

Preparation of Khoa Burfi Blended with Alphonso Mango Pulp

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ABSTRACT

The Traditional dairy product and sweets are Integral part of Indian heritage. India is largest milk producing country in word with 155.5 million tones milk production (GOI, 2015-16). There is scope for expanding and improving the indigenous confections by introducing a variety of products adopting improved methods and technology. It is estimated that about 6.5 per cent of total milk produced in India is converted into khoa and condensed milk. Amongst the khoa based sweets; burfi and pedha are very popular. Now days mango fruit pulp containing burfi is gaining popularity amongst consumers due to its flavour and nutritional value. Therefore, it was envisaged to see the acceptability of highly acceptable mango burfi can Prepared from Buffalo milk utilizing 15% mango pulp (w/v of milk) 5% sugar (w/v of milk) and 0.15% turmeric powder (w/v of milk), Incorporating them at pat formation stage of khoa making. The product is shelf stable up to 6 days at ambient storage temperature which was 3 time shelf of control burfi.

Key word: Buffalo milk, Khoa, Sensory evaluation, Mango pulp, Statistical analysis and Turmaric etc.

INTRODUCTION

Traditional dairy products and sweets are an integral part of Indian heritage. These products have great social, religious, cultural, medicinal and economic importance and have been developed over a long period with the culinary skills of homemakers and halwais. There is scope for expanding and improving the indigenous confections by introducing a variety of products by adopting improved methods and technology. It is estimated that about 6.5 per cent of total milk produced in India is converted into khoa and condensed

milk. Amongst the khoa based sweets; burfi and pedha are very popular. Now-a-days, mango fruit pulp containing burfi is gaining popularity amongst consumers due to its flavour and nutritional value. The mango pulp is a rich source of vitamin A and fair amount of vitamin C. *Burfi* gets an attractive look when blended with mango pup, in addition to obtaining natural light orange with yellow tinge replacing synthetic colours. The pulp also probably contributes to good body and texture of *burfi*. Chemical preservatives' in milk sweetmeats are not permitted by PFA.

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Natural preservatives are finding preferential application in food products globally¹¹. Turmeric (*Curcuma longa*) is extensively used as a spice, food preservative and colouring material in India, China and South East Asia. Curcumin, the main yellow bioactive component of turmeric has shown several biological functions including anti-inflammatory, antioxidant, anti-carcinogenic, antimutagenic, anticoagulant, anti-diabetic, antibacterial and antifungal, anti-protozoal, antiviral, antifibrinolytic, antivenom, antiulcer, hypotensive and hypocholesteremic. Therefore, it was envisaged to see the acceptability of Burfi containing added Alphonso mango pulp and using turmeric as herbal preservation to verify whether it can prolong its shelf life.

MATERIAL AND METHODS

The research project was conducted at the Dept. of Animal Husbandry and Dairy Science, College of Agriculture, Dapoli, Maharashtra. Buffalo milk was obtained from the dairy farm of the College. Alphonso mango pulp (Makarand brand), cane sugar and turmeric powder (Rajapuri brand) were procured from local market. The burfi was prepared as the procedure suggested by De⁷ with slight modifications. Sugar, mango pulp and turmeric were added at pat formation stage of khoa, followed by spreading the mixture in greased tray, cooling and setting for 6-8h, followed by room temperature storage. The percent yield of khoa obtained on an average was 32.0%

The trial was conducted in three phases:

Phase- I: In this phase, the stage of incorporation of mango fruit pulp (@10% w/v of Milk) was studied. (Stage1– At the start of boiling of milk, 2- at semi solid/pasty consistency 3- At pat formation.

Phase- II: on deciding the stage of adding mango pulp (i.e. pat formation), the level of sugar and mango pulp was decided.

- 1) Level of mango pulp
T0 - No pulp; T1, T2, and T3 -5, 10 and 15% (w/v of milk) respectively.
- 2) Level of sugar (% of milk)

S1, S2, S3, - 4, 5 and 6% (w/v of milk) respectively).

