Evaluation of acidity and fatty acid compositions in Iranian and imported olive oils

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Abstract

Identifying Fatty Acid compositions which form triglycerides is an indicator which helps to identify olive oil from the other oil products. In the present study three types of olive oils (Spanish, Italy and Iran) were prepared and percentage of Free Fatty Acid (FFA) based on Oleic acid as well as Fatty Acid Profiles were determined by Gas Chromatograph equipped with a Capillary Column Cp Sill 88. It was shown that the amount of Free Fatty Acid and olive oil forming Fatty Acid Compositions varied with oil type and geographic conditions so that olive oil from Italy and Spanish had more Oleic acid and lower Linoleic acid and Palmitic acid compared with Iranian olive oil.

Keywords: Acidity, Fatty Acid, Olive oil

Introduction

Olea europaea L. is a plant that belongs to the Oleaceae family and is an evergreen tree. The olive plant has been an important source of nutrition and medicine for centuries. Olive oil is of highly important due to presence of significant amount of mono-unsaturated Fatty Acid namely Oleic Acid and natural antioxidants (Boskou, 1996). On the other hand, natural antioxidants, Phenolic compositions, α-tocopherol and β-caroten contribute to oil resistance against oxidation. There is a positive correlation between the presence of the said compound and Olive oil stability during storage (Baldisoi et al., 1996). Today olive oil is available in different types such as Virgin olive oil, extra virgin oil, refined olive oil, pure olive oil, refined olive residue oil and residue (Boskou, 1996). The amount of Free Fatty Acid is an important quality factor which is used as an index for classification of different commercial gr ads of olive oil. FFA amount is the first index which was used at early 20th century for olive oil. FFA is expressed as the percent of Oleic acid. Acidity and flavor are two factors that determine suitability of olive oil consumption. At present, more than 50% of Olive oil produced at Mediterranean countries has high acidity as well as poor sensory properties and can’t be consumed until it is refined. Virgin olive oil is derived from fruit of Olea europaea by mechanical method or other physical techniques. Superior virgin olive oil has on excellent flavor and smell and its maximum acidity expresses as Oleic Acid is 2g per 100g oil. First grade virgin olive oil has a very good flavor and smell and its maximum acidity is 2g per 100g oil. Ordinary virgin olive oil has a good flavor and smell and its maximums acidity is 3.3g per 100g oil. Refined olive oil is obtained from refinement of virgin olive oil without any change in initial glycoside structure. Maximum acidity of this oil is 5g per 100g oil on the basis of Oleic acid (Tiscornia et al., 1982).

The objective of this study was to evaluate the Acidity and Fatty Acid Compositions in Iranian and Imported Olive oils.
Materials and Methods

Materials

Olive oil samples included imported ones from Spain and Italy and an Iranian one (Dasht-e-khorram Co.) which were signified with N, I, and S, respectively. It should be mentioned that Italian and Spanish olive oils were of extra virgin olive, and Iranian olive oil was of refined olive type.

Methods

Percentage of Free Fatty Acid based Oleic acid was measured by titration method according to AOAC standard number 28.930 (Fireston, 1994). Also in order to determine Fatty Acid Composition of olive oil samples, preparation of samples was performed in the form of methyl ester derivative. In doing so, a Gas Chromatograph equipped with Capillary column Cp Sil 88 was used according to AOCS standard number 91-Ce 1e. Statistical analysis was done by using SPSS software (version 10) and Duncan's multiple range tests was used for mean comparison.

Results and discussions

Olive oil is unique edible oil due to palatable flavor, high stability and nutritional value and its production is limited to some regions in the world. This oil is consumed without purification therefore it is expensive and mixed with cheaper vegetable oils by some dealers. Identification of triglyceride-forming fatty acids can help us to identify olive oil from the other produced oils (Kiosseoglou et al., 1993). Table 1 shows the results of average acidity and Table 2 shows the results related to type and amount of Fatty Acid Composition of olive oil samples. As you can see from Table 1, Iranian refined olive oil had the lowest acidity due to filtration process, and showed a significant difference with two other samples (p<0.01).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Acidity (Oleic acid %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>0.583</td>
</tr>
<tr>
<td>I</td>
<td>0.579</td>
</tr>
<tr>
<td>N</td>
<td>0.272</td>
</tr>
</tbody>
</table>

In each column, means with the same letter are not significantly different (P<0.01)

Table 2. The mean of type and Fatty Acid compositions in imported and Iranian olive oils

<table>
<thead>
<tr>
<th>Treatment</th>
<th>C\textsubscript{16:0}</th>
<th>C\textsubscript{16:1}</th>
<th>C\textsubscript{18:0}</th>
<th>C\textsubscript{18:1}</th>
<th>C\textsubscript{18:2}</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>10.2\textsuperscript{a}</td>
<td>0.9\textsuperscript{a}</td>
<td>2.5\textsuperscript{a}</td>
<td>77.3\textsuperscript{a}</td>
<td>7.1\textsuperscript{a}</td>
</tr>
<tr>
<td>I</td>
<td>10.9\textsuperscript{b}</td>
<td>0.7\textsuperscript{b}</td>
<td>2.3\textsuperscript{b}</td>
<td>79.2\textsuperscript{a}</td>
<td>6.9\textsuperscript{b}</td>
</tr>
<tr>
<td>N</td>
<td>9\textsuperscript{c}</td>
<td>0.7\textsuperscript{b}</td>
<td>2.1\textsuperscript{c}</td>
<td>78.4\textsuperscript{b}</td>
<td>9.8\textsuperscript{a}</td>
</tr>
</tbody>
</table>

In each column, means with the same letter are not significantly different (P<0.01)

Also based on Table 2 the most predominant Fatty Acid in olive oil samples tested was related to mono-unsaturated Fatty Acid, Oleic acid followed by Palmitoleic acid, respectively. The difference observed at the amount of the said Fatty Acid was mainly due to geographic conditions of produced oil as well as oil filtration process (Kiosseoglou et al., 1993). Furthermore, no significant difference was observed between imported olive oils in the amount of Oleic acid; however there was a significant difference in Oleic acid amount between imported and Iranian olive oils. In addition, Italian olive oil had the highest amount of Palmitic acid followed by Spain olive oil and significant difference, and lowest amount of Palmitic acid was related to Iranian olive oil (p<0.01). Regarding Linoleic acid, the highest amount was related to Iranian olive oil (significant difference with the treatments) and the lowest amount was related to imported sample (without significant difference). The most amount of Stearic acid was observed at Spanish, Italian and Iranian oils, respectively. Spanish oil showed the highest amount of Palmitoleic acid and a significant difference with the other treatments. The lowest amount of Palmitoleic acid was related to Italian and Iranian oils.

Conclusion

Type and amount of Fatty Acid compositions vary with the type of olive oil, filtration process and geographic conditions of produced oils. Usually this property can identify olive oil from the other oils. Further
it was shown that Italian and Spanish olive oil had more amount of Oleic acid and lower amounts of Linoleic and Palmitic acid but Iranian olive oil had lower amount of Oleic acid but more amounts of Linoleic and Palmitic acid. Olive oils are classified into two kinds; the first kind contains a little palmitic and linoleic acid and a high amount of oleic acid. The second kind contains high amounts of Linoleic and Palmitic acids and a little amount of Oleic acid. Olive oils from Spain, Italy and Greece are some examples of the first kind. Oil from Tunisia is an example of the second kind.

References


