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Cost of production of *lassi* blended with pineapple powder (*Ananas comosus*)

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Abstract
The present study was carried out in the Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur (VNMKV) during the year 2024-25. The objective was to enhance the nutritional quality of dessert 'lassi' by supplementing it with pineapple powder. Lassi was prepared from buffalo milk with varying levels of pineapple powder: 0% (T_1), 3% (T_2), 6% (T_3), and 9% (T_4). These samples were compared with a control sample (T_0) prepared without pineapple powder. The results indicated that the lassi containing 6% pineapple powder exhibited the highest acceptability, followed by the control (normal lassi). The production cost of the most acceptable pineapple powder lassi (T_4) was ₹220.59 per kg, which was higher than that of the normal lassi.

Keywords: Buffalo milk, pineapple powder, *Lassi*, cost of production

Introduction
India continues to hold the top position globally in milk production, firmly establishing itself as a leading dairy powerhouse. The country's dairy sector has achieved an impressive Compound Annual Growth Rate (CAGR) of 4.97% between 2018-19 and 2023-24, reaching a record production of 239.30 million tonnes in 2023-24. According to the FAO, India proudly leads the world in milk production, followed by the USA, Pakistan, China, and Brazil.

Lassi, a traditionally fermented milk beverage that originated in India, is widely consumed across South Asia in various forms. It is well known for its pleasant taste, cooling effect, thirst-quenching nature, and health benefits. Lassi has a creamy texture, a mildly acidic flavor, a rich sweet aroma, and refreshing palatability (Patel *et al.*). It is a ready-to-serve drink that holds a prominent place in the Indian diet. Typically, lassi is prepared by blending curd (dahi) with water, along with the addition of spices or fruits (Sudheendra *et al.*, 94-97) [5]. The beverage is produced by fermenting heated whole or skimmed milk with specific bacterial cultures—mainly lactic streptococci—and sweetening it with sugar (Nichal *et al.*, 2022) [3].

Pineapple juice is a rich source of ascorbic acid, a powerful antioxidant that helps protect against bacterial and viral infections while promoting iron absorption. It is also high in essential minerals such as magnesium, which supports bone formation and enzyme function. Furthermore, pineapple provides copper and other trace elements that assist in iron metabolism, blood pressure regulation, and heart rate control. Pineapple powder is widely used in the preparation of various products, including jam and cheese. According to Tabassun *et al.* (2017) [7], pineapple contains 2.0% moisture, 12% protein, 10% fat, 1.57% ash, 2.23% crude fiber, 74% carbohydrates, and notable amounts of vitamins such as Thiamine (2 mg), Riboflavin (0.375 mg), Niacin (2.27 mg), and Pyridoxine (67.5 mg).

Materials and Methods
Materials
Fresh, standardized buffalo milk was used in the preparation of lassi. The buffalo milk (Natural Milk Company) was sourced from the local market. White crystalline cane sugar was also obtained locally. A standard dahi culture (NCDC-167) was procured from the National Dairy Research Institute (NDRI), Karnal, while pineapple powder was purchased from an e-commerce marketplace.

Statistical Analysis

The data were statistically analyzed using a Completely Randomized Design (CRD) following the method described by Panse and Sukhatme (1967). The significance of the results was determined based on the critical difference (CD) obtained from all four replications.

1. Cost of production of prepared product

Table 1: 4.30 presents the effect of pineapple powder supplementation on the cost structure of lassi.

Sr. No	Particu-lars	Cost (Rs. /kg)	T_1		T_2		T_3		T_4	
			Qty. (Per ml)	Amt. (Rs)	Qty. (Per ml)	Amt. (Rs)	Qty. (Per ml)	Amt. (Rs)	Qty. (Per ml)	Amt. (Rs)
1.	Dahi (gram)	80	1000	80	970	77.6	940	75.2	910	72.8
2.	Pineapple Powder (gram)	2100	-	-	30	63	60	126	90	189
3.	Sugar@ 15% (gm)	42	150	6	150	6	150	6	150	6
4.	Water (200ml)	-	200	-	200	-	200	-	200	-
4.	Labour charge	-	-	15	-	15	-	15	-	15
5.	Fuel charge			10		10		10		10
6.	Micellaneous charge	-	-	5	-	5	-	5	-	5
7.	Total cost of Product obtained (lit)	-	1350	116	1350	176.6	1350	237.2	1350	297.8
8.	Cost per 1000 ml	-	1000	85.92	1000	130.81	1000	175.7	1000	220.59

The production cost of both plain lassi (without pineapple powder) and lassi supplemented with pineapple powder was estimated. While calculating the total production cost, the expenses incurred for all ingredients—such as dahi, pineapple powder, and sugar—were considered, along with fuel and labor charges. The prices of the ingredients were based on prevailing market rates.

The calculated production costs of lassi are presented in Table 1. The cost per 1000 ml of the control sample (T_1) and the lassi blended with pineapple powder at different levels (T_2, T_3, and T_4) were ₹ 85.92, ₹ 130.81, ₹ 175.70, and ₹220.59, respectively.

It was observed that the production cost of lassi enriched with pineapple powder was higher than that of the control (normal lassi). The increased cost corresponds to the rising levels of pineapple powder used in the formulation. Although the pineapple powder lassi is more expensive, it offers additional health benefits due to the presence of bioactive compounds such as bromelain enzymes, which possess anti-inflammatory and cardiovascular benefits. Furthermore, it provides essential nutrients like ascorbic acid and magnesium, which help boost the immune system and promote bone health. Despite its higher cost, the pineapple-fortified lassi offers a similar taste, texture, and palatability to regular lassi, making it a suitable option for health-conscious consumers willing to pay a premium for nutritionally enriched products.

The study concludes that good-quality lassi can be prepared using pineapple powder, albeit at a slightly higher production cost compared to traditional lassi. However, this cost difference may be acceptable to consumers seeking functional beverages with added health benefits.

The present findings align with those of Pawar *et al*. (2024) [6], who reported that the addition of apple powder at levels of 2%, 4%, and 6% similarly increased the production cost of apple-enriched lassi with higher inclusion rates.

Conclusion

From the findings of the present study, it can be concluded that pineapple powder can be effectively utilized in the preparation of lassi. The incorporation of pineapple powder enhanced the sensory attributes and overall acceptability of the product. In addition to imparting a pleasant and distinctive flavor, it also contributed medicinal and nutritional benefits without significantly altering the basic composition of lassi.

The most acceptable quality of lassi was obtained with the addition of 9% pineapple powder. However, the production cost of this formulation was considerably higher than that of the control (plain) lassi. This indicates that pineapple powder-based lassi is relatively more expensive to produce.

Despite the higher cost, the developed pineapple powder lassi offers additional health advantages, such as antioxidant and digestive benefits, while maintaining comparable taste, mouthfeel, and consumer satisfaction to that of conventional lassi. In today's health-conscious market, consumers are increasingly willing to pay a premium for nutritionally enriched and functional beverages. Therefore, pineapple powder lassi can serve as a value-added, health-oriented alternative to traditional lassi available in the market.

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