IMPACT OF HERBS ON NUTRITIONAL AND ORGANOLEPTIC ATTRIBUTES OF NECTAR DEVELOPED USING BOTTLE GOURD (LAGENARIA SICERARIA)

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Nectar is a refreshing beverage consisting of 15°B TSS, at least 20% juice and not more than 1.5% acidity. Nectar is a ready-to-drink type of product which is prepared via pulp or juice of fruits, vegetables or both along with water and sugar. Present study was undertaken to evaluate various nutritive and organoleptic qualities of bottle gourd based herbal nectar, during 90 days of storage under ambient condition. Nine treatments were prepared by blending different percent of bottle gourd (100-75%), mint (5-20%), basil (5-20%) and lemon juice (5%). Nutritional value of nectar mostly showed positive inclination with the incorporation of mint and basil, at preparation day. Among treatments, T7 (85:10:5:: Bottle gourd: Basil: Lemon juice) was adjudged as superior on the basis of flavour, taste and consistency. Thus, organoleptic evaluation revealed that nectar blended with 10% basil: 5% lemon juice along with 85% bottle gourd was most acceptable.

Key words : Nectar, Bottle gourd, Mint, Basil, Lemon.

ABSTRACT

Nectar is a refreshing beverage consisting of 15°B TSS, at least 20% juice and not more than 1.5% acidity. Nectar is a ready-to-drink type of product which is prepared via pulp or juice of fruits, vegetables or both along with water and sugar. Present study was undertaken to evaluate various nutritive and organoleptic qualities of bottle gourd based herbal nectar, during 90 days of storage under ambient condition. Nine treatments were prepared by blending different percent of bottle gourd (100-75%), mint (5-20%), basil (5-20%) and lemon juice (5%). Nutritional value of nectar mostly showed positive inclination with the incorporation of mint and basil, at preparation day. Among treatments, T7 (85:10:5:: Bottle gourd: Basil: Lemon juice) was adjudged as superior on the basis of flavour, taste and consistency. Thus, organoleptic evaluation revealed that nectar blended with 10% basil: 5% lemon juice along with 85% bottle gourd was most acceptable.

Key words : Nectar, Bottle gourd, Mint, Basil, Lemon.

Introduction

One of the most popular cucurbitaceous crops of India that could be cultivated in various tropical and subtropical regions of the globe is Lagenaria siceraria which is commonly known as bottle gourd. It is a large sized fruit which consist of many seeds per fruit. Bottle gourd possess good bearing habits, low cultivation cost and has utility as a cooked vegetable (Koffi et al., 2009). It is utilized for preparation of sweets, rayata, pickles etc. Different parts of bottle gourd plant consist of several medicinal properties (Jain et al., 2018).

Mentha piperta is a common herbal plant that is cultivated in Europe and North America. Mint is used in both Eastern and Western traditions and is also considered as world’s ancient medicinal herb. Herbs are commonly used for cooking purpose and in medicines by Ancient Greek, Roman and Egyptian cultures. Peppermint is considered important for treatment of non-obstructive dyspepsia without any known side effects. Mint is considered as a good analgesic to be applied topically and is also utilized as coolant for the skin (Balakrishnan, 2015).

“Ocimum” is a generic name which originated from a Greek word “Okimon”, which means smell. Ocimum sanctum (basil) is an aromatic herb, which is widely branched and erect, having a height of about 75 cms (Tucker and De Baggio, 2000). Basil is a herb belonging to Lamiaceae family. It is an essential ingredient in numerous cooking traditions and practices. Basil is both morphologically and chemically variable and these variations are strongly influenced by ecological factors. O. sanctum possesses numerous properties for instance, antibacterial, antiviral and antifungal and is also useful in treating copious systemic diseases as well as localized infections. A decrease in blood and urinary uric acid level has been reported in albino rabbits because of the intake
Materials and Methods

For the experiment fresh bottle gourd, mint, basil and lemon were collected from local market of Jammu region. Fresh raw materials were washed under running tap water to eliminate dirt and other irrelevant material. Bottle gourd was peeled and cut from top (20 mm) and bottom (15 mm). The bottle gourd fruits were sliced and later on blanched for about 3-4 min. at 80°C, followed by extraction of juice via mechanical juice extractor. The juice extracted was filtered using muslin cloth. The leaves of mint and basil were plucked from stalk, cleaned, then blanched for 2 min. and the juice were extracted by mechanical juicer followed by filtration. Lemons were cut into two halves, its seeds were removed and the juice was extracted by squeezing and strained using muslin cloth.

