Preparation and Evaluation of Apple and Ginger Based Squash

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To avoid postharvest losses, efforts have been made to utilize the surplus crops of Himachal Pradesh viz. apple, lemon and ginger for the development of new products. Five different combinations of apple pulp, apple juice concentrate (70°B), ginger and lemon juice were tried. Analysis of the products showed differences in the physico-chemical characteristics. Based on the sensory analysis, a combination of 25 per cent apple pulp, 15 per cent lemon juice and 10 per cent ginger juice was found to give the best product. The product had appealing colour, body and sugar-acid blend. The cost of production of the product is found to be comparable with other fruit squashes showing a potential for commercial exploitation.

Introduction

Apple (*Malus domestica*) is the principal fruit of temperate zone in India. Hill lemon (galgal) is another fruit which has wider adaptability but is not cultivated at the commercial scale due to its low market value. The present investigation was carried out to find out the suitable blend of the apple pulp or juice concentrate with lemon and ginger juice for the development of apple based squash.

Materials and Methods

Apple fruit was procured from the Dr Y S Parmar, University of Horticulture and Forestry, Solan research farm, while other materials were purchased locally. Fruits were washed, crushed and grated manually. Ascorbic acid (0.5 per cent) was sprayed while grating to check browning as per the conventional procedure. Apple and ginger juice were extracted manually with a basket press, whereas, lemon juice was extracted with a Rosset type citrus juice extractor (BSB make). Apple was also converted into pulp after cooking the apple pieces in a pressure cooker. The cooked apples were passed through a pulper to make the pulp.

The initial characteristics of the extracted juices were as follows: apple juice TSS 9.5°B and titratable acidity 0.25; lemon juice TSS 7.5°B and acidity 6.0 per cent; ginger juice TSS 5.5°B and titratable acidity 0.25 per cent and apple juice concentrate 72.5°B and 1.25 per cent acidity. The resultant juices were utilized for preparation of squash. Five different combinations, T1-T5 tried are: T1=Apple pulp (25 per cent), lemon juice (25 per cent), ginger juice (10 per cent), potassium metabisulphite KMS (700 ppm); T2=apple juice concentrate (62.5 per cent), lemon and ginger juice (each 9.5 per cent), KMS(700 ppm); T3=apple pulp (25 per cent), lemon juice (15 per cent), ginger juice (10 per cent), citric acid (0.5 per cent), KMS( 700 ppm); T4=apple juice(15 per cent) lemon juice (10 per cent) ginger juice (5 per cent), citric acid (1.0 per cent) and KMS (700 ppm); T5=lemon juice (20 per cent) ginger juice 20 per cent and KMS 700 ppm. These treatments were made based on the FPO specifications that the products should contain minimum 25 per cent of pulps/juice contents taken together with minimum TSS of 40 per cent. The differences between the treatments are mainly due to the quantities of various ingredients with the purpose of making suitable combinations. The chemical parameters of the prepared squashes viz., TSS(°B), titratable acidity, pH and sugars were estimated as per the methods described by Ranganna.

The colour of the blends was measured in a Lovibond tintometer using one inch cell and expressed as red,
yellow and blue units. The products were stored at room temperature (10-30°C) for a period of 6 months and were analysed for various parameters discussed earlier. Sensory evaluation was carried out by a trained panel of experts. The experts were given coded samples and separate proformas for evaluation in different booths. Averages of scores were calculated. Based on the cost of the raw materials used and conventional costing procedure, the price of the products was calculated and reported here.

**Results and Discussion**

A perusal of data in Table 1 reveals that reducing sugars, total sugars and TSS of the products had almost a similar trend. Further, all the squashes had TSS within the FPO specifications (Minimum 40° Brix) as expected because sugar was added proportionately. Titratable acidity and pH had similar trend, with treatment T3 recording the highest acidity (1.78% per cent) and the lowest was observed in T1. Differences could be correlated with the composition of the initial materials used in the squash preparation. In general, the pH correlated with acidity of the respective treatment but some variations were also noted which could be due to the buffering action of different action found in the ingredients used. Differences in reducing and total sugars in the final products are apparently due to the fact that total soluble solids (direct refractometer reading) also include soluble component other than sugars, depending upon the raw material used. Use of apple juice concentrate (T1) improved red and yellow tintometer colour units. In all the treatments a similar trend in red and yellow tintometer colour units was observed, except in treatment T4 where yellow tintometer colour units were fairly improved.

In storage studies, a slight increase in TSS and reducing sugars was noticed in all the treatments except T4 and T5, whereas no appreciable change was observed in titratable acidity, pH and colour units (Table 2). The increase in reducing sugars could be attributed to hydrolysis of non-reducing sugar while, a small increase in TSS might be the result of solubilization of some juice/pulp constituents during storage of six months. In general, the pH value increased during storage, though the increase was comparatively small. But over all it re-
Table 3 – Cost of production of apple appetizer

<table>
<thead>
<tr>
<th>A) Raw Material(s)</th>
<th>Qty. (Kg/units)</th>
<th>Rate (Rs/kg)</th>
<th>Total value (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Apple (kg)</td>
<td>1.6</td>
<td>3.50</td>
<td>5.60</td>
</tr>
<tr>
<td>ii) Lemon (kg)</td>
<td>1.5</td>
<td>3.00</td>
<td>4.50</td>
</tr>
<tr>
<td>iii) Ginger (kg)</td>
<td>1.0</td>
<td>18.00</td>
<td>18.00</td>
</tr>
<tr>
<td>iv) Sugar (kg)</td>
<td>1.75</td>
<td>15.00</td>
<td>26.25</td>
</tr>
<tr>
<td>v) Citric acid (g)</td>
<td>22.0</td>
<td>35.00</td>
<td>0.80</td>
</tr>
<tr>
<td>vi) KMS (g)</td>
<td>22.0</td>
<td>35.00</td>
<td>0.88</td>
</tr>
<tr>
<td>vii) Essence and colour</td>
<td></td>
<td></td>
<td>0.50</td>
</tr>
</tbody>
</table>

(B) Packing cost

| i) Bottles (Nos) | 5 | 2.50 | 12.50 |
| ii) Crown cork (Nos) | 5 | 0.15 | 0.75  |
| iii) Labels (Nos) | 5 | 0.08 | 0.40  |

Total raw material cost: 70.26

(C) Processing cost @ 20 per cent of total raw material cost: 14.05

(D) Overhead charges @ 10 per cent of total raw material cost: 7.02

Total: 91.33

(E) Cost of production/bottle: 18.26

(F) Profit @ 20 per cent of cost of production: 3.65

(G) Sale price/bottle: 21.91

remained within the range, generally found in the squashes. Moreover it remained in the acidic range of 0.1. During the entire storage period no spoilage was recorded in any of the treatments. Based upon these results it is concluded that the products could be stored at room temperature (10-30°C) for six months without undesirable chemical change or microbial spoilage. Indirectly, it reflects usage of correct concentration of preservative and the procedure employed to prepare the products.

Sensory evaluation (Table 2) revealed that treatment T1 was the best for body, taste, flavour and overall quality but was comparable in colour to other treatments. Improvement of body in this treatment could possibly be due to the use of apple pulp while addition of ginger in proper proportion might have improved the flavour of the final product. Further, liking of the product of treatment T1 is apparently due to balanced acid-sugar blend, giving the desirable taste.

The cost per bottle (650 ml size) of the product comes to Rs.21.91 for T1. It was comparatively lower than the similar fruit appetizers/squashes available in the market (Table 3). Hence, a squash could be produced using a blend of apple, lemon and ginger juice, economically.

References