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Microbial studies and cost of production of chhana burfi prepared by using chocolate flavoured whey protein powder

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Abstract

Burfi, is a khoa based, popular confection in India. It is highly popular mainly because of their delicious taste and high nutritive value. For preparation of chhana burfi, attempts were made to prepare burfi by using chhana as a base material instead of khoa. Use of whey protein powder was made to enhance taste of product and nutritive value. In present study, chhana burfi was prepared using different levels of whey protein powder viz., 5, 10 and 15 per cent and represented as T₁, T₂ and T₃ respectively. Among these levels, 10 per cent level of addition was found to be acceptable. The most acceptable level of chhana burfi was analysed for microbial qualities and shelf-life studies at atmospheric and refrigerated conditions and work out the production cost of chhana burfi.

Keywords: Chhana, burfi, whey protein, chocolate

Introduction

Chhana is a popular traditional Indian dairy product acquired by heat-acid coagulation of milk with removal of whey. It is widely used as a base product for various indigenous dairy products. It is mainly used in preparation of a large number of Bengali sweets such as *rasogolla*, *sandesh*, *rasmalai*, *cham-cham*, *chhana-murki*, *rajbhog*, *pantua*, *chhana jhilli*, etc. It is popularly known as Paneer in northern part of the country.

Whey protein is the collection of globular proteins isolated from a by-product of cheese called whey, manufactured from cow or buffalo milk. The effect of whey protein on human health are of great interest. Nowadays, it is used as a dietary supplement and also in various health claims.

Chhana burfi blended with chocolate flavoured whey protein powder is a unique innovative product of with rich chocolaty taste and flavour and has soft body texture. Due to the addition of sugar the product has sweet taste.

Material and Methods

For preparation of chhana burfi incorporated with chocolate flavoured whey protein powder, buffalo milk was received from Dairy farm, College of Agriculture, Dapoli, whereas chocolate flavoured whey protein powder was of Muscle Blaze Company and sugar were purchased from the local market. The base of burfi, chhana was prepared as per the procedure given by Kadam *et al.* (2017) ^[1] and the chhana burfi was prepared as per the procedure standardized by Aneja *et al.* (2002) ^[2] with slight modifications.

The fresh good quality buffalo milk was filtered and heated at 80°C to 82°C for 10 minutes. The milk was cooled to 70°C and coagulated with citric acid (2 % solution). After coagulation, chhana was separated and the clear whey was drained by muslin cloth. Sugar was added @ 24 per cent of obtained weight of chhana. Chocolate flavoured whey protein powder was added as per treatment i.e., @ 5, 10 and 15 per cent of chhana. The mixture was properly kneaded and heated on low flame for 2-3 minutes. Spreading of mixture on greasy tray for cooling/setting (1-2 hrs). After that, cut it into pieces and stored at refrigerated temperature.

Flow diagram for preparation of chhana

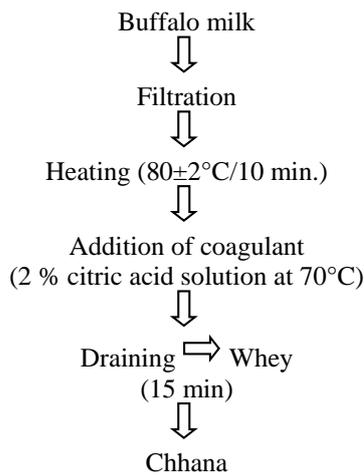


Fig 1: Flow diagram for preparation of chhana

Flow diagram for preparation of chhana burfi

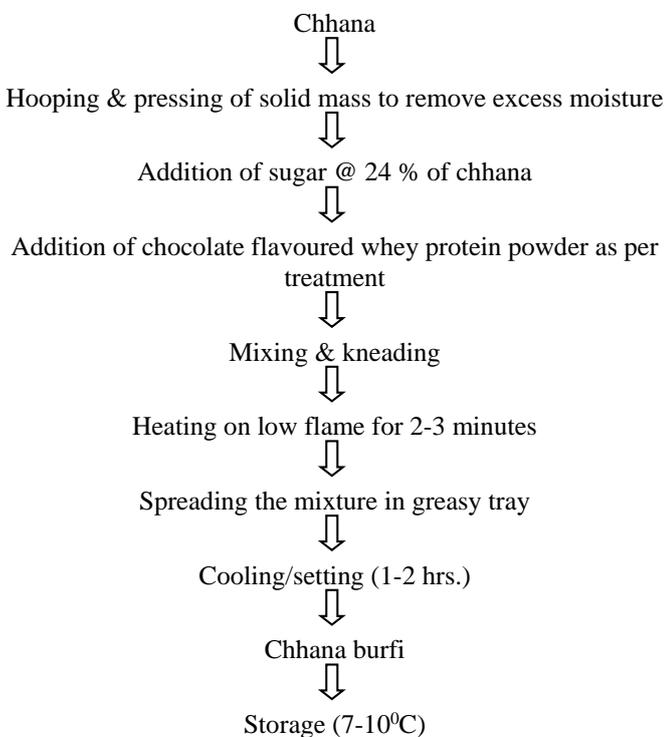


Fig 2: Flow diagram for preparation of chhana burfi

The total solids and protein content of milk and chhana burfi were determined as per IS: 1479 (part II), 1961 [6]. The fat content of milk and chhana burfi was determined by using standard Gerber method as per IS: 1224 (part I), 1977 [7]. The acidity of milk and chhana burfi was estimated according to IS: 1479 (part I), 1960 [5]. The ash content of milk and chhana

burfi was determined as per the procedure given in A.O.A.C. (1975) [1]. The lactose content of milk and chhana burfi was estimated as per IS: 1479 (II) 1961. The data were statistically analyzed according to Snedecor and Cochran (1994) [12] using randomized block design.