Bottle gourd, mint, basil and lemon juices were blended in distinct proportions as T1 (control), T2 (90:5:5::Bottle gourd: Mint: Lemon juice), T3 (85:10:5::Bottle gourd: Mint: Lemon juice), T4 (80:15:5::Bottle gourd: Mint: Lemon juice), T5 (75:20:5::Bottle gourd: Mint: Lemon juice), T6 (90:5:5::Bottle gourd: Basil: Lemon juice), T7 (85:10:5::Bottle gourd: Basil: Lemon juice), T8 (80:15:5::Bottle gourd: Basil: Lemon juice) and T9 (75:20:5::Bottle gourd: Basil: Lemon juice). TSS and acidity of the nectar was maintained at 15°Brix and 0.3% with help of sugar and lemon/citric acid wherever necessary, then heated for 10 min. at 85°C. Afterwards, in 250 ml of pre-sterilized glass bottles, the nectar was poured, keeping 1.5-2.0 cm head space. Later on the bottles were sealed airtight with crown caps by using crown corking machine. Then the bottles were pasteurized at 85°C for 15 min., cooled to room temperature and labeled. The bottles were afterwards stored under ambient temperature for period of 90 days.

Vitamin C was estimated with 2,6-dichlorophenol indophenol dye and sugars were determined by using Fehling solution as described by Ranganna (2014). The crude protein content was estimated by micro Kjeldhal method, by using factor 6.25 for converting nitrogen content into crude protein (Sadasivam and Manickam, 2008). For calcium estimation, sample (1 ml) was titrated with standard EDTA (N/50) as described by Jaiswal (2003). Phosphorous content was estimated with the help of spectrophotometer by using Vandate-molybdate reagent (AOAC, 2012).

Total phenolic content of sample was estimated by Folin-Ciocalteau method (Ahmed and Abozed, 2015). The experiment for determining free radical scavenging activity was performed by using DPPH (1,1-diphenyl-2-picryl-hydrazyl) (Luo et al., 2009). Organoleptic evaluation of blended herbal nectar was conducted by the panel consisting of 10 semi-trained judges using 9 point hedonic scale (scores assigned as 9 “like extremely” to 1 “dislike extremely”) (Amerine et al., 1965). Statistical analysis was conducted (Gomez and Gomez, 1984) using completely randomized design for interpretation of results through analysis of variance at significant level ($p \leq 0.05$).

Results and Discussion

Nutritional evaluation of herbal nectar

The ascorbic acid and crude protein content (Fig. 1) of bottle gourd based herbal nectar increases with addition of mint and basil. In control and mint treatments, 23.95% and 69.84% increase was observed with addition of mint whereas, in control and basil treatments, 19.33% and 80.95% increase was observed with addition of basil, in ascorbic acid and crude protein content of the nectar, respectively. Significant difference among the treatment was observed with respect to ascorbic acid and crude protein content. Ascorbic acid and crude protein content of herbal nectar increased with the incorporation of mint and basil juice as compared to T1 (control), this could be result of variation in ascorbic acid and crude protein content in raw materials added. Similar results for ascorbic acid were reported in whey based pineapple and bottle gourd mixed herbal beverage (Baljeet et al., 2013).

Among control and mint treatments, 19.34% and 23.17% decline was recorded in reducing sugar and total sugar content of the nectar, with increase in mint concentration whereas, in control and basil treatments, 23.46% and 23.65% decline was recorded with increase
Impact of Herbs on Nutritional and Organoleptic attributes of Nectar Developed using Bottle Gourd

Fig. 1: Ascorbic acid, crude protein, reducing sugar and total sugar of blended herbal nectar.

Fig. 2: Calcium, phosphorus, total phenol and antioxidant activity of blended herbal nectar.

in concentration of basil, respectively (Fig. 1). With the incorporation of mint and basil juice in the bottle gourd based herbal nectar, reducing sugar and total sugar content decreased which might be due to their lower concentration in the raw materials added. Similar studies for reducing sugar were recorded in blended herbal beverage (Gupta et al., 2022a). The results of total sugar were in accordance with findings of Tiwari and Deen (2015) in blended RTS from bael.

The incorporation of mint and basil lead to increases in phosphorus, calcium, phenols and antioxidant activity (Fig. 2) of bottle gourd based herbal nectar. From treatment T1 to T5, 648.83, 170.19, 33.88 and 3.23% increase was recorded in phosphorus, calcium, phenol and antioxidant activity of the nectar with addition of mint whereas, among control and basil treatments, inclination of 560.43, 4.29, 38.91 and 2.54% was recorded with addition of basil, respectively. The increase in mineral content with treatment could be attributed to the declining percent of bottle gourd with increasing level of mint and basil juice which are rich in minerals. The mint and basil have high phenol and antioxidant activity, so their incorporation in blended nectar increases the total phenolic content and antioxidant activity of the product. Similar findings for phenolic content were reported in bottle gourd blended drink (Gupta et al., 2022b). The results of antioxidant activity reported similar findings in RTS beverages made from medicinal plants (Hirdyani, 2015).

