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Shelf-life studies and cost of production of misti dahi blended with sapota (*Achras sapota* L.) pulp

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Abstract

Indians have a profound affection for the fermented delicacy known as "Misti Dahi." Renowned for its delightful taste and robust nutritional profile, this treat has been subject to innovative variations, incorporating milk, sugar, and sapota pulp as foundational elements. The integration of fresh sapota pulp serves not only to enhance the nutritional value but also to elevate the overall flavour. In the recent exploration, misti dahi formulations were crafted with sapota pulp concentrations of 15%, 17%, and 20%, denoted as P₁, P₂, and P₃, respectively. Among these, the 20% sapota pulp addition emerged as the optimal level. The objective was to figure out the production costs of sapota misti dahi and conduct shelf-life tests with microbial evaluation at ambient and refrigerated temperatures. The most acceptable level of dahi was then analysed.

Keywords: Milk, misti dahi, sapota

Introduction

Dahi, a popular traditional dairy product in India, is made by fermenting milk with lactic acid, serving as a base for various local fermented dairy items. Misti dahi, a sweetened version, is crafted by adding sugar to this beneficial ingredient. In the eastern part of the country, it goes by names like misti doi, payodhi, and lal dahi. Misti dahi, produced from fermented and sweetened cow or buffalo milk, holds intriguing health implications. Today, it finds use in various health claims and as a nutritional supplement. The combination of misti dahi with fresh sapota pulp creates a distinctive product with a luscious flavour, smooth texture, and a tender consistency, enhanced by its sweet taste from the added sugar.

Materials and Methods

To prepare misti dahi infused with fresh sapota pulp, buffalo milk was sourced from the dairy farm at the College of Agriculture, Dapoli. Fresh sapota fruits were procured from the Central Research Station in Tetavali block, Wakavali, affiliated with Dr. BSKKV, Dapoli. The starter culture NCDC-263 a mixed strain of *Streptococcus thermophilus* and *Lactobacillus bulgaricus*, was acquired from the National Collection of Dairy Cultures at NDRI, Karnal. This freeze-dried culture was used to prepare stock, mother, and working cultures. Additionally, sugar was obtained from the local market. The sapota pulp was prepared following the method outlined by Jadhav, P.V. (2002) [5]. The sapota misti dahi was then crafted using the standard procedure with minor adjustments.

The process began with heating fresh, high-quality buffalo milk to boiling temperature until its volume was reduced by 20% (resulting in a final volume of 80% of the original). Subsequently, the milk was cooled to 40–45 °C. The next steps involved adding sugar based on the treatment, i.e., at 8%, 10%, and 12% of the final volume (w/w). Additionally, the starter culture was introduced at a rate of 1.5% of the final volume (w/w). Sapota pulp was then incorporated, respecting the treatment variations at 15%, 17.5%, and 20% of the final volume (w/w).

The mixture underwent an aging process before being poured into pre-sterilized cups. Following this, the product was incubated at a temperature of 40–41 °C for 7–8 hours and subsequently stored at 6–8 °C. This meticulous procedure was implemented to ensure the quality and characteristics of the final sapota misti dahi product.

