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Economic Analysis and Cost Structure of Dragon Fruit (*Hylocereus costaricensis*) Milkshake

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Abstract

The present investigation was undertaken to evaluate the economics of production of dragon fruit milkshake prepared using different levels of dragon fruit pulp. The study was conducted at the Section of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur, during 2025–26. Buffalo milk was used as the basic dairy ingredient and dragon fruit pulp was incorporated at five levels, viz., 0 per cent (T₁), 6 per cent (T₂), 8 per cent (T₃), 10 per cent (T₄) and 12 per cent (T₅). The cost of production was calculated by considering the prevailing costs of buffalo milk, dragon fruit pulp, sugar, labour, fuel, electricity and miscellaneous expenses. The cost of production per litre was ₹111.57, ₹127.02, ₹131.81, ₹136.43 and ₹140.90 for T₁, T₂, T₃, T₄ and T₅, respectively. The cost of production increased progressively with increasing levels of dragon fruit pulp, mainly because of the additional quantity of fruit pulp required in the respective treatments. The 10 per cent dragon fruit pulp treatment (T₄), which was the most acceptable treatment in the thesis, had a production cost of ₹136.43 per litre. The benefit-cost ratio was highest for the control treatment and decreased with increasing pulp level. From an economic as well as product-acceptability perspective, T₄ was identified as the superior formulation.

Keywords: Dragon fruit, milkshake, cost of production, economics, pulp incorporation, benefit-cost ratio, value addition

Introduction

Milk-based beverages provide an important opportunity for value addition in the dairy sector. Incorporation of fruit pulp into milkshake can improve product diversity and provide an avenue for utilization of fruits in value-added dairy products. Dragon fruit is an attractive fruit with potential for incorporation into dairy beverages. The development of dragon fruit milkshake therefore provides an opportunity for value addition and commercialization of a novel dairy product. The investigation identifies calculation of the cost structure as one of the major objectives of the study. Red pitaya contains bioactive compounds such as flavonoids and betalains, which possess strong antioxidant properties and may help reduce oxidative stress. Dragon fruit peel is also a valuable source of dietary fibre, making it a potential health-promoting by-product. (Rijal et al., 2019) [4]. Economics is an important consideration in the development of any value-added food product because an increase in the quantity of a costly ingredient may increase the production cost. Poul et al. (2010) [3] reported increasing production costs for custard apple milkshake with increasing incorporation of pulp, while Mule et al. (2014) [2] reported that milkshake containing 5% fig pulp was more cost-effective than formulations containing higher levels of fig pulp.

Materials and Methods

Experimental Site

The present investigation entitled “Development of Technology for Preparation of Milkshake Using Dragon Fruit (*Hylocereus costaricensis*) Pulp” was conducted in the Section of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur, during the year 2025–2026.

Buffalo Milk

Fresh and clean composite samples of buffalo milk were procured from the local market of Nagpur. Before use, the milk was filtered through a clean muslin cloth to remove extraneous matter. The milk was analyzed for fat, total solids, acidity, protein, ash, solid-not-fat and moisture.

Dragon Fruit

Fresh dragon fruits were purchased from the local market of Nagpur. The fruits were washed thoroughly with clean water to remove adhering dust and soil and were dried using a clean cloth. The fruits were manually peeled and the pulp was separated. The pulp was mashed using a spoon to obtain a uniform dragon fruit pulp.

Sugar

Good-quality cane sugar was procured from the local market and was added at 6 per cent in all treatments.

Treatment Details

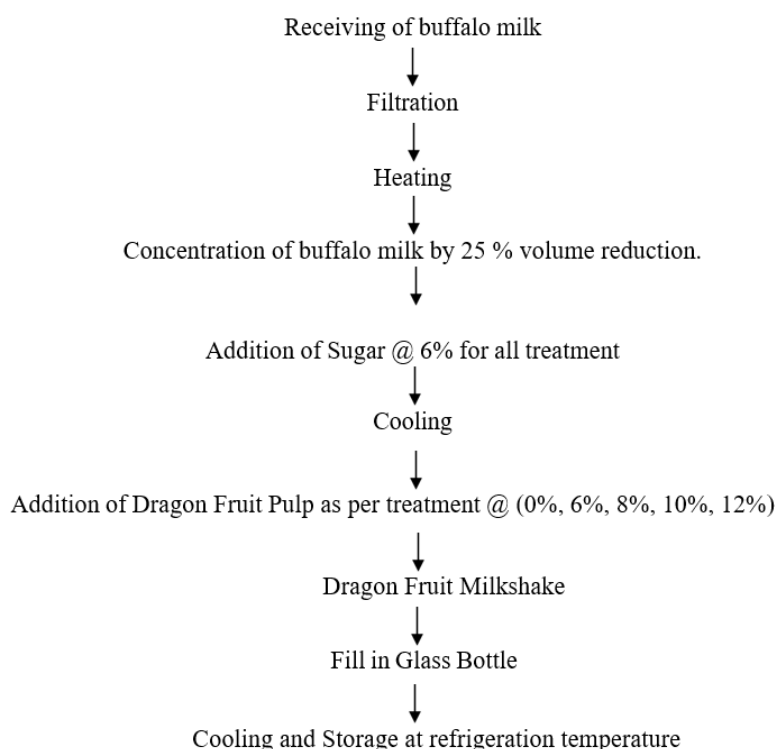
Five treatment combinations were studied with five replications. Different levels of dragon fruit pulp were incorporated into buffalo milk as follows:

