



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2022; 11(12): 5452-5456  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 28-09-2022

Accepted: 26-10-2022

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## Keeping quality of misti *dahi* blended with millets flour on the basis of sensory evaluation

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### Abstract

The study was planned to prepared misti *dahi* by blending millets flour with cow milk at different proportion. The acceptability misti *dahi* was prepared from cow milk by blending at 2, 4, 6 parts of foxtail millet flour, 2, 4, 6 parts of finger millet flour and the combination of both millet flours was measured in terms of sensory attributes, by using 9 point hedonic scale by panel of semi trained judges. The study shows effect of foxtail millet and finger millet flour incorporation on sensory quality with respect to flavour, colour and appearance, taste, body and texture and overall acceptability of misti *dahi* were studied during refrigerated storage at  $5\pm 1^\circ\text{C}$ , it was carried out on 0 day, 3<sup>rd</sup>, 6<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> day. The overall acceptability of control and experimental misti *dahi* on 0 day irrespective of the treatments was (7.50) which decreased to (5.92) on the 12<sup>th</sup> day.

**Keywords:** Keeping quality, misti *dahi*, millets flour, cow milk

### Introduction

Milk has played a major contribution in the human diet in many different countries across the world. In a predominantly vegetarian people consume milk as part of their daily diet. India is ranked first in milk production contributing 23 per cent of global milk production. Milk production in the country has risen at a compound annual growth rate of about 6.2 per cent to reach 209.96 million tonnes of milk as in the year 2020-21 as per Department of Animal Husbandry and Dairying (Govt. of India). About 70 per cent of this milk is handled in unorganised sector whereas 30 per cent is handled by organised sector. About 55 per cent milk produced is used for product manufacture and 45 per cent is consumed as liquid milk. Out of 55 per cent milk used for product manufacture, about 40 per cent is used for manufacture of Indian traditional dairy products.

Fermented foods are of great significance since they provide and preserve vast quantities of nutritious foods in a wide diversity of flavor, aroma and texture which enrich the human diet. Fermentation is used as a method of value addition and conversion of raw materials by microorganisms and enzymes into various types of products with distinct nutritional and sensory properties. Indian fermented dairy products like Dahi (curd), Mishti Doi (sweetened curd), Shrikhand, Lassi and Chhach or Mohi (buttermilk), etc. are consumed frequently by the India population. This foods even find mention in our Ayurveda system of medicine for treatment of various ailments specially, gastrointestinal disorders Rasane *et al.* (2017) [9].

Misti dahi is also known as misti doi, payodhi and lal dahi. It is traditional sweetened fermented milk product popular in the eastern part of India, notably West Bengal, Bihar and Assam. It is prepared by lactic acid fermentation of sweetened milk. Misti dahi is regarded as a special dessert on ceremonial occasions both in the rural and urban Bengal. According to ancient Bengali literature, milk meant for curdling was first thickened by boiling before adding caramelized palm jaggery, cane jaggery or sugar and then allowed to set as curd to yield misti dahi Raju and Pal, (2011) [7].

Millets are known as one of the most important cereal grains. Millets are used as food and are widely used in rural areas. Millets having amazing values in their nutrition content and play a significant role in traditional diets in many regions. India is the largest producer and consumer of millet in the world. Millets have medicinal and nutraceutical properties in the form of antioxidants which prevent deterioration of human health such as lowering blood pressure, risk of heart disease, obesity, prevention of cancer and cardiovascular diseases, diabetes and decreasing tumor cases etc. Himanshu *et al.* (2018) [3].

Foxtail millet (*Setaria italica*) is native to China. Nutritional composition of foxtail millet per 100g includes, carbohydrate (60.9g), protein (12.3g), fat (4.3g), crude fibre (8.0g), mineral (3.3g), energy value (351kcal), iron (2.8mg), calcium (34mg) and phosphorus (290mg). It is rich in magnesium, manganese and phosphorus. Foxtail millet is richest source of fibre among the all millets. It also contains carotenes and tocopherols. Foxtail millet is good food for the heart as it contain high amount of magnesium. Wandhekar *et al.* (2021)<sup>[11]</sup>. Finger millet (*Eleusine corcana*) is considered to be originated in Ethiopia. It has high nutritional value and phytochemical content which makes it a super cereal which can be used for the development of functional foods Kumari and Kumar (2020). It is a good source macronutrient like protein (7.3 g/100g), carbohydrate (71g/100g), crude fiber (3.6g/100g), calorific value (334Kcal) and it is low in fat (1.5-2g/100g). The major fatty acids present in finger millet are oleic, palmitic and linolenic acids. It is good source of minerals and contains the highest calcium content (300-350mg/100g) among cereals. It is also a good source of phosphorus (250mg/100g), iron (4.2mg/100g). Consumption of finger millet is useful for pregnant women because it improves lactation. Its consumption promotes the growth of child. It is gluten free hence it lowers the risk of gall stones. Chamoli *et al.* (2018)<sup>[11]</sup>.

