Quality and Storage Stability of Developed Dried Apricot-Date Jam

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Abstract

Jam is the thick, sweet spread made by cooking crushed or chopped fruits and sugar with or without addition of pectin, the latter case contributing to low pectin fruits with apricots as a member. The geographic presence of apricots in a country like India makes their fresh processing difficult other than sun drying, due to the inclined weather conditions and far off region. The possibility of converting dried apricots into jam has been investigated in this study that showed a great promise in its manufacture and storage. The combination of apricots with dates enriches the jams with different of nutrients and minerals and offers a novel perspective. These rich sources of Vitamin A (beta carotene) and C, potassium, phyto-chemicals and fiber (both soluble and insoluble) are available year round in dried forms and appear as first signs of summer in Kashmir and Ladakh regions.

Keywords: Apricot, Sugar, Dates, Jam, Soluble solids, Pectin.

1. Introduction

Jam is the product that contains fruit pulp from whole fruit or more kinds of fruit boiled with sufficient quantity of sugars at low pH (2.5-3.2) to produce a tissue with firm and gel like consistency with or without addition of water (Codex Ailmamentarius, 2009). Pectin and acids are added to obtain a good quality jam with total solids and fruit accounting not less than 65% and 45% respectively. Jams are good carriers of fruit related components (sugar, fiber and other bioactive compounds) to humans finding their way during early hours on ones breakfast table. The production of apricots is limited to high altitude regions of the world with temperate temperatures that makes their processing difficult.

Apricots, the rich sources of vitamin A, vitamin C, iron, potassium, fiber and organic acids (citric and malic acids), are low in pectin and therefore they need added pectin for setting the jam. The annual production of apricots in India is 18,000 tones limited to arid regions of Ladakh, Kashmir and Himachal Pradesh, contributing a negligible percentage of 0.45% to the world’s production (Aina and Adesina, 1991). Dates contain calcium, sulphur, iron, potassium, phosphorus, manganese, copper, magnesium, volatile oils, vitamin-B6, folic acid, potassium, iron and magnesium, proteins, sugars, vitamins and are rich in natural fibers and sugar (glucose and fructose) which contribute to a healthy body and mind. Sugars with high re-crystallization potential (glucose) are not used in jam manufacture as it poses problems due to their use in large quantities. On the contrary refined sucrose has low tendency of re-crystallization and is partly inverted to glucose and fructose at low pH that retards the tendency of crystal formation while as the complete inversion of sucrose may result in crystallization of glucose in the product (Rangana, 1986). The phenolics present in apricots mainly include hydroxycinnamic and hydroxybenzoic acids impart it with antioxidant properties (Hussain et al., 2013). The study by Vardi et al. (2013) showed the protective role of apricots against the renal failure and apoptosis.

Manufacturing jams is an efficient preservation process of making use of surplus quantity of fruits during their peak production season. The production of jam usually goes on simultaneously with their raw material production season only, that left a big void for the rest of the production year. Utilization of dried or other type preserved fruits can be used for all year production of jam. This paper focuses on the use of dried apricots and dates for the development of jam with its physico-chemical analysis during the storage period.

2. Materials and Methods
The raw materials for the work were purchased from Ladakh region (apricots) and dates from the Srinagar market. The present work was done in the Department of Food Technology at Islamic University of Science and Technology Awantipora.

2.1 Preparation of Jam

The schematic diagram of the jam manufacture given in Fig 1. The semi soft fruits were blended (apricots) and shredded (dates) with the former used to calculate the amount of TSS and acidity by using a refractometer and titration, respectively needed in the calculation of sugars and acids to be added during its manufacture. Pectin used during the jam preparation is necessary for its setting and is used in apricot jam manufacture as they are low in pectin.

Jam was prepared by boiling the fruit pulp with the known quantity of sugar, pectin and citric acid to a thick consistency that is strong enough to hold fruit issues in position. The fruit pulp was cooked for some time with the added sugar followed by the addition of date shreds. A little amount of the mix was added with the calculated amount of pectin in a separate bowl. The pectin + pulp mixture was then added to the fruit mix followed by the addition of the citric acid to bring down the pH of the jam to enhance its setting. The mixture was cooked and examined for the desired pH at regular intervals and was cooked up to desired 68°B followed by its filling hot in the pre sterilized glass bottles. The sample bottles were stored and analyzed just after processing and at a period of 30 and 60 days. The recipe employed for the jam manufacture is as: acidity 1.2%, pectin 1.5%, dates 5%, apricot pulp 45% and sugar 68%.

