Determination shelf life of raw dried pistachio nuts

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Introduction

The kernel of pistachio is a rich source of oil (50 - 60 %) and contain linoleic and inoleic fatty acids, essential for human died and oleic acid (Maskan and Karatas, 1998). Pistachio nuts dried to 4-6% moisture are very stable and could held for up 12 months at temperatures as high as 20 °C without significant losses in quality attributes (Kader et al, 1982). Shelf life is defined as the period of time under defined conditions of storage, after manufacture or packaging. (IPST, 1993). There are several established approaches such as ASLT, Sensory Evaluation, Instrumental Measurements, Chemical, Physical property and Microbiological tests for estimating shelf life of foods. Sensory evaluation by a trained panel usually best approximates the overall quality state of the food even. The time at which a large percentage of panelist judge the food as being at or beyond that level is the end of shelf life. (Labuza and Schmitt, 1988). The objectives of this work was to evaluate the sensorial changes of raw dried pistachio nuts stored at various conditions in order to detect the quality parameters and estimate the shelf life of this product.

Materials and methods

Pistachio nut samples. The raw dry pistachio nut(Ohadee variety) samples with an average moisture content of about 5%(wet basis) initially were supplied from Rafsanjan Pistachio Factory in Iran.

Sensory evaluation. Sensory evaluation was performed using descriptive analysis and affective testing (Ston and Sidel, 1985). A sensory score of 2.5 was taken as the cut off for acceptability and termination of shelf life.

Statistical analysis. The results were compared by multifactor analysis of variance. Means of the groups were compared using the least significant difference (LSD) multiple range test using a Statgraphics plus, 2000. Differences among sample means were reported to be significant when p<0.05, and Sigma Plot 8 soft ware was used for drawing plots of linear regression for prediction shelf life of sample pistachio nuts (Kubala and Caculi, 1974).
Results and discussion

Sensory evaluation. Table 1 shows the results of LSD Multiple Range Test for taste, texture and overall acceptability; all factors (O₂ concentration, storage time and temperature) affected sensory properties. Increase of storage time and temperature showed negative effects on sensory attributes, while but with decrease of O₂ concentration showed a positive effect.

Shell life prediction models. Temperature, the single most important environmental factor, influences all mechanisms of food spoilage, so the effects of temperature must be evaluated in all shelf life studies (Dominic Man 2002). Data of multiple linear regression and estimated shelf life of pistachio nuts at various conditions are depicted in Table 2 respectively. All storage temperatures (5,20,35,45 °C) The initial score for overall acceptability of raw dried pistachio nuts decreased in all three types of oxygen percent (< 1% and < 2%) after 12 weeks of storage, and maximum shelf life was 284 days for the sample stored at < 2% O₂ and 4°C. Minimum shelf life was 172 days for sample of stored at 21% O₂ and 43°C. The shelf life prediction curves for raw dried pistachio nuts at different storage temperature showed in Fig. 1. It is clearly seen in Fig. 1 that increase at storage temperature and oxygen percent decrease shelf life of raw dried pistachio nuts. For estimating the best fitting model data fit to the multiple linear regression, first order, second order, and

<p>| Table 1. The results of LSD multiple range test for taste, texture and overall acceptability of raw dried pistachio nuts at c =0.05 level, data represent a 5-point hedonic scale ranging from 1(bad) to 5(excellent) |</p>
<table>
<thead>
<tr>
<th>Variables</th>
<th>Levels</th>
<th>Count</th>
<th>Taste LS mean</th>
<th>Texture LS mean</th>
<th>Overall acceptance LS mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage temperature (°C)</td>
<td>5</td>
<td>150</td>
<td>3.60</td>
<td>3.75</td>
<td>3.36</td>
</tr>
<tr>
<td>O₂ Concentration (%)</td>
<td>20</td>
<td>150</td>
<td>3.48</td>
<td>3.60</td>
<td>3.17</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>150</td>
<td>3.39</td>
<td>3.36</td>
<td>3.16</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td>150</td>
<td>3.25</td>
<td>3.10</td>
<td>3.10</td>
</tr>
<tr>
<td></td>
<td>21%</td>
<td>200</td>
<td>3.37</td>
<td>3.22</td>
<td>3.17</td>
</tr>
<tr>
<td></td>
<td>&lt;2%</td>
<td>200</td>
<td>3.33</td>
<td>3.37</td>
<td>3.14</td>
</tr>
<tr>
<td>Storage time (weeks)</td>
<td>4</td>
<td>120</td>
<td>3.93</td>
<td>4.02</td>
<td>3.39</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>120</td>
<td>3.62</td>
<td>3.57</td>
<td>3.25</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>120</td>
<td>3.29</td>
<td>3.29</td>
<td>3.14</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>120</td>
<td>3.01</td>
<td>2.98</td>
<td>2.99</td>
</tr>
</tbody>
</table>