### Materials and Methods

The materials used and methods employed during the course of present investigation on preparation of misti *dahi* from blends of cow milk with foxtail millet and finger millet flour are as under.

In this investigation cow milk was used for conducting the experimental trials. The fresh, clean cow milk was procured from livestock instructional farm, Department of Animal Husbandry and dairy science, Dr. PDKV, Akola. Good quality organically produced dehulled Foxtail millet (CO-1) and Finger millet (Phule Nachani) was procured Center for Organic Agriculture Research and Training Department of Agronomy Dr. PDKV, Akola. The mixed starter culture NCDC-263 (*Streptococcus thermophiles* and *Lactobacillus bulgaricus*) was procured from the National Collection of Dairy Cultures (NCDC), NDRI, Karnal. Used for inoculation. The starter culture was maintained in autoclaved reconstituted skimmed milk (12.5 g\100 mL) by sub culturing once in a fortnight for attaining high activity. Clean crystalline commercial grade cane sugar was purchased from local market of Akola city, used as per requirement.

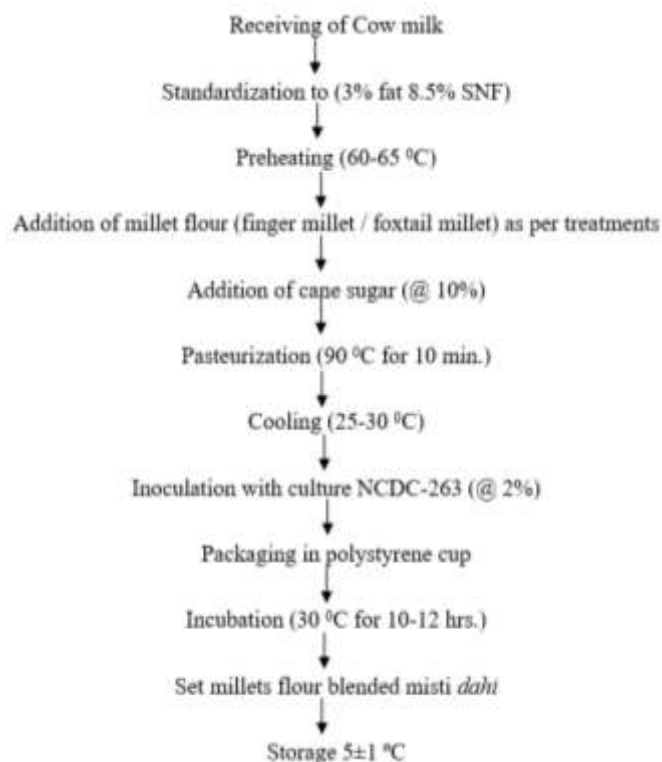
### Methods

#### Technique for preparation of misti *dahi* blended with foxtail millet and finger millet flour

The misti *dahi* was prepared from cow milk as per the method described Ranganadham *et al.* (2016)<sup>[8]</sup> with slight modification for addition of millets flour.

Fresh cow milk was received from the livestock instructional farm of department of Animal husbandry and Dairy Science, Dr. PDKV, Akola. The milk after its receive was filtered through muslin cloth and then standardized to 3% fat using Pearson's square method. The standardized milk was pre-heated at (60-65 °C). After preheating of milk foxtail millet

and finger millet flour was added slowly and milk was then stirred to avoid clot formation of flour. Then sugar was added 10 per cent. It was mixed thoroughly and it was pasteurized at 90 °C for 10 minute. After pasteurization cooling of milk 25-30 °C. After cooling 2 per cent active starter culture (NCDC-263) containing *Streptococcus thermophiles* and *Lactobacillus bulgaricus* was used for inoculation. The inoculated milk was packaging (Polystyrene cup) and incubated 30 °C for 10-12 hours until firm curd was obtained. Stored at refrigeration temperature (5±1 °C) for further study.



### Statistical analysis

The data obtained in the present investigation was tabulated. The data were analyzed statistically by using Factorial Completely Randomized Design (FCRD).

