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Studies on preparation and effect of potato flour on chemical composition of cow milk Burfi

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Abstract
The research work on effect of different combinations of potato flour on sensory quality, proximate composition of cow milk burfi was conducted during 2017-2018 in the department of Animal Husbandry and Dairying at College of Agriculture, Nagpur. The different concentrations of potato flour were T_1 (0%), T_2 (05%), T_3 (10%), T_4 (15%) and T_5 (20%). 30 per cent constant rate sugar was mixed in a khoa for preparation of burfi. The different levels of potato flour had a definite effect on improving the sensory quality like flavour, body and texture, colour and appearance also on overall acceptability of potato flour burfi. The score regarding the quality of cow milk burfi showed that the burfi prepared by utilizing cow milk khoa with 10 per cent potato flour had secured highest score (96.25 out of 100) and ranked as most acceptable product. Thus, it is inferred that a good quality cow milk burfi with utilizing potato flour can be prepared by 90% khoa + 10% potato flour and 30 per cent sugar.

Keywords: Cow milk, potato flour, materials and methods, chemical composition

Introduction
Milk is an almost ideal food. Milk has been used as an article of food since ancient times in India. It plays an important role in the diet. It is highly nutritious food which is rich in several nutrients, calcium, potassium, vitamins and proteins. People have been using cow milk since 6000, 8000 BC and 14th century, it has gained immense popularity as one of the healthiest foods. Milk is high in protein, bone forming minerals, health giving vitamins and provides energy giving lactose and milk fat. Besides, supplying essential fatty acid. India's milk production is 18.5 per cent of world milk production and now standing in first rank. Annual output about 163.6 million tonnes during 2016-17 and per capita availability in India is 351 grams per day by 2016-2017 (Anonymous, 2017) [6]. Out of total milk production 46 per cent is utilizes as fluides milk and remaining is convert into various milk products like paneer, rabri, basundi, cheese, ghee, ice-cream, channa, butter, yoghurt, Dahi, etc. (Anonymous, 2015)[7]. Among various milk sweets burfi is the most popular and nutritious khoa based indigenous sweet, prepared either from cow or buffalo milk or a combination thereof and sugar. It contains a considerable amount of milk solids and sugar is added in different proportions in different varieties. Indigenous milk product, burfi is capable of becoming such a novelty product in the world market. The manufacture of value added products like filled dairy products could be a better alternatives. Now-a-day local producers are using orange, mango, coconut, potato, etc. in preparation of Burfi.

Potato (*Solanum tuberosum*) is one of the most important staple food crops for human consumption, together with wheat, rice and corns. Currently more quantities of potatoes are processed into value added products to fulfill the need of fast food and convenience to food industry. Potato products found highly nutritious and these can easily supplemented to eradicate malnutrition among children. Potato has good food satisfaction value and must be consumed daily nutrition (Kaur and Kochhar, 2014) [14]. The energy intake from potatoes by an individual in developed and developing countries was 130 and 41 Kcal/day, respectively. Potatoes provide significant amounts of carbohydrates, potassium and ascorbic acid in the diet (Chandrasekara and Kumar, 2016) [11]. Potato flour is used in various value added products like soup, biscuits, breads, tikki, burfi, etc. Potato contains a number of nutrients and nutritional components that may play a role in health promotion and reducing the risk of chronic disease. Keeping in view the nutritive value of both, the above research had done.

Materials and Methods

The present study was conducted on the studies on preparation of burfi blended with potato flour at Department of Animal Husbandry and Dairy Science Section, College of Agriculture, Nagpur during the year 2017-2018. The materials used and methods employed for conducting the experiments are as follows.

