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Studies on sensory quality and shelf life of *burfi* blended with unripen banana (*Musa paradisiaca*) Pulp

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Abstract

The research entitled “Studies on Preparation of *Burfi* Blended with Unripen Banana (*Musa paradisiaca*) Pulp” was conducted in the Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani during 2025–26. The *burfi* was prepared by blending 1.5, 2.5 and 3.5 per cent of unripen banana pulp. The sensory evaluation showed that the incorporation of unripe banana pulp significantly decreased the scores for colour and appearance, flavour, body and texture, and overall acceptability with increasing pulp levels. The sensory scores of T₁, T₂, T₃, T₄ for colour and appearance 8.81, 8.31, 7.81, 7.31; Flavour 8.69, 8.19, 7.69, 7.19; body and texture 8.81, 8.31, 7.81, 7.31; and for overall acceptability 9.00, 8.63, 8.13, 7.63. The *burfi* was stored for 7 days at 30 ± 2°C, SPC, yeast and mould counts increased progressively in all treatments, with higher counts observed at higher levels of banana pulp. On the 7th day, SPC ranged from 5.0 × 10⁴ to 6.9 × 10⁴ CFU/g, while yeast and mould count ranged from 16 to 47 CFU/g. Coliforms were not detected throughout the storage period.

Keywords: *Burfi*, unripen banana pulp, *Musa paradisiaca*, sensory quality

Introduction

India is the world's leading milk-producing country, with milk production increasing from 146.31 million tonnes in 2014–15 to 247.87 million tonnes in 2024–25. Per capita milk availability also increased from 319 to 485 g/day, indicating the growing importance of the dairy sector in the country (Anonymous, 2025–26) [3].

Khoa is classified into three types—*Pindi*, *Dhap* and *Danedar*. *Pindi khoa* is mainly used for preparing traditional sweets such as *burfi* and *peda*. It is an important base ingredient in several Indian milk-based sweets, including *peda*, *burfi*, *milk cake*, *kalakand* and *gulabjamun* (Shilar *et al.* 2024) [8].

Burfi is one of the most popular *khoa*-based traditional sweets in India, with its body and texture largely influenced by the quality of *khoa*. Various types of *burfi* are prepared by incorporating ingredients such as gram flour, cashew, pistachio, fruits and spices according to consumer preference (Mohod *et al.* 2020) [7].

Unripe bananas have lower flavour and aroma than ripe fruits but offer considerable potential as functional food ingredients. They can act as natural thickening agents and improve the nutritional quality of food products (Abd El-Khair *et al.* 2024) [2].

Materials and Methods

The present study was conducted during 2025–2026 in the Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani.

Materials

Fresh Standardized Buffalo milk (6% fat and 9% SNF), Unripen banana crystalline cane sugar was purchased from local market of Latur.

Microbiological Media

The Shelf life of *burfi* samples was analyzed for standard plate count, coliform count, yeast and

mould count by using Nutrient Agar (NA), Violet Red Bile Agar (VRBA) and Potato Dextrose Agar (PDA) media, respectively.

Methodology

Unripen banana fruits were washed, blanched at 80°C for 3 minutes, cooled, peeled and cut into small slices. The slices were blended into a smooth pulp, collected and used for *burfi* preparation. *Burfi* was prepared using buffalo milk standardized to 6 per cent fat and 9 per cent SNF. The milk was heated to boiling and blended with blanched unripen banana pulp. The mixture was concentrated with continuous stirring and scraping until a homogeneous khoa-like consistency was attained. Sugar was added at 30 per cent of the khoa weight and mixed thoroughly to obtain a uniform mass. The product was then transferred to trays, spread evenly, and allowed to cool and set at room temperature. After setting, the *burfi* was cut into rectangular pieces, packaged suitably, and stored at 30 ± 1°C for further evaluation.