### Result and Discussion

Effect of foxtail millet and finger millet flour incorporation on sensory quality with respect to flavour, colour and appearance, taste, body and texture and overall acceptability of misti *dahi* were studied during refrigerated storage at 5±1°C, it was carried out on 0 day, 3<sup>rd</sup>, 6<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> day. The storage study showed that millets flour blended misti *dahi* unacceptable at 15<sup>th</sup> and 18<sup>th</sup> day of storage due to surface discoloration, off odor and present higher amount of yeast and mould growth which is an indication of contamination making the product unfit for judging.

### Flavour

The observation on the effect of 2, 4, 6 % foxtail millet flour and 2, 4, 6 % finger millet flour and their combination blended on misti *dahi* on flavour parameter during refrigerated storage are shown in table 1.

**Table 1:** Effect of storage period on flavour of Foxtail millet and Finger millet flour blended misti *dahi* during refrigerated storage (5±1°C) (Max. score 9) (Means of 5 replications)

Storage days	Flavour							Mean
	0	3	6	9	12	15	18	
T <sub>1</sub>	7.67	7.56	7.41	7.22	6.72	S	S	7.32
T <sub>2</sub>	7.59	7.48	7.34	6.90	5.31	S	S	6.92
T <sub>3</sub>	7.72	7.62	7.51	6.80	5.36	S	S	7.00
T <sub>4</sub>	7.48	7.21	7.10	6.52	5.15	S	S	6.69
T <sub>5</sub>	7.60	7.52	7.40	6.78	5.40	S	S	6.94
T <sub>6</sub>	8.12	8.00	7.91	7.00	6.50	S	S	7.51
T <sub>7</sub>	7.50	7.39	7.27	6.70	5.20	S	S	6.81
T <sub>8</sub>	7.26	7.19	7.05	6.48	5.10	S	S	6.62
T <sub>9</sub>	7.10	7.00	6.90	6.50	4.80	S	S	6.46
T <sub>10</sub>	6.75	6.70	6.62	6.10	4.62	S	S	6.16
Mean	7.47	7.37	7.25	6.70	5.42	S	S	
			Source	C.D. at 5%			SE(m) ±	
			Treatment	0.009			0.003	
			Period	0.006			0.002	
			T X P	0.017			0.006	

(S) - Indicates the prepared product was spoiled

This means that the (T<sub>6</sub>) misti *dahi* was liked slightly at the end of storage period. Irrespective of the treatments the flavour score decreased from (7.47) on 0 day to the score of (5.42) on 12<sup>th</sup> day of storage. During storage the flavour score decreased significantly at every stage of storage period which might be due to the gassiness and flavour defect associated with lypolysis of milk fat. The results of the present study are comparable to the findings of Rajini *et al.* (2014) [6], Chatterjee *et al.* (2016) [2], Jitender *et al.* (2016) [4], Saikia and Mishra (2017) [10], where they observed a steady decline in flavour score of of functional frozen misti dahi 0 day sample gave highest mean value of 7.0 whereas, least mean value of 4.4 was given by 10 days storage period.

**Colour and appearance:** The scores of colour and appearance for refrigerated stored samples of millets flour blended misti *dahi* samples are presented in table 2.

**Table 2:** Effect of storage period on colour and appearance of Foxtail millet and Finger millet flour blended misti *dahi* during refrigerated storage (5±1°C) (Max. score 9) (Means of 5 replications)

Storage days	Colour and appearance							Mean
	0	3	6	9	12	15	18	
T <sub>1</sub>	7.46	7.34	7.20	6.31	5.50	S	S	6.76
T <sub>2</sub>	7.40	7.21	7.10	6.52	5.15	S	S	6.68
T <sub>3</sub>	7.74	7.62	7.51	6.80	5.36	S	S	7.01
T <sub>4</sub>	7.20	7.07	6.86	5.55	5.10	S	S	6.36
T <sub>5</sub>	7.50	7.41	7.13	7.00	6.62	S	S	7.13
T <sub>6</sub>	8.08	8.00	7.89	7.54	7.00	S	S	7.70
T <sub>7</sub>	7.25	7.19	7.05	6.48	5.10	S	S	6.61
T <sub>8</sub>	7.10	7.00	6.90	5.19	4.90	S	S	6.22
T <sub>9</sub>	7.00	6.90	6.79	6.35	5.00	S	S	6.41
T <sub>10</sub>	6.61	6.49	6.35	6.21	4.91	S	S	6.11
Mean	7.33	7.22	7.08	6.40	5.46	S	S	
			Source	C.D. at 5%			SE(m) ±	
			Treatment	0.007			0.002	
			Period	0.006			0.002	
			T X P	0.015			0.005	

Moreover, significantly highest (7.70) score was received to misti *dahi* containing 4% finger millet flour (T<sub>6</sub>) over that of all other treatments. This means that the (T<sub>6</sub>) misti *dahi* was

liked moderately the end of storage period. Irrespective of the treatment the colour and appearance score decreased significantly with increased of storage period. The mean score decreased from (7.33) on 0 day to the score of (5.46) on 12<sup>th</sup> day.