Phase – III: Based on the results of Phase -I and II the most acceptable treatment combination (i.e. 15% mango pulp, 5% sugar added at pat formation stage) for burfi was studied for preservation using varying quantities of turmeric powder.

Level of Turmeric powder used was 0(T0), 0.10(T1), 0.15 (T2) and 0.20% ((T3) (w/v of milk) added at pat formation stage.)

The burfi was packaged in HDPE (87 µ thick) and was evaluated for chemical, rheological, sensory and microbial quality parameters as under:

Chemical composition- Acidity, pH, FFA, Peroxide value, hydroxymethyl furfural (HMF) value

Rheological quality- Hardness

Microbiological quality at alternate days- Standard Plate count, Yeast and mold count, coliform count, lipolytic and proteolytic bacterial count

Sensory quality (Colour and appearance, flavor, body and texture, overall acceptability)

The above observations were taken on product at every alternate day till 8th day, stored at room temperature (i.e. 30 °C)

The fat and moisture protein and lactose¹, Acidity peroxide value² free fatty acids³ were analyzed using standard procedures. HMF was estimated using method of Keeney and Besset. Hardness was determined using Universal penetrometer (Maharana Model No. 4168, MFG Coupay, Ajmer). The spindle weight was 50 g and 3 sec. relaxation time was used. 9-Point hedonic scale was used for scoring the product for sensory characteristics as judged by 10 trained judges. The burfi samples were evaluated for microbiological parameters as per the procedure of Anon.⁵. The mean data of experiment were analyzed as per standard procedure¹². The data of organoleptic qualities were analyzed as per Friedman's test⁴.

RESULTS AND DISCUSSION

The Chemical quality of buffalo milk, Alphonso pulp and turmeric powder used for the preparation of burfi is given in the Table 1

The TS of khoa obtained prior to adding Mango pulp and sugar ranged from 64-67%.

Phase-I: It was found appropriate to incorporate sugar and mango pulp at pat formation stage. Incorporating such additives

at earlier stages (i.e. in milk and at semi-solid consistency) resulted in loss of mango flavour and development of loose body and granular texture.

Table 1: Chemical quality of milk mango Pulp and turmeric powder

Sr. No.	Constituents	Buffalo milk	Alphonso mango pulp	Turmeric Powder
1	Total Solids, %	15.75	30.65	-
2	Fat, %	6.55	0.84	5.1
3	Protein %	3.80	-	6.3
4	Lactose,%	4.60	-	-
5	Total sugar,%	-	18.76	-
6	Ash content,%	-	-	3.5
7	Acidity, % (LA for milk, citric acid for Mango pulp)	0.14	0.40	-

Phase-I

From Table 2, it was observed that fat, protein and lactose content of burfi did not show significant variation when mango pulp was incorporated at different stages of milk concentration, whereas moisture, acidity and

FFA content varied significantly. HMF value, an indicator of degree of browning did not differ significantly. The FFA content of burfi made by adding mango pulp at pat formation stage was the least, which differed significantly from the one added to boiling milk.

Table 2: Chemical quality of burfi added with mango pulp at different stages of khoa making

Stage of pulp addition	Moisture %	Fat %	Protein %	Lactose %	Acidity (% LA)	F.F.A. (% oleic acid)	HMF (μ moles/100g)
T1	19.95	21.71	9.58	19.01	0.31	0.40	0.38
T2	21.78	22.43	10.27	18.84	0.33	0.36	0.41
T3	23.39	22.86	10.41	19.02	0.36	0.34	0.43
CD (P< 0.05)	0.16	NS	NS	NS	0.018	0.038	NS

HMF – Hydroxy methylfurfural, LA- Lactic acid; T1, T2, T3 – Mango pulp added to boiling milk, semi-solid concentrated phase and at pat formation stages respectively.

