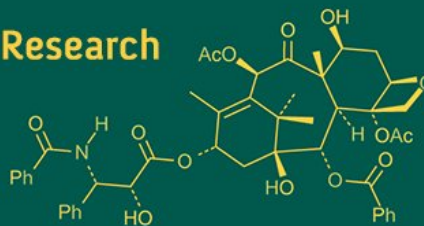


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Effect of addition of unripen banana (*Musa paradisiaca*) pulp on proximate composition and production cost of *burfi*

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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 (T₂), 2.5 (T₃) and 3.5 (T₄) percent unripen banana pulp. The proximate composition of *burfi* blended with unripen banana pulp showed significant increase in percent moisture in 19.66 (T₂), 20.39 (T₃) and 21.07 (T₄) and total sugar 40.22 (T₂), 40.97 (T₃) and 41.47 (T₄) than control T₁ (18.85 and 39.17) respectively. The total solid 80.34 (T₂), 79.61 (T₃) and 78.93 (T₄) percent; Fat 21.16 (T₂), 20.38 (T₃) and 19.78 (T₄) percent; Protein 16.14 (T₂), 15.61 (T₃) and 15.22 (T₄) percent; and ash 2.82 (T₂), 2.66 (T₃) and 2.46 (T₄) percent decreased significantly in all treatments due to addition of banana pulp as compare to control T₁ (81.15, 22.28, 16.61 and 3.09 percent, respectively). The cost of production was decreased in treatments with 1.5 (T₂), 2.5 (T₃) and 3.5 (T₄) percent unripen banana pulp from Rs. 319.02 to 312.92 per 1 kg than control T₁ Rs. 323.60 per kg.

Keywords: *Burfi*, unripe banana, pulp, proximate composition, cost, dairy products

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, registering a 69.41 percent increase. Per capita milk availability also rose from 319 to 485 g/day during the same period. The dairy sector plays a significant role in the Indian economy, contributing 30.87 percent to the economic value of the agricultural and allied sector and 5.49 percent to the national economy (Anonymous, 2025-26) [2].

Milk-based traditional sweets are an integral part of Indian cultural and social traditions and are widely consumed during festivals, religious functions and social occasions. Their increasing commercial value has also encouraged organized dairy industries to enter the traditional sweets sector for value-added production (Kumar *et al.*, 2016) [11].

Burfi is a popular khoa-based traditional sweet in India. The versatility of khoa permits incorporation of various food ingredients, resulting in different types of *burfi*. Kamble *et al.* (2010) [9].

Banana is an important fruit crop valued for its pleasant flavour and high nutritional content. It is a rich source of vitamins A, C and B₂ and minerals such as potassium, calcium, phosphorus, magnesium, sodium and iron. Besides fresh consumption, banana is widely utilized for value-added products such as chips, flour, powder, jam and beverages. Unripen bananas are commonly used for flour production, whereas ripe bananas are used for powder preparation (Kuchi *et al.*, 2017) [10].

Materials and Methods

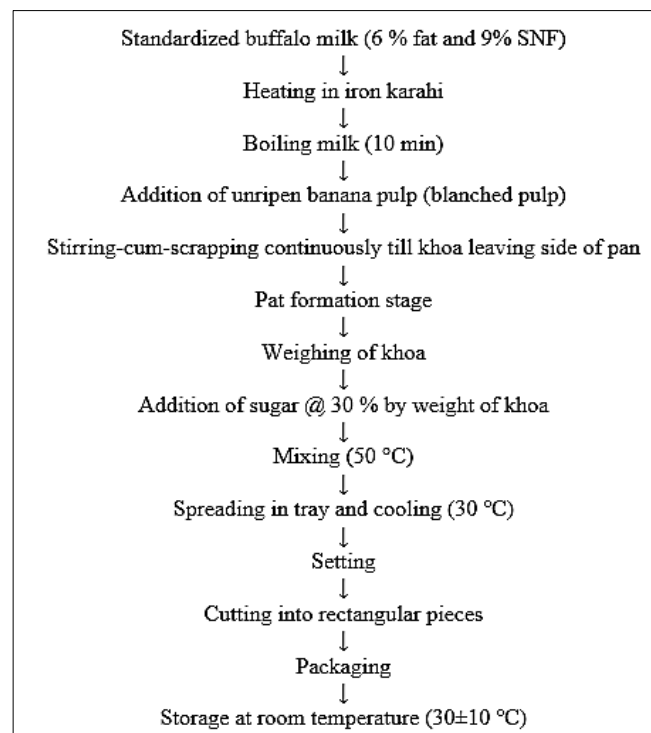
The present study was conducted during 2025-2026 in the Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani.