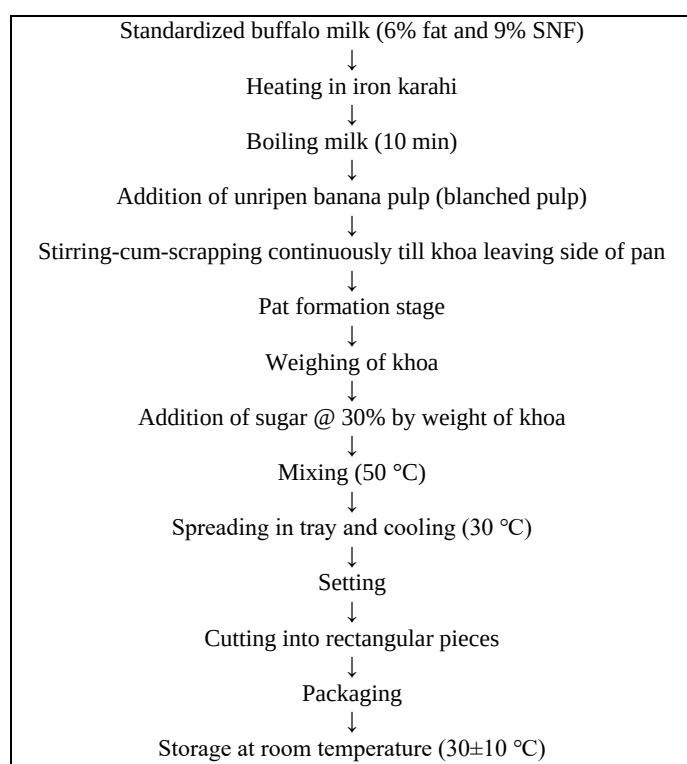


Fig 1: Preparation of *burfi* blended with unripen banana pulp (Kuchi *et al.* 2017) [5]

Treatment combination

Burfi blended with unripen banana pulp was prepared using 30 per cent sugar by weight of khoa and unripen banana pulp as per the treatment combination as follows:

- T₁ - 100 part of khoa by weight (Control)
- T₂ - 94 part of khoa+ 6 part of unripen banana pulp by weight
- T₃ - 90 part of khoa+ 10 part of unripen banana pulp by weight
- T₄ - 86 part of khoa+ 14 part of unripen banana pulp by weight

Sensory evaluation of control and *burfi* blended with unripen banana pulp was conducted by semi- trained panel of 5 judges using 9-point hedonic scale. The sensory attributes such as colour and appearance, body and texture, flavour and overall acceptability was studied and data obtained were analysed with Completely Randomized Block Design (CRD). The scores given

by judges for different sensory parameters were recorded and subsequently discussed as follows. The shelf life of *burfi* was analysed for standard plate count, yeast and mould count, coliform count was performed according to A.O.A.C. method.

Results and Discussion

Colour and appearance score of *burfi* blended with unripen banana pulp

The mean score for colour and appearance of *burfi* blended with unripen banana pulp was given in Table 1.

Table 1: Colour and appearance score of *burfi* blended with unripen banana pulp (per cent)

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	9	8.5	9	8.75	8.81 ^a
T ₂	8.5	8	8.5	8.25	8.31 ^b
T ₃	8	7.5	8	7.75	7.81 ^c
T ₄	7.5	7	7.5	7.25	7.31 ^d
S.E. ± 0.1196, C.D. at 5% 0.3687					

The values with differ significantly ($p < 0.05$)

The mean score for colour and appearance in control (T₁) and *burfi* blended with unripen banana pulp T₂, T₃ and T₄ were 8.81, 8.31, 7.81 and 7.31, respectively. The colour and appearance score decreased significantly with increase in the level of pulp incorporation, resulting in lowest score in T₄ (7.31). The significant decrease in colour and appearance score among the treatment groups as compared to control was due to incorporation of unripen banana pulp, with slight brown colour which was due to oxidation of polyphenol oxidase in unripen banana pulp when exposed to air and subsequent heating. The results of the present study are similar to Asati *et al.* (2019) [4] who reported that addition of orange rind at 10, 15 and 20 per cent influenced the colour and appearance score of *burfi* resulted in decreased score of *burfi* from 8.08 per cent in control to 7.92, 7.78 and 7.76.

Flavour score of *burfi* blended with unripen banana pulp

The mean score for flavour of *burfi* blended with unripen banana pulp was given in Table.

