ABSTRACT

Burfi, prepared from partially dehydrated, heat desiccated whole milk (khoa) is a delicious sweet confectionery of Indian subcontinent. It is blended with varieties of nutritionally rich pulses and fruits to enhance its taste and aroma. This paper depicts preparation of herbal burfi, with blending of wood apple (L. acidissima) pulp, which is used as a folk remedy against many diseases, particularly gastric ailments in India. The pulp of ripe wood apple (WA), procured from the local market was blended with buffalo milk khoa at 5%, 10%, and 15% concentrations. Burfi prepared without adding wood apple pulp served as the control. The proximate composition, sensory characteristics and cost structure of different combinations of the product were compared against normal burfi prepared from buffalo milk. The study revealed that wood apple burfi had significantly (P≤0.05) higher moisture (%), total sugar (%), and acidity (%), but lower (P≤0.05) fat (%), protein (%), ash (%), and total solids (%) than the control. The fat (%), protein (%), ash (%), and total solids of WA burfi significantly (P≤0.05) declined, while moisture (%), sugar (%) and acidity (%) increased (P≤0.05) with the increase in the concentration of wood apple pulp in the product. The sensory scores of 10% wood apple burfi were significantly (P≤0.05) higher than ordinary burfi (control) in respect of texture, flavour, and overall acceptability. It was better (P≤0.05) than 5% WA burfi with respect to texture, and was better (P≤0.05) than 15% WA burfi with respect to all sensory parameters, viz., colour, texture, flavour and overall acceptability. The production cost of 10% WA burfi, was Rs. 121.72/ kg which was higher than the normal burfi by a margin of Rs. 1.51/ kg. The study tends to conclude that 10% wood apple burfi could be projected as an herbal confectionery for persons with gastric ailments like peptic ulcer and/or renal calculi.

KEY WORDS

Buffalo milk, Proximate analysis, Sensory quality, Wood apple burfi
INTRODUCTION

Burfi, prepared from partially dehydrated, heat desiccated whole milk (khoa) is a delicious sweet confectionery of Indian subcontinent (Image-1). There are many varieties of burfi, depending on the ingredients mixed with it, viz., besan burfi (made with gram flour), kaaju barfi (made with cashew nuts), and pista burfi (made with pistachio) etc., and fruits/ spices added to it, viz., mango burfi, coconut burfi, and cardamom burfi etc. However, herbal burfi prepared by adding fruits with medicinal values have not been tried so far.

MATERIALS AND METHODS

Extraction of wood apple pulp: Wood apple fruits, purchased from the local market were washed and cleaned, and the pulp was extracted manually. It was homogenized in a deluxe pulper machine to obtain fine pulp.

Preparation of wood apple burfi: Wood apple burfi was prepared as per the procedure laid down by Sachdeva and Rajorhia (1982), the detail sequences of which have been provided in the flow chart.

Buffalo milk was procured, filtered through muslin cloth, and standardized to 6% fat and 9% SNF. The milk was heated in a pan for conversion to khoa. Khoa was fortified with 40% (w/w) sugar, and wood apple pulp at different concentrations, viz., 5%, 10%, and 15% (w/w) of khoa. The mixture was heated on low fire with stirring till the desired texture was obtained. The mixture was spread in an aluminum tray and allowed to cool and settle. After setting, the mass was cut into rectangular blocks of 3 x 3 cm size. Wood apple burfi was obtained as the final product.

This paper depicts preparation of herbal burfi by adding the pulp of Indian wood-apple (Limonia acidissima), colloquially known as kapitha (Sanskrit) and kaitha (Hindi) in India (Image-2). It is nutritious, digestive, and confers immense medicinal benefits in the treatment of stomach ulcers and kidney stones (Jayakumar and Geetha, 2012).
PREPARATION OF WOOD APPLE BURFI
[FLOW CHART]

Procurement & filtration of buffalo milk
Standardization of milk (Fat-6%, SNF-9%)
Pan-heating of milk to obtain khoa
Addition of sugar
Addition of wood apple pulp
Heating till solidification
Cooling & Setting
Cutting to desirable shape
Final Product

Treatment details

T<sub>1</sub>: Burfi without wood apple pulp (Control)

T<sub>2</sub>: Burfi with wood apple pulp @5% by weight of khoa

T<sub>3</sub>: Burfi with wood apple pulp @10% by weight of khoa

T<sub>4</sub>: Burfi with wood apple pulp @15% by weight of khoa

Proximate composition: The proximate composition of the finished products were evaluated on five samples from each of the treatments with respect to moisture (IS, 1964), fat (Gerber’s method, IS 1977), protein (Kjeldahl’s method, Menefee and Overman, 1940), total sugar (lane-eynon volumetric method, IS 1981), ash (lane-eynon volumetric method, IS 1981), and acidity (IS, 1981).

