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VG Adhav

PG Scholar, Department of
Animal Husbandry and Dairy
Science, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

SP Nage

Professor, Department of Animal
Husbandry and Dairy Science,
Dr. Panjabrao Deshmukh Krishi
Vidyapeeth, Akola,
Maharashtra, India

RR Shelke

Professor, Department of Animal
Husbandry and Dairy Science,
Dr. Panjabrao Deshmukh Krishi
Vidyapeeth, Akola,
Maharashtra, India

SD Chavan

Associate Dean of PGI and
Head, Department of Animal
Husbandry and Dairy Science,
Dr. Panjabrao Deshmukh Krishi
Vidyapeeth, Akola,
Maharashtra, India

NO Khandare

Professor, Shri Shivaji College of
Agriculture, Amravati,
Maharashtra, India

Corresponding Author:

VG Adhav

PG Scholar, Department of
Animal Husbandry and Dairy
Science, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

Studies on blending of different levels of chia seeds (*Salvia hispanica*) on the sensory evaluation and cost structure of cow milk lassi

VG Adhav, SP Nage, RR Shelke, SD Chavan and NO Khandare

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Abstract

The present investigation was undertaken to study the effect of different levels of chia seed (*Salvia hispanica* L.) incorporation on the sensory evaluation, physico-chemical quality and cost structure of lassi prepared from cow milk. The experiment was conducted during 2025-26 at the Department of Animal Husbandry and Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra. Five treatments consisting of different levels of chia seeds, viz., T₁ (0%), T₂ (1%), T₃ (2%), T₄ (3%) and T₅ (4%), were evaluated. Water and sugar were incorporated at 10 per cent in all treatments. The experiment was conducted in Completely Randomized Design (CRD) with four replications. Sensory evaluation was carried out using a 9-point hedonic scale for flavour, colour and appearance, body and texture, and overall acceptability.

The sensory scores increased with increasing chia seed incorporation up to 3 per cent and subsequently decreased at 4 per cent. Treatment T₄ containing 3 per cent chia seeds recorded the highest flavour score (8.17), colour and appearance score (8.17), body and texture score (8.13), and overall acceptability score (8.17). Physico-chemical analysis showed that fat, protein, total solids, pH and ash increased with increasing chia seed level, whereas moisture and titratable acidity decreased. Fat increased from 3.50 per cent in T₁ to 4.58 per cent in T₅, protein from 2.45 to 2.98 per cent, total solids from 20.63 to 23.56 per cent, pH from 4.60 to 5.00 and ash from 0.58 to 0.73 per cent. Moisture decreased from 79.37 to 76.42 per cent, while acidity decreased from 0.50 to 0.46 per cent. The cost of production increased progressively from Rs. 79.96 kg⁻¹ in T₁ to Rs. 82.65 kg⁻¹ in T₅. Under the conditions of the present investigation, incorporation of 3 per cent chia seeds produced the highest sensory scores and was associated with improved measured physico-chemical characteristics, with a production cost of Rs. 82.00 kg⁻¹.

Keywords: Chia seed, *Salvia hispanica* L., cow milk, lassi, sensory evaluation, physico-chemical properties, cost structure, functional dairy product

Introduction

Lassi is a popular traditional fermented milk beverage in India, commonly prepared from curd or yoghurt by adding water, sugar and other ingredients. Fermentation gives lassi its characteristic flavour and improves its acceptability as a dairy beverage.

Nowadays, consumers are increasingly interested in nutritious and functional foods. Chia seed (*Salvia hispanica* L.) is gaining attention because it contains protein, dietary fibre and polyunsaturated fatty acids, particularly α -linolenic acid. Its ability to form a gel and provide thickening and stabilizing properties makes it useful for incorporation into different food products.

Several researchers have studied the use of chia in dairy products. Nakov *et al.* (2024) [19] reported the effect of chia seed fortification on the quality of yoghurt, while Shelkande *et al.* studied the incorporation of encapsulated chia seed oil in shrikhand. These studies indicate that chia incorporation can influence the nutritional, physico-chemical and sensory characteristics of dairy products. Therefore, incorporation of chia seeds into lassi provides an opportunity to develop a value-added dairy beverage while studying the effect of different incorporation levels on sensory quality, physico-chemical characteristics and production cost.

Materials and Methods

Materials

Fresh cow milk was obtained from the Dairy Unit, Department of Animal Husbandry and Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, and standardized at a 4 per cent fat level. High-quality chia seeds and clean commercial-grade cane sugar were sourced from the local market.

Methods

Lassi was prepared using standardized milk (4% fat) heated to 80-90 °C for 5 minutes and cooled to room temperature (25-30 °C). The milk was incubated by adding a 1% starter culture (*Streptococcus lactis*). The set curd coagulum was broken, and potable water and sugar were added at 10% each respectively. Chia seeds were blended into the mixture as per the specific treatment level.

Methods

Lassi was prepared following the method described by Tambe (2017) with slight modification.