Materials

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

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 percent fat and 9 percent 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 percent 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



(Kuchi *et al.* 2017) [10]

Fig 1: Preparation of *burfi* blended with unripen banana pulp

Treatment combination

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

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

Burfi blended with unripen banana pulp and control *burfi* were analysed for moisture, ash, fat, total solids, total sugar and protein by using standard methods. Moisture was determined as per standard procedure described by (Anonymous, 1959) [1]. Ash content was determined by methods described in IS: SP (Part XI) 1981. The fat content was determined by using Gerber's method described in IS: SP 1224 (Part II), 1977. Total solid content was determined as per the method described in IS: 1479 (Part II) 1961. Total

sugar content was estimated by subtraction method i.e. Total sugar = 100-(moisture + fat + protein + ash). The protein content was determined by the method of Lowry *et al.* (1951) [12].

Results and Discussion

Moisture content of *burfi* blended with unripen banana pulp

The mean value for percent moisture content of the control (T₁) and *burfi* blended with unripen banana pulp at T₂, T₃ and T₄ was 18.85, 19.66, 20.39 and 21.07 percent, respectively. The percent moisture content of control (T₁) sample was (15.63) lower and differ significant from all treatments. Among the treatment percent moisture content increased significantly toward higher level of addition of banana pulp. Moisture content in T₄ (21.07) was highest and differ significantly than all other treatment and among the treatment group values differ significantly from each other. The significant increase in moisture content of *burfi* blended with unripen banana pulp was due to the higher moisture content (68.45) of unripen banana pulp. The results obtained in the present study are similar with Navale *et al.* (2014) [14], who reported that of *burfi* with addition of wood apple pulp at 5, 10 and 15 percent levels, with moisture increasing from 16.96 to 20.30 percent. Similarly, Kumar *et al.* (2016) [11] who reported that addition of pineapple pulp at 10, 20 and 30 percent levels increased the moisture content of *burfi* from 19.81 to 22.38 percent.

Table 1: Moisture content of *burfi* blended with unripen banana pulp (per cent)

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	18.74	18.94	18.82	18.91	18.85 ^d
T ₂	19.51	19.68	19.85	19.61	19.66 ^c
T ₃	20.38	20.46	20.31	20.40	20.39 ^b
T ₄	20.97	21.16	21.04	21.12	21.07 ^a
S.E. ± 0.04981 C.D. at 5% 0.1534					

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

Fat content of *burfi* blended with unripen banana pulp

The mean values for percent fat content of the control (T₁) and *burfi* blended with unripen banana pulp T₂, T₃ and T₄ was 22.28, 21.16, 20.38 and 19.78 percent, respectively. The percent fat content decreased significantly with increasing levels of pulp in treatment group and values in treatment group differed significantly from each other. The control T₁ (22.28) showed highest percent fat content and differ significantly than all treatment T₄ (19.78) recorded the lowest percent fat content than all other treatment.

The significant decrease in fat content of *burfi* blended with unripen banana pulp was due to lower fat content (0.19) in unripen banana pulp compared to khoa.

The results obtained in present study are similar to Kamble *et al.* (2010) [9], who reported a decline in fat content of *burfi* with addition of pineapple pulp at 5, 10, 15, 20 and 25 percent levels. The fat content decreased from 21.95 percent in the control to 15.81 percent. Similarly, Navale *et al.* (2014) [14] reported that decrease in percent fat content of *burfi* with addition of wood apple pulp at 5, 10 and 15 percent levels, from 20.41 percent in the control to 17.03 percent in T₄.

Table 2: Fat content of *burfi* blended with unripen banana pulp (per cent)

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	22.21	22.36	22.24	22.30	22.28 ^a
T ₂	21.06	21.26	21.13	21.20	21.16 ^b
T ₃	20.29	20.46	20.34	20.41	20.38 ^c
T ₄	19.61	19.77	19.84	19.90	19.78 ^d

S.E. $\pm$ 0.04555 C.D. at 5% 0.1403The values with different superscripts differ significantly ($p < 0.05$)**Protein content of *burfi* blended with unripen banana pulp**

The mean value for percent protein content of the control (T₁) and *burfi* blended with unripen banana pulp T₂, T₃ and T₄ was 16.61, 16.14, 15.61 and 15.22 percent, respectively. The percent protein content of control (16.61) was significantly higher than other treatments. Among all the treatments protein content decreased significantly towards higher level of addition of unripen banana pulp. The percent protein content T₂ (16.14) was highest and T₄ (15.22) was lowest among the treatment group. The reduction in protein content may be attributed to the comparatively lower protein content of the unripen banana pulp (1.15) as compared to khoa (17.8), resulting in a significant decrease in the overall protein content of *burfi* in treatment group. The results obtained in present study are similar to Kumar *et al.* (2016) [11], who reported a decrease in protein content of *burfi* addition of pineapple pulp at 5, 10, 15, 20 and 25 percent levels. The percent protein content decrease from (15.67) percent in the control to (12.47) percent in T₄ with addition of pineapple pulp.