Sensory evaluation indicated superiority of Mango burfi made using pulp added at pat stage (i.e. T3), followed in decreasing order for sample T2 and T1 (overall acceptability score of 8.04, and 7.71 and 6.92 respectively). The superiority of T3 sample was due to better retention of pulp colour and flavour since the contact period of heating with mango pulp was least.

Phase II

The moisture, acidity and HMF content of burfi showed linear increase with increasing levels of mango pulp addition. Conversely, a decrease in fat, protein and sugar content was

observed with higher addition of mango pulp in burfi preparation (Table 3) such effect was found to be statistically significant; significant difference was also noticed between each burfi samples for all compositional attributes, except for HMF where T1, and T2 and T3 had values at par with each other (Table 3)

The interaction between mango pulp and sugar addition was found to be significant only for moisture and fat content of burfi.

The hardness of burfi samples decreased with increasing mango pulp addition in its manufacture; the effect was found to be significant.

Table 3: Chemical quality and hardness of burfi as affected by different levels of mango pulp and sugar

Constituents	Level of Mango pulp					Level of sugar			
	T0	T1	T2	T3	CD (P<0.05)	S1	S2	S3	CD (P<0.05)
Moisture, %	17.57	20.27	21.32	21.70	0.14	20.05	20.11	20.18	NS
Fat, %	23.44	21.22	19.67	17.78	0.57	21.00	20.42	20.17	0.50
Acidity,% LA	0.26	0.31	0.34	0.38	0.01	0.32	0.32	0.33	NS
Protein,%	11.67	10.72	10.28	9.58	0.28	10.57	10.62	10.51	NS
Lactose,%	18.36	17.73	16.49	15.33	0.26	17.16	16.96	16.80	0.23
H.M.F.(μ moles/100g)	0.43	0.45	0.48	0.49	0.03	0.46	0.47	0.46	NS
Hardness (mm)	15.22	18.83	21.94	25.33	0.62	19.50	20.20	21.29	0.53

T0, T1, T2, T3 Mango pulp addition at 0, 5,10,15% levels respectively; S1, S2, S3, sugar level of 4,5 and 6% respectively.

The sugar level addition did not show and significant effect on moisture, protein, acidity and HMF of burfi. However, as expected it did have significant influence on fat and lactose contents; both tended to decrease with increasing level of sugar added (Table3). Some workers found significant difference in protein content of burfi when sugar level was varied^{11,14}. The treatment combination of sugar-pulp levels had significant influence of burfi. The results are in agreement with those

of Date and Bhatia⁶, Rastogi *et al.*¹³, Sharma and Zariwala¹⁵, Sachdeva and Rjorhia and Bhatale and Balachandran.

Sensory characteristics of Mango burfi

The sensory evaluation of Mango burfi made using different levels of Mango pulp and sugar revealed that buffalo milk added with 15% mango pulp (T3) and 5% sugar (S2) on milk basis (w/v) yielded burfi having highest overall acceptability (Table 4) .

Table 4: Sensory quality of burfi as influenced by different levels of mango pulp and sugar combinations

Treatments	Colour and appearance*	Body and texture*	Flavour*	Overall acceptability*
T0 S1	7.05	7.17	7.16	3.92
T0 S2	6.06	6.45	7.12	3.50
T0 S3	6.64	6.82	6.93	6.14
T1 S1	7.45	7.50	7.28	6.51
T1 S2	7.27	7.49	7.34	6.43
T1 S3	7.45	7.48	7.54	6.59
T2 S1	7.61	7.33	7.59	6.57
T2 S2	7.40	7.37	7.42	6.60
T2 S3	7.33	7.53	7.50	6.62
T3 S1	7.78	7.69	7.61	6.75
T3 S2	8.20	8.39	7.03	7.11
T3 S3	7.90	7.81	7.76	6.89
Cal. Value	28.74	27.56	29.00	29.72

T1, T2, T3 - Mango pulp addition at 0,5,10 and 15% level respectively; S1, S2, S3 – Sugar addition at 4,5, and 6% levels respectively. *Sensory score based on 9-point hedonic scale.