Results and Discussion

Microbial evaluation of chhana burfi at atmospheric and refrigerated conditions

The most optimum level found during research was subjected for shelf-life study up to 12 days under atmospheric and refrigerated (7 to 10⁰ C) conditions. The microbial parameters studied were SPC, *E. coli* count and yeast and mould count.

This most optimum level was subjected to sensory evaluation also on 0, 4, 8 and 12 days of storage.

The results pertaining to Microbial evaluation of most acceptable level chhana burfi at various time intervals are presented in Table 1.

Table 1: Microbial evaluation of most acceptable level of chhana burfi at various time intervals.

Microbial parameter	Standard Plate count (10 ⁵ cfu/ g)		Coliform count (10 ¹ cfu/ g)		Yeast & Mould count (10 ¹ cfu/g)		Overall acceptability	
	AT	RT	AT	RT	AT	RT	AT	RT
Period (days)								
D ₀	0.20	0.20	ND	ND	ND	ND	8.07	8.07
D ₄	9.85	3.60	ND	ND	0.45	ND	5.50	7.30
D ₈	--	5.90	--	ND	--	ND	--	6.85
D ₁₂	--	14.25	--	ND	--	0.60	--	4.90

All the microbial parameters under study viz. Standard plate count, and Yeast and mould count increased during storage. The gradual increase in the all parameters at various time intervals was observed. *E. coli* was absent throughout storage. The chhana burfi remains in “good” and “edible” state up to 4th day under atmospheric conditions and up to 8th day at refrigerated conditions.

In case of storage under atmospheric conditions of Dapoli (temp. min. 18 to 20⁰C, max. 28 to 32⁰C; RH 65 to 75%), it was found that burfi remains in edible conditions up to four days only. The SPC and Yeast & Mould count was not appreciably high, but atmospheric conditions affected on body & texture of product, surface became dry and cracks were observed. However, flavour was not so objectionable but there was remarkable dullness in colour.

In case of storage at refrigerated conditions, it was observed that there was sudden rise in SPC from 8th to 12th day of storage and it was almost three-fold. On 12th day yeast-mould count exceeded maximum permissible limit (i.e. 50 cfu/g) as per FSSAI (2014).

Production cost of Chhana burfi

Table 2: Cost of production of Chhana burfi incorporated with different level of chocolate flavoured whey protein powder (₹) (based on cost of ingredients only).

Ingredients	Rate (₹)						
		T ₁		T ₂		T ₃	
		Qty (g)	Cost (₹)	Qty (g)	Cost (₹)	Qty (g)	Cost (₹)
Chhana	280/- per kg	500	140.00	500	140.00	500	140.00
Whey protein powder	192/- per 100g	25	48.00	50	96.00	75	144.00
Sugar	40/- per Kg	120	4.80	120	4.80	120	4.80
Cost of Ingredients (₹)	--	--	192.80	--	240.80	--	288.80

Yield of Chhana burfi obtained (g)	--	630	--	650	--	675	--
Total cost per 100 gm (₹)	--	--	30.60	--	37.05	--	42.78
Total cost of Chhana burfi per Kg (₹)	--	--	306.00	--	370.50	--	427.80

Note: While calculating cost of chhana the cost of buffalo milk @ Rs.52/- lit, percent recovery of chhana, cost of LPG utilized and cost of Citric Acid @ Rs. 9.6 per 100 g have been taken into account.