Table 3: Protein content of *burfi* blended with unripen banana pulp (per cent)

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	16.52	16.04	16.59	16.70	16.61 ^a
T ₂	16.27	16.09	16.13	16.06	16.14 ^b
T ₃	15.60	15.54	15.63	15.67	15.61 ^c
T ₄	15.17	15.23	15.20	15.27	15.22 ^d

S.E. $\pm$ 0.03470 C.D. at 5% 0.1069The values with different superscripts differ significantly ($p < 0.05$)**Ash content of *burfi* blended with unripen banana pulp**

The mean value for percent ash content for control (T₁) and *burfi* blended with unripen banana pulp T₂, T₃ and T₄ was 3.09, 2.82, 2.66 and 2.46 percent, respectively. The percent ash content decreased significantly towards increasing levels of addition of pulp in treatment groups and all the treatments differed significantly from each other. The percent ash content in control was the highest (3.09) and differ significantly. Whereas, in treatment T₄ (2.46) showed lowest ash content as compare to control as well T₂ (2.82) and T₃ (2.66). The significant decrease in ash content may be attributed to the comparatively higher moisture content in unripen banana pulp than the khoa, resulting in a gradual reduction in content of the developed *burfi*. The results of the present study are similar with Kumar *et al.* (2016) [11], who reported a decrease in ash content of *burfi* from 3.18 percent in the control to 2.49 percent with the addition of 10, 20 and 30 percent pineapple pulp. Similarly, Bhosale *et al.* (2018) [3] observed that the ash content of *burfi* decreased

from (2.80) percent in the control to (2.39) percent in T₄ with addition of 5, 10 and 15 percent bottle gourd pulp.

Table 4: Ash content of *burfi* blended with unripen banana pulp (per cent)

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	3.03	3.14	3.06	3.11	3.09 ^a
T ₂	2.76	2.84	2.80	2.89	2.82 ^b
T ₃	2.58	2.68	2.62	2.74	2.66 ^c
T ₄	2.39	2.47	2.43	2.54	2.46 ^d

S.E. $\pm$ 0.03464 C.D. at 5% 0.1067The values with different superscripts differ significantly ($p < 0.05$)**Total solids content of *burfi* blended with unripen banana pulp**

The mean value for percent total solids content of the control (T₁) and *burfi* blended with unripen banana pulp T₂, T₃ and T₄ was 81.15, 80.34, 79.61 and 78.93 percent, respectively. In control T₁ (81.15) total solid content was highest and differ significantly from all other treatments. A significant decrease in total solids content was observed with increasing levels of unripen banana pulp in *burfi*. Among the treatments the percent total solid in T₂ (80.34) was the highest, whereas in treatment T₄ the lowest (78.93). The significant decrease in total solids content was due to the increase in moisture content with increasing levels of unripen banana pulp in *burfi*. The results of the present study are similar with Kumar *et al.* (2016) [11], who reported a decrease in total solids content of *burfi* from 80.19 percent in the control to 77.62 percent with addition of 10, 20 and 30 percent pineapple pulp.

Table 5: Total solid content of *burfi* blended with unripen banana pulp (per cent)