Table 2: Flavour score of *burfi* blended with unripen banana pulp

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	9	8.5	8.75	8.5	8.69 ^a
T ₂	8.5	8	8.25	8	8.19 ^b
T ₃	8	7.5	7.75	7.5	7.69 ^c
T ₄	7.5	7	7.25	7	7.19 ^d
S.E. ± 0.1196, C.D. at 5% 0.3687					

The values differ significantly ($p < 0.05$)

The mean score for flavor in control (T₁) and *burfi* blended with unripen banana pulp T₂, T₃ and T₄ were 8.69, 8.19, 7.69 and 7.19, respectively. The significant decrease in flavor score *burfi* with unripen banana pulp was due to the increased intensity of slight starchy and grassy flavor of unripen banana pulp at higher levels of incorporation, which was affected the desirable flavor and taste of *burfi*. The results of the present study are similar to Asati *et al.* (2019) [4] who reported that addition of orange rind at 10, 15 and 20 per cent influence on flavour score of *burfi* resulted in decreased in score of *burfi* from 7.92 per cent in control to 7.8, 7.78 and 7.7.

Body and texture score of *burfi* blended with unripen banana pulp

The mean score for body and texture of *burfi* blended with unripen banana pulp was given in Table 3.

Table 3: Body and texture score of *burfi* blended with unripen banana pulp

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	9.00	8.50	9.00	8.75	8.81 ^a
T ₂	8.50	8.00	8.50	8.25	8.31 ^b
T ₃	8.00	7.50	8.00	7.75	7.81 ^c
T ₄	7.50	7.00	7.50	7.25	7.31 ^d
S.E. $\pm$ 0.1196, C.D. at 5% 0.3687					

The values differ significantly ($p < 0.05$)

The mean score for body and texture in control (T₁) and *burfi* blended with unripen banana pulp T₂, T₃ and T₄ were 8.81, 8.31, 7.81 and 7.31, respectively. The results indicated that the addition of pulp in *burfi* gradually decreased the body and texture score from T₂ to T₄. The body and texture score of the control treatment T₁ (8.81) was highest than all the treatments, while T₄ (7.31) recorded the lowest score than control as well as other treatments. The significant decrease in body and texture score at higher per cent in treatments due to changes in consistency, resulting in a softer and less firm texture of *burfi* due to high moisture content in unripen banana pulp. The results of the present study are similar with Asati *et al.* (2019) [4], who reported that addition of orange rind at 10, 15 and 20 per cent levels influence on the body and texture of *burfi* resulted in decrease score of *burfi* from 7.68, 7.6, 7.54 to 7.46.

Overall acceptability score of *burfi* blended with unripen banana pulp

The mean score for overall acceptability of *burfi* blended with unripen banana pulp was given in Table 4.

Table 4: Overall acceptability score of *burfi* blended with unripen banana pulp

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	9.00	9.00	9.00	9.00	9.00 ^a
T ₂	8.50	9.00	8.50	8.50	8.63 ^b
T ₃	8.00	8.50	8.00	8.00	8.13 ^c
T ₄	7.50	8.00	7.50	7.50	7.63 ^d
S.E. $\pm$ 0.1082, C.D. at 5% 0.3335					

The values with different superscripts differ significantly ($p < 0.05$)

The mean score for overall acceptability scores of the control (T₁) and *burfi* blended with unripen banana pulp T₂, T₃ and T₄ were 9.00, 8.63, 8.13 and 7.63, respectively. The overall acceptability score decreases with increased level of pulp incorporation resulted in the lowest score (7.63) in T₄. The significant decrease in overall acceptability attributed to the combined changes in colour, flavour, body and texture at higher levels of pulp incorporation, which reduced the sensory preference of the product. The results of the present study are similar with Kumar *et al.* (2016) [6], who reported that incorporation of pineapple pulp at 5, 10, 15, 20 and 25 per cent influence the overall acceptability score of *burfi* resulted in decrease score of *burfi* from 7.28, 7.81, 7.63 to 7.53.