Treatments	Milkshake (%)	Dragon fruit pulp (%)
T ₁	100	0
T ₂	94	6
T ₃	92	8
T ₄	90	10
T ₅	88	12

Sugar was added at 6% in all treatments. The experiment was conducted using a Completely Randomized Design (CRD) with five treatments and five replications.

Preparation of Dragon Fruit Milkshake

The milkshake was prepared according to the following procedure:



Cost of production of Dragon fruit milkshake

Cost will be calculated as per prevailing rates of milk and other ingredients use for preparation of dragon fruit milkshake blended with different levels of dragon fruit pulp.

Result and Discussion

The effect of addition of dragon fruit pulp on the cost structure of milkshake prepared under various treatments was studied and presented in Table 1.

The cost of production of 1 litre of dragon fruit milkshake under different treatments was calculated by considering the prevailing retail market prices of the ingredients used, such as buffalo milk, sugar and dragon fruit pulp. Other expenses, including labour, fuel and miscellaneous charges, were also taken into account for calculating the total cost of production. The data showed that the cost of production of 1 litre of dragon fruit milkshake gradually increased with an increase in the level of dragon fruit pulp. The higher cost at

increased pulp levels may be attributed to the additional quantity of dragon fruit pulp used in the respective treatments.

The data presented in Table 1 indicates the cost of production of 1 litre dragon fruit milkshake prepared with addition of dragon fruit pulp at 0% T₁, 6% T₂, 8% T₃, 10% T₄ and 12% T₅ as Rs 111.57, Rs 127.02, Rs 131.81, Rs 136.43 and Rs 140.90.

Sawale (2008) [5] reported that the cost of production of 1 litre sapota milkshake increased from ₹27.83 in control (T₁) to ₹28.86, ₹28.88 and ₹29.40 with increasing levels of sapota pulp (T₂, T₃ and T₄), respectively.

Poul *et al.* (2009) [3] reported that the cost of production of custard apple milkshake increased with increasing levels of custard apple pulp. The cost per litre increased from ₹24.98 in control to ₹30.65, ₹33.49 and ₹36.32 with 10, 15 and 20 per cent pulp, respectively. The increase in production cost was mainly due to the additional quantity of fruit pulp used

in the formulation. Similar increasing trends can therefore be expected in fruit-based milkshakes with higher pulp incorporation. Similarly, Hingane *et al.* (2016) ^[1] reported

that the cost of papaya milkshake increased from ₹65.31 to ₹66.06 per litre with an increase in papaya pulp from 5 to 20 per cent.

Table 1: Cost of Production of 1 litre milkshake prepared from different levels of dragon fruit pulp (Rs)

Sr. no	Particulars	T ₁	T ₂	T ₃	T ₄	T ₅
1.	Quantity of Milk used in Lit (1lit)	1	1	1	1	1
2.	Wight of raw milkshake (ml)	750	750	750	750	750
3.	Cost of Buffalo Milk Rs 60/-	60	60	60	60	60
4.	Dragon fruit pulp required as per treatment (gm)	00	45	60	75	90
5.	Cost of one Dragon fruit Rs 100 per weight of fruit 300 (gm)	00	18	24	30	36
6.	Sugar @6% used in (gm)	45	45	45	45	45
7.	Cost of Sugar Rs 50/kg	2.25	2.25	2.25	2.25	2.25
8.	Miscellaneous Cost (Labour-300 Rs/8 hrs., Gas- 1800 Rs/19 kg, Electricity- @ Rs 8/unit)	26.45	26.45	26.45	26.45	26.45
9.	Total weight of Milkshake (ml)	795	840	855	870	885
10.	Total cost of Production (3+5+7+8)	88.7	106.7	112.7	118.7	124.7
11.	Total cost of Production Rs/Litre	111.57	127.02	131.81	136.43	140.90
12.	Average Market Price of Milkshake/litre	250	250	250	250	250
13.	B:C ratio	1:2.24	1:1.96	1:1.89	1:1.83	1:1.77

Conclusion

The cost of production of dragon fruit milkshake increased progressively with increasing levels of dragon fruit pulp, from ₹111.57/L in T₁ (0%) to ₹140.90/L in T₅ (12%). Among the treatments, T₄ (10% dragon fruit pulp) was considered economically suitable, with a production cost of ₹136.43/L and the highest overall acceptability.

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