Storage changes in Mango burfi containing turmeric powder

There was no significant difference in the moisture content of burfi during storage of up to 8 days. The interaction effect between storage period and turmeric levels on moisture,

acidity, pH, FFA and peroxide value was found to significant. The effect of turmeric powder on acidity of burfi during storage periods was found to be significant. The acidity of burfi T3 differed significantly from acidity of other samples. During storage

significant increase in acidity of burfi was observed. The acidity; of burfi at 8th day of storage was higher than fresh burfi.

The effect of turmeric additive on pH value of burfi was found to be significant. The pH Value increased with increasing levels of turmeric. During storage there was less decrease in pH experimental burfi compared to control.

There was no significant difference in FFA between samples T1, T2, and T3 During storage of experimental burfi, the FFA increased marginally indication that turmeric incorporation helped in reducing the development of FFA during storage of burfi. The peroxide value ranged from 1.60-1.73, 1.49-1.86, and 1.47-2.10 meq/kg for turmeric levels T1, T2, and T3 respectively, when stored for 8 days at room temperature. The HMF value was unaffected by storage of burfi

containing turmeric powder. The hardness of Burfi was 19.66, 20.26, 21.60 and 20.68 mm respectively for samples T0, T1, T2 and T3 respectively. The variation in hardness of burfi during storage was significant. Similar values of FFA in burfi has been reported by Hemvathy and Prabhakar¹⁰, Goyal and Srinivasan⁹ reported FFA values lower than the current findings.

Sensory score of Mango burfi during storage

The sensory score of stored Mango burfi revealed that there was a gradual decrease in all of the sensory attributes monitored with advancement in storage (Table 5) However, the burfi samples retained good sensory score till 6th day; beyond that (i.e on 8th day) the sensory score further declined but were still acceptable as against control which was not acceptable beyond 2 days.

Table 5: Sensory score* of Mango burfi containing turmeric (0.15%) during room temperature storage

Sensory attributes	Storage period (days)					Calculated value	Table value
	P0	P1	P2	P3	P4		
Colour and appearance	8.48	8.12	7.74	7.27	6.43	7.81	0.05
Body and Texture	8.68	8.29	7.82	7.33	6.73	7.81	0.05
Flavour	8.72	8.38	7.93	7.61	6.84	7.81	0.05
Overall acceptability	8.63	8.26	7.83	7.40	6.66	7.81	0.05

P0, P1, P2, P3 and P4 – Storage period of 0,2,4,6 and 8 days respectively at 30°C, * 9-point hedonic scale.

Impact of presence of turmeric on microbiological quality of Mango burfi

The presence of turmeric powder in burfi helped in restricting the growth of SPC, yeast and mold, coliform, lipolytic as well as proteolytic bacterial count (Table 6); the effect was more pronounced with increasing levels of

turmeric added. The SPC in burfi showd significant difference with regard to turmeric levels, storage period and their interaction. The antimicrobial properties of turmeric (due to curcumin) are well established. The tolerance of human to curcumin is high (i.e. 8-10 g/day).

Table 6: Microbiological quality of burfi as affected by level of turmeric powder

Microbial count (cfu/g)	Level of turmeric powder					Storage days					
	T0	T1	T2	T3	CD (P< 0.05)	P0	P1	P2	P3	P4	CD (P< 0.05)
Coliform (x10 ²)	2.84	1.76	1.08	0.76	0.37	1.05	1.20	1.60	1.90	2.30	0.41
Lipolytic (x10 ²)	2.12	1.44	0.80	0.68	0.38	0.35	1.00	1.10	1.45	2.40	0.43
Proteolytic	3.80	2.12	1.52	1.36	0.61	1.20	1.80	1.90	2.72	3.35	0.68
Y&M (x10 ³)	3.56	2.60	1.88	1.68	0.32	0.95	1.75	2.35	3.00	4.10	0.36
SPC (x10 ⁵)	13.60	10.64	5.92	5.16	1.50	4.00	8.15	9.55	10.65	11.80	1.68

T0, T1, T2, T3 – turmeric level of 0,0.1,0.15 and 0.20% respectively; P0, P1, P2, P3 and P4 – storage period of 0,2,4,6 and 8 days respectively at 30°C

Cost of Mango burfi

The raw material cost of Mango burfi (5% sugar, 15% mango pulp, 0.15% turmeric) was computed at Rs 128 per kg.