Organoleptic evaluation of herbal nectar

The different colour scores were obtained for different treatments developed. Diminishing trend was observed in colour score when blended with mint and basil juice which could be because of green colour contributed by the herbs. Percentage inclination among treatments from minimum mean colour score (6.72) to maximum mean colour scores (7.90) was 17.60% (Table 1). Kumari et al. (2011) and Majumder et al. (2018) recorded similar results in tulsi flavoured yoghurt and in bottle gourd blended herbal drink, respectively. With progress in storage period, the mean colour scores showed 9.39% decline which could possibly resulted from degradation of colour pigment and browning caused by copolymerization of organic acids of the product (Hamid and Thakur, 2017).

The incorporation of mint and basil juice up to certain limits improve the flavour of nectar. Among treatments, 15.09% inclination was observed in lowest (6.89) and highest (7.93) mean flavour score (Table 1) of blended nectar. Similar findings were recorded in Ocimum based herbal RTS (Madhuri et al., 2021) and in whey-banana blended herbal beverage (Yadav et al., 2010). The decline in mean flavour score, during 90 days of storage was 9.31% in bottle gourd based herbal nectar, which might be because of certain enzymatic, physiological or biological changes. The decline in volatile aromatic compounds could be responsible for reduction in flavour scores during storage period (Yadav et al., 2010). Similar decreasing pattern was observed by Sharma et al. (2009) in jamun-mango blended RTS beverage and Ocimum
Table 1: Effect of treatment and storage period on colour and flavour (hedonic score) of blended herbal nectar.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Colour scores (Mean)</th>
<th>Flavour scores (Mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Storage period (Days)</td>
<td>(Treatment)</td>
</tr>
<tr>
<td></td>
<td>0 30 60 90</td>
<td></td>
</tr>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt; (Control)</td>
<td>7.36 7.15 6.92 6.62</td>
<td>7.01 7.49 7.32 7.08 6.72</td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt; (90:5:5::BGJ:MLJ:LJ)</td>
<td>7.96 7.70 7.51 7.28</td>
<td>7.61 7.61 7.45 7.21 6.86</td>
</tr>
<tr>
<td>T&lt;sub&gt;3&lt;/sub&gt; (85:10:5::BGJ:MLJ:LJ)</td>
<td>7.51 7.27 7.09 6.80</td>
<td>7.17 7.75 7.58 7.34 6.99</td>
</tr>
<tr>
<td>T&lt;sub&gt;5&lt;/sub&gt; (75:20:5::BGJ:MLJ:LJ)</td>
<td>7.11 6.82 6.64 6.31</td>
<td>6.72 7.23 7.05 6.81 6.45</td>
</tr>
<tr>
<td>T&lt;sub&gt;6&lt;/sub&gt; (90:5:5::BGJ:BLJ:LJ)</td>
<td>8.23 8.04 7.80 7.53</td>
<td>7.90 8.09 7.94 7.72 7.42</td>
</tr>
<tr>
<td>T&lt;sub&gt;7&lt;/sub&gt; (85:10:5::BGJ:BLJ:LJ)</td>
<td>8.12 7.89 7.66 7.42</td>
<td>7.77 8.2 8.07 7.85 7.59</td>
</tr>
<tr>
<td>T&lt;sub&gt;8&lt;/sub&gt; (80:15:5::BGJ:BLJ:LJ)</td>
<td>7.83 7.57 7.39 7.14</td>
<td>7.48 7.98 7.82 7.60 7.29</td>
</tr>
<tr>
<td>T&lt;sub&gt;9&lt;/sub&gt; (75:20:5::BGJ:BLJ:LJ)</td>
<td>7.68 7.40 7.25 6.95</td>
<td>7.32 7.87 7.70 7.46 7.15</td>
</tr>
<tr>
<td>Mean (Storage)</td>
<td>7.67 7.42 7.23 6.95</td>
<td>7.73 7.57 7.33 7.01</td>
</tr>
</tbody>
</table>

Effects of Colour, Flavour, Bottle Gourd Juice, Mint Leaf Juice, Basil Leaf Juice, Lemon Juice