The present research finding are comparable with the observation recorded by Kale *et al.* (2011) [5], Rajini *et al.* (2014) [6] It was observed the sensory attributes for the foxtail millet *dahi* with added WPC showed steady decrease from 1st day to the last day of storage.

**Taste**

The scores of taste of millets flour blended misti *dahi* during refrigerated storage are presented in table 3. It was observed from the results presented above that the taste score showed decreasing trend from the day of preparation up to 12<sup>th</sup> day of storage. The mean value of taste on 0 day irrespective of the treatments was (7.45) which decreased to (5.65) on 12<sup>th</sup> day. Good quality of misti *dahi* has pleasant milky to slight sour taste. The decreased in taste score might be due to increased in acidity and sourness during storage period.

**Table 3:** Effect of storage period on taste of Foxtail millet and Finger millet flour blended misti *dahi* during refrigerated storage (5±1 °C) (Max. score 9), (Means of 5 replications)

Storage days	Taste							Mean
	0	3	6	9	12	15	18	
T <sub>1</sub>	7.75	7.64	7.53	7.00	6.10	S	S	7.20
T <sub>2</sub>	7.61	7.50	7.44	6.70	5.80	S	S	7.01
T <sub>3</sub>	7.90	7.80	7.69	7.10	6.20	S	S	7.34
T <sub>4</sub>	7.22	7.15	7.00	6.10	5.40	S	S	6.57
T <sub>5</sub>	7.79	7.69	7.54	6.90	6.00	S	S	7.18
T <sub>6</sub>	8.16	8.00	7.90	7.20	6.80	S	S	7.61
T <sub>7</sub>	7.32	7.25	7.12	6.20	5.20	S	S	6.62
T <sub>8</sub>	7.10	7.00	6.90	5.19	5.10	S	S	6.26
T <sub>9</sub>	7.00	6.90	6.79	6.35	5.00	S	S	6.41
T <sub>10</sub>	6.60	6.49	6.35	6.21	4.91	S	S	6.11
Mean	7.45	7.34	7.23	6.50	5.65	S	S	
			Source	C.D. at 5%			SE(m) ±	
			Treatment	0.006			0.002	
			Period	0.007			0.002	
			T X P	0.016			0.005	

This view get support of Paul *et al.* (2016), Saikia and Mishra (2017)<sup>[10]</sup> where they noticed decreased in taste score of misti dahi supplemented with flax lignan, functional frozen misti dahi during storage periods.

**Body and texture**

The scores of body and texture of millets flour blended misti dahi during refrigerated storage are presented in table 4.

**Table 4:** Effect of storage period on body and texture of Foxtail millet and Finger millet flour blended misti dahi during refrigerated storage (5±1 °C) (Max. score 9) (Means of 5 replications)

Storage days	Body and Texture							Mean
	0	3	6	9	12	15	18	
Treatment								
T <sub>1</sub>	7.69	7.58	7.41	7.00	5.90	S	S	7.12
T <sub>2</sub>	7.49	7.35	7.22	6.30	5.50	S	S	6.77
T <sub>3</sub>	7.77	7.68	7.57	7.05	6.10	S	S	7.23
T <sub>4</sub>	7.39	7.21	7.10	6.12	5.15	S	S	6.59
T <sub>5</sub>	7.63	7.52	7.44	6.70	5.70	S	S	7.00
T <sub>6</sub>	8.10	8.00	7.90	7.10	6.60	S	S	7.54
T <sub>7</sub>	7.56	7.45	7.35	6.50	5.40	S	S	6.85
T <sub>8</sub>	7.24	7.13	7.02	6.21	5.00	S	S	6.52
T <sub>9</sub>	6.90	6.79	6.61	5.34	4.93	S	S	6.11
T <sub>10</sub>	6.70	6.69	6.43	5.21	4.76	S	S	5.96
Mean	7.45	7.34	7.21	6.35	5.50	S	S	
				Source	C.D. at 5%		S.E (m) ±	
				Treatment	0.004		0.001	
				Period	0.003		0.001	
				T X P	0.009		0.003	

It was observed from the results mentioned above that the body and texture score showed decreasing trend from the day of preparation to 12<sup>th</sup> day of storage. The mean value of body and texture on 0 day irrespective of the treatments was (7.45) which decreased to (5.50) on 12<sup>th</sup> day. The decreased in body and texture score might be due to loss of moisture content, Ingredients used on the media in the multiplication process might contribute desirable changes of body and texture of misti dahi during refrigerated storage period. The storage period and treatments individually exerted a significant effect also interaction between them showed a significant effect on

body and texture score of the misti dahi.

