Formulation and Sensory Evaluation of Products Developed from Neolamarckia cadamba Fruit
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Abstract: The potential of some underutilized indigenous fruits such as kadam (Neolamarckia cadamba) has remained largely unknown. Most tropical fruits can be processed and preserved in small-scale operations using simple techniques. Various uses have been reported for kadam on the basis of its medicinal properties. Though it has been reported that the ripe fruits are edible in raw state but very few works have been done on its dietary utilization among human beings. This study was carried out to investigate the possibility of introducing kadam as a fruit for human consumption and to develop its preservation techniques. Sensory evaluation of the products was also done to assess the acceptability of the products. Human acceptability test by untrained panellists indicated promising consumer satisfaction.

Keywords: Indigenous, Neolamarckia cadamba, Tropical fruits, Medicinal properties, Dietary utilization, Preservation techniques, Sensory evaluation.

I. Introduction

India is home to the largest number of hungry people in the world. The Global Hunger Index (GHI) 2010 ranks India at 67 out of 122 countries; whereas the ‘2012 Global Hunger Index’ (IFPRI) ranks it at 65 among 79 countries. Similarly, malnutrition in India, especially among children and women, is widespread, acute and even alarming (1). Agricultural production has to increase by 70% by 2050 to cope with an estimated 40% increase in world population (2).

Due to the commercialization of few vegetables and other crop species, the entire country mainly depends on handful of crop species, neglecting large number of vegetables, fruits and other crops with high nutritional and medicinal values that were grown traditionally in the past. Identification and selection of these underutilized plants should be focused to increase the nutritional status of the people (3). Kadam has been stated to be one of the most frequently planted trees in the tropics. But it is mainly planted for its timbers, leaves etc. Kadam fruits are generally neglected and a large number of kadam fruits are wasted every year though the fruits are reportedly edible by tribals.

Kadam is a plant which is widely used in many instances in the classical Ayurvedic texts for various ailments (2, 3, 4). Charaka mentioned Kadambo to be used as vegetable and fruit (5). Susrutha had described it in first group of sour fruits (6). In Ramayana and Mahabharata, Kadambo was mentioned as the fruit bearing plant. Pathanjali in his Mahabhasya, mentioned the Kadamba, while describing fruit varieties. Kadam was favourite tree of ancient India (7).

Underutilized fruits are highly nutritious and important source of food (8). The ethnic people residing in the fringe of the forest are dependent on these potential local food resources (9). Recently, the use of underutilized fruits as food has increased due to improvement and hybridization in cultivated fruit plants. On the other hand, increase in urbanization and gradual exploration of forest and waste land has led to the threat of the extinction of underutilized plant species (10). Ethnic people still use them extensively as food to meet their nutritional requirements (11). Some are preserved for use during periods of famine and scarcity. They are sometimes sold in the market. Although, the popularity of these underutilized fruit has declined. It is necessary to pay special attention to maintain and improve these important sources of food supply (12). Indigenous underutilized fruits mostly used by the ethnic people can supplement to some extent the micronutrients provided by familiar fruits as well as other popular foods generally used. These may also be provided substantial income to the economy of the rural population.

Now a days, popularity of such kind of traditional, nutritious food is increasing which have both dietary and medicinal benefits. It is, therefore, important to improve existing methods and to develop new preservation methods for the greater utilization of perishable and underutilized food resources. Proper utilization of underutilized indigenous food species like kadambo fruit, will contribute to the development of the health status.
of poor people who are suffering from different types of micronutrient deficiencies and also may promote indirectly the economic development of the country.

II. Objectives
1. To formulate products from Neolamarckia cadamba fruit namely Pickle, Jam and Squash.
2. To conduct sensory evaluation of the products formulated and to assess their acceptability.

III. Materials and Methods

- **Fruit Collection:**
  Fresh, ripe fruits of the plant *N.cadamba* were collected from the surrounding campus of Dept. of Home Science, University of Calcutta.

- **Product Development:**
  **Jam:**
  Ripe kadamba fruits were sliced. Seeds and outer portion were separated. It was then boiled with equal amount of water to make fruit pulp. Equal quantities of sugar and pulp were taken and kept on fire till the required consistency was achieved. Sheet test was used for testing doneness. It was stored in a sterilized, airtight jar.