Flow diagram for preparation of fresh sapota pulp

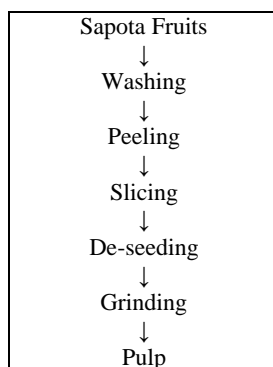


Fig 1: Flow diagram for preparation of fresh sapota pulp

Flow diagram for preparation of Sapota Misti Dahi

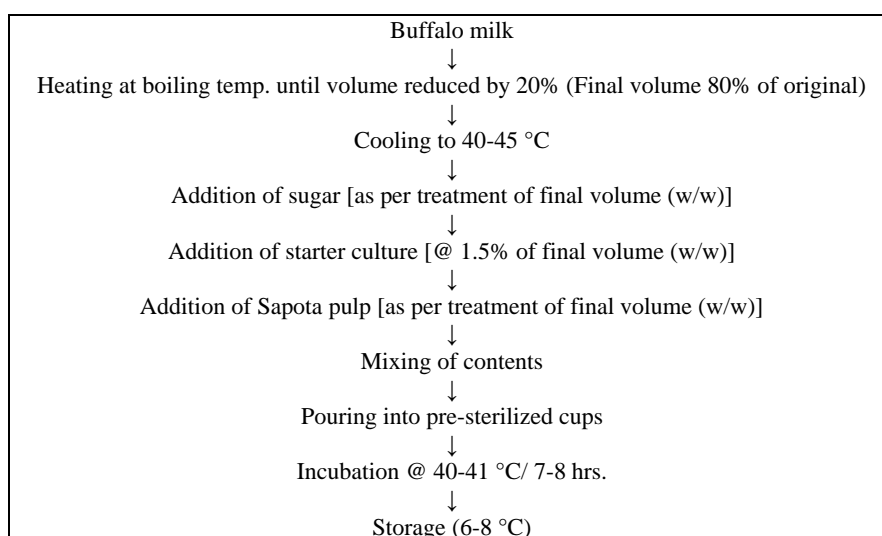


Fig 2: Flow diagram for preparation of Sapota Misti Dahi

The total solids and protein content of milk and sapota misti dahi were determined as per IS: 1479 (part-II), 1961 [4]. The fat content of milk and sapota misti dahi was determined by using standard Gerber method as per IS: 1224 (part-I), 1977 [2]. The acidity of milk and sapota misti dahi was estimated according to IS: 1479, (part-I), 1960 [3]. The ash content of milk and sapota misti dahi was determined as per the procedure given in A.O.A.C. (1975) [1]. The total sugar content was determined as per the method described IS: 1479 (II) 1960. The pH was determined by using pH meter. The data was tabulated and analysed by employing FCRD i.e., Factorial completely Randomized Design.

Results and Discussion

Shelf-life studies of sapota misti dahi at atmospheric and

refrigerated conditions

When applying the standards commonly used for assessing fermented milk products, it can be deduced that misti dahi blended with 20% fresh sapota pulp and 10% sugar (S₂P₃) maintains a "good and edible state" for up to three days under atmospheric conditions and up to nine days under refrigerated conditions. These assessments align with established norms, where the maximum permissible limit for *E. coli* and yeast and mold is 1 × 10 and 1 × 10² cfu/g, respectively. If these limits are exceeded, the product is deemed hazardous to health. Therefore, the microbial evaluation indicates that misti dahi with 20% sapota pulp and 10% sugar content meets the specified safety criteria within the mentioned time frames and conditions.

Table 1: Shelf-life studies of most acceptable level of sapota Misti Dahi at various time intervals.

Period (days)	S.P.C. (X 10 ⁵ cfu /g)		<i>E. coli.</i> (X 10 cfu /g)		Yeast and Mould (X 10 cfu /g)		Overall acceptability	
	AT	RT	AT	RT	AT	RT	AT	RT
D ₀	0.80	0.30	ND	ND	ND	ND	8.50	8.50
D ₃	11.60	2.80	ND	ND	4.20	ND	5.60	8.10
D ₆	23.90	6.60	--	ND	9.90	2.40	4.50	6.80
D ₉	--	10.70	--	ND	--	4.40	--	6.00
D ₁₂	--	14.90	--	ND	--	9.80	--	5.40

(Note- AT: Atmospheric Temperature; RT: Refrigerated Temperature)

The current study revealed the absence of *E. coli* throughout the storage period. However, on the sixth day under atmospheric conditions and the twelfth day under refrigerated conditions, the yeast and mold count approached the specified legal limits. Despite this, the product maintained a score of less than 5.5 on the nine-point hedonic scale for overall acceptability on the respective days. Consequently, further

studies were not pursued. It's noteworthy that, as a fermented milk product, there are no specific norms mentioned for SPC (standard plate count) or aerobic count in this context. The study provides insights into the microbial stability and consumer acceptability of misti dahi with sapota pulp under the specified storage conditions.

