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Studies on sensory properties and cost of production of *Lassi* blended with date palm (*Phoenix dactylifera*) Pulp

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Abstract

The research entitled “Studies on Preparation of *Lassi* Blended with Date Palm Pulp (*Phoenix dactylifera*)” was conducted in the Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani, during 2025–26. *Lassi* was prepared by adding date palm pulp at 6, 9 and 12 per cent levels. Sensory evaluation showed significant differences among the treatments in terms of colour and appearance, flavour, taste, consistency and overall acceptability. The mean scores for colour and appearance were 8.38, 7.88, 7.38 and 7.00; for flavour, 7.13, 7.75, 8.25 and 8.75; for taste, 7.75, 8.25, 8.75 and 7.25; for consistency, 8.88, 8.38, 8.13 and 7.50; and for overall acceptability, 8.25, 8.88, 7.75 and 7.25 for T₁, T₂, T₃ and T₄, respectively. Among all the treatments, T₂ with 6 per cent date palm pulp received the highest overall acceptability score (8.88), making it the most preferred treatment. The cost of *lassi* production increased with increasing levels of date palm pulp and was Rs. 112.07, 123.34, 130.03 and 136.92 per 1000 ml for T₁, T₂, T₃ and T₄, respectively. The higher cost at increased pulp levels was mainly due to the additional expenditure on date palm pulp.

Keywords: *Lassi*, date palm pulp, sensory properties and cost of production

Introduction

India is the leading milk-producing country in the world. Milk production increased from 146.31 million tonnes in 2014–15 to 247.87 million tonnes in 2024–25, registering a 69.41 per cent increase, with an annual growth rate of about 6.3 per cent, compared with around 2 per cent globally. Per capita milk availability increased from 319 to 485 g/day during the same period, compared with the world average of 394 g/day. The livestock sector contributed 30.87 per cent to the economic value added of the agricultural and allied sectors and 5.49 per cent to the national economic value added in 2023-24, highlighting the growing importance of the dairy sector in India (Anonymous 2025-26) ^[1].

Milk is a rich source of essential minerals and vitamins, while changing dietary patterns have contributed to the rising prevalence of lifestyle-related diseases (Dixit *et al.* 2018) ^[3].

Lassi is a traditional fermented milk beverage widely consumed in India and is a popular indigenous dairy product. It is generally prepared by blending *curd* with water to obtain the desired consistency and may be served as sweet or savoury. Sugar is added to sweet *lassi*, while salt and spices such as roasted cumin powder are used for savoury varieties. *Lassi* is particularly popular during summer due to its refreshing and cooling properties and is valued for its pleasant taste and health benefits (Pagore *et al.* 2025) ^[13].

Date palm (*Phoenix dactylifera* L.), belonging to the family Arecaceae (Palmae), is one of the oldest cultivated fruit crops. The fruit is a sweet, fleshy drupe consisting of an edible mesocarp, hardened endosperm (pit), and calyx cap. It is consumed fresh, dried, or as a paste and is valued for its high natural sugar and carbohydrate content. Date fruits contain approximately 50.00 to 88.00 per cent carbohydrates, depending on variety, maturity, and moisture content, along with proteins, lipids, dietary fibre, minerals, vitamins, tannins, and other phytochemicals. Thus, dates are considered a nutritious fruit and a natural source of readily available energy (Mete *et al.* 2017) ^[12].

Materials and Methods

The present study was conducted during 2025-26 in the Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani.

Materials

Curd, date palm and crystalline cane sugar was purchased from local market.

Methodology

Fresh Kimia dates were peeled, deseeded, and ground into a smooth pulp. The pulp was collected in clean containers and refrigerated until further use. Buffalo milk standardized to 6 per cent fat and 9 per cent SNF was heated at 85°C for 10 minutes and subsequently cooled to 35°C. The cooled milk was inoculated with 2 per cent starter culture and incubated at 35°C for approximately 8 hours to obtain firm *curd*. After complete coagulation, the *curd* was gently stirred to break the coagulum and achieve a uniform consistency. Potable water, equivalent to 20 per cent of the *curd* weight, was added, followed by the incorporation of date palm pulp according to the respective treatment combinations. Sugar was added according to the desired level of sweetness, and the mixture was thoroughly blended to obtain a smooth and homogeneous *lassi*. Finally, the prepared *lassi* was packed in clean, sterilized containers and stored under refrigerated conditions ($7 \pm 2^\circ\text{C}$) until further analysis.