Sensory evaluation: Sensory evaluation was done by an expert panel of five judges. The sensory properties, such as, colour & appearance, flavour, body & texture, and overall acceptability of the finished product were evaluated on the basis of 9 point hedonic scale (Gupta, 1976).

Statistical method: The data were analyzed statistically by using completely randomized design (CRD) as per Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The proximate composition, sensory characteristics, and cost structure of wood apple burfi (Image-3) are given below.

Proximate composition: The proximate composition of wood apple burfi revealed that it had significantly (P≤0.05) higher moisture(%), total sugar (%), and acidity (%), but lower (P≤0.05) fat (%), protein (%), ash (%), and total solids (%) than the control (Table-1, Image 4).

Comparison between the treatment groups indicated that fat (%), protein (%), ash (%), and TS (%) significantly (P≤0.05) declined, while moisture (%), sugar (%), and acidity (%) increased (P≤0.05) with the increase in
the concentration of wood apple pulp in the product.

Increase in moisture content of wood apple burfi is attributed to addition of wood apple pulp, which has increased moisture content (Jayakumar and Geetha, 2012) than buffalo milk khoa (Patel and Shah, 2009).

There was consistent decrease in fat%, protein%, and ash% with the increase in the content of wood apple pulp due to the presence of these elements in lower proportion in wood apple pulp (Jayakumar and Geetha, 2012) compared to buffalo milk khoa (Patel and Shah, 2009).

The chemical parameters of wood apple burfi obtained in our study agreed with the findings of Wakchaure (1998), Kolhe (2003), Matkar (2006), Galande (2007), and Bankar et al. (2013).

**Table-1. Proximate composition (%) of wood apple (WA) burfi.**

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Control</th>
<th>5% WA</th>
<th>10% WA</th>
<th>15% WA</th>
<th>SE</th>
<th>CD at 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>16.96&lt;sup&gt;a&lt;/sup&gt;</td>
<td>18.10&lt;sup&gt;c&lt;/sup&gt;</td>
<td>19.17&lt;sup&gt;b&lt;/sup&gt;</td>
<td>20.30&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.06</td>
<td>0.18</td>
</tr>
<tr>
<td>Fat</td>
<td>20.41&lt;sup&gt;a&lt;/sup&gt;</td>
<td>19.34&lt;sup&gt;b&lt;/sup&gt;</td>
<td>18.10&lt;sup&gt;c&lt;/sup&gt;</td>
<td>17.03&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.06</td>
<td>0.18</td>
</tr>
<tr>
<td>Protein</td>
<td>14.88&lt;sup&gt;a&lt;/sup&gt;</td>
<td>14.37&lt;sup&gt;b&lt;/sup&gt;</td>
<td>13.52&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.67&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.07</td>
<td>0.22</td>
</tr>
<tr>
<td>Ash</td>
<td>2.98&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.82&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.69&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2.56&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.01</td>
<td>0.05</td>
</tr>
<tr>
<td>Total solids</td>
<td>83.04&lt;sup&gt;a&lt;/sup&gt;</td>
<td>81.90&lt;sup&gt;b&lt;/sup&gt;</td>
<td>80.83&lt;sup&gt;c&lt;/sup&gt;</td>
<td>79.70&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.06</td>
<td>0.18</td>
</tr>
<tr>
<td>Total Sugar</td>
<td>44.77&lt;sup&gt;d&lt;/sup&gt;</td>
<td>45.37&lt;sup&gt;c&lt;/sup&gt;</td>
<td>46.52&lt;sup&gt;b&lt;/sup&gt;</td>
<td>47.44&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.06</td>
<td>0.18</td>
</tr>
<tr>
<td>Acidity</td>
<td>0.31&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.40&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.51&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.01</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Note: Means bearing different superscripts in a row differ significantly at P≤0.05.
Sensory evaluation: The sensory scores of wood apple burfi (Table-2) revealed that 10% WA burfi was significantly (P≤0.05) better than ordinary burfi in respect of texture (8.37), flavor (8.37), and overall acceptability (8.45). It was better (P≤0.05) than 5% WA burfi with respect to texture, and was better (P≤0.05) than 15% WA burfi with respect to colour, texture, flavour, and overall acceptability (Image-5). The results of our study are in agreement with the findings of Gargade (2004), Matkar (2006), and Galande (2007). The acceptability of 15% WA burfi (6.77) was significantly (P≤0.05) lower than the normal and other combinations of WA burfi.

