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Studies on sensory properties and microbiological quality of *burfi* blended with apple (*Malus pumila*) pulp

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Abstract

The *burfi* was prepared by blending 15, 20 and 25 per cent of apple pulp in buffalo milk *khoa* aimed, to study sensory properties and microbiological quality of *burfi* blended with apple pulp. The sensory score with respect to colour and appearance, flavour, body and texture and overall acceptability showed that addition of 25 per cent apple pulp decrease flavour (8.00, 8.25, 8.75 and 8.50), body and texture (8.25, 8.50, 8.75 and 8.00) and overall acceptability (8.00, 8.50, 8.75, 8.25) score as compare to 15 and 20 per cent apple pulp. However, addition of apple pulp resulted in increased score for colour and appearance (8.00, 8.25, 8.50, 8.75). The microbial results indicate the standard plate count, yeast and mould count and coliform count were within the all permissible limits.

Keywords: *Burfi*, Apple pulp, sensory, microbiology

Introduction

Heat desiccation techniques is the most ancient technology used to process the milk and milk products. These products are rich in nutrition and also provide vital calories. Cutting across the different regions of the Indian sub-continent, are famous for heat desiccated milk products are based on *khoa*/*mawa*, which is used as base material such as *burfi*, *peda*, *gulabjamun*, *kalajamun*, *kalakand*, *milk cake*, *rabri*, *khurchan*, *basundi*, etc. About 600,000 metric tonnes of *khoa* was produced annually in India which utilize 7% of total milk production.

Burfi is the most popular *khoa* based confection in Indian sub-continent. It is prepared by mixing different proportions of *khoa* and sugar along with some other ingredients i.e. dry fruits, fruit pulps, different cereals, pulses and their flours and flavouring materials. Traditionally, *burfi* was prepared by vigorous blending of *khoa* and sugar in open shallow kettle till a homogenous, smooth and fine grain mass appears and is transferred hot into a tray for cooling and setting.

Apple fruits are a good source of fiber and vitamin C. They also contain polyphenols. Apple fruits may aid weight loss in several ways which are linked to lower blood pressure and stroke risk. Apple fruits promote heart health in several ways. They are high in soluble fiber, lower cholesterol. Apple fruit is a fruit with many associated health benefits, lower risk of type 2 diabetes, lower risk of cancer and death from cancer, protect against asthma, promote bone health and, weight loss. Apple fruit is rich in vitamins B₁, B₂, B₆, C & A. It contains dietary fiber, energy, potassium, phosphorous, magnesium, Sodium, Iron, Zinc and copper (Kedaree *et al.*, 2021) ^[3].

Materials and Methods

The research was conducted during 2024-25 in Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani.

Materials

Buffalo milk

Fresh standardized Buffalo milk (6% fat and 9% SNF) was procured from local market (Natural Milk Pvt. Ltd., Kallam).

Apple fruit

Fresh matured apple fruit (Red delicious) was procured from the local market and used in the present investigation for preparation of *burfi*.

Sugar

Good quality clean crystalline, cane sugar was purchased from local market of Latur city.

Microbiological Media

The *burfi* sample was analyzed for standard plate count, yeast and mould count and coliform count by using Nutrient Agar (NA), Potato Dextrose Agar (PDA) and Violet Red Bile Agar (VRBA) media, respectively.

Methodology

Sensory evaluation of control and *burfi* blended with apple pulp was conducted by semi-trained panel of 5 judges using 9-point hedonic scale. The sensory attributes such as colour and appearance, flavour, body and texture, overall acceptability was studied and data obtained were analysed with Completely Randomized Block Design (CRD). The score given by judges for different sensory parameters were recorded and subsequently discussed as follows. The microbiological analysis of *burfi* samples for standard plate count, yeast and mould count and coliform count was performed according to A.O.A.C. method (1975).

Treatment combination

Burfi blended with apple pulp was prepared using 30 per cent sugar by weight of *khoa* and apple pulp as per the treatment combination as follows.