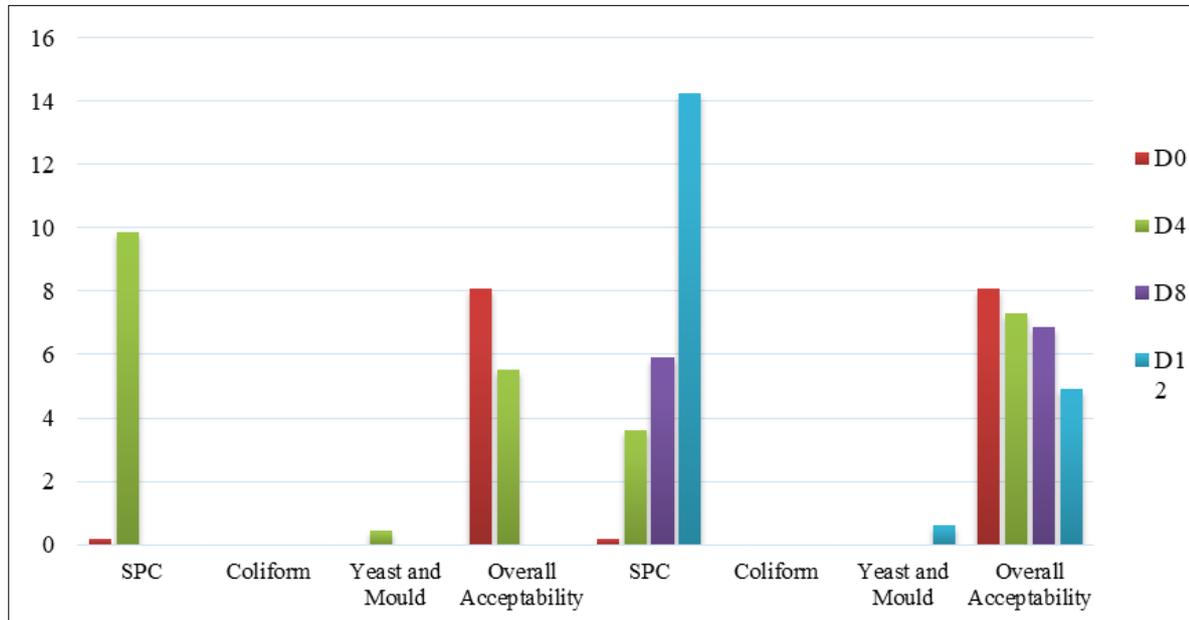


Fig 1: Microbial evaluation of most acceptable level of Chhahana burfi

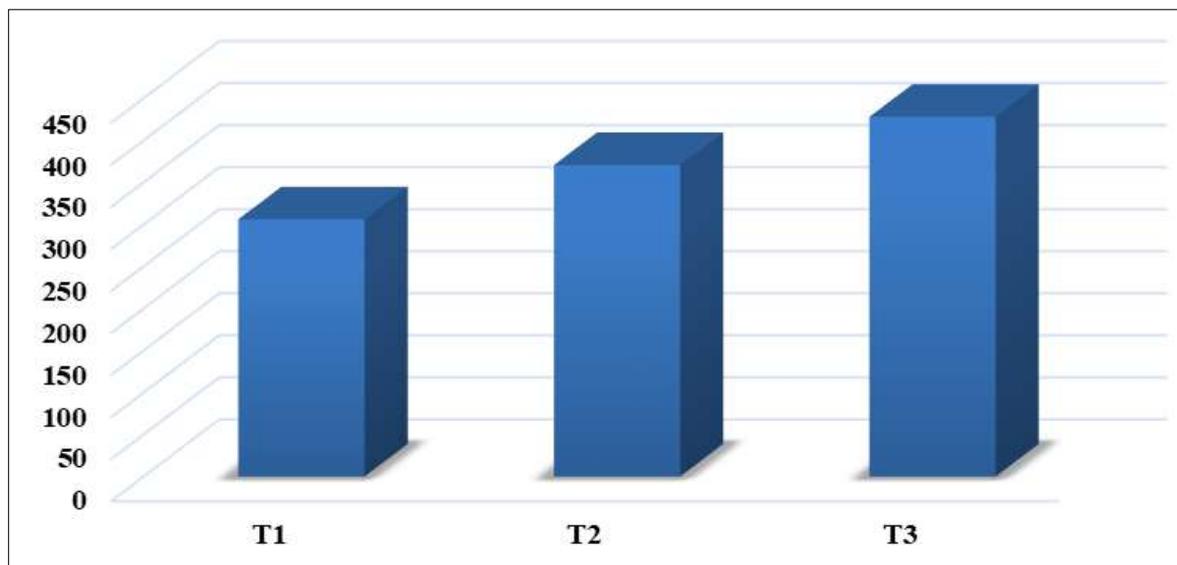


Fig 2: Cost of production of Chhahana burfi/Kg (based on cost of ingredients only)

The higher cost (Rs. 427.80 per kg) was recorded in case of Chhahana burfi prepared with 15 per cent Chocolate flavoured whey protein powder i.e. (T₃), while lowest cost (Rs.306 per kg) recorded in case of Chhahana burfi prepared with 5 per cent Chocolate flavoured whey protein powder i.e. (T₁). It was observed that the cost of Chhahana burfi was increased with the increase in the level of whey protein powder. The increase in cost was obviously due to higher rates of whey protein powder. The production cost of most acceptable level (T₂) was Rs. 370.50/- per kg.

Conclusion

From the results of the present studies, it could be concluded that chocolate flavoured whey protein powder could be successfully utilized for the manufacture of Chhahana burfi. The

studies on shelf life indicate that most acceptable level of chocolate flavoured whey protein powder chhana burfi remains in edible state up to four days at atmospheric and up to twelve days at refrigerated conditions. There was increase in cost of production as level of chocolate flavoured whey protein powder increases. The production cost of most acceptable level was found as ₹ 370.50 per kg.

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