Int.J.Curr.Microbiol.App.Sci (2018) *7*(9): 1344-1351

EXCELLENT PUBLISHERS

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 7 Number 09 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.709.160

Optimization of Technical Process for Manufacture of Peanut Powder Enriched *Burfi*

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Keywords

Central composite rotatable design, Burfi, Sugar, Peanut, Response surface methodology

Article Info

Accepted:
10 August 2018
Available Online:
10 September 2018

A B S T R A C T

In India, *burfi* is most popular *khoa* based milk sweet, white to light cream in colour with firm body and smooth to granular texture. Sugar is added in different proportion and other ingredient incorporated according to demand by consumer. Milk burfi is an Indian traditional confectionery prepared using concentrated milk and sugar. Peanut are rich in protein, oil and filaments. Levels of ingredients in burfi such as peanut powder, sugar and khoa were optimized using response surface methodology (RSM) for its physico-chemical properties basis. The best formulation was experiment no. 6 with 10 % peanut powder, 20 % sugar and 80%. This formulation was found to be most appropriate for manufacture of peanut powder enriched burfi with predicted scores of, 12.255%, 62.29%, 33.09, 23.34 and 2.45% for get maximum possible quality moisture, fat, carbohydrate, protein, and ash respectively. Due to presence of Peanut nutritional value of burfi is increased as compare to other burfi available in market it is cheap and nutritious too.

Introduction

In India, *burfi* is most popular *khoa* based milk sweet, white to light cream in colour with firm body and smooth to granular texture. Sugar is added in different proportion and other ingredient incorporated according to demand by consumer. Various forms are made with varying types of additives depending upon regional preferences. Several varieties of *burfi* are sold in market depending on the additives present viz., plain, mava, pista, nut, chocolate, coconut and rava *burfi*. A large variation can be observed in physical attributes of market samples. Good quality *burfi* however, is characterized by moderately sweet taste, soft, and greasy body and smooth texture with very fine grains. Colour, unless it is chocolate *burfi*, would be white or yellowish. burfi retains its quality for considerable long period at atmospheric temperature due to its low moisture content and higher concentration of sugar. The method of preparation also ensures the destruction of almost all microorganisms present in raw material. During preparation, handling, packaging and storage, contamination from undesirable micro-organisms is avoided.About 50–55% of milk produced is converted into a variety of Indian milk products by the traditional sector (by halwais or sweetmeat makers) using processes such as heat

desiccation, heat acid coagulation and fermentation, out of which about, 5.5% of total milk production is utilized for khoa making in India (Banerjee 1997; Bandyopadhyay *et al.,* 2006). But according to Nygaard (1996) about 7% of total milk produced in India is converted into khoa. Khoa (mawa, khoya, khawa) is a heat desiccated milk product used as a base material for a large variety of sweetmeats like *burfi*, peda, gulabjamun, etc. Cow milk usually yields 17–19% of khoa by weight. The yield of khoa from buffalo milk is reported to be 21–23% by weight (De 1980). The shelf life of khoa is short which limits its marketing (Ghatak *et al.,* 2003 and Zia-ur Rehman and Salariya 2006). Khoa is the major constituent as raw material for the preparation of *burfi*, Peda, Gulabjamun, Doda *burfi*, Malai role and certain other sweets. Traditional dairy products have great commercial significance as they account for over 90% of all dairy products consumed in the country (Aneja *et al.,* 2002). burfi is also called as Indian cheesecake, as the dessert exudes a hint of cheese and also resembles different kinds of hard cheeses, even though these sweets taste entirely different from any cheese recipes. Some of the most common varieties of burfi includes Doda burfi (Jha 2003), Kaju- burfi (Rao *et al.,* 1993), Groundnut burfi (Khan *et al.,* 2006), mango burfi (Shelke *et al.,* 2008), coconut burfi (Gupta *et al.,* 2010), bitter gourd burfi (Srivastava and Saxena 2012), and burfi with honey (Kadam 2010). Other varieties of burfi are also available like besan burfi, pista burfi, kesar burfi, rava burfi, chocolate burfi, jackfruit burfi, rice flakes burfi, tricolor burfi, apple burfi and so on. Good quality burfi, however, is characterized by moderately sweet taste, soft and slightly greasy body and smooth texture with very fine grains. High-intensity low-fat and protein enriched burfi provide consumers with many benefits, both psychologic and physiologic. Health professionals and consumers believe that low-fat and protein enriched food product are effective in weight maintenance, weight reduction, reduction of dental cavities and reduction in the risks associated with obesity. Peanuts are believed to have originated in Central American region from where they spread to other parts of the world. They are widely cultivated in India, Africa, South America, United States (D D Tom 2007), China (G. Yao 2004) and a few other countries. Peanuts often are enriched with health benefiting nutrients that are beneficial to human health. They are actually legumes but are the most frequently eaten “nut” in the United States. Studies show that peanuts, peanut butter, and peanut oil significantly reduce the risk of heart disease when consumed daily, similar to other nuts. More than 300 different varieties of peanuts are grown worldwide, which include Virginia, Valencia, Georgia runner, Tennessee red, Tennessee white and many others. They are usually consumed after roasting or boiling, and also processed into different forms such as peanut butter, candy, chocolates, cakes, and others. Peanut butter and jelly sandwiches are popular in the American culture (W H F 2007), with raw, roasted, shelled or unshelled forms of peanuts being available in United States throughout the year. Peanuts vary in color from red to brown and are usually coarse in their appearance. Raw peanuts and peanuts prepared without salt are naturally low in sodium, having 18 mg of sodium per 100 g. This equates to only 5.4 mg of salt in a 30 g serving. The nutritional importance of peanuts is due to the energy and growth supplementing constituents present in them. These include carbohydrates, lipids, proteins, vitamins, minerals, some organic acids and purines. It is estimated that as much as 30% of the population from many countries in the world are suffering from malnutrition (FAO 2000). Peanuts, which are a rich source of protein and essential amino acids, can help in preventing malnutrition (G H Pelto and M Armar-