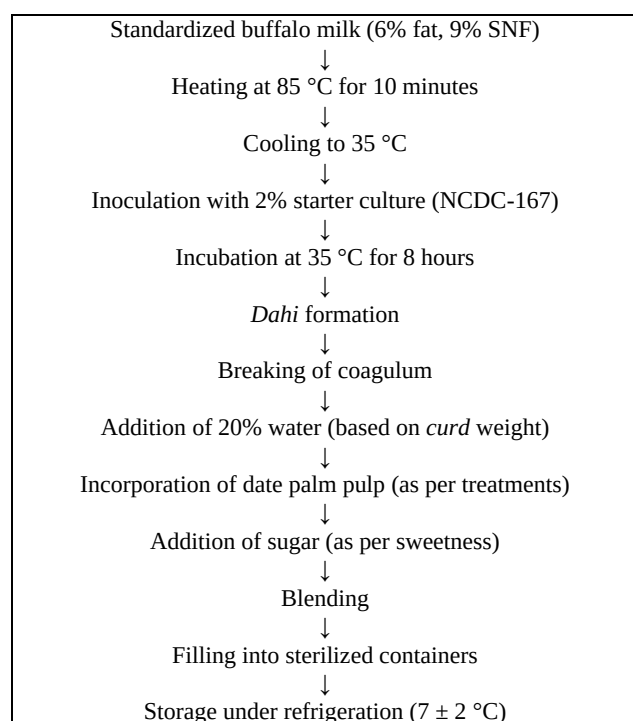


Fig 1: Flow chart for the preparation of *lassi* blended with date palm pulp (Kedaree *et al.* 2021) ^[10]

Treatment combination

For the preparation of *lassi* incorporated with date palm (*Phoenix dactylifera* L.) pulp, different treatment combinations were evaluated on a weight basis as given below:

T₁ (Control): 100% *curd* + 15% sugar

T₂: 94% *curd* + 6% date palm pulp + 14% sugar

T₃: 91% *curd* + 9% date palm pulp + 12% sugar

T₄: 88% *curd* + 12% date palm pulp + 10% sugar

Sensory Evaluation

The sensory quality of the control and date palm pulp incorporated *lassi* was evaluated by a semi-trained panel of five judges using a 9-point hedonic scale for colour and appearance, flavour, taste, consistency and overall acceptability. A score card was provided to all the judges for sensory evaluation using the 9-point hedonic scale developed by the Quartermaster Food and Container Institute, U.S.A. (Gupta, 1976) ^[4].

Cost of production

The cost of producing the control and date palm pulp-incorporated *lassi* was calculated using the prevailing market prices of milk, sugar, and date palm pulp. The cost of fuel and other materials used during processing was included under miscellaneous expenses. The total cost of production was then worked out for each treatment.

Results and Discussion

A. Sensory properties of *lassi* blended with date palm pulp

Colour and appearance score of *lassi* blended with date palm pulp

The mean scores for colour and appearance in control (T₁) and *lassi* blended with date palm pulp T₂, T₃ and T₄ were 8.38, 7.88, 7.38 and 7.00, respectively. The colour and appearance scores decreased with increase in the level of date palm pulp incorporation, resulting in the lowest score (7.00) in T₄. The significant decrease in colour and appearance scores among the treatment samples as compared to control was due to incorporation of date palm pulp, with darker colour in *lassi* which was due to the natural colour of date palm pulp with increasing level of incorporation. The results of present study are similar to Pardhi *et al.* (2014) ^[15], who reported that incorporation of finger millet flour at 2, 3 and 4 per cent influenced the colour and appearance score of *lassi*, resulting in decrease score of *lassi* from 7.97 to 7.66, 7.54 and 7.17, respectively.

Table 1: Colour and appearance score of *lassi* blended with date palm pulp

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	8.50	8.00	8.50	8.50	8.38 ^a
T ₂	8.00	7.50	8.00	8.00	7.88 ^b
T ₃	7.50	7.00	7.50	7.50	7.38 ^c
T ₄	7.00	7.00	7.00	7.00	7.00 ^d
S.E. $\pm$ 0.1083, C.D. at 5% 0.3336					

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

Flavour score of *lassi* blended with date palm pulp

The mean scores for flavour in control (T₁) and *lassi* blended with date palm pulp T₂, T₃ and T₄ were 7.13, 7.75, 8.25 and 8.75, respectively. The significant increase in flavour score of *lassi* with date palm pulp was due to the pleasant characteristic flavour and natural sweetness of date palm pulp at higher levels of incorporation, which enhanced the desirable flavour and taste of *lassi*. The results of the present study are similar to Jadhav (2013) ^[8], who reported that incorporation of orange juice at 5, 10, 15 and 20 per cent levels influenced the flavour score of *lassi*, resulting in an increase in score from 8.15 in control to 8.76 with 20 per cent orange juice.

