.

Last but not the least I would like to thank my parents for their constant motivation and financial flexibility, to our near and dear ones and to the juniors too for their honest and informal feedbacks to help me out to some extent in course of the research work.

## VII. References

- 1) Ali, J., Kachroo, J., Bhat, D.J. and Bhat, A., 2018. Analysis of Prices and Arrivals of Apple Fruit in Narwal Market of Jammu. *Economic Affairs*, 63(1), pp.107-111.
- 2) AOAC.1990. Official Methods of Analysis. Trends in Food Science Technology. Association of Official Analytical Chemists, Washington DC, USA.
- 3) Bhutkar, S. S., Toraskar, S. D., & Shinde, P. B. (2015). Standardization and Production of Traditional Indian Milk Product "Basundi" from Cow Milk with Bottle Gourd Pulp. *IOSR J Agril. Vet. Sci.*
- 4) Boyer, J. and Liu, R.H., 2004. Apple phytochemicals and their health benefits. *Nutrition journal*, 3(1), p.5.
- 5) De, S., 1980. Outlines of dairy technology. *Outlines of dairy technology*.
- 6) Feskanich, D., Ziegler, R.G., Michaud, D.S., Giovannucci, E.L., Speizer, F.E., Willett, W.C. and Colditz, G.A., 2000. Prospective study of fruit and vegetable consumption and risk of lung cancer among men and women. *Journal of the National Cancer Institute*, 92(22), pp.1812-1823.
- 7) Gaikwad, A.S., Chavan, K.D. and More, K.D., 2016. Preparation of Fibre Fortified Basundi Using Date Fruit (Phoenix dactylifera). *J Nutrition Health Sci*, 3(3), pp.1-8.
- 8) Gaikwad, S.M. and Hembade, A.S., 2011. Standardization and Production of traditional Indian Milk product 'Ujanibasundi' from Buffalo milk. *International Journal of Livestock Production*, 2(8), pp.129-133.
- 9) Gite, A.S., More, D.R. and Satwadhar, P.N., 2017. Development and standerdization of custard apple basundi. *Journal of Pharmacognosy and Phytochemistry*, 6(5), pp.1170-1172.
- 10) Gokhale, A.J., Patel, A.M., Mallik, J.M., Modha, H.M. and Patel, H.G., 2018. Development of technology for manufacture of low fat protein enriched functional Basundi. *Journal of Pharmacognosy and Phytochemistry*, 7(4), pp.2270-2276.
- 11) Kashish and Dhawan, V. 2017. A Study on Production and Trade Performance of Fruits in India. *Agric Res J* 54 (1): 108-113.
- 12) Landes, M., Cessna, J., Kuberka, L. and Jones, K., 2017. *India's Dairy Sector: Structure, Performance, and Prospects*. United States Department of Agriculture.
- 13) Patel, H.G. and Upadhyay, K.G., 2001. Characterization of basundi sold in selected cities of Gujarat. *Indian journal of dairy science*, 54(6), pp.344-348.
- 14) Raghavan, D. and Kumar, K., 1961. First Indian dairy year book 1960. *First Indian dairy year book 1960*.
- 15) Raghavan. Glossary of Indian dairying terms. First Indian Dairy Book, Pub., ICAR, New Delhi, Ed. Raghavan, 1960, pp.101-102.
- 16) Rozenberg, S., Body, J.J., Bruyere, O., Bergmann, P., Brandi, M.L., Cooper, C., Devogelaer, J.P., Gielen, E., Goemaere, S., Kaufman, J.M. and Rizzoli, R., 2016. Effects of dairy products consumption on health: benefits and beliefs—a commentary from the Belgian Bone Club and the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases. *Calcified Tissue International*, 98(1), pp.1-17.
- 17) Rupali, P., 2003. *Studies on preparation of rabri blended with mango pulp* (Doctoral dissertation, Thesis submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli.→ Easy online submission process→ Rapid peer review process).
- 18) Sesso, H.D., Gaziano, J.M., Liu, S. and Buring, J.E., 2003. Flavonoid intake and the risk of cardiovascular disease in women. *The American journal of clinical nutrition*, 77(6), pp.1400-1408.
- 19) Vissers, P.A., Streppel, M.T., Feskens, E.J. and de Groot, L.C., 2011. The contribution of dairy products to micronutrient intake in the Netherlands. *Journal of the American College of Nutrition*, 30(sup5), pp.415S-421S.