The present research finding are comparable with the observation recorded by Rajini *et al.* (2014)<sup>[6]</sup>, Chatterjee *et al.* (2016)<sup>[2]</sup> and Jitender *et al.* (2016)<sup>[4]</sup> reported body and texture score decreased with increased in storage period.

**Overall acceptability**

The scores of overall acceptability of millets flour blended misti dahi during refrigerated storage are presented in table 5.

**Table 5:** Effect of storage period on overall acceptability of Foxtail millet and Finger millet flour blended misti dahi during refrigerated storage (5±1 °C) (Max. score 9) (Means of 5 replications)

Storage days	Overall acceptability							Mean
	0	3	6	9	12	15	18	
Treatment								
T <sub>1</sub>	7.76	7.64	7.51	7.10	6.90	S	S	7.38
T <sub>2</sub>	7.65	7.52	7.41	7.00	6.50	S	S	7.22
T <sub>3</sub>	7.98	7.83	7.68	7.27	7.00	S	S	7.55
T <sub>4</sub>	7.32	7.21	7.10	6.52	5.15	S	S	6.66
T <sub>5</sub>	7.78	7.68	7.57	7.05	6.10	S	S	7.24
T <sub>6</sub>	8.20	8.02	7.90	7.11	7.00	S	S	7.65
T <sub>7</sub>	7.45	7.34	7.20	6.31	5.50	S	S	6.76
T <sub>8</sub>	7.20	7.07	6.86	5.55	5.10	S	S	6.36
T <sub>9</sub>	7.00	6.89	6.18	6.07	5.00	S	S	6.23
T <sub>10</sub>	6.71	6.59	6.36	6.15	4.90	S	S	6.14
Mean	7.50	7.38	7.18	6.61	5.92	S	S	
				Source	C.D. at 5%		SE(m) ±	
				Treatment	0.004		0.001	
				Period	0.003		0.001	
				T X P	0.009		0.003	

\*Treatments

T <sub>1</sub> : 100% milk	T <sub>2</sub> :2% Foxtail millet flour	T <sub>3</sub> :4% Foxtail millet flour	T <sub>4</sub> :6% Foxtail millet flour	T <sub>5</sub> :2% Finger millet flour	T <sub>6</sub> :4% Finger millet flour	T <sub>7</sub> :6% Finger millet flour	T <sub>8</sub> :2% FoMF + 2% FiMF	T <sub>9</sub> :4% FoMF + 4% FiMF	T <sub>10</sub> :6% FoMF + 6% FiMF
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It was observed from results presented above that the overall acceptability score showed decreasing trend from the day of preparation up to 12<sup>th</sup> day of storage and the misti *dahi* was acceptable up to the 9<sup>th</sup> days of storage. The mean value of overall acceptability on 0 day irrespective of the treatments was (7.50) which decreased to (5.92) on the 12<sup>th</sup> day. The decreased in the overall acceptability score was due to the decreased in the flavour, colour and appearance, taste and body and texture during the storage period. The results of the present study are in line with the finding of Kale *et al.* (2011)<sup>[5]</sup>, Rajini *et al.* (2013)<sup>[12]</sup>, Rajini *et al.* (2014)<sup>[6]</sup> where they observed the sensory scores with respect to overall acceptability of *dahi* were gradually declining up to the last day of storage. Similar view were mentioned by Chatterjee *et al.* (2016)<sup>[2]</sup>, Jitender *et al.* (2016)<sup>[4]</sup>, Saikia and Mishra (2017)<sup>[10]</sup> where they reported decline overall acceptability score during storage period.

### Conclusion

It concluded that organoleptically acceptable misti *dahi* containing foxtail millet and finger millet flour could be implemented in future as a beneficial for health to eradicate the malnutrition problems from developing and under developed countries. The misti *dahi* prepared by added 4% per cent finger millet flour was found more suitable on sensory attributes. The decreased in the overall acceptability score was due to the decreased in the flavour, colour and appearance, taste and body and texture during the storage period.

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