  **Pickle:**
  Ripe kadamba fruits were collected and sliced after the removal of seeds and outer portion and dipped into vinegar for 3 days. Then the cut fruits were mixed with oil and spices and kept in a sterilized jar and left out in the sun for 2-3 days.

  **Squash:**
  At first saturated sugar syrup was prepared and cooled it at the room temperature. Then boiled fruit pulp was added to it and stirred. Then spices, salt and required amount of sodium benzoate were added and stored in a sterilized bottle.

IV. Results and Discussion:

- **SENSORY EVALUATION:**
  3 food products were prepared i.e. Pickle, Jam and Squash. 50 panel members rated the products. The 5-point hedonic scale (13), also known as degree-of-liking scale, is the most common hedonic scale for measuring product liking by consumers. Samples were presented to consumer panellists one at a time and they were asked to rate their hedonic response on the scale that can be in a vertical or horizontal line without affecting results. The hedonic scale is based on equal interval, which is important in the assignment of numerical values to the response choices (from 1 = “dislike very much” to 5 = “like very much”) Sensory analysis was carried out for the following attributes:
  a) Appearance
  b) Colour
  c) Smell
  d) Taste
  e) Overall acceptability
  The above attributes were rated on a 5 point Hedonic scale indicating the following scores:
5 - Like very much
4 – Like a little
3– Neither like nor dislike
2 – Dislike a little
1 – Dislike very much

**Statistical Analysis:**
The data of the sensory evaluation of products from kadam fruit was analysed using Statistical Package for Social Sciences (SPSS) version 17 to determine the most desirable formulations.

**TABLE 1: Mean scores of attributes of Kadam fruit products as evaluated by panel members:**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the Product</th>
<th>Appearance</th>
<th>Colour</th>
<th>Smell</th>
<th>Taste</th>
<th>Overall Acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pickle</td>
<td>4.42±0.111</td>
<td>4.52±0.087</td>
<td>4.32±0.109</td>
<td>3.80±0.143</td>
<td>17.08±0.366</td>
</tr>
<tr>
<td>2.</td>
<td>Jam</td>
<td>4.28±0.081</td>
<td>4.52±0.082</td>
<td>4.10±0.112</td>
<td>4.48±0.091</td>
<td>17.38±0.271</td>
</tr>
<tr>
<td>3.</td>
<td>Squash</td>
<td>4.64±0.085</td>
<td>4.56±0.076</td>
<td>4.82±0.062</td>
<td>4.82±0.068</td>
<td>18.84±0.209</td>
</tr>
</tbody>
</table>

**Appearance:**
Squash received the highest mean score (4.64) for appearance indicating that this product was perceived as appealing to the panel members. Pickle and jam received the mean score 4.42 and 4.28 respectively.

**Colour:**
In this attribute also kadam squash received the highest mean score (4.56). But Pickle and jam were also appealing to the panel members and received the same mean score (4.52) which was not very low from the squash.

**Smell:**
In this attribute again squash received the highest mean score (4.82) indicating that the panel members found kadam fruit squash most acceptable. The other two products of kadam fruit i.e. pickle and jam received the mean score 4.32 and 4.10 respectively.

**Taste:**
Here kadam fruit squash received the mean score 4.82, followed by jam (4.48) which were quite higher than the fruit pickle (3.80).

**Overall Acceptability:**
Kadam fruit squash received the highest mean score in all the attributes and in overall acceptability (18.84). Jam and pickle received 17.38 and 17.08 respectively.

**Figure 1: Sensory evaluation scores for appearance, colour, smell, taste and overall acceptability of pickle, jam, and squash prepared from kadam fruit**

![Sensory evaluation scores for appearance, colour, smell, taste and overall acceptability of pickle, jam, and squash prepared from kadam fruit](image)

**V. Conclusion**
The study on the formulation and sensory evaluation of products with *Neolamarckia cadamba* fruit was done and fruits had been used in making of the three products i.e. pickle, jam, squash. Sensory evaluation was done on a five-point hedonic scale - the appearance, colour, smell, taste and overall acceptability of the products have been assessed. All the products were accepted by the panel members which revealed that kadam fruit can be accepted as the fruit for human consumption and it can be preserved by making different products using simple household
techniques. Hence measures should be taken to create awareness about kadam fruit among people as it can be inexpensive, widely and easily available in our country.

VI. References