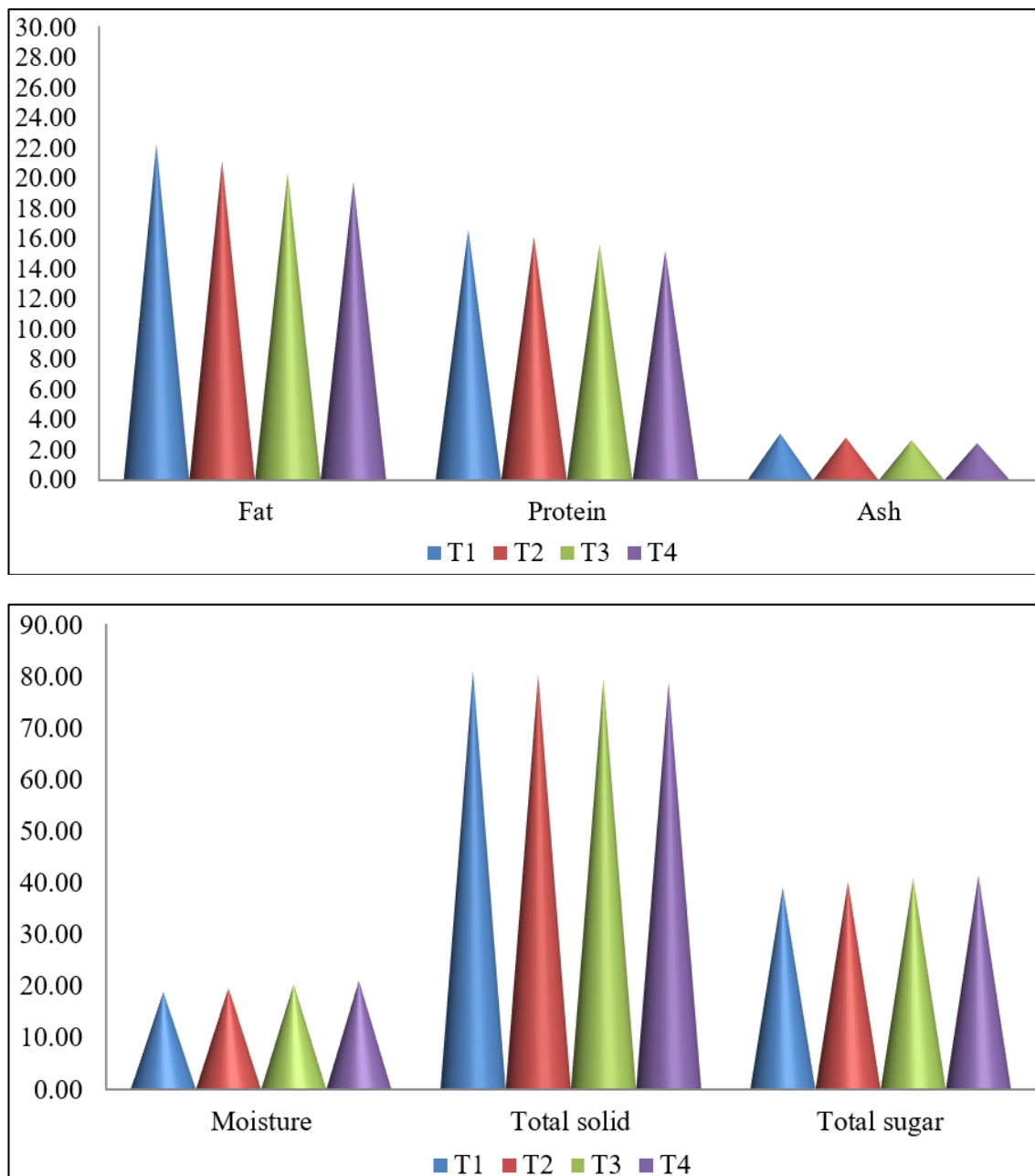
Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	81.26	81.06	81.18	81.09	81.15 ^a
T ₂	80.49	80.32	80.15	80.39	80.34 ^b
T ₃	79.62	79.54	79.69	79.60	79.61 ^c
T ₄	79.03	78.84	78.96	78.88	78.93 ^d

S.E. $\pm$ 0.04981 C.D. at 5% 0.1534**Total sugar content of *burfi* blended with unripen banana pulp**

The mean value for percent total sugar content for the control (T₁) and *burfi* blended with unripen banana pulp T₂, T₃ and T₄ was 39.17, 40.22, 40.97 and 41.47 percent, respectively. The percent total sugar content in control T₁ (39.17) was lowest, whereas in treatment T₄ (41.47) showed highest total sugar content and differ significantly from other treatments. The significant increase in total sugar content of *burfi* towards higher levels of unripen banana pulp addition attributed to the presence of naturally occurring sugars and carbohydrates in the added pulp, which resulted in significant increase in sugar content in the *burfi*. The results of the present study are similar to Navale *et al.* (2014) [14], who reported that addition of wood apple pulp at 5, 10 and 15 percent levels increased the total sugar content of *burfi* from 44.77 percent in the control to 45.37, 46.52 and 47.44 percent.