Table-2. Sensory characteristics scores of wood apple (WA) burfi.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Control</th>
<th>5% WA</th>
<th>10% WA</th>
<th>15% WA</th>
<th>SE</th>
<th>CD at 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>8.45a</td>
<td>7.90b</td>
<td>7.20c</td>
<td>6.44d</td>
<td>0.16</td>
<td>0.50</td>
</tr>
<tr>
<td>Texture</td>
<td>7.62a</td>
<td>7.62b</td>
<td>8.37a</td>
<td>6.75c</td>
<td>0.20</td>
<td>0.62</td>
</tr>
<tr>
<td>Flavour</td>
<td>7.37a</td>
<td>7.82ab</td>
<td>8.37a</td>
<td>6.62c</td>
<td>0.18</td>
<td>0.56</td>
</tr>
<tr>
<td>Acceptability</td>
<td>7.75a</td>
<td>8.01ab</td>
<td>8.45a</td>
<td>6.77c</td>
<td>0.16</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Note: Means bearing different superscripts in a row differ significantly at P≤0.05.
Table-3. Cost structure of wood apple (WA) burfi.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Particulars</th>
<th>Rate (Rs)</th>
<th>0% WA</th>
<th>5% WA</th>
<th>10% WA</th>
<th>15% WA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Buffalo milk-cost</td>
<td>20.00/lit</td>
<td>57.20</td>
<td>55.40</td>
<td>53.60</td>
<td>51.60</td>
</tr>
<tr>
<td>2</td>
<td>Buffalo milk-amount</td>
<td>---</td>
<td>2.86 l</td>
<td>2.77 l</td>
<td>2.68 l</td>
<td>2.58 l</td>
</tr>
<tr>
<td>3</td>
<td>Sugar-cost</td>
<td>35.00/kg</td>
<td>10.01</td>
<td>9.66</td>
<td>9.38</td>
<td>9.03</td>
</tr>
<tr>
<td>4</td>
<td>Sugar-amount</td>
<td>---</td>
<td>286 g</td>
<td>276 g</td>
<td>268 g</td>
<td>258 g</td>
</tr>
<tr>
<td>5</td>
<td>Wood apple-cost</td>
<td>60.00/kg</td>
<td>---</td>
<td>2.96</td>
<td>5.74</td>
<td>8.28</td>
</tr>
<tr>
<td>6</td>
<td>Wood apple-amount</td>
<td>---</td>
<td>---</td>
<td>34.6 g</td>
<td>67 g</td>
<td>96.75 g</td>
</tr>
<tr>
<td>7</td>
<td>Miscellaneous cost</td>
<td>---</td>
<td>---</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
</tr>
<tr>
<td>8</td>
<td>Fuel charge</td>
<td>---</td>
<td>---</td>
<td>18.00</td>
<td>18.00</td>
<td>18.00</td>
</tr>
<tr>
<td>9</td>
<td>Labour charge</td>
<td>100/lit</td>
<td>25 (2)h</td>
<td>25 (2)h</td>
<td>25 (2)h</td>
<td>25 (2)h</td>
</tr>
<tr>
<td>10</td>
<td>Total cost</td>
<td>---</td>
<td>120.21</td>
<td>121.02</td>
<td>121.72</td>
<td>121.91</td>
</tr>
</tbody>
</table>

Note: Miscellaneous items include cost of parchment paper and depreciation @ 10% of cost of utensils etc.

**Cost structure:** The production cost of 10% WA burfi, which had significantly (P<0.05) higher acceptability score than the normal and other combinations of WA burfi was Rs. 121.72/kg. It was costlier than normal burfi by Rs. 1.51/kg.

**CONCLUSION**

Our study revealed that Indian customers would prefer 10% wood apple burfi over the normal burfi, and other combinations of wood apple burfi.

**ACKNOWLEDGEMENT**

The authors are thankful to the Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra for providing laboratory facilities for this research work.

**REFERENCES**


HOMAGE

(Julius) Lothar Meyer was a German chemist, who had discovered the Periodic Law, independently of Dmitry Mendeleev, at about the same time (1869) was born on 19 August 1830. He examined the effect of carbon monoxide on blood, and compared atomic volume to atomic weight. He also established the concept of valency by indicating that a given element combined with a characteristic number of hydrogen atoms, and coined the terms like univalent, bivalent, and trivalent, based on that number. Animal Science Reporter pays its humble homage to this ingenious scientist on his birth day.

(Courtesy: todayinsci.com)