T₁ - 100 part of *khoa* by weight (Control)

T₂ - 85 part of *khoa* + 15 part of apple pulp by weight

T₃ - 80 part of *khoa* + 20 part of apple pulp by weight

T₄ - 75 part of *khoa* + 25 part of apple pulp by weight

Procedure for preparation of *burfi* blended with apple (*Malus pumila*) pulp

The *burfi* was prepared as per the procedure given. Buffalo milk was standardized at 6% fat and 9% SNF was taken in an iron karahi and heated on gentle fire. At the time of boiling, milk was stirred with the help of a khunti in a circular manner. The stirring-cum-scrapping process was continued till a pasty consistency was reached. Addition of apple pulp as per treatment and sugar at 30 per cent by weight of *khoa* was added. The mixture was then further heated with continuous kneading at 50°C up to desirable solid mass stage attained. Then the mixture was spreading into greasy stainless-steel tray for cooling at 30°C. After cooling of mixture it was cutting into rectangular blocks. The final product packaging and storage at room temperature.

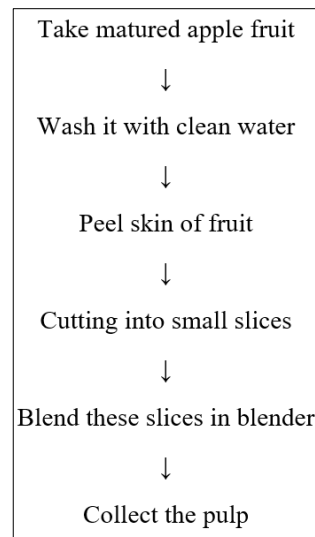


Fig 1: Flow diagram for preparation of apple pulp

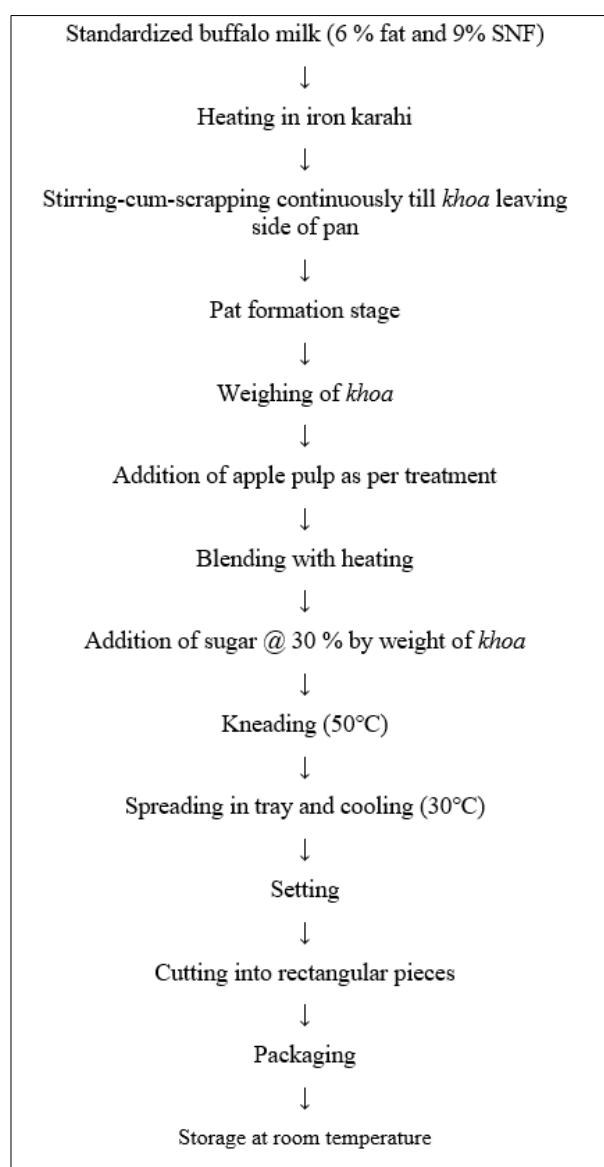


Fig 2: Flow diagram of preparation of *burfi* blended with apple pulp

Results and Discussion

Colour and appearance score of *burfi* blended with apple pulp

The score for colour and appearance of *burfi* blended with apple pulp are given in Table No.1

Table 1: Colour and appearance score of *burfi* blended with apple pulp

Treatment	Replication				Mean
	R ₁	R ₂	R ₃	R ₄	
T ₁	7.00	9.00	9.00	7.00	8.00
T ₂	8.00	7.00	9.00	9.00	8.25
T ₃	9.00	8.00	8.00	9.00	8.50
T ₄	9.00	9.00	8.00	9.00	8.75
S.E. $\pm$ 0.4208 C.D. at 5% 1.2966					

The value differ non-significantly ($P < 0.05$)

The colour and appearance score for control and *burfi* blended with apple pulp T₂, T₃ and T₄ are 8.00, 8.25, 8.50 and 8.75, respectively and presented in Table 1. The results indicated that addition of apple pulp in *burfi* increased colour and appearance score non-significantly towards higher level of addition of apple pulp in *burfi*. The colour and appearance score for T₄ (8.75) was highest and differ non significantly from T₁ (8.00), T₂ (8.25) and T₃ (8.50).

