Studies on preparation of composite dairy food-bottle gourd burfi

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ABSTRACT

Bottle gourd burfi was prepared with different proportions of bottle gourd shreds (BGS) to khoa, 10% (T1), 20% (T2), 50% (T3), 100% (T4) and 200% (T5). Sugar (@ 30% on mixture basis) and khoa (150 g) were kept constant in all the experiments. It was observed that on increasing the proportion of BGS sensory scores for color and sweetness increased, whereas scores for flavor, texture and overall acceptability decreased. Maximum scores were fetched by treatment T4 in terms of flavor (8.42), texture (8.21) and overall acceptability (8.33), and by treatment T5 in terms of color and appearance (8.10) and sweetness (8.33). Treatment T1 got lowest sensory scores for all parameters. Proximate analysis indicated that on increasing the proportion of BGS; fat, protein, titratable acidity and ash contents showed a decreasing trend. However moisture content of the product increased, treatment T5 showed maximum moisture content (30.74%).

Key words: Bottle gourd, Burfi, Composite dairy food, Fiber, Sweetmeat.

INTRODUCTION

Availability of liquid milk and preparation of milk based delicacies has been a practice from time immemorial. Out of the total milk produced, only 46 per cent is consumed as liquid milk whereas 47 per cent is converted into traditional products like desi butter, ghee, paneer, khoa, curd etc. and 7 per cent of milk goes for the production of Western milk products like milk powder, processed butter and cheese (Bankar et al 2013). As far as traditional milk products are concerned, it has been estimated that 6.5 percent of total milk produced in India is converted into khoa and other condensed milk products (Shete et al 2012). The value of khoa manufactured annually in India becomes almost double on its conversion into variety of popular indigenous khoa based sweets particularly burfi, peda, gulabjamun, kalakand etc. (Kadam et al 2010). Khoa prepared from buffalo milk can be adapted for preparing wide varieties of traditional sweets because of its appealing flavor, body and texture. Khoa bases sweets bear high commercial significance because of their popularity throughout the country and longer shelf life. In India, these milk sweets have been an indispensable part of the socio-cultural life (Kumar 2013).

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. A number of other optional ingredients can be incorporated to improve the taste as well as composition. Based on this, different types of burfi can be prepared by adding fruits, nuts, coconut, saffron, rava etc. and are available in the market; however the quality and recipe varies across the cities and shops. Burfi has a good shelf life compared to other milk sweets owing to its lower moisture content and higher total solids (Shelke et al 2008). Khoa burfi contains muscle and bone building proteins and minerals but is deficient in fiber and vitamin C. These deficiencies can be overcome by integration of khoa with cereals, vegetables and other food ingredients to form composite dairy food like carrot milk cake, dhoda burfi etc. In the present study bottle gourd (lauki) was utilized in preparation of burfi along with khoa and sugar.

Bottle gourd (Lagenaria siceraria) is one of the excellent fruits gifted by nature to human beings having a well-balanced composition of all the essential constituents that are required for good health and quality human life. It is rich in calcium, potassium and other minerals, and also contains vitamins, lipids and some amino acids (Parle and Kaur 2011). It also contains highest content of choline than any other vegetable (Rahman et al 2003). Parle and Kaur (2011) reported that bottle gourd (its fruit, juice, seeds, powder) possess anti-hyperlipidemic, analgesic, anti-inflammatory, diuretic, antioxidant, immuno-modulatory, cardio protective, anthelmintic and hepatoprotective properties. It possesses many medicinal benefits like aiding digestion, weight loss, reducing high blood pressure, constipation, hyperacidity, bleeding disorders, and is cooling and astringent in nature (Anonymous 2014).

The production of this burfi has been a practice at household level and can be rarely found over the shelves of sweet makers. Also the literature review pertaining to the

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same is insufficient, therefore quality characteristics prepared by various methods varies significantly, since standard technology is not available with respect to its preparation. Therefore study was undertaken to check the various levels of bottle gourd for its standardized preparation.

MATERIALS AND METHODS

**Preparation of khoa:** Khoa, the base material for burfi was prepared from mixed milk in a stainless steel double jacketed vat as per the method suggested by De (1980) with slight modifications. Mixed milk was filtered through muslin cloth into a stainless steel double jacketed vat and heat desiccated to khoa. The finished product was spread in stainless steel tray and kept in refrigerator.

**Shredding of bottle gourd:** Raw bottle gourd of variety (Punjab Long) was purchased from local market and thoroughly washed with clean water. The vegetable was peeled to remove outer skin and then cut into two halves with the help of sharp knife. These pieces were grated into fine shreds using a food processor (Make-Inalsa, Maxie plus Model) to get uniform sized shreds, removing objectionable thick pulp from the shreds obtained.

