Research Article

Impact of brine, lye solution and water on sensory attributes of olive fruits

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Abstract

Olive is the only fruit of Oleaceae family which bear edible fruit. The fruit is unable to eat fresh because it contains a bitter glucoside. Olive fruit are only processed for oil extraction but due to its bitter taste very little amount of fruits can be processed to preserve for human consumption. To reduce the bitter taste of olive fruit and made them edible, the olive fruits were treated by lye, water and brine solutions. Samples were analyzed for color, flavor, taste and overall acceptability. Results showed that initially mean score value for color of olive fruit treated with water was recorded as 9.00 which gradually decreased to 7.33, while for flavor mean value of judges was 2.67 which increased to 6.67, similarly mean value for taste was 1.67 which gradually increased to 6.00 during 4 weeks treatments. Similarly for color of brine treated olives fruits initially the mean score value of judges was 9.00 which decreased to 5.33, for flavor the score was recorded as 2.33 which increased to 6.00 and for taste the mean score value was recorded as 2.00 which increased to 5.67. Mean score values for lye treated olive fruit decreased from 9.00 to 5.33 while flavor and taste decreased from 2.33 to 6.00 and 2.00 to 5.67 respectively during four weeks of treatment. Organoleptic evaluation of treated olive fruits showed that fruit with water treatment was found best followed by fruits which were treated with brine solution.

Keywords: Color; Flavor; Lye solution; Olive fruit; Overall acceptability; Taste brine; Water

Introduction
Kalamata fruits are variety of the olive tree which belongs to Oleaceae family cannot be eaten when picked in fresh form because it contains glucosides which produce bitter taste. The bitterness can be reduced by salt or lye treatment or it can present whole fruit as a food. Oil can also be extracted from olive fruit. In California, bitterness of the olive fruit removed before processing [1, 2]. During maturation the carbohydrates content of olive fruits such as minitol, glucose and saccharoses decreased from 3.50 to 6.00. While olive fruit contains 1.5-2.2% protein content by fruit weight basis. Texture of the flesh mostly affect by cement like substance called pectic acid which hydrolysed during processing enzyme pectinolytic and affect the fruit texture become softer. Olive fruit contains high levels of free fatty acids, succinic, malic acid and citric acids as in the form of organic acids [3]. Olives enhance consumers’ perception of quality and production of healthier products,
can be observed worldwide to fulfill their nutritious thirst. Olives contain 45-55% water, oil 13-28%, 1.5-2.0% N-compound, 18-40% Carbon containing compound, Ash in the amount of 1-2% and 5-8% fibre respectively [4].

Olives contain antioxidant and antimicrobial properties due to the presence of tocopherols and phenolic compounds, which act as protecting agent against disease causing microorganisms especially from arthrosclerosis, cardiovascular and cancer [5]. The debittering process is a treatment of the olives with sodium hydroxide solutions with concentrations ranging between 1.5% and 3.0%. The principal objectives of this operation are to eliminate the bitter taste conferred by the glycoside oleuropein [6] and to increase the permeability of the fruits in order to facilitate the exit of different nutrients to be used by lactic bacteria during the subsequent fermentation process [7]. The lye treatment gives rise to complex chemical and physical changes in the fruits, and its extent also affects the subsequent diffusion of salt and the progress of the lactic fermentation [8, 9]. The skin is a natural barrier to the penetration of NaOH and other solutes to the interior of the olives. Its permeation is a function of the treatment conditions such as lye concentration and temperature, and olive variety and maturity [10]. Drusas et al. [11] quantified the diffusion of sodium chloride into green olives placed in brines of various concentrations. They studied untreated olives and olives pretreated with lye at 1.8% for 6 h and calculated salt effective diffusion coefficients assuming a hollow sphere geometry and negligible external resistance to mass transfer. They measured the absorption of salt from changes in brine concentration. During the treatment with lye, sugars and other nutrients are lost into the solution. These losses also continue during the rinsing of the olives [12] and the subsequent curing in brine. Due to the diffusion process, the brine becomes an appropriate growth media for microorganisms responsible of the lactic fermentation [6, 13] that will provide the acidity necessary for the stability and preservation of the olives [14]. The necessary nutrients come from within the olives and their concentration in the brine is determined by the extent of the debittering process. The edibility of olive fruits can be achieve by curing of olive fruit, brining of the Spanish green olive, while Greek black olive can be cured in salt solution or may be processed by other treatment [15]. Adverse weather conditions, different stage of maturity and seasonal variation can affect composition of olive fruit and also quantity of the fruit [16]. Due to bitter glycosides olive fruits are unable to eat. The treatments were done in order to minimize the bitterness level of olive fruits. Thus enhancing the eat-ability of olive fruits and the consumers’ perceptions regarding the acceptability of these fruits.

