Development and quality evaluation of beverages from Bottle Gourd, Lagenaria siceraria (Mol.) Standl.

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Cucurbitaceae family is a major source of medicinal agents since ancient times. Various plant parts including fruits of this family have been established for their pharmacological potential. Lagenaria siceraria (Mol.) Standl. (Family-Cucurbitaceae) commonly known as Lauki (Hindi) and Bottle gourd (English) is a medicinal plant. It is used as medicine in India, China, European countries, Brazil, etc. for its cardiotonic, general tonic and diuretic properties. The vegetable has been widely used by the cardiac patients; this property may be correlated with the presence of radical scavenging activity. The juice of bottle gourd was determined for antioxidant activity by 1, 1-Diphenyl-2 picrylhydrazl (DPPH) assay and found high in the antioxidant activity (91%). However, vegetable juices are not consumed as such but this nutritive vegetable juice was utilized after blending with lemon juice and basil leaf extract to adjust the acidity and increase the palatability. After standardization of the ratio, this blend was used for the formulation of health nectars using honey as sweetener. Honey also being rich in nutrients and medicinal properties enhanced the health benefits of the nectar.

Keywords: Bottle gourd, Lagenaria siceraria, Juice, Nectar, Honey.

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Introduction

Lagenaria siceraria (Mol.) Standl. (Family-Cucurbitaceae) commonly known as Bottle gourd is considered to be indigenous to various regions of India. Bottle gourd is used as a vegetable and is a good source of vitamin C¹. Traditionally, it is used as vermifuge, purgative, diuretic and as an anti-inflammatory agent² and is also recommended for increasing the lactation in lactating mothers. It is reported to possess antithioperoxidative

and antiulcer activities¹, ³. Fresh juice of its fruit along with juice of fresh leaves of Ocimum sanctum L., Mentha arvensis L., Piper nigrum L. and rock salt is recommended to the patients of coronary atherosclerosis⁴. Keeping in view the health benefits of fresh juice of bottle gourd, a blend was formulated which had the medicinal properties of basil (O. sanctum) which is known to have digestive, diuretic, expectorant, stomachic and useful in asthma, bronchitis, catarrhal fever, hiccough, vomiting, ringworm and other skin diseases⁵ and lemon juice as it contains high vitamin C content. Bottle gourd-basil-lemon juice is a good source of vitamins and antioxidants providing health benefit to consumers. The best adjusted blend was utilized for the development of sugar and honey based nectars.

Materials and Methods

Bottle gourd was purchased from the local market of Solan (Himachal Pradesh). The honey was procured from the Department of Entomology where as basil leaves were collected from Herbal Garden, Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.). Other ingredients, like sugar, lemon were procured from the local market of Nauni, Solan (Himachal Pradesh).

The fruits of bottle gourd were washed, de-skinned, cut into pieces and extracted the juice by mechanical juice extractor. Basil leaves were separated from stalk, cleaned, cut into small pieces, blanched in boiling water for 2 min. and the juice was extracted by mechanical juice extractor. Lemon juice was extracted following the standard method. These juices were analyzed for their quality characteristics. Ingredients composition of the juice blends was optimized by keeping the quantity of bottle gourd juice constant and varying the amount of basil leaves extract and lemon juice (Tables 1 & 2).

After adjusting the acidity and evaluating the blends by sensory scoring for taste and colour (Figs 1 & 2), the nectars were prepared according to the specification of FSSAI, 2006. However, the sugar and honey based nectar were prepared from the best adjudged blend. All the fresh and processed products were analyzed for different quality characteristics.
Physico-chemical analysis

Different biochemical parameters were analysed with standard methods. Total acidity was determined by titration with N/10 Sodium Hydroxide solution and expressed as citric acid. Total soluble solids were determined by refractometer ATAGO (0-32 Brix). Total and reducing sugars were determined according to Nelson Somagi method and Lane and Eynon method as given by Ranganna. Phenol content was determined by Sadasivam, vitamin C was determined by titration method using 2, 6 dichlophenol indophenol dye.