Table 2: Flavour score of *lassi* blended with date palm pulp

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	7.00	7.50	7.00	7.00	7.13 ^d
T ₂	7.50	8.00	7.50	8.00	7.75 ^c
T ₃	8.00	8.50	8.00	8.50	8.25 ^b
T ₄	8.50	9.00	8.50	9.00	8.75 ^a
S.E. $\pm$ 0.1398, C.D. at 5% 0.4307					

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

Taste score of *lassi* blended with date palm pulp

The mean score for taste in control (T₁) and *lassi* blended with date palm pulp T₂, T₃ and T₄ were 7.75, 8.25, 8.75 and 7.25, respectively. The taste score increased with increase in the level of date palm pulp up to T₃, followed by a decrease at higher level of incorporation. The taste score of treatment T₃ (8.75) was highest among all the treatments, whereas T₄ (7.25) recorded the lowest score. The significant increase in taste score up to T₃ may be attributed to the optimum level of date palm pulp, which resulted in better taste and acceptability of *lassi*. The results of the present study are similar to Jamdar *et al.* (2020) [9], who reported that incorporation of germinated bio-fortified sorghum grain extract influenced the taste score of *lassi*, resulting in an increase in score from 7.55 in control to 8.13 in T₃ (70:30), followed by a decrease to 7.10 in T₄ (60:40).

Table 3: Taste score of *lassi* blended with date palm pulp

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	7.50	8.00	7.50	8.00	7.75 ^c
T ₂	8.00	8.50	8.00	8.50	8.25 ^b
T ₃	8.50	9.00	8.50	9.00	8.75 ^a
T ₄	7.00	7.50	7.00	7.50	7.25 ^d
S.E. $\pm$ 0.1444, C.D. at 5% 0.445					

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

Consistency score of *lassi* blended with date palm pulp

The mean score for consistency in control (T₁) and *lassi* blended with date palm pulp T₂, T₃ and T₄ were 8.88, 8.38, 8.13 and 7.50, respectively. The consistency score decreased with increase in the level of date palm pulp, resulting in the highest score (8.88) in control T₁ and the lowest score (7.50) in T₄. The significant decrease in consistency score with increasing levels of date palm pulp may be attributed to the higher level of pulp incorporation, which affected the desirable consistency of *lassi*. The results of the present study are similar to Kedaree *et al.* (2021) [10], who reported that incorporation of kiwi pulp at 2.5, 5 and 7.5 per cent levels influenced the consistency score of *lassi*, with the highest score (8.30) at 2.5 per cent kiwi pulp and the lowest score (7.18) at 7.5 per cent.

Table 4: Consistency score of *lassi* blended with date palm pulp

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	9.00	8.50	9.00	9.00	8.88 ^a
T ₂	8.50	8.00	8.50	8.50	8.38 ^b
T ₃	8.00	8.50	8.00	8.00	8.13 ^c
T ₄	7.50	7.50	7.50	7.50	7.50 ^d
S.E. $\pm$ 0.1083, C.D. at 5% 0.334					

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

Overall acceptability score of *lassi* blended with date palm pulp

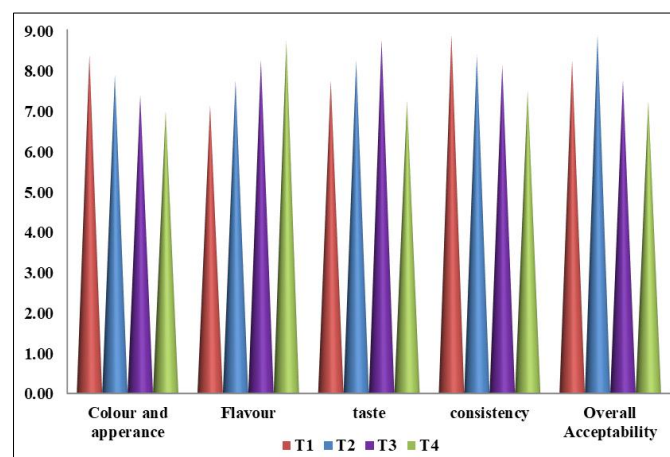
The mean score for overall acceptability in control (T₁) and *lassi* blended with date palm pulp T₂, T₃ and T₄ were 8.25, 8.88, 7.75

and 7.25, respectively. The overall acceptability score increased with increase in the level of date palm pulp up to T₂, followed by a decrease at higher levels of incorporation, resulting in the highest score (8.88) in T₂ and the lowest score (7.25) in T₄. The overall acceptability increased up to T₂ and subsequently decreased with further increase in date palm pulp incorporation, indicating T₂ as the most acceptable treatment. The results of the present study are similar to Dhumal *et al.* (2018) [2], who reported that incorporation of *Mentha arvensis* extract influenced the overall acceptability score of *lassi*, with the highest score (8.00) at 2.5 per cent extract and the lowest score (7.17) at 7.5 per cent extract.