2.2 Physico-Chemical Analysis

The prepared product was analyzed for Total Soluble Solids, Acidity, pH, Reducing sugars and Total sugars.

2.2.1 Titrable Acidity and pH Value

The acidity as determined by titration methods (Rangana, 1986) is a measure of stability and shelf life of jam. The organic acids present in fruits and those added during making the jam manufacture contribute to the acidity and thus decrease the pH. The pH was measured by the standard procedures of AOAC (AOAC, 2005). The sample prepared for the pH determination involved weighing of 25gm of the sample and dissolving it in 200ml of distilled water followed by boiling on a water bath for 1 hour. The solution was cooled and diluted to 250ml with distilled water, filtered and used for analysis. The pH was determined by using a digital pH meter. The titrable acidity was expressed as % citric acid and calculated by the following formula:

\[
\text{% Titrable Acidity} = \frac{\text{Titre} \times \text{normality of alkali} \times \text{vol. made up} \times \text{eq. wt. of major acid} \times 100}{\text{Volume of sample taken for estimation} \times \text{Wt. of sample taken} \times 1000}
\]

% Reducing Sugars = mg of invert sugar \times \text{Dilution} \times 100
% Total sugars are also calculated from the above equation making use of titre value obtained in the determination of total sugars.

2.2.2 Reducing Sugars and Total Sugars

The reducing sugars were determined by Lane and Eynon method (Rangana, 1986) which determines the reducing sugars, expressed as invert sugar that reduces the copper in Fehling’s solution to red, insoluble cuprous oxide. The procedure involves blending 50 gm of sample with 400 ml of water and neutralizing it with 1N sodium hydroxide using phenolphthalein indicator, followed by gently boiling for about an hour and maintaining its water level during the boiling. The cooled solution is filtered and put into 500ml volumetric flask marking up the volume and taking out 100ml aliquot added with 200ml water and 2ml neutral lead acetate solution, the excess of the later is precipitated with potassium oxalate solution. The sugar solution was titrated with 10 ml of mixed Fehling solution and 50 ml water in a 250 ml flask to reduce almost completely the Fehling’s solution. The flask was heated and boiled for 15 seconds with persistence of blue color indicating unreduced Fehling solution and adding few more ml of sugar solution until whole of the Fehling’s solution gets reduced. The presence of faintest perceptible blue color is the time for adding few drops of methylene blue followed by adding sugar solution until the indicator is completely decolorized. The readings were recorded and then employed used in the calculation of % reducing sugars as:

\[
\text{% Reducing Sugars} = \frac{\text{mg of invert sugar} \times \text{Dilution} \times 100}{\text{Titre} \times \text{Volume of sample} \times 100}
\]

2.2.3 Total Soluble Solids

Total soluble solids were determined by a refractometer at room temperature and applying the temperature correction to correct the reading. The observed TSS as 68°B determines percentage of the TSS in the jam.

2.3 Organoleptic Evaluation of Jam

Sensory evaluation evaluates the various food properties by humans involving their own perception based on senses. The product control and quality measurement of the newly developed products are best evaluated by employing sensory properties. The

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Sensory evaluation was done using a five point evaluation chart. The product was evaluated organoleptically using semi-trained panelists consists of faculty and post graduate students using five hedonic scale for their preferences in appearance, color, flavor, texture and overall acceptability of the product in the score sheet as shown in Fig 2.

3. Results and Discussion

The analyzed acidity (%), pH, TSS (°B), reducing sugars (%) and total sugars (%) of jam just after preparation and at an interval of 30 and 60 days are presented in Table 1. The parameters showed a notable change during the storage period.

3.1 Acidity and pH

The results pertaining to the titrable acidity (Table 1) showed its increase during storage from 1.093 % (Day 1) to 1.253% (Day 60). The results correlated with Hussain and Shakir (2010), for mixed jam (apple and apricot) with different formulations (Gowda et al., 2005; Sindhu et al., 1984). To obtain optimum gel conditions of jam the pH is an important factor and its estimation during storage provides us the information whether it was maintained or not during the entire study for effective preservation. The values of pH (Table 1) reveal its decrease due to the formation of acidic compounds. The results were similar with Lindorth (1980), Ehsan et al. (2002), Ehsan et al. (2003) and Shakir et al. (2008). The Statistical analysis revealed that storage effect on the acidity and pH of all the samples were significant (p≤0.05).

