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To study the effect of dried crushed Mahua (*Madhuca longifolia*) flowers on physico chemical properties of milk shake

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Abstract

The present research entitled “To study the effect of dried crushed Mahua (*Madhuca longifolia*) flowers on physico-chemical properties of milk shake.” was conducted in year 2022. Various combinations of milk and Mahua pulp were used: 100:00 (T₁), 95:05 (T₂), 92.5:7.5 (T₃), 90:10 (T₄), and 87.5:12.5 (T₅). The milkshake blended with 5 parts of Mahua pulp (T₂) achieved the highest score. Data revealed that fat, protein & total solids percentage of milk shake were decreased with increase in level of Mahua pulp, while, ash, moisture & titratable acidity increased with increase in level of Mahua pulp. Milk shake prepared by blending with 5 parts of Mahua pulp (T₂) had 3.74 percent fat, 5.32 percent protein, 0.22 percent titratable acidity, 26.20 percent total solids, 73.80 percent moisture & 1.53 percent ash.

Keywords: Cow milk, milk shake, Mahua flowers, fat, protein, titratable acidity, total solids, moisture, ash

Introduction

The nutritional significance of milk in human nutrition has been universally recognized. It serves as a source of body-building proteins, bone-forming minerals, and energy-providing substances such as lactose and milk fat. The constituent components of milk not only ensure nutritional adequacy but also offer potential health benefits in different forms. Milk is considered a rich source of nutrients due to its high-quality proteins, lactose, and flavor-enhancing fats. Milk happens to be the nature’s most blessed food best owed with almost every nutrient needed for our survival and growth. Though, from time immemorial, the life of an individual begins with milk and this association may continue for whole life. Cow milk, recognized as a highly nutritious food, abounds in essential nutrients such as calcium, vitamins, potassium, and protein. Its immense popularity stems from being perceived as one of the healthiest foods available. Fulfilling fundamental bodily requirements, milk significantly contributes to bone growth and development while aiding in disease prevention. High in protein, bone-forming minerals, health-promoting vitamins, and energy-providing lactose and milk fat, milk also supplies essential fatty acids, rendering it a comprehensive food source for human consumption (Meshram, 2014) [4].

Milkshake, a product originating from the West, is prepared by mixing milk, skim milk powder, stabilizer, and sugar, and then rapidly mixing the mixture in a mixer to achieve a pourable consistency and generate foam (Sharma and Gupta, 1978) [8]. In the Indian subcontinent, commercially available milkshakes typically comprise sweetened cold milk infused with coloring and flavoring agents, without undergoing freezing, but instead vigorously shaken. Common flavor combinations include rose, coffee, and chocolate. Fruit juice centers across many regions in our country sell milkshakes throughout the year. This beverage is widely favored by consumers due to its palatability and nutritional value (Kadav, 2001) [3].

The Mahua tree (*Madhuca longifolia*), also known as the Indian Butter-nut Tree, holds significant economic importance among tribal populations due to the versatile utilization of its various parts, including flowers, fruits, seeds, and timber (Ramadan *et al.*, 2016) [7].

Flowering during the sparse agricultural season of March-April, it serves as a crucial source of income and employment for the most vulnerable segments of society. The edible flowers, characterized by fleshy corollas, are abundant in natural sugars and a diverse array of vitamins and minerals, conferring them with nutritional significance (Sinha *et al.*, 2017) [10]. Moreover, these flowers are recognized for their antioxidant and antimicrobial properties, further enhancing their value (Sinha *et al.*, 2017) [10]. Within Ayurveda, Mahua flowers are esteemed for their cooling, carminative, galactagogue, and astringent properties, underscoring their traditional medicinal uses (Sinha *et al.*, 2017) [10].

Treatment Details

T₁ - 100% Milk + 0% Mahua pulp + 7% Sugar

T₂ - 95% Milk + 5% Mahua pulp + 7% Sugar

T₃ - 92.5% Milk + 7.5% Mahua pulp + 7% Sugar

T₄ - 90% Milk + 10% Mahua pulp + 7% Sugar

T₅ - 87.5% Milk + 12.5% Mahua pulp + 7% Sugar

Materials and Methods

Cow milk was sourced from the Section of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur, while dried Mahua flowers, high-quality cane sugar, and Sodium alginate were procured from the Nagpur market. The milkshake preparation followed minor modifications, with preliminary trials conducted to establish the optimal range of Mahua pulp for incorporation. Based on these trials, five levels of Mahua pulp (0%, 5%, 7.5%, 10%, and 12.5%) were selected for further study, with each level replicated five times.