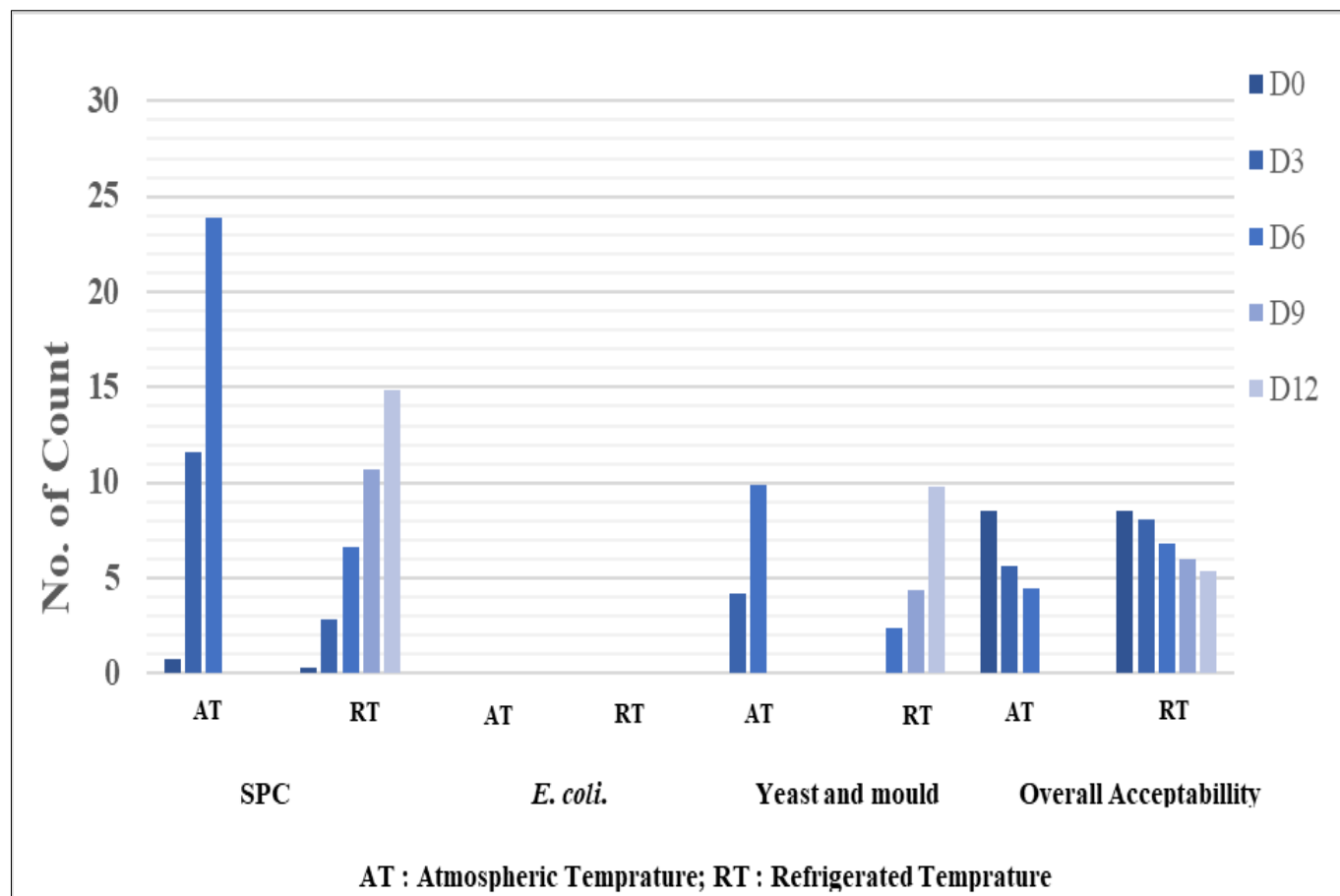


Fig 1: Shelf-life evaluation of most acceptable level of Sapota Misti Dahi

Production cost of Sapota Misti Dahi

Cost of raw material

Milk: Rs 64 / Liter

Sapota: Rs 120 / Kg

Sugar: Rs 40 / Kg

Table 2: Production cost of Sapota Misti Dahi (based on cost of ingredients only)

Treatments	Milk		Sapota		Sugar		Total		Price per 1000 g (Rs.)
	Qty.(g)	Cost Rs.	Qty.(g)	Cost Rs.	Qty.(g)	Cost Rs.	Qty.(g)	Cost Rs.	
S ₁ P ₁	100	6.4	15	1.8	8	0.32	123	8.52	69.26
S ₁ P ₂	100	6.4	17.5	2.1	8	0.32	125.5	8.82	70.27
S ₁ P ₃	100	6.4	20	2.4	8	0.32	128	9.12	71.25
S ₂ P ₁	100	6.4	15	1.8	10	0.40	125	8.60	68.8
S ₂ P ₂	100	6.4	17.5	2.1	10	0.40	127.5	8.90	69.80
S ₂ P ₃	100	6.4	20	2.4	10	0.40	130	9.20	70.76
S ₃ P ₁	100	6.4	15	1.8	12	0.48	127	8.68	68.34
S ₃ P ₂	100	6.4	17.5	2.1	12	0.48	129.5	8.98	69.34
S ₃ P ₃	100	6.4	20	2.4	12	0.48	132	9.28	70.30

The highest cost (Rs. 71.25 per kg) was recorded in case of sapota misti dahi prepared with 8% sugar and 20% sapota pulp (S₁P₃), followed by S₂P₃ i.e., sapota misti dahi prepared with 10% sugar and 20% sapota pulp (70.76 per kg). While lowest cost (Rs. 68.34 per kg) recorded in case of treatment S₃P₁ i.e., sapota misti dahi prepared with 12% sugar and 15% sapota pulp.