Klemesu, 2011). Moreover, peanuts contain lipids and carbohydrates which are energy rich compounds, capable of complementing the basic energy demands of the human body. In this article the chemical composition of peanuts, all types, dry-roasted, without salt is reviewed, and their importance as a useful source of nutrition is discussed. The present experiment was undertaken to optimize production of peanut powder-based Indian dairy dessert (*burfi)* using a statistical software tool namely response surface methodology (RSM) to optimize the various parameters in the production of food products with desired quality four. The numerical process optimization was carried out by Design Expert 9.0.5 by applying response surface methodology, many solutions were obtained for the optimum covering criteria with a highest desirability of 1.0 under these circumstances, the solution contained the maximum peanut powder, sugar and khoa were in the normal range. The solution was obtained for optimized peanut enriched *burfi* condition by incorporation of 10 % peanut, 20% sugar and 80% khoa. Several workers have used response surface methodology (RSM) for optimization studies of cake formulations (Macdonald and Bly 1966).

Materials and Methods

The experimental work was performed in the research laboratory of Animal Husbandry and Dairying, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. A laboratory experiment conducted for manufacturing of *peanut* blended with khoa, and sugar as main ingredients was optimized. Peanut and sugar were procured from local market. Buffalo milk was procured from dairy farm of Banaras Hindu University. Various levels of peanut (10-20%) sugar (30-40%) & khoa (60-80 %) (Table 1) and three different temperatures (85°C, 87°C and 90°C) were used in the investigation. 20 trials generated by the Central composite rotatable design (CCRD) of Design expert, which were conducted to obtain a combination of selected parameters for production of the best quality peanut enriched *burfi*.

Preparation of peanut powder based enriched burfi

Burfi was prepared by following the traditional method of preparation (Ramna *et al.,* 1983).

Results and Discussion

Effect on moisture

The Moisture score varied from 12.50 to 12.33 (Table 2). The minimum moisture was obtained for experiment no.11 while maximum was obtained in experiment no. 1. Figure 1 shows that response surface plot for Moistureas influenced by the level of sugar and peanut, by keeping khoa constant. From the figure 1 and it can observed that there was significant effect on Moisturewith the increase in the level of sugar. These finding are agreement with Sachadeva and Rajorhia (1982) found the moisture content in burfi 12.71 to18.96 per cent.

Effect on Fat

The Fat varied from 24.38 to 30.03 (Table 2). The minimum fat was obtained for experiment no.20 while maximum was obtained in experiment no.6. Figure 2 shows the response surface plot for fat as influenced by increase in the level of khoa, sugar and peanut. From the figure, it can be observed that with the increase in the level of khoa, sugar and peanut the fat was affected by optimum level of khoa, sugar and peanut. This investigation is agreed with results obtained by Verma and De (1978) as 16.83 to 18.73, Wankhede (2005) in mango burfi.

