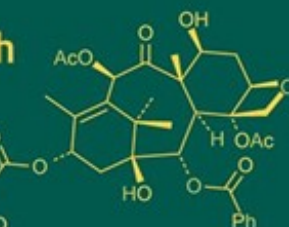
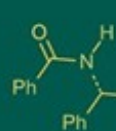


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Optimization of level of *Moringa* leaves powder and jaggery in preparation of burfi

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ABSTRACT

The present study was conducted to evaluate the effect of incorporating moringa leaves powder at different levels (0%, 0.5%, 1%, 1.5%, and 2%) on the chemical properties of burfi prepared using jaggery (35%) as a sweetening agent. Burfi was prepared by incorporating graded levels of moringa leaves powder, while the control treatment contained no moringa leaves powder. The use of jaggery at 35% provided sweetness and contributed to the overall solids and mineral content of the product. Among the different treatments, the appropriate level of moringa leaves powder can improve the nutritional quality of burfi without adversely affecting its chemical characteristics. The study suggests that moringa leaves powder and jaggery can be effectively utilized to develop a nutritionally enriched and value-added burfi product.

Keywords: Sensory score, Flavour, body and acceptability, Texture, colour and appearance, Milk and burfi

Introduction

India is currently the world's leading milk-producing country, with an estimated annual milk production of 248 million tonnes during 2024-2025. This information is reported by the National Dairy Development Board (NDDB), based on data from the Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India. During the same period, the per capita availability of milk in India reached approximately 448 grams per day.

Burfi is a widely consumed traditional Indian dairy sweet that is primarily prepared using khoa and milk. It generally has a white to pale-cream appearance and is characterized by a firm consistency with a smooth yet slightly granular texture. The quantity of sugar used may vary depending on the desired taste, while additional ingredients are incorporated according to consumer preferences and regional traditions. Consequently, numerous varieties of burfi are available, including plain, mava, pista, nut, chocolate, coconut, and rava burfi, with each variety distinguished by its specific added ingredients.

Moringa, traditionally considered an underutilized plant, has gained considerable attention in recent years because of its nutritional and nutraceutical properties. It is often referred to as the "Miracle Tree" due to its wide range of potential health benefits. According to the APEDA Market Intelligence Report (2019), the global market for moringa-based products was projected to increase from approximately USD 5.5 billion in 2018 to USD 10 billion by 2025, representing a Compound Annual Growth Rate (CAGR) of around 8.9%. Growing consumer awareness regarding the nutritional and medicinal properties of moringa is expected to further support the expansion of this market. India is particularly significant in the global moringa industry and is estimated to account for nearly 80% of the world's moringa demand. Owing to its rich nutritional profile and potential health-promoting properties, moringa is increasingly recognized as a superfood. Divya *et al.* (2024) [1] reported that moringa leaves are highly nutritious, containing approximately 20-35% protein, dietary fiber, carbohydrates, essential amino acids, and vitamins A, B-complex, C, and E. They also provide essential minerals, including calcium, potassium, iron, magnesium, phosphorus, and zinc. The researchers highlighted that moringa leaves have a greater nutrient density compared with many commonly consumed vegetables.

Materials and Methods

The burfi was prepared at section of animals husbandry and dairy science, Nagpur by blending with moringa leaves powder and khoa with different levels. The moringa leaves powder were prepared at the laboratory of the section and jaggery was used as sweetening agent for preparation of burfi. The level of jaggery was finalized by using sensory evaluation.

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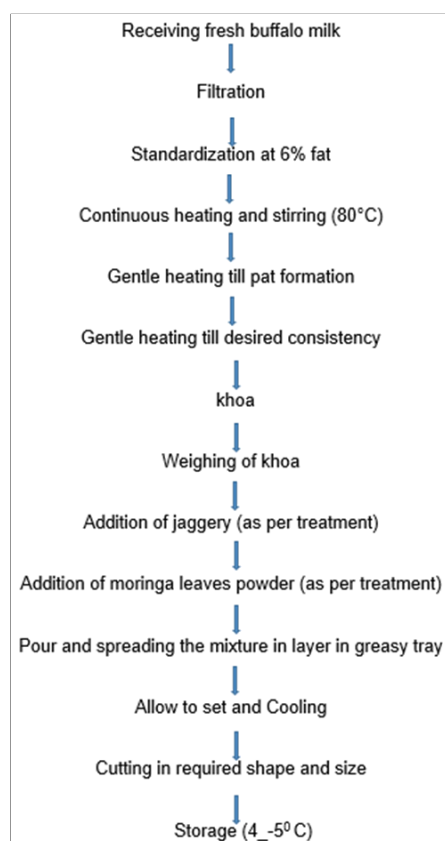


Figure 1. Flow chart for preparation *Moringa* leaves powder burfi

Treatment details used for study

For preparation of burfi the level of jaggery is finalized first by sensory evaluation by using 9 point hedonic scale and finalized the levels of moringa leaves powder for preparation of burfi.