Materials and methods

Olives’ fruits were collected from research station CCRI which is situated at Persabak, district Nowshera. Sorting of the fruits were carried out in the Laboratory to remove the spoiled fruits. After pre-treatment of the fruits, pulper machine was to extract the edible portion and plastic bottles, jars were used for the preservation of pulp for further study. Proposed plan has given in table 1.

<table>
<thead>
<tr>
<th>Water Treatments</th>
<th>Brine Treatments</th>
<th>Lye Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week-1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>Week-1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>Week-1&lt;sup&gt;st&lt;/sup&gt;</td>
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<tr>
<td>Week-2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>Week-2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>Week-2&lt;sup&gt;nd&lt;/sup&gt;</td>
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<td>Week-3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>Week-3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>Week-3&lt;sup&gt;rd&lt;/sup&gt;</td>
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<td>Week-4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Week-4&lt;sup&gt;th&lt;/sup&gt;</td>
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</tbody>
</table>
Organoleptic evaluation
Treatments were subjected to trained judges for organoleptic evaluation (taste, color, flavor, overall acceptability) using Hedonic scale having 1-9 points [17].

Statistical analysis
Statistical evaluation of the data was done by Statistix 1.8 registered software for statistics, graphs were made by origin software, standard deviation and means were separated by LSD as described by [18].

Results and discussion
Initially mean score value of olive fruit treated with water on 1st week was 9.00 a decreasing trend occurs on 2nd week from 9.00 to 8.00, 7.67 and 7.33, while increasing trend occurs on 2n week for flavor from 2.67 to 4.67, 6.67 and 6.67. Similarly mean score value for taste increased from 1.67 to 3.67, 4.00 and 6.00 during 4 weeks of treatments process (Table 2 & Figure 1). Durrani et al. [19] studied sensory characteristic of mango pulp and concluded that color of pulp decreased during 90 day of storage life. At room temperature by adding chemical additive the shelflife of mango pulp may increase to one year. Adding sodium benzoate along with combination of metabisulphite retained the sensory properties of mango pulp [20].

Table 2. Mean scores of judges of overall acceptability for treated olive fruit after dipping on weekly basis