The non-significant difference in colour and appearance score among the treatments and control was due to slight brown colour of apple pulp. However, at higher level T₂, T₃ and T₄ colour and appearance was appealing due to brown colour of *burfi*. The results of present study are similar with Sahu *et al.* (2021) who reported that addition of apple pulp in *shrikhand* at 15, 20 and 25 per cent increased colour and appearance score at 25 per cent level of apple pulp (7.27) than control (5.95).

Flavour score of *burfi* blended with apple pulp

The score for flavour of *burfi* blended with apple pulp are given in Table No.2

Table 2: Flavour score of *burfi* blended with apple pulp

Treatment	Replication				Mean
	R ₁	R ₂	R ₃	R ₄	
T ₁	9.00	7.00	7.00	9.00	8.00
T ₂	9.00	7.00	8.00	9.00	8.25
T ₃	9.00	8.00	9.00	9.00	8.75
T ₄	8.00	9.00	9.00	8.00	8.50
S.E. $\pm$ 0.4208 C.D. at 5% 1.2966					

The values differ non-significantly ($P < 0.05$)

The flavour score for control (T₁) and *burfi* blended with apple pulp T₂, T₃ and T₄ are 8.00, 8.25, 8.75 and 8.50, respectively and presented in Table 2. The results indicates that addition of apple pulp in *burfi* increased flavour score non-significantly up to T₃ then decreased. The non-significant difference in flavour score of T₃ (8.75) was higher due to mild pleasant flavour was obtained in the *burfi* blended with apple pulp. However, the flavour score for T₃ was highest and differ non-significantly from T₁ (8.00), T₂ (8.25) as well as T₄ (8.50). Therefore flavour score decrease in T₄ but value does not differ significantly. The results of present study are in agreement with results obtained by Navale *et al.* (2014) who reported that addition wood apple pulp in *burfi* at 5, 10 and per cent significantly increased flavour score from T₁ (7.37) to T₃ (8.37) and further decreased from T₃ (8.37) to T₄ (6.62).

Body and texture score of *burfi* blended with apple pulp

The score for body and texture of *burfi* blended with apple pulp are given in Table No.3

Table 4: Body and texture score of *burfi* blended with apple pulp

Treatment	Replication				Mean
	R ₁	R ₂	R ₃	R ₄	
T ₁	8.00	9.00	8.00	8.00	8.25
T ₂	8.00	9.00	9.00	8.00	8.50
T ₃	9.00	9.00	8.00	9.00	8.75
T ₄	8.00	7.00	8.00	9.00	8.00
S.E. $\pm$ 0.3061					
C.D. at 5% 0.9434					

The values differ non-significantly ($P < 0.05$)

The body and texture score for control (T₁) and *burfi* blended with apple pulp T₂, T₃ and T₄ are 8.25, 8.50, 8.75 and 8.00, respectively and presented in Table 3. The results indicated that addition of apple pulp in *burfi* increased body and texture non-significantly up to T₃ then decreased. The body and texture score of *burfi* in treatment T₃ (8.75) was superior over rest of the treatments which had soft body and smooth grained texture *burfi*. However, body and texture score T₄ (8.00) was lowest among all treatments as well as control T₁ (8.50). The results of present study are in agreement with results obtained by Navale *et al.* (2014) who reported that addition of wood apple pulp in *burfi* at 5, 10 and 15 per cent significantly increased body and texture score from T₁ (7.62) to T₃ (8.37) and further decreased from T₃ (8.37) to T₄ (6.75).