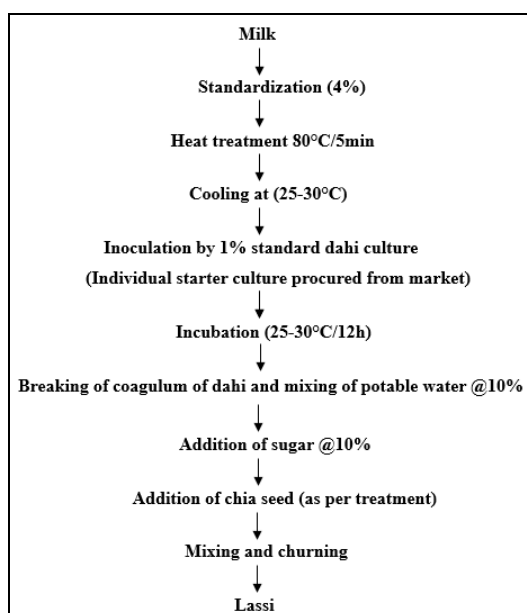


Fig 1: Flow Chart for the preparation of chia seed lassi

Treatment Details

- T₁ = 100 per cent Lassi (control)
- T₂ = 99 per cent Lassi + 1 per cent Chia seeds
- T₃ = 98 per cent Lassi + 2 per cent Chia seeds
- T₄ = 97 per cent Lassi + 3 per cent Chia seeds
- T₅ = 96 per cent Lassi + 4 per cent Chia seeds

Sensory Evaluation of Lassi Blended with Chia Seeds

The acceptability of the lassi blended with chia seeds was measured in terms of sensory attributes (flavour, body and texture, colour and appearance, and overall acceptability) by a panel of judges using a “9-point Hedonic scale”.

Statistical Analysis

The data obtained in the present investigation were tabulated and analyzed statistically using a Completely Randomized Design (CRD).

Results and Discussion

The acceptability of the control and experimental lassi was

measured in terms of sensory attributes using a 9-point hedonic scale by a panel of semi-trained judges. The results obtained were tabulated, statistically analyzed, and presented in Table 1

Flavour Acceptability

The mean flavour scores were 7.56, 7.66, 7.73, 8.17, and 7.79 for lassi prepared under T₁, T₂, T₃, T₄, and T₅ treatments respectively. The highest score obtained for flavour was treatment T₄ (8.17) containing 3 per cent chia seeds, while the lowest score was obtained for the control treatment T₁ (7.56).

Colour and Appearance Acceptability

The colour and appearance score of lassi was significantly affected due to the addition of different levels of chia seeds. The scores were T₁ (7.54), T₂ (7.67), T₃ (7.75), T₄ (8.17), and T₅ (7.78). The highest score (8.17) was obtained by lassi prepared with 3 per cent chia seeds. An increase in chia seeds resulted in better colour and appearance up to a certain limit and thereafter it decreased.

Body and Texture Acceptability

The body and texture scores were 7.17, 7.43, 7.61, 8.13, and 7.71 for lassi prepared under T₁, T₂, T₃, T₄, and T₅ treatments respectively. The highest score for body and texture was recorded for treatment T₄ (8.13), whereas the lowest score was recorded for treatment T₁ (7.17). Treatment T₄ was significantly superior to all treatments.

Overall Acceptability

The mean scores for overall acceptability for T₁, T₂, T₃, T₄, and T₅ treatments were 7.42, 7.58, 7.70, 8.17, and 7.77 respectively. The highest score for overall acceptability was recorded for treatment T₄ (8.17) because it got maximum scores in flavour, colour and appearance, and body and texture.

Table 1: Overall average sensory evaluation of lassi blended with chia seeds

Treatment	Flavour	Colour and appearance	Body and texture	Overall acceptability
T ₁	7.56	7.54	7.17	7.42
T ₂	7.66	7.67	7.43	7.58
T ₃	7.73	7.75	7.61	7.70
T ₄	8.17	8.17	8.13	8.17
T ₅	7.79	7.78	7.71	7.77
‘F’ test	Sig	Sig	Sig	Sig
SE (m)±	0.0161	0.0233	0.0322	0.0158
CD at 5%	0.0486	0.0496	0.0971	0.0477

Cost Structure

The cost of production increased progressively with increasing chia seed incorporation. The calculated costs were Rs. 79.96, 80.65, 81.33, 82.00 and 82.65 per kg for T₁, T₂, T₃, T₄ and T₅, respectively. The cost calculation used cow milk at Rs. 60 kg⁻¹, sugar at Rs. 56 kg⁻¹ and chia seeds at Rs. 150 kg⁻¹. The cost structure also included miscellaneous expenses such as electricity, labour and gas.

Table 2: Cost of production of chia seed-blended lassi

Treatment	Chia seed level (%)	Cost of production (Rs./kg)
T ₁	0	79.96
T ₂	1	80.65
T ₃	2	81.33
T ₄	3	82.00
T ₅	4	82.65

Conclusion

The present investigation demonstrated that incorporation of chia seeds influenced the sensory and physico-chemical characteristics of cow milk lassi.

Among the five treatments, the sensory scores increased up to the 3 per cent chia seed level and subsequently decreased at 4 per cent. Treatment T₄ containing 3 per cent chia seeds recorded flavour, colour and appearance, body and texture, and overall acceptability scores of 8.17, 8.17, 8.13 and 8.17, respectively.

Increasing chia seed incorporation was associated with increased fat, protein, total solids, pH and ash, while moisture and titratable acidity decreased. Fat increased from 3.50 to 4.58 per cent and protein from 2.45 to 2.98 per cent across T₁ to T₅.

The production cost increased from Rs. 79.96 kg⁻¹ for the control to Rs. 82.65 kg⁻¹ for the 4 per cent chia seed treatment. The cost associated with T₄ was Rs. 82.00 kg⁻¹.

Under the experimental conditions reported in this study, the 3 per cent chia seed treatment (T₄) showed the highest recorded sensory scores and was identified in the thesis as the suitable level for preparation of chia seed-blended cow milk lassi.

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Author's Contribution

Not available

Conflict of Interest

Not available

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