The treatment were khoa and moringa leaves powder (99.5:0.5)% T₂, (99:1)% T₃, (98.5:1.5%) T₄ and (98:2)% (T₄) were compared with (100:0)% control (T₁)

The burfi was prepared by the standard method with certain modifications. The finished product is then analysed for sensory, physico chemical properties of burfi.

Statistical analysis

The data obtained during different phases of this study was analyzed by using CRD (Completely Randomized Design) with five treatments and five replications.

Sensory evaluation

Sensory evaluation of Burfi samples were carried out by a well-trained panel of 5 judges by using 9-point hedonic scale described by Nelson and Trout (1964). Flavour, Body and Texture, Colour and appearance and Overall acceptability sensory parameters were included in the study.

Result and Discussion

The present study and investigation on " **Optimization of Level of *Moringa* Leaves Powder and Jaggery in Preparation of Burfi**" were analysed for the sensory qualities including (Flavour, Body and Texture, Colour and Appearance and Overall acceptability).

Sensory evaluation of jaggery

Treatments	Replications				Mean
	R-1	R-2	R-3	R-4	
T ₁ (25 %)	7.52	7.56	7.61	7.55	7.6
T ₂ (30 %)	7.86	7.91	7.92	7.84	7.9
T ₃ (35 %)	8.32	8.56	8.34	8.39	8.4
T ₄ (40 %)	7.42	7.35	7.27	7.33	7.3

S.E ± 0.0431
C.D. 5 % 0.0903
Result Sig.

The results indicate that the sensory quality of burfi was influenced by concentration of jaggery level. The most acceptable combinations were associated with 35% jaggery, each receiving a mean overall acceptability score of 8.4. Increasing jaggery beyond 35% reduced acceptability.

Annapurna *et al.* (2025) [2] suggests that jaggery can successfully replace refined sugar in milk chocolate, particularly when cane and palm jaggery are used together. The 23% + 23% combination provided the best balance of sensory qualities and consumer acceptance.

Sensory evaluation of burfi

Treatment	Parameters			Overall Acceptability (9)
	Flavour	Body and texture (9)	Colour and Appearance (9)	
T ₁	7.58	7.57	7.59	7.6
T ₂	7.80	7.81	7.81	7.8
T ₃	7.93	7.99	8.01	8.0
T ₄	8.45	8.46	8.47	8.4
T ₅	7.54	7.53	7.54	7.4
S.E (m) ±	0.0543	0.0503	0.0580	0.06
C.D	0.1136	0.1054	0.1214	0.12
Result	sig	sig	sig	sig

Flavour score

The flavour scores of burfi samples prepared with moringa leaves powder at different proportions, namely 100:0 (T₁), 99.5:0.5 (T₂), 99:1 (T₃), 98.5:1.5 (T₄), and 98:2 (T₅), were 7.58, 7.80, 7.93, 8.45

and 7.54, respectively. The incorporation of moringa leaves powder

significantly influenced the flavour acceptability of burfi. Among the treatments, T₄ recorded the highest flavour score of 8.45 out of 9. The findings indicated that burfi containing 2 parts moringa leaves powder was more acceptable in terms of flavour than those containing 10, 15, and 25 parts. The results further suggested that increasing the level of moringa leaves powder improved the flavour score up to an optimum level, beyond which the flavour acceptability declined.

The results are accordance with Bhosale *et al.* (2018) [3] reported that increasing the level of bottle gourd pulp improved the flavour of burfi. The flavour scores increased from 39.50 in T₁ to 43.58 in T₄. The highest flavour score (43.58 out of 45) was recorded for burfi containing 15% bottle gourd pulp, indicating that this level was most acceptable to the sensory panel.