Overall acceptability score of *burfi* blended with apple pulp

The score for overall acceptability of *burfi* blended with apple pulp are given in Table No.3

Table 4: Overall acceptability score of *burfi* blended with apple pulp

Treatment	Replication				Mean
	R ₁	R ₂	R ₃	R ₄	
T ₁	9.00	8.00	8.00	7.00	8.00
T ₂	9.00	8.00	8.00	9.00	8.50
T ₃	8.00	9.00	9.00	9.00	8.75
T ₄	8.00	8.00	8.00	9.00	8.25
S.E. $\pm$ 0.3061 C.D. at 5% 0.9434					

The values differ non-significantly ($P < 0.05$)

The overall acceptability score for control (T₁) and *burfi* blended with apple pulp T₂, T₃ and T₄ are 8.00, 8.50, 8.75 and 8.25, respectively and presented in Table 4. The results indicated that addition of apple pulp in *burfi* increased overall acceptability score up to T₃ further decrease. The overall acceptability was highest score for treatment T₃ (8.75) and differ non-significantly from T₁ (8.00), T₂ (8.50) and T₄ (8.25). Overall acceptability score of T₄ was lowest among all treatment as well as control but value decrease differ significantly. The results of present study are similar with findings of Navale *et al.* (2014) who reported that addition of wood apple pulp in *burfi* at 5, 10 and 15 per cent significantly increased overall acceptability score from T₁ (7.75) to T₃ (8.45) and further decreased from T₃ (8.45) to T₄ (6.77).

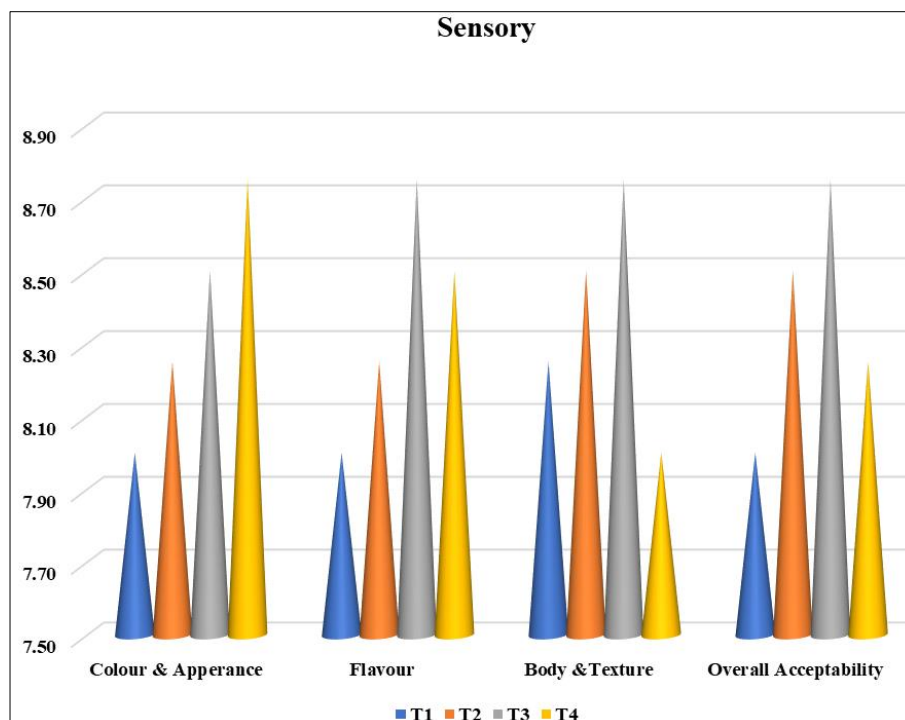


Fig 3: Sensory quality of burfi blended with apple pulp

Microbial quality of fresh burfi blended with apple pulp

The fresh product prepared was subjected to microbial analysis with respect to standard plate count, yeast mould count and coliform count.

Standard Plate Count of fresh burfi blended with apple pulp

The standard plate count of burfi blended with apple pulp are presented on Table No. 5

Table 5: Standard plate count of fresh burfi blended with apple pulp

Treatment	Replication				Mean
	Microbial count cfu×10 ³ /gm				
	R ₁	R ₂	R ₃	R ₄	
T1	7	9	9	7	8 ^d
T2	12	11	10	11	11 ^c
T3	13	15	13	15	14 ^b
T4	19	18	20	19	19 ^a
S.E. + 0.5 C.D. at 5% 1.5406					

The values with different superscripts differ significantly ($P < 0.05$)

The mean value of standard plate count for control (T₁) and burfi blended with apple pulp T₂, T₃ and T₄ was (8, 11, 14 and 19 cfu×10³/gm, respectively) and presented in Table 5. The standard plate count of control (T₁) sample was (8 cfu×10³/gm) lower and differ significantly from all treatments. Among the treatments per cent standard plate count of (T₄) was (19 cfu×10³/gm) higher than all other treatment and differ significantly toward higher level of addition of apple pulp. The significant increase in standard plate count of burfi toward higher level of apple pulp was due to higher moisture (85.56 per cent) content in apple pulp. The results of present study are similar with Waghmare (2012) who reported that addition of bottle gourd pulp in fresh burfi at 5, 10, 15 per cent increased standard plate count from 9 to 19 cfu×10³/gm significantly.