Table 2: Effect of treatment and storage period on taste and consistency (hedonic score) of blended herbal nectar.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Taste scores (Mean)</th>
<th>Consistency scores (Mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Storage period (Days)</td>
<td>(Treatment)</td>
</tr>
<tr>
<td></td>
<td>0 30 60 90</td>
<td></td>
</tr>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt; (Control)</td>
<td>7.46 7.18 6.90 6.71</td>
<td>7.06 7.36 7.16 7.05 6.71</td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt; (90:5:5::BGJ:MLJ:LJ)</td>
<td>7.59 7.31 7.05 6.85</td>
<td>7.20 7.47 7.34 7.17 6.85</td>
</tr>
<tr>
<td>T&lt;sub&gt;3&lt;/sub&gt; (85:10:5::BGJ:MLJ:LJ)</td>
<td>7.72 7.48 7.22 7.09</td>
<td>7.38 7.63 7.49 7.31 6.98</td>
</tr>
<tr>
<td>T&lt;sub&gt;5&lt;/sub&gt; (75:20:5::BGJ:MLJ:LJ)</td>
<td>7.20 6.93 6.65 6.41</td>
<td>6.80 7.03 6.87 6.73 6.45</td>
</tr>
<tr>
<td>T&lt;sub&gt;6&lt;/sub&gt; (90:5:5::BGJ:BLJ:LJ)</td>
<td>8.10 7.91 7.66 7.50</td>
<td>7.79 8.02 7.91 7.72 7.38</td>
</tr>
<tr>
<td>T&lt;sub&gt;7&lt;/sub&gt; (85:10:5::BGJ:BLJ:LJ)</td>
<td>8.19 8.08 7.84 7.69</td>
<td>7.95 8.17 8.09 7.87 7.56</td>
</tr>
<tr>
<td>T&lt;sub&gt;8&lt;/sub&gt; (80:15:5::BGJ:BLJ:LJ)</td>
<td>7.97 7.79 7.53 7.36</td>
<td>7.66 7.89 7.77 7.59 7.29</td>
</tr>
<tr>
<td>T&lt;sub&gt;9&lt;/sub&gt; (75:20:5::BGJ:BLJ:LJ)</td>
<td>7.85 7.63 7.38 7.24</td>
<td>7.52 7.75 7.61 7.46 7.14</td>
</tr>
<tr>
<td>Mean (Storage)</td>
<td>7.71 7.49 7.22 7.04</td>
<td>7.61 7.47 7.31 6.99</td>
</tr>
</tbody>
</table>

Effects of Taste, Consistency, Bottle Gourd Juice, Mint Leaf Juice, Basil Leaf Juice, Lemon Juice

Mint and basil juice enhanced the taste score significantly, when added up to 10% but its higher concentration degraded the taste. The percentage increase among treatments from lowest (6.80) to highest (7.95) mean taste scores was 16.91% (Table 2). Similar studies were observed by Madhuri et al. (2021) in herbal RTS prepared using basil and by Baljeet et al. (2013) in herbal beverage blended with whey-based pineapple and bottle gourd. Significant decline of 8.69% was recorded based herbal RTS (Madhuri et al., 2021).
in mean taste score, during the storage period. The decrease in taste scores during storage might be due to loss of sugar-acid balance which is responsible for taste (Hamid and Thakur, 2017). The results were in correspondence to various studies that have reported similar findings such as blended RTS beverage with different proportions of sweet orange and pomegranate juice, during their storage period (Bhavyasree and Vanajalata, 2015).

Significant increase in consistency score was observed when mint and basil juice was added but their higher concentration (>10%) decreases the consistency of nectar (Table 2). Among treatments, 16.99% inclination in mean consistency score was recorded where, lowest and highest mean consistency score of blended nectar were 6.77 and 7.92, respectively. Majumder et al. (2018) reported similar results in bottle gourd blended beverage. During 90 days of storage, significant decrease of 8.15% in consistency scores was noted, in bottle gourd based herbal nectar. The decline in consistency scores could be due to phenols and protein interaction as well as development of cation complexes with phenols and pectin (Hamid and Thakur, 2017). Similar results were recorded by Gajera and Joshi (2015) while studying the quality of bottle gourd blended juice for 180 days of storage period and by Majumder et al. (2018) in bottle gourd blended beverage.

Conclusion

Presently, vegetable beverages are gaining more popularity when compared to chemical drinks, due to their taste, flavour, appealing colour and higher nutritive value. The blended nectar showed enhanced nutritional and sensory characteristics in comparison to T1 (control). The herbal nectar incorporated with 10% basil was highly acceptable. The study concluded that the blended herbal nectar possibly satisfies consumer’s taste and was safe for consumption up to 90 days of storage period.

References


Gupta, S., Sood M., Bandral J.D. and Gupta N. (2022a). Effect of blending traditional herbs on physico-chemical changes in bottle gourd nectar. J. Eco-Friendly Agricult., 17(2), 413–419.