Antioxidant activity (Free radical scavenging activity) was measured as per the method of Brand-Williams et al. DPPH (2, 2-diphenyl-1-picrylhydrazyl) was used as a source of free radical. A quantity of 3.9 mL of 6 × 10⁻⁵ mol/L DPPH in methanol was put into a cuvette with 0.1 mL of sample extract and the decrease in absorbance was measured at 515 nm for 30 min or until the absorbance become steady. Methanol was used as blank. The antioxidant activity was calculated using the following equation:

\[
\text{Antioxidant activity (\%) = } \frac{\text{Ab}_{(B)} - \text{Ab}_{(S)}}{\text{Ab}_{(B)}} \times 100
\]

Where, \( \text{Ab}_{(B)} \) = Absorbance of blank; \( \text{Ab}_{(S)} \) = Absorbance of sample

Sensory analysis

Samples were evaluated by a panel of 9 members for colour, flavour, taste and overall acceptability of the blends. The tests were performed using 9-point hedonic scale, where 9 were like extremely and 1 was dislike extremely.

Result and Discussion

The fresh juices of bottle gourd, basil leaves and lemon juice were evaluated for different quality parameters (Table 1). The total soluble solid content of bottle gourd, basil leaves extract and lemon juice was 4.2, 0.2 and 7.4%, respectively. However, the phenolic content of basil leaves (7 mg/mL) was significantly higher than bottle gourd (6.5 mg/mL) and lemon juice (3 mg/mL) (Fig. 3). The higher amount of phenols results in higher antioxidant activity. The bottle gourd juice had high antioxidant activity (91%) which was similar to the results of
Despande et al.\textsuperscript{10}, followed by basil leaves extract (85\%) (Fig. 4). DPPH radical scavenging ability is widely used as an index to evaluate the antioxidant potential, it is stable, free radical method and a sensitive way to determine the antioxidant activity of plant extract (\textit{O. sanctum})\textsuperscript{11}.

The juices of bottle gourd, basil leaves and lemon juice were blended in different ratios and analyzed for their acid content as well as sensory quality. However, treatment T\textsubscript{3} (bottle gourd, basil leaves and lemon juice in the ratio of 50:25:5) was adjudged best by the panelist on the basis of colour and taste. The antioxidant rich blend was further made nutritive as well as palatable by utilizing it for the preparation of honey based nectar (Fig. 5, Flow chart).

The blends as well as the nectar were analyzed for physico-chemical characteristics (Table 3). However, the antioxidant activity was highest in treatment T\textsubscript{3} (84.84\%) followed by honey based nectar (61.54\%) and sugar based nectar (58.24\%), the higher radical scavenging ability of the blend T\textsubscript{3} was due to the presence of high antioxidants in bottle gourd juice\textsuperscript{10} and basil leaves\textsuperscript{12} (Fig. 4). There was a significant difference in the non-reducing sugars content of honey based (3.18\%) and sugar based (6.5\%) nectars. The lower non-reducing sugars in honey based nectar leads to lower glycemic index\textsuperscript{13} and this might be due to the composition of honey. These health nectars were successfully stored for a period of six months.
Conclusion

The blend selected is a rich source of antioxidants and phenols. Therefore, the blend can be successfully utilized for the preparation of ready-to-serve nectars and other value added products. The honey based nectars further enhanced its medicinal properties. The product being thirst quenching also satisfies the consumer’s demand for nutritious health food.

References


Table 3—Physico-chemical characteristics of blend (T3), sugar and honey based nectar

<table>
<thead>
<tr>
<th>Sample</th>
<th>TSS (°B)</th>
<th>Total sugar (%)</th>
<th>Reducing sugar (%)</th>
<th>Non-Reducing sugar (%)</th>
<th>Ascorbic acid mg/mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blend (T3)</td>
<td>3</td>
<td>4.33</td>
<td>2.25</td>
<td>1.97</td>
<td>10</td>
</tr>
<tr>
<td>Honey based nectar</td>
<td>17</td>
<td>15.85</td>
<td>12.5</td>
<td>3.18</td>
<td>12</td>
</tr>
<tr>
<td>Sugar based nectar</td>
<td>17</td>
<td>16.3</td>
<td>9.45</td>
<td>6.51</td>
<td>10</td>
</tr>
</tbody>
</table>

Fig. 5 – Flow chart for the preparation of honey and sugar based nectars