Table.1 Independent variables used for optimization

Independent Variables	Symbol Code	Unit	Actual levels	
			Low	High
Peanut powder	A	%	10	20
Sugar	B	%	30	40
Khoa	C	%	60	80

Table.2 Experimental runs and Actual values of factors used in central composite rotatable design

Runs	Variables			Physico-chemical properties				
	Khoa	Sugar	Peanut	Moisture (%)	Fat (%)	Carbohydrate (%)	Protein (%)	Ash (%)
1	70	35	15	12.33	48.58	33.29	24.66	2.47
2	60	30	20	10.38	52.93	28.04	20.77	2.08
3	70	35	15	11.17	50.81	30.16	22.34	2.23
4	80	40	10	10.35	53.86	27.96	20.71	2.07
5	60	40	10	11.23	56.95	30.32	22.46	2.25
6	80	30	10	12.25	62.29	33.09	23.34	2.45
7	80	40	20	10.30	58.72	27.81	20.60	2.06
8	60	40	20	11.74	59.18	31.71	23.49	2.35
9	70	35	15	11.83	60.39	31.94	23.66	2.37
10	80	30	20	11.40	58.36	30.78	22.80	2.28
11	70	35	15	12.50	49.03	33.00	22.03	2.50
12	87	35	15	11.80	50.32	31.86	23.60	2.36
13	70	35	15	10.37	54.89	28.00	20.74	2.07
14	60	30	10	10.47	58.13	28.27	20.94	2.09
15	70	35	23	11.81	52.35	31.90	23.63	2.36
16	70	27	15	10.54	61.30	28.47	21.09	2.11
17	70	35	15	11.77	59.25	31.78	23.54	2.35
18	70	43	15	11.50	61.60	31.05	23.00	2.30
19	53	35	15	10.53	58.27	28.43	21.06	2.11
20	70	35	7	10.15	49.42	27.42	20.31	2.03

Fig. 1

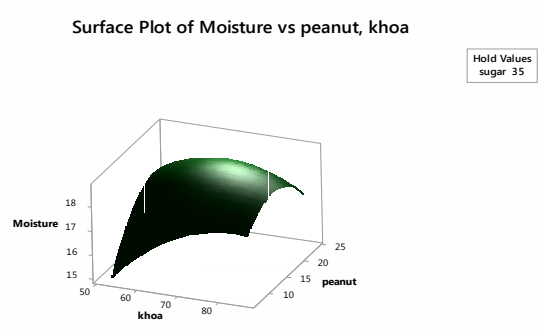


Fig. 2

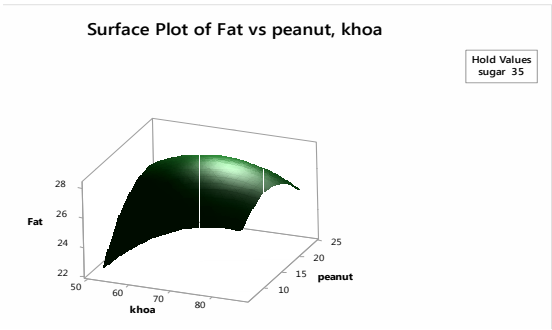


Fig. 3

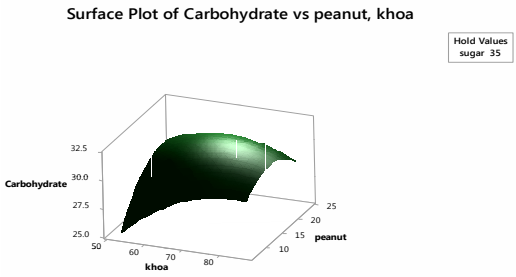


Fig. 4

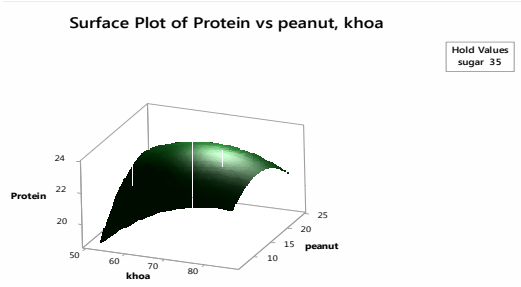
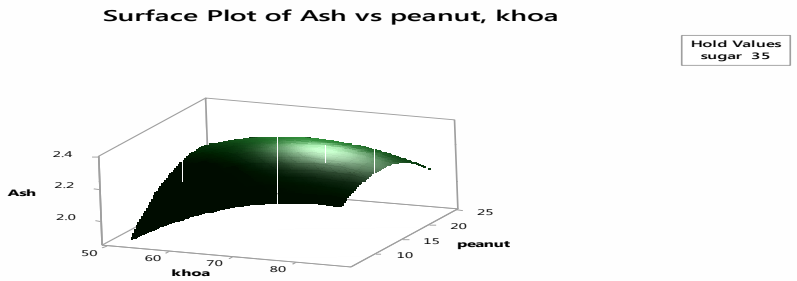