Results and Discussion

Table 1: Physico-chemical analysis of milk shake blending with Mahua pulp

Sample	Parameters					
	Fat	Protein	Total solids	Moisture	Acidity	Ash
T ₁	4.02	5.64	27.42	72.58	0.19	0.82
T ₂	3.74	5.32	26.20	73.80	0.22	1.53
T ₃	3.70	5.30	25.33	74.67	0.25	1.68
T ₄	3.58	5.29	23.82	76.18	0.29	1.85
T ₅	3.35	5.26	21.26	78.74	0.32	1.95
S.E (m) ±	0.023	0.076	0.044	0.044	0.007	0.011
C.D	0.067	0.225	0.131	0.131	0.019	0.031

Fat

The highest fat content i.e. 4.02 percent was observed in mahua milk shake prepared with addition of mahua pulp at 0% (T₁). While the fat contents of mahua milk shake with addition of pulp at 5% (T₂), 7.5% (T₃), 10% (T₄) and 12.5% (T₅) were 3.74, 3.70, 3.58 and 3.35 percent respectively. Fat percentage of mahua milk shake was decreased continuously with increase in the level of mahua pulp. The findings of the present study align with those of Shinde *et al.* (2018) [9], who observed a significant decrease in the mean fat content from T₀ to T₄. The milkshake prepared without date pulp (T₀) exhibited the highest fat content at 4.38%, whereas the milkshake containing 10% date pulp (T₄) recorded the lowest fat content at 3.60%.

Protein

The addition of Mahua pulp at various levels significantly influenced the protein content of Mahua milkshake. Protein content decreased with increasing levels of Mahua pulp, with values recorded as 5.64%, 5.32%, 5.30%, 5.29%, and 5.26% for milkshakes prepared with 0% (T₁), 5% (T₂), 7.5% (T₃), 10% (T₄), and 12.5% (T₅) Mahua pulp respectively. The highest protein content, 5.64%, was observed in the milkshake with 0% Mahua pulp (T₁). The results obtained in the current study are more or less consistent with those reported by Poul *et al.* (2009) [6], who documented protein content in custard apple milkshake ranging from 3.84% to 2.92%. It was observed that an increase in the proportion of custard apple pulp in the blend corresponded to a simultaneous decrease in the protein content of the milkshake.

Titrateable acidity

The addition of Mahua pulp at varying levels significantly impacted the titrateable acidity content of Mahua milkshake. The acidity content increased with higher levels of Mahua

pulp, with values recorded as 0.19%, 0.22%, 0.25%, 0.29%, and 0.32% for milkshakes prepared with 0% (T₁), 5% (T₂), 7.5% (T₃), 10% (T₄), and 12.5% (T₅) Mahua pulp respectively. The acidity content of mahua milk shake was increased with increase in the level of mahua pulp. The highest acidity content i.e. 0.32 percent was observed in the milk shake prepared with addition of 12.5% mahua pulp (T₅). The results of the present study are in line with Pooja Mule *et al.* (2014) [5] who reported that as the level of fig increased the acidity content of milk shake also increased from 0.08 to 0.14 percent.

Total solids

The total solids content of mahua milk shake prepared with addition of mahua pulp at 0% (T₁), 5% (T₂), 7.5% (T₃), 10% (T₄) and 12.5% (T₅) were 27.42, 26.20, 25.33, 23.82 and 21.26 percent respectively. The Maximum total solids content (27.42%) was noticed in milk shake prepared with addition of 0% mahua pulp (T₁). Whereas lowest total solid content (21.26) was noticed in milk shake prepared with Addition of 12.5% mahua pulp (T₅). The total solid content of the mahua milk shake decreased with increase in the level of mahua pulp). The findings of the current study align closely with those of Shinde *et al.* (2018) [9], who reported a decrease in total solids content of milkshake with increasing levels of date pulp. The milkshake without date pulp (T₀) exhibited the highest total solids content at 21.35%, whereas the milkshake containing 10% date pulp (T₄) recorded the lowest total solids content at 29.55%.

Moisture

The addition of Mahua pulp at various levels significantly influenced the moisture content of Mahua milkshake. Moisture content increased with higher levels of Mahua pulp, with values recorded as 72.34%, 73.80%, 74.66%, 76.66%, and 78.73% for milkshakes prepared with 0% (T₁),

5% (T₂), 7.5% (T₃), 10% (T₄), and 12.5% (T₅) Mahua pulp respectively. The milkshake with 12.5% Mahua pulp (T₅) exhibited the highest moisture content at 78.73%, while the milkshake with 5% Mahua pulp (T₁) demonstrated the lowest moisture content at 72.34%. The results of the present investigation are more or less similar to the findings of Hukare (2015)^[2] who stated that the moisture content of custard apple milk shake ranged from 80.03 percent to 77.38 percent, respectively.

Ash

The addition of Mahua pulp at various levels significantly influenced the ash content of Mahua milkshake. Ash content increased with higher levels of Mahua pulp, with values recorded as 0.82%, 1.53%, 1.68%, 1.85%, and 1.95% for milkshakes prepared with 0% (T₁), 5% (T₂), 7.5% (T₃), 10% (T₄), and 12.5% (T₅) Mahua pulp respectively. The findings of the current study align with those of Ramesh Avhad *et al.* (2017)^[1], who analyzed the ash content in custard apple soy milkshake for treatments T₁, T₂, and T₃, reporting values of 0.72%, 0.75%, and 0.88% respectively. Treatment T₃ exhibited a higher ash content compared to the others.

Conclusion

It can be concluded that the milkshake prepared with the addition of 5 parts of Mahua pulp and 95 parts of milk obtained the highest scores for all sensory attributes, including flavor, body and texture, color and appearance, and overall acceptability, compared to milkshakes with varying proportions of milk and Mahua pulp: 100:00 (T₁), 92.5:7.5 (T₃), 90:10 (T₄), and 87.5:12.5 (T₅) parts of Mahua pulp respectively.

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