Table 6: Total sugar content of *burfi* blended with unripen banana pulp (per cent)

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	39.50	38.92	39.29	38.98	39.17 ^d
T ₂	40.40	40.13	40.09	40.24	40.22 ^c
T ₃	41.15	40.86	41.10	40.78	40.97 ^b
T ₄	41.86	41.37	41.49	41.17	41.47 ^a

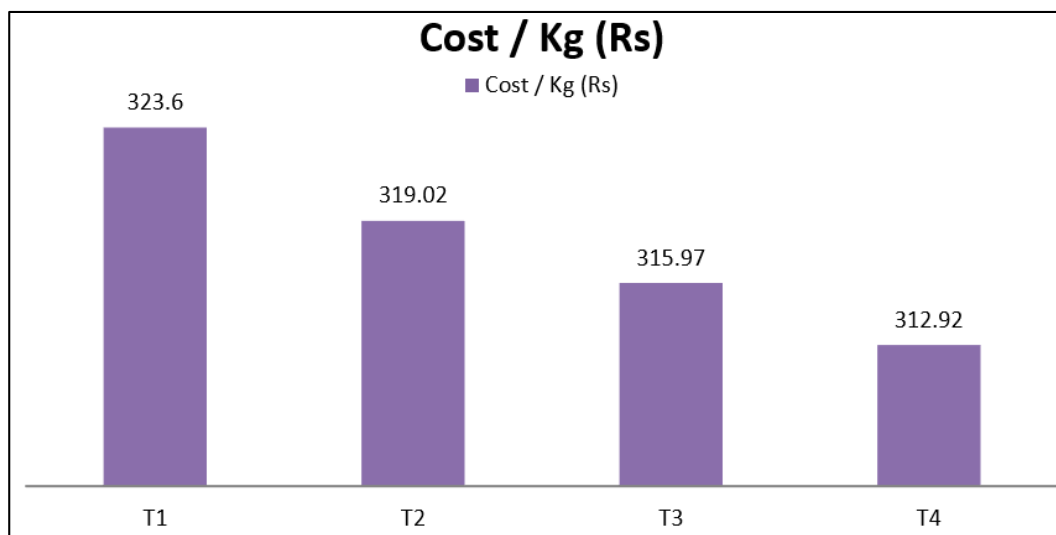
S.E. $\pm$ 0.11452 C.D. at 5% 0.3528The values with different superscripts differ significantly ($p < 0.05$)**Fig 2:** Graphical presentation of the proximate composition of *Burfi* blended with unripen banana pulp**Production Cost of prepared product**

The production cost of control *burfi* and unripen banana pulp blended *burfi* was calculated on the basis of the cost of ingredients used, viz., khoa, unripen banana pulp and sugar required for preparation of the product. In addition to ingredient cost, labour and fuel charges were also considered while calculating the production cost. The ingredients were considered according to their prevailing market prices. The production cost of unripen banana pulp

blended *burfi* was worked out and presented in the table. The production cost of control *burfi* (T₁) and *burfi* blended with 1.5, 2.5 and 3.5 percent unripen banana pulp (T₂, T₃ and T₄) was found to be Rs. 323.60, 319.02, 315.97 and 312.92 per kg, respectively. The cost of *burfi* blended with unripen banana pulp was observed to be decreased than control as well as towards the higher level of addition of unripen banana pulp was due to lower price of added unripen banana as compared to khoa.

Table 7: Cost of production of *burfi* blended with unripen banana pulp

Sr. No	Particulars	Cost (Rs)	Treatment Combination							
			T ₁		T ₂		T ₃		T ₄	
			Qty (per gm)	Amt (Rs.)	Qty (per gm)	Amt (Rs.)	Qty (per gm)	Amt (Rs.)	Qty (per gm)	Amt (Rs.)
1.	Khoa	Rs.380/kg	700 gm	266	685 gm	260.3	675 gm	256.5	665 gm	252.7
2.	Unripen Banana	Rs. 0.074/gm	-	-	15	1.12	25	1.87	35	2.62
3.	Sugar @ 30% (kg)	42	300	12.6	300	12.6	300	12.6	300	12.6
4.	Labour Charge	120/8 hrs	-	30	-	30	-	30	-	30
5.	Fuel Charges	-	-	15	-	15	-	15	-	15
6.	Product Obtained (kg)	-	1.00	-	1.00	-	1.00	-	1.00	-
7.	Cost per 1 kg	-	-	323.60	-	319.02	-	315.97	-	312.92

**Fig 3:** Graphical presentation of the production cost of *Burfi* blended with unripen banana pulp

Conclusions

The value added and nutritious *burfi* could be prepared by blending of buffalo milk khoa with unripen banana pulp. It was concluded that addition of unripen banana pulp influenced the proximate composition of *burfi*, with moisture and total sugar increasing, while fat, protein, ash and total solids decreased as the level of pulp increased. The cost of production also decreased with increasing levels of unripen banana pulp.

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