Kolwate (2019) [4] observed that the flavour of burfi improved with increasing levels of shredded pumpkin pulp up to a certain level. Beyond this level, the flavour score decreased. This indicates that an optimum amount of pumpkin pulp is necessary to obtain better flavour and sensory acceptability of burfi.

Body and texture score

The body and texture scores of burfi samples prepared with moringa leaf powder at different proportions, namely 100:0 (T₁), 99.5:0.5 (T₂), 99:1 (T₃), 98.5:1.5 (T₄), and 98:2 (T₅), were recorded as 7.57, 7.81, 7.99, 8.46 and 7.53 respectively. The incorporation of moringa leaf powder significantly influenced the body and texture characteristics of burfi. Among the treatments, T₄ received the highest score of 8.46 out of 9, indicating superior body and texture compared with the other treatments. The burfi prepared under T₄ exhibited a soft body and smooth, well-developed grain structure. The findings indicated that increasing the level of moringa leaf powder improved the body and texture scores up to an optimum level, beyond which the scores gradually declined.

The results are accordance with Lahankar *et al.* (2018) [5] observed that the body and texture of burfi were influenced by the addition of green peas. The highest score (8.63 out of 9) was obtained for burfi prepared without green peas, while the lowest score (6.93 out of 9) was recorded for burfi containing 10 parts of green peas. This indicates that higher incorporation of green peas reduced the acceptability of body and texture.

Kamble *et al.* (2019) reported that the body and texture score of burfi decreased gradually with increasing levels of sugar and green chickpea. This suggests that higher incorporation of these ingredients negatively affected the desirable body and texture characteristics of burfi.

Colour and appearance score

The colour and appearance scores of burfi samples prepared with moringa leaves powder at proportions of 100:0 (T₁), 99.5:0.5 (T₂), 99:1 (T₃), 98.5:1.5 (T₄), and 98:2 (T₅) were 7.59, 7.81, 8.01, 8.47 and 7.54, respectively. The incorporation of moringa leaves powder significantly influenced the colour and appearance of the burfi. Among all treatments, T₄ recorded the highest score of 8.47 out of 9, indicating superior colour and appearance compared with the other treatments. Thus, the results suggest that increasing the level of moringa leaves powder improved the colour and appearance of burfi up to an optimum level, beyond which the sensory score declined.

The results are accordance with Ramteke *et al.* (2018) [6] reported that increasing the level of potato flour improved the colour and appearance of burfi up to an optimum level. The highest score (18.50 out of 20) was obtained for burfi containing 10 parts potato flour (T₃), whereas the lowest score (15.75 out of 20) was recorded with 20 parts potato flour. This indicates that moderate incorporation of potato flour produced better colour and appearance.

Mohod *et al.* (2020) [7] reported that the colour and appearance of burfi were influenced by the level of finger millet flour. The highest sensory score (8.95 out of 9) was obtained with 85:15 (T₃) finger millet flour, while the lowest score (7.33 out of 9) was recorded for 75:25

(T₄). This indicates that a moderate level of finger millet flour resulted in better colour and appearance of burfi.

Overall acceptability score

It is revealed from Table 16 that, the mean overall acceptability scores of burfi prepared with khao to moringa leaf powder in the proportions of 100:0 (T₁), 99.5:0.5 (T₂), 99:1 (T₃), 98.5:1.5 (T₄), and 98:2 (T₅) were 7.6, 7.8, 8.0, 8.4, and 7.4, respectively.

The results are accordance with Ramteke *et al.* (2018) [6] reported that increasing the level of potato flour improved the overall acceptability of burfi up to an optimum level. However, beyond this level, further addition of potato flour resulted in a decline in the sensory score. This indicates that a suitable level of potato flour is important for achieving better overall acceptability of burfi.

Jadhao *et al.* (2021) [8] evaluated the sensory quality of burfi based on flavour, colour and appearance, body and texture, and overall acceptability. They found that incorporation of 20% skim milk powder produced burfi with desirable sensory characteristics and was considered acceptable by the sensory panel.

Conclusion

The result shown for burfi prepared with adding 1.5 per cent moringa leaves powder and jaggery 35 per cent results in good flavour, body and texture, colour and appearance and overall acceptability having highest score. Hence, it is concluded that acceptable Burfi can be prepared by incorporating 1.5 per cent moringa leaves powder and jaggery 35 per cent. The moringa leaves powder (1.5%) and jaggery (35%) could be successfully utilized for preparation of burfi with increased nutritional values.

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