**Preparation of burfi:** Calculated quantity of grated bottle gourd of different levels (10, 20, 50, 100, and 200%) on khoa basis was weighed and transferred to a stainless steel karahi, kept on low fire and cooked by covering with lid for 10-20 minutes with occasional stirring. The calculated amount of sugar @ 30 per cent of mixture was added to bottle gourd and cooking was continued. Following this, calculated amount of khoa (150g in each batch) was added to the mixture. These khoa proportions on per cent basis increased in every treatment starting from 69, 64, 51, 38 and 25 per cent for treatments T1, T2, T3, T4, and T5 respectively. Finally, the mixture was heated on a low fire with stirring till the desired texture was obtained. The finished product was spread in a greased tray and allowed to cool and set. The flow diagram of the same has been shown in Fig 1.

**Treatment details:** The following proportions of bottle gourd shreds (BGS) and khoa were used.

- T1= 10% bottle gourd shreds on khoa basis + 150g khoa
- T2= 20% bottle gourd shreds on khoa basis + 150g khoa
- T3= 50% bottle gourd shreds on khoa basis + 150g khoa
- T4= 100% bottle gourd shreds on khoa basis + 150g khoa
- T5= 200% bottle gourd shreds on khoa basis + 150g khoa

**Sensory evaluation:** Male panelists (n=7) and female panelists (n=3) between the ages of 35 to 55y participated in this study and provided informed consent. Prior to sensory evaluation, sensory panel was trained. Nine-point hedonic scale was employed to carry out the evaluation of samples (Amerine et al 1965; Shone et al 1979) and total of five different attributes were generated pertaining to parameters which could fully describe the bottle gourd burfi were color, flavor, texture, sweetness and overall acceptability covering each and every parameter, completely describing the product. The nine-point hedonic scale includes various scales of grading i.e. liked extremely (9), liked very much (8), liked moderately (7), liked slightly (6), neither liked nor disliked (5), disliked slightly (4), disliked moderately (3), disliked very much (2), disliked extremely (1) (Lawless and Heymann 1998).

**Physico-chemical analysis:** Different standard procedures were adopted to analyze various physio-chemical parameters like moisture (IS: 1964), fat and sugar (IS: 1981), protein (Menefee and Overman 1940), acidity and ash (AOAC 1975).

- pH was recorded using digital pH meter (LABINDIA pH analyzer) using standard buffers of 7.0, 4.0, and 9.2 for calibration.

Microbiologically the samples were analyzed for standard plate count, yeast and mould count, and coliform count. The sample for microbial assay was drawn aseptically to obtain error free results

**RESULTS AND DISCUSSION**

**Selection of level of bottle gourd addition:** As mentioned earlier, different levels of bottle gourd were tested to choose...
the optimized level of bottle gourd to be added in burfi making. The basic ingredients of bottle gourd burfi constitute as- bottle gourd shreds, khoa and sugar, wherein bottle gourd is source of dietary fiber and other vital components to the product. Five different levels of BGS were tested in burfi making, considering minimum lowest and maximum highest ranges of bottle gourd above and below which product structural integrity in not possible and nomenclature is not valid. The different levels 10, 20, 50, 100 and 200% of bottle gourd was used for product formulation and designated as T1, T2, T3, T4 and T5, respectively.

**Sensory evaluation:** The sensory scores for various treatments have been presented in comparative form in Table 1. Bottle gourd burfi samples with 10% BGS (on khoa basis) fetched minimum overall scores and an increasing trend of sensory scores was observed with increasing levels of bottle gourd used. Increasing the proportion of BGS, beyond a certain level in the product increased the scores for all the attributes except flavor, texture and OA of the product. Maximum scores of burfi were observed in product prepared with 100% bottle gourd shreds. However, a decrease in sensory score trend was observed in flavor, texture and overall acceptability values when 200% BGS was used for product preparation. However, the scores in respect to color and appearance, and sweetness were highest in samples containing 200% BGS, 8.25 and 8.33, respectively. It was noted that increasing the proportion of BGS increased the sensory scores for flavor except for the last two treatments where reverse trend between 100 and 200% BGS was observed. This may be due to higher concentration of BGS which might have masked the flavor of dairy product used in the preparation viz khoa. However in burfi with 10% BGS lowest scores were recorded (7.67). The similar trend of decreasing flavor scores with increasing pineapple pulp and ash gourd pulp in burfi and peda were observed by Bankar et al. 2013 and Sirsat et al. 2013, respectively. As the literature pertaining to bottle gourd burfi is scanty, wherever possible the results have been compared either other sweet meats or dairy based delicacies.

Increasing the proportion of BGS till 200% also improved the texture of the product; however a minor acceptance difference was recorded between last two treatments. Samples with 100% BGS produced maximum scores (8.21), however increasing it to 200% led to little decrease in scores (8.08). This may be attributed to increase in moisture content of burfi with increasing proportion of BGS, which resulted in soft texture of the product. Similar results were reported by Srivastava and Saxena (2012) for bitter gourd burfi. This necessitates the use of in-between ratio of bottle gourd to be used for bottle gourd burfi making. Sweetness of the samples having 10% BGS scored the lowest scores (7.17) due to high content of sugar compared to the bottle gourd used. The high content of sugar also led to the gummy, hard texture product, resembling somewhat towards the candy. However, improved scores were recorded in further treatments. This could be due to the fact that higher sugar content releases more amount of water from BGS, leading to more cooking time, thus producing hard textured product. Burfi having 200% BGS fetched maximum sweetness scores (8.33) by sensory panel. The findings are concurrent with findings of ash gourd peda by Sirsat et al. 2013.