Materials

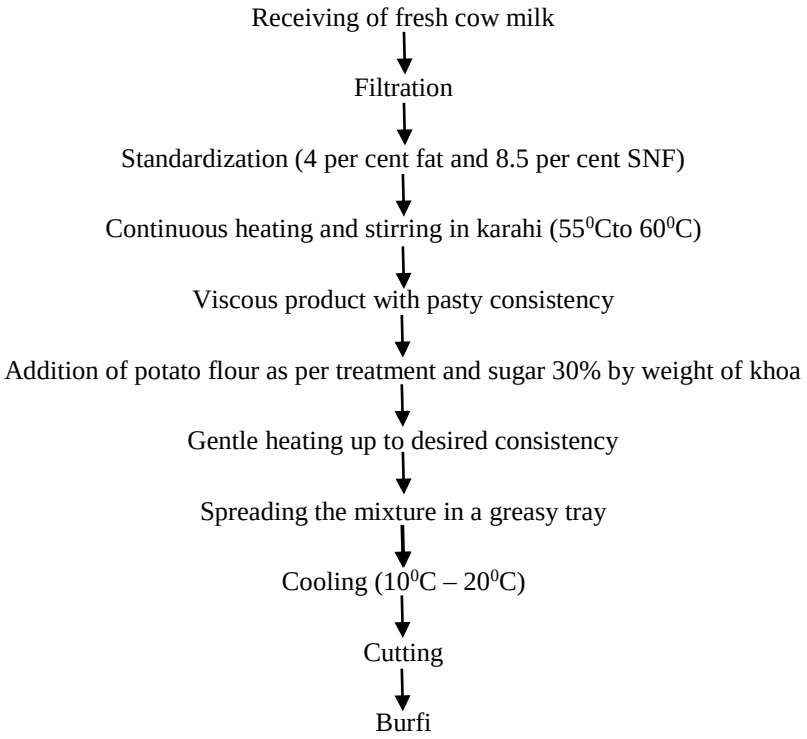
Clean, fresh and whole cow milk was taken from Animal Husbandry and Dairy Science Section, College of Agriculture, Nagpur. Bulk milk sample was obtained in stainless steel container from the morning milking and the milk was filtered through the muslin cloth to avoid dirt and extraneous matter. The milk sample was analyzed for different milk constituent's viz., fat, protein, total solids, moisture and ash. The milk was standardized at 4 per cent fat by the addition of skim milk and cream was followed for adjustment of fat. Good quality ingredients like milk, sugar and potato were purchased from local market of Nagpur. Different equipments viz., Karahi, khunti, stainless steel trays, mixture grinder, gas burner, etc were available in the department. Analytical reagent grade chemicals were used for the chemical analysis.

Methods

Treatments included different combinations like;

T_1 = 100 parts of cow milk khoa + 0 parts of potato flour i.e. (Control)
T_2 = 95 parts of cow milk khoa + 5 parts of potato flour
T_3 = 90 parts of cow milk khoa + 10 parts of potato flour
T_4 = 85 parts of cow milk khoa + 15 parts of potato flour
T_5 = 80 parts of cow milk khoa + 20 parts of potato flour

Procedure for preparation of Burfi - The cow milk was concentrated to a pasty consistency by evaporating in open pan on gentle fire. Sugar at the rate of 30 per cent was added and heated gently till pat formation. When the product started to leave the sides of karahi (within 5 to 8 min), the potato flour was added @ rate of 0 (T_1), 5 (T_2), 10 (T_3), 15 (T_4) and 20 (T_5) per cent and further heated on low flame till the product again started to leave the sides of karahi. The product taken off the flame and transferred into greasy tray and was allowed to cool and cut into a desirable size.



Flow chart for preparation of Burfi

The fat content of burfi was determined by Mojonnier fat extraction method and recorded (Anonymous, 1977) [4, 5]. Protein content was estimated by Micro-kjeldahl's method (Anonymous, 1961) [3]. Total solids was determined by gravimetric method (Anonymous, 1961) [3]. Solids not fat content was estimated by subtraction method i.e. Solids not fat = T.S. Percentage - fat percentage. Moisture content of burfi was determined by subtraction method i.e. Moisture (%) = 100-Total solids (%). Ash content estimated (Anonymous, 1967) [2]. Statistical analysis was done as per method suggested by Snedecor and Cochran (1994) [17].