Yeast and Mould Count of fresh burfi blended with apple pulp

The yeast and mould count of burfi blended with apple pulp are presented on Table No. 5

Table 5: Yeast and mould of fresh burfi blended with apple pulp

Treatment	Replication				Mean
	Microbial count cfu×10 ³ /gm				
	R ₁	R ₂	R ₃	R ₄	
T ₁	2	3	2	1	2 ^d
T ₂	6	7	8	7	7 ^c
T ₃	10	9	8	9	9 ^b
T ₄	11	13	10	14	12 ^a
S.E. + 0.5773 C.D. at 5% 1.7789					

The values with different superscripts differ significantly ($P < 0.05$)

The mean value of yeast and mould count for control (T₁) and burfi blended with apple pulp T₂, T₃ and T₄ was (2, 7, 9 and 12 cfu×10³/gm, respectively) and presented in Table 6. The yeast mould count of control (T₁) sample was (2 cfu×10³/gm) lower and differ significantly from all treatments. Among the treatments per cent yeast mould count of (T₄) was (12 cfu×10³/gm) higher than all other treatment and differ significantly toward higher level of addition of apple pulp. The significant increase in standard plate count of burfi toward higher level of apple pulp was due to higher moisture (85.56 per cent) content in apple pulp. The results of present study are similar with Waghmare (2012) who reported that addition of bottle gourd pulp in fresh burfi at 5, 10, 15 per cent increased yeast mould count from 3 to 13 cfu×10³/gm significantly.

Coliform count of fresh burfi using apple pulp

In present study the product prepared by addition of different level of apple pulp with buffalo milk khoa was found to be free from coliform, indicates the hygienic quality of burfi.

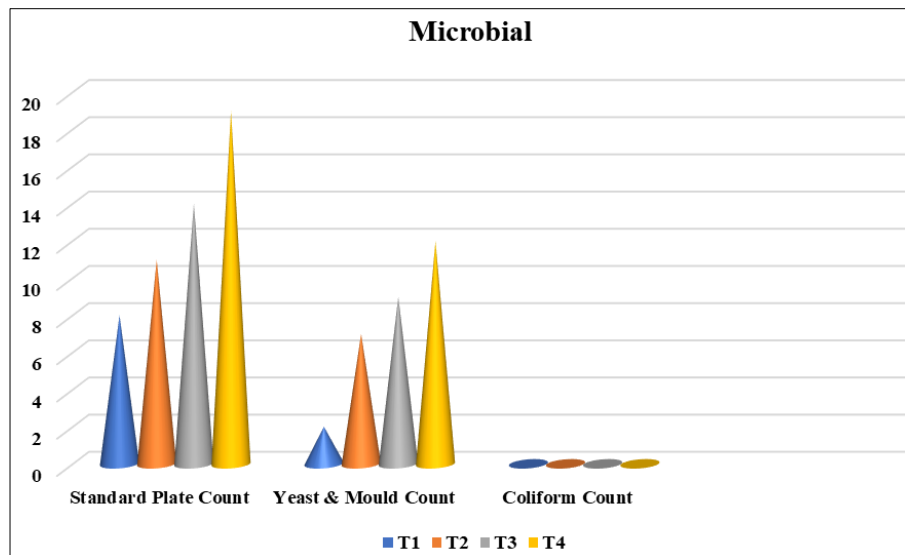


Fig 4: Microbial quality of *burfi* blended with apple pulp

Conclusions

From present investigation it was observed that sensory parameters such as colour and appearance had positive effect on *burfi*. However, addition of 25 per cent apple pulp decrease flavour, body and texture and overall acceptability score as compare to control. From the results of sensory score it could be concluded that 20 per cent apple pulp could be added in *burfi* without affecting flavour, body and texture and overall acceptability. The microbial results indicate the standard plate count, yeast and mould count and coliform count were within the all permissible limits.

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