Table Overall acceptability score of *lassi* blended with date palm pulp**Table 5:** Overall acceptability score of *lassi* blended with date palm pulp

Treatment	Replication				Mean
	R1	R2	R3	R4	
T ₁	8.50	8.00	8.50	8.00	8.25 ^c
T ₂	9.00	9.00	9.00	8.50	8.88 ^a
T ₃	7.50	8.00	8.00	7.50	7.75 ^b
T ₄	7.00	7.50	7.50	7.00	7.25 ^d
S.E. $\pm$ 0.1398, C.D. at 5% 0.431					

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

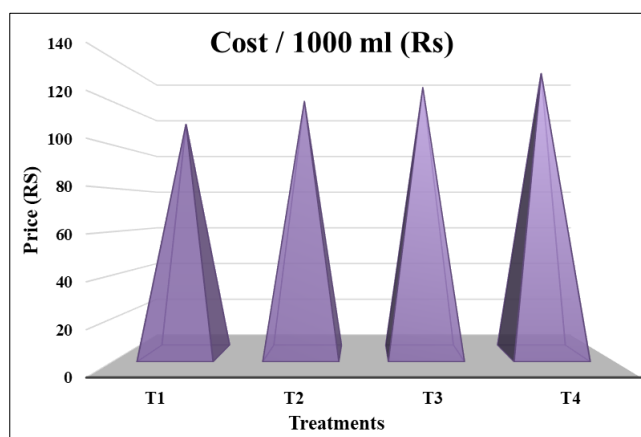
**Fig 2:** Graphical presentation of sensory properties of *lassi* blended with date palm pulp

B. Cost of production of prepared product

The production cost of control *lassi* and date palm pulp blended *lassi* was calculated on the basis of the cost of ingredients used, i.e., *dahi*, date palm pulp and sugar required to prepare a given quantity of the product. In addition to ingredients cost, fuel and labour charges were also considered while calculating production cost. The ingredients were taken according to their market price. The production cost of date palm pulp blended *lassi* was worked out and is presented in Table 6. The production cost of control *lassi* (T₁) and *lassi* blended with date palm pulp at 6, 9 and 12 per cent levels (T₂, T₃ and T₄) was found to be Rs. 112.07, 123.34, 130.03 and 136.92 per 1000 ml respectively. It was observed that there was an increase in the production cost of date palm pulp blended *lassi* in comparison to control sample. The percentage increase in production cost of date palm pulp blended *lassi* was due to the incorporation of date palm pulp in the formulation. There was an increase of Rs. 11.27, 17.96 and 24.85 per 1000 ml in the production cost of T₂, T₃ and T₄ over the control sample. The increased production cost of blended *lassi* was due to the high cost of date palm pulp incorporated at different levels.

Table 6: Cost of production of *lassi* blended with date palm pulp

Sr. No.	Particulars	Cost (Rs. /Kg.)	T ₁		T ₂		T ₃		T ₄	
			Qty/ ml	Amt. (Rs.)	Qty/ ml	Amt. (Rs.)	Qty/ ml	Amt. (Rs.)	Qty/ ml	Amt. (Rs.)
1	Dahi (g)	110	1000	110	940	103.4	910	100.1	880	96.80
2	Date palm pulp (g)	350	-	-	60.00	21	90.00	31.50	120.0	42.00
3	Sugar@ 15% (g)	42.00	150	6.30	140	5.88	120	5.04	100	4.20
4	Water (200ml)	-	200	-	200	-	200	-	200	-
5	Labour charges	-	-	15.00	-	15.00	-	15.00	-	15.00
6	Fuel charges	-	-	10.00	-	10.00	-	10.00	-	10.00
7	Miscellaneous charges	-	-	5.00	-	5.00	-	5.00	-	5.00
8	Starter Culture	-	-	5.00	-	5.00	-	5.00	-	5.00
9	Total cost of production (lit)	-	1350	151.30	1280	165.28	1260	171.64	1240	178.00
10	Cost per 1000 ml	-	1000	112.07	-	123.34	-	130.03	-	136.92

**Fig 3:** Graphical presentation of cost of production *lassi* blended with date palm pulp

Conclusion

A value-added and palatable *lassi* could be prepared by the addition of date palm pulp to buffalo milk *lassi*. It was concluded that the addition of date palm pulp influenced the sensory quality of *lassi*. Among the different treatments, *lassi* containing 6 per cent date palm pulp (T₂) recorded the highest overall acceptability score (8.88), indicating that it was the most preferred treatment. The sensory attributes, including colour and appearance, flavour, taste, consistency and overall acceptability, varied significantly with the level of date palm pulp. The cost of production increased with increasing levels of date palm pulp and was Rs. 112.07, 123.34, 130.03 and 136.92 per 1000 ml for T₁, T₂, T₃ and T₄, respectively.

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