Values within a column followed by the same letter are not significantly different at the 95% confidence level.
Table 2. The linear model shelf life equations, $H^t$ and estimated shelf life of pistachio nuts at various storage conditions.

<table>
<thead>
<tr>
<th>Temperature ($^\circ$C)</th>
<th>$O_2$ %</th>
<th>Model equation</th>
<th>$R^2$</th>
<th>Shelf life (Weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>21</td>
<td>$Y=3.64-0.035X$</td>
<td>0.942</td>
<td>32.5</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>$Y=3.66-0.035X$</td>
<td>0.720</td>
<td>33.1</td>
</tr>
<tr>
<td></td>
<td>&lt; 2</td>
<td>$Y=3.92-0.035X$</td>
<td>0.942</td>
<td>40.5</td>
</tr>
<tr>
<td>20</td>
<td>21</td>
<td>$Y=3.48-0.045X$</td>
<td>0.920</td>
<td>21.7</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>$Y=3.32-0.035X$</td>
<td>0.942</td>
<td>23.4</td>
</tr>
<tr>
<td></td>
<td>&lt; 2</td>
<td>$Y=3.64-0.035X$</td>
<td>0.942</td>
<td>32.5</td>
</tr>
<tr>
<td>35</td>
<td>21</td>
<td>$Y=3.44-0.045X$</td>
<td>0.920</td>
<td>20.8</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>$Y=3.52-0.05X$</td>
<td>0.925</td>
<td>20.4</td>
</tr>
<tr>
<td></td>
<td>&lt; 2</td>
<td>$Y=3.62-0.05X$</td>
<td>0.926</td>
<td>22.4</td>
</tr>
<tr>
<td>45</td>
<td>21</td>
<td>$Y=3.5-0.055X$</td>
<td>0.916</td>
<td>18.1</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>$Y=3.58-0.055X$</td>
<td>0.916</td>
<td>19.6</td>
</tr>
<tr>
<td></td>
<td>&lt; 2</td>
<td>$Y=3.56-0.055X$</td>
<td>0.892</td>
<td>21.2</td>
</tr>
</tbody>
</table>

Fig 1.-Shelf life prediction curves for raw dried pistachio nuts at different storage temperature.
der and exponential decay. The $R^2$ value of regression analyses were used to select the best fitting model from among them and the second order function had a best fit with $R^2 > 0.80$ at all oxygen percent condition levels (21, 8, & < 2% $O_2$). Our results showed a significant effect of $O_2$% on the sensory attribute (taste, texture) of raw dried pistachio nuts. Similar results were obtained by Kader et al.(1982). Blakiston (1998) reported that flushing with $N_2$ is currently commonly used to reduce residual $O_2$ in packages containing cashews, pistachios, mixed nuts and dried fruit. Maskan and Karatas(1998) reported that differences in peroxide values due to storage conditions were not significantly different during 6 months of storage for pistachio nuts and he showed that the pistachio nuts had a high stability.

Conclusion

We found that raw dried pistachio nuts had a good shelf life for storage at all storage condition, but use of cold storage and lower oxygen percent can be extended shelf life. High oleic Acid content, natural antioxidant such as tocopherols and low moisture gave good shelf life and stability to raw dried pistachio nuts.

References