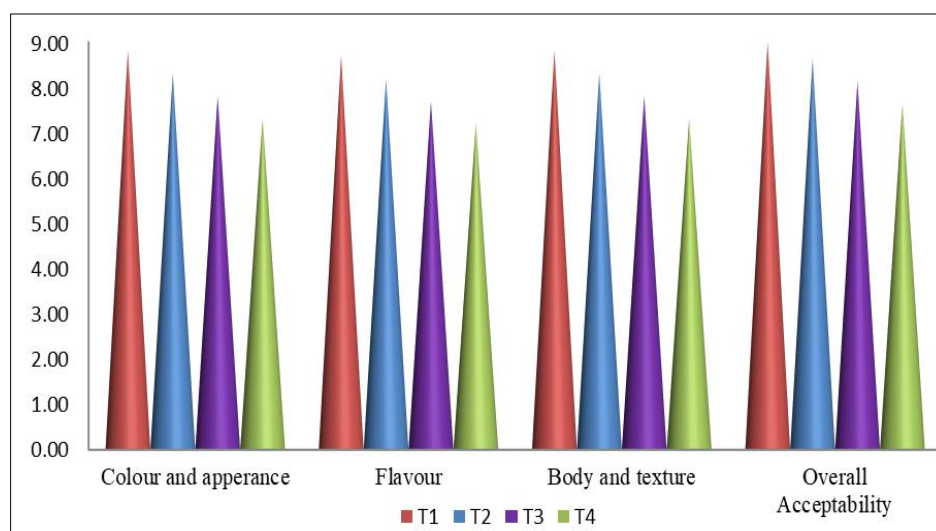


Fig 2: Graphical presentation of sensory quality of *Burfi* blended with unripen banana pulp

Shelf life of developed product using unripen banana pulp

The shelf life of *burfi* depends on the packaging and storage conditions. *Burfi* blended with unripen banana pulp was stored at room temperature ($30 \pm 2^\circ\text{C}$). The shelf life was monitored on the basis of standard plate count, yeast and mould count and coliform count in the *burfi* during storage.

Standard plate count of *burfi* blended with unripen banana pulp

The standard plate count of *burfi* blended with unripen banana pulp was given in Table 5.

Table 5: Standard plate count of *burfi* blended with unripen banana pulp

Days/ Treatment	Standard plate count			
	0 th day	3 rd day	5 th day	7 th day
T ₁	0	2.9	4.1	5.0
T ₂	0	3.2	4.5	5.6
T ₃	0	3.4	4.7	6.2
T ₄	0	3.7	5.1	6.9

The Standard Plate Count (SPC) of *burfi* increased gradually during storage at room temperature in all the treatments. SPC count was not detected in control as well as in all treatment group

on 0 day of storage. On the 3rd day, the SPC values in T₁, T₂, T₃ and T₄ were 2.9, 3.2, 3.4 and 3.7×10^4 CFU/g respectively. On 5th day, the values in T₁, T₂, T₃ and T₄ were 4.1, 4.5, 4.7, 5.1×10^4 CFU/g and on 7th day the values in T₁, T₂, T₃ and T₄ were 5.0, 5.6, 6.2, 6.9×10^4 CFU/g of the storage. The progressive increase in SPC during storage may be attributed to microbial multiplication under room-temperature storage indicating gradual microbial growth affecting shelf life of product adversely. T₄ recorded the highest SPC count (6.9×10^4 CFU/g), whereas T₁ recorded the lowest count (5.0×10^4 CFU/g) on the 7th day of storage. The higher microbial count observed in all the treatments containing higher levels of unripen banana pulp due to the nutrients and moisture in the pulp, which favoured microbial growth during storage.

Yeast and mould count of *burfi* blended with unripen banana pulp

The yeast and mould count of *burfi* blended with unripen banana pulp was given in Table 6.

The yeast and mould count of *burfi* increased gradually during storage at room temperature ($30 \pm 2^\circ\text{C}$) in the control as well as all the treatments. No yeast and mould growth were observed on the first day of storage. However, the count increased gradually on the 3rd, 5th and 7th days of storage. The yeast and mould count in T₁, T₂, T₃ and T₄ were 2, 3, 2 and 7; 3, 6, 8 and 16; and 16, 25, 36 and 47 CFU/g on the 3rd, 5th and 7th days, respectively.