Results and Discussion

The chemical composition of potato flour burfi affected by blending with different levels of potato flour is given in Table 1.

Chemical composition of burfi

Fat

The data pertaining to fat content of burfi with different levels of potato flour are presented in table 1. The mean fat percentage were 27.09, 25.74, 24.43, 23.12 and 21.81 per cent with proportion of 100:0 (T_1), 95:05 (T_2), 90:10 (T_3), 85:15 (T_4), and 80:20 (T_5) khoa to potato flour, respectively. Fat content in burfi was decreased as the proportion of potato flour in the burfi increased. This might be due to low fat content in potato flour i.e. 1.02 per 100g (Kaur and Kochhar, 2014) [14].

More or less similar results were reported by Meshram (2014) [15], who reported that with increase in air potato flour levels, there was proportionately decrease (18.92 to 16.22%) in the fat content of burfi, this might be due to low fat content in air potato.

Likewise, Tanuja *et al*. (2017) [18], reported that with increase in Apple pomace levels, there was proportionately decrease (24.65 to 17.44%) in the fat content of burfi, this might be due to low fat content in Apple pomace. Increase in pineapple pulp level, there was proportionately decreased (22.11 to 18.37%) in the fat content of burfi Bankar *et al*. (2013) [10].
These results are in line with the results of present study.

Protein

Protein content in burfi by the different levels of potato flour burfi ranged from 18.79, 18.12, 17.50, 16.86 and 16.23 per cent with proportion of 100:0 (T_1), 95:05 (T_2), 90:10 (T_3), 85:15 (T_4), and 80:20 (T_5) khoa to potato flour, respectively. It was observed that from the present study that as the level of potato flour increased, there was decreased in the protein content in the burfi. This might be due to low protein contents (6.22%) in the potato flour as compared to the protein content in khoa.
More or less similar results were reported by Karuna Datarkar (2012) [12], she reported that with the increase in the levels of singhara flour, there was proportionate decreased (16.20 to 14.17%) in the level of protein. Likewise Anurag and Chawla (2016) also reported that with the increase in the levels of bottle gourd pulp, there was proportionate decrease (18.06 to 10.47%) in the level of protein content in burfi.
These results are comparable with the results of present study.

Total Solids

Total Solids content in burfi was affected by addition of different levels of potato flour. Total Solids content in burfi by the different levels of potato flour burfi ranged from 76.69, 77.20, 77.70, 78.17 and 78.75 per cent with proportion of 100:0 (T_1), 95:05 (T_2), 90:10 (T_3), 85:15 (T_4), and 80:20 (T_5) khoa to potato flour, respectively. Significantly highest total solids were noticed in T_5 (78.75%). It is indicated that as the potato flour level increased, total solids content in burfi also increased. This was due to higher content of total solids (86.93%) in potato flour.
Karuna Datarkar (2012) [12], reported that with the increase in singhara flour level, there was proportionately increased (85.49 to 86.09%) in the total solids content of burfi. The result obtained in present study are also comparable with the results observed by Adani (2011) [1], who reported that with the increase in the levels of dried date, there was proportionate increased (77.43 to 81.03%) in the level of total solids contents in burfi.
It was noticed that total solids content of besan (Gram flour) burfi was significantly increased with the addition of besan. It was seen that as the level of gram flour increases, there was an increase in content of burfi. This might be due to higher total solids content of gram flour. Increase in gram flour level, there was proportionately increased (79.63 to 83.00%) in the total solids content of burfi Sable (2005) [16].
These findings are agreeable with the findings of present study.