3.2 Total Soluble Solids (°Brix)

Total soluble solids showed a gradual increase during storage period (Table 1) from 68 (Day 1) to 74 °B (Day 60). The solubilization of the jam constituents may be the reason of its increase. Similar results were reported by Tremazi (1967), Riaz et al. (1999), Lindorth (1980), Ehsan et al. (2002), Ehsan et al. (2003), Shakir et al. (2008) and Hussain and Shakir (2010).

3.3 Total Sugars and Reducing Sugars (%)

Reducing property of the sugars contributes to their name as reducing sugars whose estimation involves determining the starch material. There is a gradual increase in the reducing sugar content of the jam during the storage from 39.4 to 44.2% (Table 1). The same results are shown by Riaz et al. (1999), Shakir et al. (2008) and Hussain and Shakir (2010). Anjum et al., (2000) and Vidhya and Narain (2011), while working on apricot diet jam and wood apple jam respectively, observed increase in reducing sugar content during storage period. The inversion of sucrose into reducing sugar (glucose and fructose) due to acid and high temperature during storage results in its increase.

Table 1: Storage effect on the chemical constituents of dried apricot-date jam

<table>
<thead>
<tr>
<th>Storage days</th>
<th>Titrable Acidity °B</th>
<th>TSS °B</th>
<th>pH</th>
<th>Reducing Sugars %</th>
<th>Total Sugars %</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 day</td>
<td>1.09</td>
<td>68.00</td>
<td>3.57</td>
<td>39.4</td>
<td>56.6</td>
<td>33.73</td>
</tr>
<tr>
<td>30 days</td>
<td>1.20</td>
<td>70.00</td>
<td>3.45</td>
<td>42.1</td>
<td>57.17</td>
<td>34.78</td>
</tr>
<tr>
<td>60 days</td>
<td>1.25</td>
<td>74.00</td>
<td>3.36</td>
<td>44.2</td>
<td>57.57</td>
<td>36.08</td>
</tr>
<tr>
<td>Mean</td>
<td>1.18</td>
<td>70.67</td>
<td>3.46</td>
<td>41.9</td>
<td>57.11</td>
<td>34.86</td>
</tr>
<tr>
<td>CD (p≤0.05)</td>
<td>0.09</td>
<td>0.75</td>
<td>0.07</td>
<td>0.45</td>
<td>0.49</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Sensory evaluation card report of the dried apricot-date jam

<table>
<thead>
<tr>
<th>Storage Period</th>
<th>Color</th>
<th>Taste</th>
<th>Texture</th>
<th>Overall acceptibility</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 day</td>
<td>4.00</td>
<td>4.00</td>
<td>5.00</td>
<td>4.33</td>
<td>4.33</td>
</tr>
<tr>
<td>30 days</td>
<td>4.33</td>
<td>4.67</td>
<td>3.67</td>
<td>4.22</td>
<td>4.22</td>
</tr>
<tr>
<td>60 days</td>
<td>4.00</td>
<td>4.33</td>
<td>4.00</td>
<td>4.11</td>
<td>4.11</td>
</tr>
<tr>
<td>Mean</td>
<td>4.11</td>
<td>4.33</td>
<td>4.22</td>
<td>4.22</td>
<td>4.22</td>
</tr>
<tr>
<td>CD(p≤0.05)</td>
<td>1.99</td>
<td>0.93</td>
<td>1.77</td>
<td>0.62</td>
<td></td>
</tr>
</tbody>
</table>

The increase can also be due to prolonged storage and hydrolysis of sugars with increase in acidity and decrease in pH. Like the reducing sugars the total sugars also showed the same phenomenon (Table 1). The increase in sugar content resulted due to formation of sugars from insoluble carbohydrates and starch. The same increase in sugar is reported by Pota et al. (1987) due to formation of sugars from other complex carbohydrates. The Statistical analysis revealed that the effect of storage on total and reducing sugars of the jam is significant (p≤0.05).

3.4 Organoleptic Attributes

The jam samples evaluated for organoleptic attributes of color, taste, texture and overall acceptability (Table 2). Color is an important attribute on which consumer preferences depend. The statistical analysis of storage effect on color, taste, texture and overall acceptability revealed significant difference.

4. Conclusion

The apricot-date jam as prepared successfully remained acceptable for 60 days after storage (DAS). There was a gradual increase in all the observed parameters due to hydrolysis or conversion of one compound into other and maintaining a low pH throughout the storage necessary for the preservation process. The successful preparation sums up the use of dried apricots for jam manufacture increasing its marketing value and hence in interest of industry to remain in working mode throughout the year. The prepared jam had acceptable color, flavor, texture and overall acceptability.

References