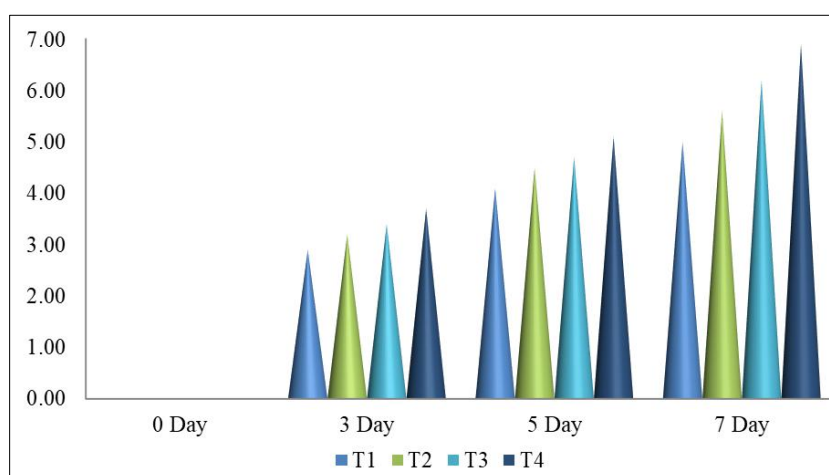
Table 6: Yeast and mould count of *burfi* blended with unripen banana pulp

Days/ Treatment	Yeast mould count			
	0 th day	3 rd day	5 th day	7 th day
T ₁	0	2	3	16
T ₂	0	3	6	25
T ₃	0	2	8	36
T ₄	0	7	16	47

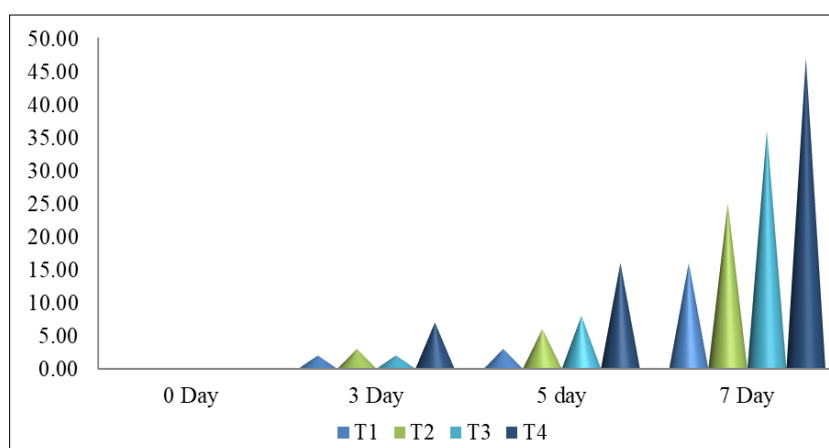
The progressive increase in yeast and mould count during storage may be attributed to fungal multiplication under room-temperature conditions, indicating gradual microbial growth and adversely affecting the shelf life of the product. T₄ recorded the highest yeast and mould count (47 CFU/g) on the 7th day, whereas T₁ recorded the lowest count (16 CFU/g). The higher yeast and mould count observed in treatments containing higher levels of unripen banana pulp may be attributed to the nutrients and moisture of the pulp.

Coliform count of *burfi* blended with unripen banana pulp

In the present study, coliforms were not detected in the control and in all treatments, indicating that proper hygienic and sanitary conditions were maintained during the preparation of *burfi* blended with unripe banana pulp.



A. Standard plate count of *burfi* blended with unripen banana pulp



B. Yeast and mould count of *burfi* blended with unripen banana pulp

Fig 3: Graphical presentation of microbiological shelf life of *burfi* blended with unripen banana pulp

Conclusion

From present study it was observed that sensory parameters such as colour and appearance, flavour, body and texture and overall acceptability the sensory quality of *burfi* decreased with increasing levels of unripe banana pulp. Among the treatments, *burfi* containing 1.5 per cent unripe banana pulp (T_2) showed better sensory acceptability. The shelf life of *burfi* blended with unripe banana pulp was studied at room temperature ($30 \pm 2^\circ\text{C}$), the standard plate count and yeast and mould count increased progressively in all treatments, whereas coliforms were not detected throughout the storage period. The lowest microbial counts were observed in the control, while counts increased with increasing levels of unripe banana pulp.

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