Solids not fat

The data presented in table 1 indicated that the average solids not fat content of burfi with addition of potato flour proportionately increased. Solids not fat content in burfi by the different levels of potato flour burfi ranged from 49.60, 51.46, 53.24, 55.05 and 56.94 per cent with proportion of 100:0 (T_1), 95:05 (T_2), 90:10 (T_3), 85:15 (T_4) and 80:20 (T_5) khoa to potato flour, respectively. Significantly highest solids not fat were noticed in T_5 (56.94). It is indicated that the potato flour level highest level increased, solids not fat content in burfi also increased. This was due to the higher content of solids not fat in to potato flour.
The results obtained in present study were agreeable with the results reported by Meshram (2014) [15], who observed that with the increase in the level of air potato flour, there was proportionate increased (66.08 to 73.58 %) in the level of solids not fat content in burfi.
Furthermore, Bhosale (2017) [9], also reported that with the increase in bottle gourd pulp level, there was proportionately increased (65.95 to 67.35%) in the solids not fat content of burfi.

Moisture

The moisture content in burfi with different levels of potato flour ranged from 23.31, 22.80, 22.32, 21.82, and 21.25 per cent with proportion of 100:0 (T_1) 95:05 (T_2), 90:10 (T_3), 85:15 (T_4), and 80:20 (T_5) khoa to potato flour, respectively. The moisture content in burfi was significantly decreased with increase in the different levels of potato flour. This might be due to lowest moisture content of potato flour i.e. 13.07 per 100g.
More or less similar results were reported by Meshram (2014) [15], they noticed that with the increase in levels of air potato flour, there was proportionately decreased (15 to 10.20%) in the moisture content of burfi.
Likewise, Adani (2011) [1] also observed that with the increase in the levels of date paste, there was proportionately decrease (22.56 to 18.96%) in the level of moisture content in burfi.
These results are in line with the results of present study.

Ash

The data pertaining to ash content of burfi with different levels of potato flour are presented in table 1. The mean ash content percentage were 3.13, 3.11, 3.09, 3.06, and 3.03 per cent with proportion of 100:0 (T_1) 95:05 (T_2), 90:10 (T_3), 85:15 (T_4), and 80:20 (T_5) khoa to potato flour, respectively. The maximum ash (3.13%) was noticed in burfi prepared without addition of potato flour (T_1) while minimum ash (3.03%) was noticed in burfi prepared with addition of 20 parts of potato flour. The data indicated that ash decreases with increased level of potato flour added in the burfi.
The results of present study are in agreement with Meshram (2014) [15], who reported that the level of air potato flour increased the ash content of burfi decreased from 3.50 to 2.40 per cent.
Likewise, Karuna Datarkar (2012) [12] also reported that with the increase in the levels of singhara flour, there was decreased 3.70 to 3.36 per cent in ash content in burfi prepared with addition of singhara flour.
Kapila Kamble (2010) [13] while studied on preparation of pine apple pulp burfi observed the chemical composition of burfi as 3.02 to 2.50 per cent ash.

Table 1: Chemical composition of potato flour burfi

Constituents	Control T_1(100:00)	T_2 (95:05)	T_3 (90:10)	T_4 (85:15)	T_5 (80:20)	SE	CD at 5%
Fat	27.09^{a}	25.74^{b}	24.43^{c}	23.12^{d}	21.81^{e}	0.055	0.165
Protein	18.79^{a}	18.12^{b}	17.50^{c}	16.86^{d}	16.23^{e}	0.057	0.169
Total Solids	76.69^{e}	77.20^{d}	77.70^{c}	78.17^{b}	78.75^{a}	0.109	0.322
Solids not fat	49.60^{e}	51.46^{d}	53.24^{c}	55.05^{b}	56.94^{a}	0.145	0.429
Moisture	23.31^{a}	22.80^{b}	22.32^{c}	21.82^{d}	21.25^{e}	0.109	0.325
Ash	3.13^{a}	3.11^{ab}	3.09^{bc}	3.06^{cd}	3.03^{d}	0.010	0.032

Values with different superscripts differ significantly (P<0.05)

It may be inferred that the superior, nutritional and medicinal quality potato flour burfi can be prepared by addition of 10 parts of potato flour and 90 parts of cow milk khoa with 30 per cent sugar. Potato flour burfi contains 24.43 per cent fat, 17.50 per cent protein, 77.70 per cent total solids, 53.24 per cent solids not fat, 22.32 per cent moisture and 3.09 per cent ash, respectively.

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