Fig. 5



Flow-chart for preparation of *peanut* enriched burfi

Receiving of buffalo milk

↓

Pre-heating (35-40°C)

↓

Filtration Standardization of milk (6 per cent fat and 9 per cent SNF)

↓

Boiling of milk with continuous stirring-cum-scrapping Pasty consistency of *khoa*

↓

Lowering of temperature upto 88-89 ^{o}C

↓

Addition of peanut and sugar (25 per cent by weight at *khoa*) as per treatment

↓

Continuous stirring with wooden *khunti* on low flame up to solid mass stage

↓

Spreading in tray and cooling

↓

Setting

↓

Cutting in to rectangular blocks

↓

Packaging in butter paper

↓

Storage at room temperature

Effect on carbohydrate

The Carbohydrate varied from 49.42 to 62.29 (Table 2). The minimum carbohydrate was obtained for experiment no. 20 while maximum was obtained in experiment no. 1. Figure 3 shows the response surface plot for carbohydrate as influenced by increase in the level of khoa and peanut.

From the figure, it can be observed that with the increase in the level of khoa, sugar and peanut the carbohydrate was affected by optimum level of khoa and peanut. Kathalkar (1995) reported the carbohydrate content of milk ber pulp burfi ranged between 51.52 to 63.14 per cent.

Effect of protein

The protein varied from 20.31 to 24.66 (Table 2). The minimum protein was obtained for experiment no.20 while maximum was obtained in experiment no. 1. Figure 4 shows the response surface plot for protein as influenced by increase in the level of khoa, sugar and peanut. From the figure, it can be observed that with the increase in the level of khoa, sugar and peanut the protein was affected by optimum level of khoa, sugar and peanut. Bankar (2011) prepared pineapple burfi and found that protein content of the product ranged between 13.29 to 15.21 per cent.

Effect on ash

The Ash varied from 2.03 to 2.50 (Table 2). The minimum ash was obtained for experiment no. 20 while maximum was obtained in experiment no. 11. Figure 5 shows the response surface plot for ash as influenced by increase in the level of khoa, sugar and peanut. From the figure, it can be observed that with the increase in the level of khoa, sugar and peanut the ash was affected by optimum level of khoa, sugar and peanut. Wakchaure (2003) recorded the ash content of sapota pulp burfi as 2.11 to 2.41 per cent.

Due to presence of Peanut nutritional value of *burfi* is increased. Hence, the formulation with 10% peanut powder, 20% sugar and 80% khoa, experiment no.6 was considered to be the most appropriate for manufacturing of peanut enriched burfi with the predicted scores of 12.25%, 62.29%, 33.09, 23.34 and 2.45% to get maximum possible qualityparameter i.e. Moisture, fat, carbohydrate, protein, andash respectively. From these results, it could be concluded that peanut powder enriched burfi can be manufactured by the dairy industry to promote value addition, export promotion and product diversification.

References

Aneja, R.P., Mathur, B.N., Chandan, R.C. and Banerjee, A.K. (2002) Technology of Indian Milk Products, New Delhi: Dairy India Publication, pp 122–125 and 150–155.

Bandyopadhyay, M., Mukherjee, R.S., Chakraborty, R. and Raychaudhuri, U. (2006) A survey on formulations and process techniques of some special Indian traditional sweets and herbal sweets, Indian Dairyman, 58, 23–35.

Banerjee, A.K. (1997) Processes for commercial production, Dairy India 5th edn. Published by PR Gupta, New Delhi, India, pp. 387.

Bankar, S.N. (2011). Preparation of pineapple *burfi*.M.Sc. (Agri.) Thesis, submitted to M.K.V., Parbhani (MS).

De, S. (1980) Outlines of dairy technology, Oxford University Press, New Delhi.

FAO, "The spectrum of Malnutrition," 2000. http://www.fao.org/worldfoodsummit/english/fsheets/mal nutrition.pdf

Ghatak, P.K., Sarkar, K., Moulick, S. and Ray, P.R. (2003) Enhancement of Shelf Life of Kalakand with Food Additives, The Indian Journal of Nutrition and Dietetics, 40, 212-217.