<table>
<thead>
<tr>
<th>Residues</th>
<th>Treatments</th>
<th>Color</th>
<th>Flavor</th>
<th>Taste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Week 1st</td>
<td>9.00a±0.01</td>
<td>2.67a±0.02</td>
<td>1.67a±0.02</td>
</tr>
<tr>
<td></td>
<td>Week 2nd</td>
<td>8.00b±0.01</td>
<td>4.67b±0.01</td>
<td>3.67b±0.04</td>
</tr>
<tr>
<td></td>
<td>Week 3rd</td>
<td>7.67bc±0.03</td>
<td>6.67c±0.00</td>
<td>4.00bc±0.02</td>
</tr>
<tr>
<td></td>
<td>Week 4th</td>
<td>7.33cd±0.02</td>
<td>6.67c±0.04</td>
<td>6.00d±0.05</td>
</tr>
<tr>
<td>Brine</td>
<td>Week 1st</td>
<td>9.00a±0.01</td>
<td>2.67a±0.03</td>
<td>1.33a±0.01</td>
</tr>
<tr>
<td></td>
<td>Week 2nd</td>
<td>8.33ab±0.01</td>
<td>4.33b±0.04</td>
<td>4.67b±0.05</td>
</tr>
<tr>
<td></td>
<td>Week 3rd</td>
<td>7.67bc±0.00</td>
<td>5.33c±0.02</td>
<td>5.33bc±0.02</td>
</tr>
<tr>
<td></td>
<td>Week 4th</td>
<td>6.67d±0.01</td>
<td>7.00d±0.01</td>
<td>5.67d±0.01</td>
</tr>
<tr>
<td>Lye</td>
<td>Week 1st</td>
<td>9.00a±0.02</td>
<td>2.33a±0.01</td>
<td>2.00a±0.03</td>
</tr>
<tr>
<td></td>
<td>Week 2nd</td>
<td>8.00b±0.01</td>
<td>5.33b±0.03</td>
<td>3.00b±0.02</td>
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<td>4.67c±0.01</td>
</tr>
<tr>
<td></td>
<td>Week 4th</td>
<td>5.33d±0.03</td>
<td>6.00cd±0.03</td>
<td>5.67bc±0.04</td>
</tr>
</tbody>
</table>

Similarly for color of brine treated olive fruit mean score value decreased from 9.00 to 8.33, 7.67 and 6.67 while mean score value of flavor and taste increased from 2.67 to 4.33, 5.33 and 7.00. Similarly mean score value for taste increased from 1.33 to 4.67, 5.33 and 5.67 during a total duration of 4 weeks. Table 2 and figure 2 findings were agreed with the concluded results of [19] who studied a decreasing trend in flavor of apple fruit pulp during storage life of 90 days. Potassium metabisulphite affect the flavor of fruits, increase the shelflife but also act as a bleaching agent and decrease the natural color of fruit.
Samples which treated with lye solution were taken for organoleptic evaluation. Initially judges score value for olive fruit treated with lye solution on 1\textsuperscript{st} week was 9.00, 2\textsuperscript{nd} week (8.00), 3\textsuperscript{rd} week (7.33) and 4\textsuperscript{th} week (5.33) respectively, while in flavor increasing trend was observed, initially on 1\textsuperscript{st} week the mean score value was 2.33 which increased from 2.33 to 5.33, 5.67 and 6.00 respectively. Similarly mean score value for taste was 2.00 on 1\textsuperscript{st} week which increased to 3.00 on 2\textsuperscript{nd} week, 4.67 on 3\textsuperscript{rd} week and 5.67 on 4\textsuperscript{th} week of treatments (Table 2 & Figure 3). These results are corresponding with [25, 26] who concluded a decreasing behavior in color and flavor of mango and Banky apple at RH 70-75\% and temperature 32 to 36 \textdegree C. [19] Investigated that the preservation effect of potassium metabisulphite with combination of potassium sorbate at 0.05\% and addition of ascorbic acid (0.1\%) on mango pulp which showed best result for sensory studies. Chemical preservatives have beaching characteristics which affect the natural yellow color of the fruit. Change in percent acidity and pH also have effect on sensory quality of the fruit during storage. Hedonic scale start from 9 (highest score) and end at 1 which shows low quality [27, 28].
Conclusion
For reduction of bitterness, brine, lye and water treatments were made. Results showed that best result was obtained by olive fruits treated with water having mean score value for color (7.33), flavor (6.67) and Taste (6.00) followed by olive fruits which were treated with brine having mean score value for color (6.67), flavor (7.00) and Taste (5.67) respectively during treatment period of time.

Authors’ contributions
Conceived and designed the experiments:, A Muhammad & M Ayub, Performed the experiments: A Muhammad, Analyzed the data:, Y Durrani & IM Qazi & Saifullah, Contributed materials/ analysis/ tools: SA Ali & MS Hashmi, Wrote the paper: A Muhammad, M Ayub, Y Durrani, IM Qazi, SA Ali, MS Hashmi & Saifullah.

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References