CONCLUSION

Highly acceptable Mango burfi can be prepared from buffalo milk utilizing 15% mango pulp (w/v of milk), 5% sugar (w/v of milk), and 0.15% turmeric powder (w/v of milk), incorporating them at pat formation stage of khoa making. The product is shelf stable up to 6 days at ambient storage temperature which was 3 times the shelf life of control burfi.

REFERENCES

1. BIS IS; 1479(II). Indian Standard Institution, Manak Bhavan, New Delhi, India (1961).
2. BIS IS; 3507. Indian Standard Institution, Manak Bhavan, New Delhi, India (1966).
3. BIS IS; 3503. Indian Standard Institution, Manak Bhavan, New Delhi, India (1968).
4. BIS Guide for sensory evaluation of food. Methods and Evaluation Cards (IS: 6273 Part III). Indian Standard Institution, Manak Bhavan, New Delhi, India (1983).
5. Anon. Bacteriological techniques for dairy purpose. Technical Bulletin No. 17, Her Majesty's Stationary office, London (1968).
6. Date W.B. and Bhatia D.S. Preservation of Indian milk sweet; Some preliminary studies on Shrikhandwadi and milk burfi. *Indian J. Dairy Sci.*, **8(2)**: 61-66 (1955).
7. De S. (1982). Outline of Dairy Technology, 2nd Edn., *Oxford University Press*, New Delhi, **9**: 385-399 (1982).
8. De S. and Ray S.C. The effect of abnormalities in milk supply on khoa production with a note on shelf life of khoa. *Indian J. Dairy Sci.*, **6**: 47 (1952).
9. GOI (2015-16) (source : Department of animal husbandry, dairy and fisheries ministry of GOI.) www.nddb.org/information/status/milkproductionindia
10. Goyal G.K. and Srinivasan M.R. Effect of packaging materials on the chemical quality of khoa during storage. *Indian J. Dairy Sci.*, **42(2)**: 165-170 (1998).
11. Hemavthy J. and Prabhakar J.V. changes in carbonyl composition of a milk based sweetmeat burfi during preparation and storage *J. Food Sci. Technol.*, **10(4)**: 156-160 (1973).
12. Rajorhia G.S. and Sen D.C. Problem of milk sweets trade in India. *Indian Dairyman*, **39 (6)**: 283 -287 (1987).
13. Panse V.G. and Sukhatme P.V. Statistical Method for Agriculture Worker, 2nd Edn., Indian Council of Agriculture Research, New Delhi (1967).
14. Rastogi M.K., Verma I.S. and Paul I.J. XVII Intl. Dairy Congr., E/F., pp. 273-7j8. Cited by Reddy C.R. and Rajorhia G.S. (1990) Equilibrium relative humidity of khoa based sweets (Peda and Burfi). *Asian J. Dairy Res.*, **9(4)**: 200-204 (1966).
15. Reddy C.R. and Rajorhia G.S. Technology and shelf life of Burfi. *Indian J. Dairy Sci.*, **35(4)**: 513-518 (1982).
16. Sharma U.D. and Zariwala I.T. Survey of quality of milk products in Bombay. *J. Food Sci. Technol.* **15**: 118-121 (1978).
17. Warner J.N. Dairying in India. The Allahabad Agril. Institute, Allahabad, MC Millan and Co. Ltd London, 219-223 (1951).