Gupta, V., Vijayalakshmi, N.S., Ashwini, B., Anbarasu, K., Vijayalakshmi, G., Prakash, M., Indiramma, A.R., Rangarao, G.C.P. and Ramesh, B.S. (2010) Shelf life enhancement of coconut *burfi* –an Indian traditional sweet, *Journal of Food Quality*, 33, 329–349. DOI: 10.1111/j.1745-4557.2010.00312.x

Jha, A. (2003) Development and evaluation of malted barley flour supplemented Doda burfi. M.Sc. Thesis, Bundelkhand University, Madhya Pradesh, Jhansi, India.

Kadam, V.S., Kadam, R.M., Choudhari, D.M. and Pawar, B.K. (2010) Assessment of organoleptic characteristics and cost of Production of burfi prepared by using honey as natural sweetener, Journal of Dairying, Foods and Home Sciences, 29 (3/4):180-184.

Kathalkar, V.S. (1995). Studies on preparation of milk ber pulp burfi. M.Sc. (Agri.) Thesis, submitted to M.K.V., Parbhani (MS).

Khan, A.Q. (2006). Milk and milk products an entrepreneurial approach, All India dairy business directory, pp.115-117.

Macdonald TA, Bly DA (1966) Determination of optimum levels of several emulsifiers in cake mix shortenings. Cereal Chem 43:571–584

Nygaard, H. (1996), India's Dairy Sector is expanding, Maclkeritidende, 109, 52-53.

Pelto, G. H., and M. Armar-Klemesu, (2011) "Balancing Nurturance, Cost and Time: Complementary Feeding in Accra, Ghana," Maternal & Child Nutrition, Vol. 7, No. 3, pp. 66-81

Ramanna, B.R., Bhat, K.K., Mahadevaiah, B., Dwarkanath, C.T., Dhanaraj, S., Pottery, V.H. and Sen, D.P. (1983). Investigation on large scale preparation and preservation of milk burfi. J. Food. Sci. Technol., 20:67-71.

Rao, T.S.S., Reddy, T.H. and Jayaraman, K.S. (1993) Studies on development of cashewnut burfi, Journal of Food Science and Technology, 30(6), 462-464.

Sachdeva, S. and G.S. Rajorhia (1982): Technology and self-life of burfi. *Indian J.Dairy Sci.*, 35 (4):518.

Shelke, C.Y., Baswade, S.V., Andhare, B.C., Mule, R.S. and Adangale, S.B. (2008) Economics of preparation of mango burfi, Journal of Dairying, Foods & Home Science, 27 (3/4), 196-198.

Srivastava, T. and Saxena, D.C. (2012) Optimization of total polyphenol content and antioxidant activity on preparation of novel bittergourd sweet. Engineering Science and Technology: An International Journal (ESTIJ), ISSN: 2250-3498, 2(5), 861-874.

Tom, D. D., "Earliest-Known Evidence of Peanut, Cotton and Squash Farming Found," 2007. http://www.eurekalert.org/pub_releases/2007-06/vu-eeo062507.php

Unknown, "Peanuts at the World's Healthiest Food," 2007. http://www.whfoods.com/genpage.php?tname=foodspice&dbid=101

Verma, B.B. and S. De (1978): Preparation of chocsidu burfi from ghee residues. *Indian J. Dairy Sci.* 81 (4):370.

Wakchaure, S.K. (2003). Studies on preparation of sapota pulp burfi. M.Sc. (Agri.) Thesis, submitted to M.K.V., Parbhani (MS). (www.nddb.org/statistics/milk production; html)

Wankhede, S.K. (2005): Use of mango pulp in the preparation of burfi. M.Sc. (Agri.) Thesis submitted to College of Agril.

Nagpur, Dr. PDKV., Akola (M.S.) India.

Yao, G., "Peanut Production and Utilization in the People's Republic of China," 2004. http://www.caes.uga.edu/commodities/fieldcrops/peanuts/pins/documents/ChinaProduction.pdf

Zia-urRehman and Salariya, A.M. (2006) Effect of Synthetic Antioxidants on Storage Stability of Khoa- A semi-solid concentrated milk product, Food Chemistry, 96, 122-125.

How to cite this article:

Preeti Yadav, D.C. Rai, Uday Pratap Singh and Vikas Patel. 2018. Optimization of Technical Process for Manufacture of Peanut Powder Enriched *Burfi*. *Int.J.Curr.Microbiol.App.Sci.* 7(09): 1344-1351. doi: https://doi.org/10.20546/ijcmas.2018.709.160