Color score of bottle gourd burfi were highest recorded in sample prepared with 200% BGS, though the variation was not remarkable among various treatments. This may be attributed to more intense green color provided by BGS inspite of artificial color addition to the product. Similarly, the overall acceptability of the product varied between 6.96 to 8.33. The similar increasing trend till 100% BGS was recorded in sensory scores. Burfi with 100% BGS samples fetched maximum scores of overall acceptability compared to 200% and the results of present study are in agreement with Kolhe (2003) and Wankhede (2005). Also, the trend of decreasing scores above 100 per cent BGS postulated the fact that a ratio lesser than 200 and above 100 per cent BGS should be tested for better results.

**Chemical composition:** The chemical composition of finished product for different treatments is shown in Table 2. The moisture content of finished product increased as the proportion of BGS increased and is attributed to more proportion of water in the bottle gourd shreds. Samples with 200% BGS had an average moisture content of 30.74%.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Sweetness (rating on 9 point Hedonic scale)</th>
<th>Flavor</th>
<th>Color &amp; appearance</th>
<th>Texture</th>
<th>Overall acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>7.17±0.30a</td>
<td>7.67±0.24</td>
<td>6.75±0.35a</td>
<td>6.25±0.44a</td>
<td>6.96±0.26a</td>
</tr>
<tr>
<td>T2</td>
<td>7.83±0.15b</td>
<td>7.83±0.15</td>
<td>7.00±0.32a</td>
<td>6.58±0.28a</td>
<td>7.31±0.10b</td>
</tr>
<tr>
<td>T3</td>
<td>8.08±0.19ab</td>
<td>8.00±0.41</td>
<td>8.00±0.18a</td>
<td>8.00±0.32a</td>
<td>8.02±0.15a</td>
</tr>
<tr>
<td>T4</td>
<td>8.25±0.24ab</td>
<td>8.42±0.28</td>
<td>8.08±0.22a</td>
<td>8.21±0.23a</td>
<td>8.33±0.10a</td>
</tr>
<tr>
<td>T5</td>
<td>8.33±0.24ab</td>
<td>8.17±0.15</td>
<td>8.25±0.16a</td>
<td>8.08±0.12a</td>
<td>8.15±0.08a</td>
</tr>
<tr>
<td>CD at 5%</td>
<td>0.45</td>
<td>NS</td>
<td>0.53</td>
<td>0.61</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Mean±SEM
Values bearing abc vary significantly (p≤0.05)
More retention of moisture content is not desirable as far as product integrity and storage issues are concerned from commercial point of view. Also such composition requires excess heat treatment for moisture removal, therefore a line of demarcation was stretched between 100% and 200% keeping in view all the desirable attributes in mind. Similarly decreasing trend was observed in percent fat content of burfi which further decreased in all the treatments. This could be because adding more proportion of bottle gourd, which lowered the fat content of burfi in the treatments of increasing order and is also due to reduced proportion of khoa in the final product comparing with all treatments. Also it can be noted down that bottle gourd is not a good source of fat content and contains 0.02 % fat in it, therefore samples having 10% BGS showed maximum fat content (20.46%). However, richness of product could be sensed, even in the samples where maximum bottle gourd had been used (15.08%). Similar results were recorded in ash gourd peda by Sirsat et al 2013. A decreasing trend in protein content has also been observed with increasing proportion of bottle gourd shreds. Similar findings were recorded by Bankar et al 2013.

The titratable acidity and ash content showed decreasing trend with increasing proportion of bottle gourd shreds. Burfi with 10% BGS showed highest values of 2.69 and 0.95 for ash content and titratable acidity respectively, which decreased with increasing proportion of bottle gourd used. The decreasing trend may be due to buffering action of minerals present in vegetables. The similar findings of decreased acidity are concurrent with the findings of Gupta et al 2010.

**Microbiological quality:** The product was microbiologically acceptable having in range standard plate count (SPC), yeast and mould count (YMC), and coliform count (shown in Table 3.). It was observed that SPC ranged in between 1.51 to 1.66 x 10³ log cfu per gram for treatment T1 and T5 respectively. As the proportion of BGS increased, the SPC count increased. The results are in agreement with study on ash gourd peda by Sirsat et al 2013. The YMC ranged between 0.67 to 0.92 log cfu per gram for treatment between T1 and T5, respectively. This increase in count may be attributed to increase in moisture of the product with increase in level of BGS. The coliform count was nil in all the treatments indicating hygienic conditions of preparation.

**CONCLUSION**

It can be concluded that optimum product will lie somewhere in between 100 and 200% proportion of BGS. Increasing the proportion of BGS to 200% led to decrease in scores for some parameters which necessitates the use of in between ratio of BGS to be used for bottle gourd burfi making. A line a demarcation can be stretched between 100% and 200% keeping in view all the desirable attributes in mind. Therefore study was extended with optimizing the proportion of BGS to khoa and a narrow range of sugar using response surface methodology.

**REFERENCES**


