Effect of heat treatment on sensory properties of processed Olive
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Abstract

Olive oil is a fat obtained from the fruit of the Olea europaea (Olive tree), a traditional tree crop of the Mediterranean region, where whole olives are pressed to produce olive oil. The oil is used in cosmetics, medicine, cooking and soaps, and was also used as a fuel for traditional lamps. The aim of this work was to assess the effect of pasteurization parameters (temperatures: 70, 75, 85°C; time: 30, 35, 45, 55 mins) of processed olive on sensory quality of final product including odor, color, taste, consistency, oiling off and texture. Results showed that the best time and temperature to reach acceptable product in terms of sensory properties was 45 min at 75°C.

Keywords : Processed Olive, Pasteurization, Sensory evaluation, odor, color, taste, consistency and texture

Introduction

The olive, known by the botanical name Olea europaea is a species of small tree in the family Oleaceae (World Checklist, 2014). The olive's fruit, also called the Olive, is of major agricultural importance in the Mediterranean region as the source of olive oil. It is one of the three core ingredients in Mediterranean cuisine (North America Program, 2014). The olive tree, Olea europaea, has been cultivated for olive oil, fine wood, olive leaf, and the olive fruit. 90% of all harvested olives are turned into oil, while about 10% are used as table olives (International Olive Council, 1996). It is recognized as a valuable source of so-called “functional food” because of their natural phenolic antioxidant content. In table olives, phenols have a great relevance because of their contribution to the color, taste, and texture of the product (Marsilio et al., 2001). No study has been performed on processed olive and only a few studies investigated the physico-chemical and nutritional properties of the olive and its oil (Wu et al., 2002). In the present study, we have determined the effect of heat treatment on processed olive quality and the results are presented.

Material and Methods

Sample preparation

Processed olive samples were prepared in accordance with the formula (Table - 1).

Method of preparation

After processing, all olives were placed in sterile glasses. Pasteurization process was performed in 70, 75 and 85°C for 30, 35, 45 and 55 mins. Microbial properties of processed olives were done according to the National Standard 2326 no. 1374. After pasteur-
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Table 1. Formulation of processed olive

<table>
<thead>
<tr>
<th>Aromatic herbs</th>
<th>Angelica</th>
<th>Salt</th>
<th>Olive oil</th>
<th>Walnut</th>
<th>Olive</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5%</td>
<td>0.5%</td>
<td>2.5%</td>
<td>0</td>
<td>10%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Table 2. Effect of different temperatures on sensory characteristic of processed olive at different pasteurization times

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>70</td>
</tr>
<tr>
<td>30</td>
<td>1±0.63b</td>
</tr>
<tr>
<td>35</td>
<td>1±0.63b</td>
</tr>
<tr>
<td>45</td>
<td>1.42±0.86b</td>
</tr>
<tr>
<td>55</td>
<td>2.08±0.8a</td>
</tr>
</tbody>
</table>

The values mean ± S.E.; Means within the same column with different letters are different (p<0.05)

zation, qualitative indicators such as oiling off and getting two-phased were measured to evaluate the quality of processed olive.

**Sensory analysis**

Sensory analysis of processed olive was performed by a panel of ten panelists. The panelists evaluated the samples for odor, color, taste, consistency, oiling off and texture on a five-point hedonic scale and the average of sensory characteristics was evaluated.

**Statistical analysis**

Statistical analysis was performed using the software SPSS16 for windows. To evaluate the effect of heat treatment (time and temperature) on sensory scores, data were subjected to analysis of variance (ANOVA). Comparison between mean variables was made by Duncan’s multiple range tests and the differences were considered significant when P<0.05. All measurements were carried out in duplicate.

**Result and Discussion**

Sensory evaluation is the most popular way of assessing the acceptability of the product. Effect of different temperatures on the sensory characteristic of processed olive of different pasteurization times is recorded in Table 2. As it can be seen from Table 1, in 70°C, a maximum score of sensory properties of processed olive was seen at 55 min and the minimum average was seen at the times of 30 and 35 min. There were no significant difference between the time of 30, 35 and 45 min but pasteurization at 55 min was significantly different from other times (P<0.05). According to Anthon and Barrett (2006), mild temperature treatments (70°C, 2 min) also enhance the activity of pectin methylesterase, resulting in increased tissue firmness as a result of a firming effect due to the cell wall component of texture. At the 75°C, maximum score of sensory characteristic belonged to the sample which was treated for 45 min. However, there was no significant difference between different times of pasteurization (P>0.05). As given in Table 2, the results of variance analysis showed that at 85°C for 55 min the samples got a high score in terms of sensory properties and got a low score at 85°C for 30 and 35 min and the differences were significant (P<0.05).
Lurie et al. (1997) evaluated a number of heat treatments to reduce chilling injury in tomatoes at the breaker stage. They found that hot water dips (30 min at 40°C or 2 min at 46, 48, or 50°C) before holding at 2°C led to an increase in phospholipid content, a lower sterol to phospholipid ratio, and more unsaturated fatty acids relative to the unheated fruits. Traditional food processing methods have relied on high temperatures as a way to ensure prolonged shelf life and food safety. However, thermal processes suffer from the limitations of heat transfer, with a gradient of temperature exposure from the outside to the inside of the food, with over-processing, causing severe damage to the sensory, nutritional, and functional properties (San Martin et al., 2002). A number of investigators have used mild heat treatments to improve the shelf life of minimally processed products. This approach is intended to reduce the microbial load and decrease enzyme activity (Stanley et al., 1995). Koskiniemi et al. (2013) pasteurized sweet potato, red bell pepper and broccoli in a continuous microwave system (3.5 kW) for 4 min at 75°C and held the products in insulating molds for 30 min. They found that the texture of red bell pepper was reduced by half after processing, and was almost completely lost at the end of a 60-day storage period at 30°C (Koskiniemi et al., 2013).

**Conclusion**

In conclusion, it is proposed that processed olive should be heated at 75°C for 45 mins to achieve a final product with good color, flavor, and consistency as well as a high content of bioactive substances such as phenolic compounds that may contribute to a better health of consumers. Increasing time and temperature of pasteurization increases oiling off, which is an undesirable phenomenon in processed olive.

**References**


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