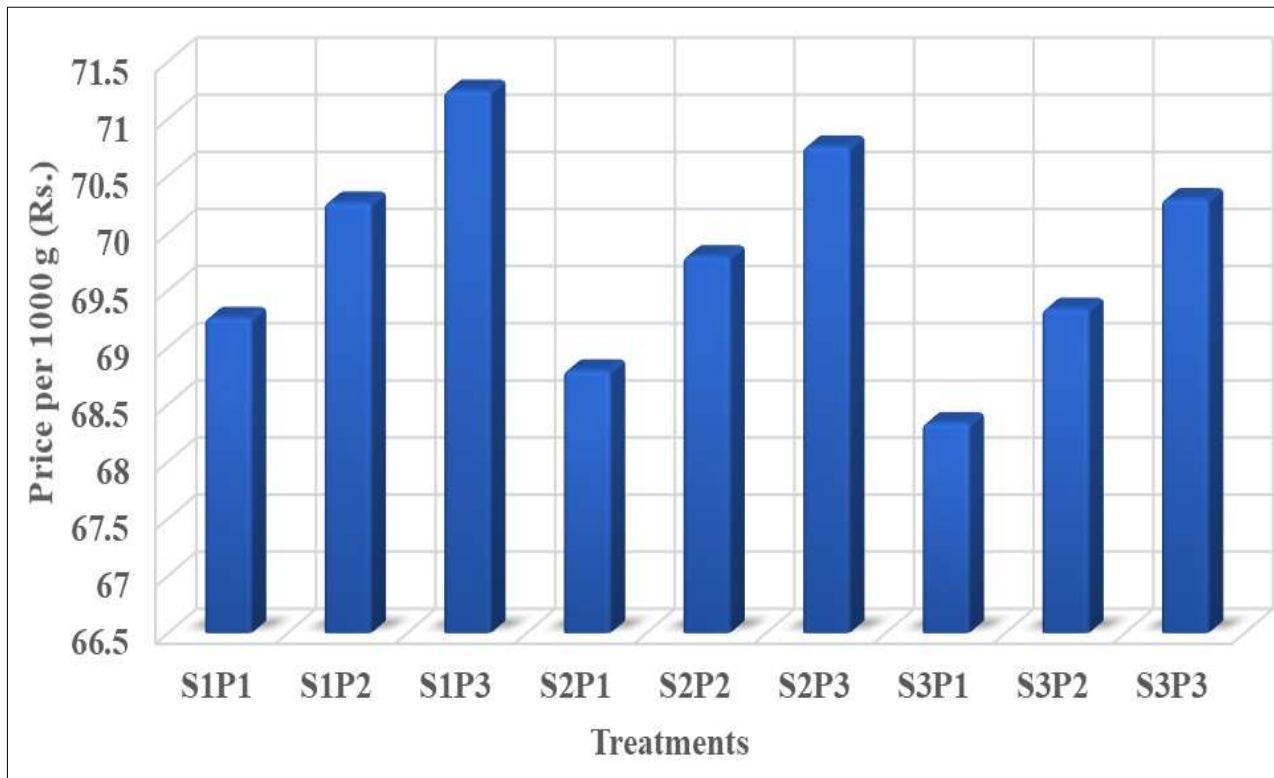


Fig 2: Cost of production of Sapota misti dahi/Kg (based on cost of ingredients only)

Conclusion

Based on the results of the recent experiments, it's evident that fresh sapota pulp can be efficiently employed in the production of misti dahi. The shelf-life studies reveal that misti dahi, enriched with the optimal level of sapota, maintains an edible state for three days under atmospheric conditions and up to nine days when refrigerated. Notably, the rise in sapota pulp content correlates with an increase in production costs. At the most acceptable level, the production cost was determined to be ₹ 70.76 per kg. This information provides valuable insights into the viability and economic aspects of producing misti dahi with sapota pulp.

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