THE PHENOLIC AND FLAVONOID CONTENT OF PEPINO (SOLANUM MURICATUM) GROWN IN THE DISTRICT OF ÇANAKKALE, TURKEY

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ABSTRACT
Pepino (Solanum muricatum) is a crop native to South America and more specifically to the Andean region. Its juicy fruits are mostly consumed in their fresh form and can also be used in salads like cucumber. The visually attractive appearance of pepino fruits due to the golden yellow to cream background enriched with purple stripes, makes these exotic fruits looked up in the market. Because of the attractiveness of the pepino fruits, nowadays, pepino is readily grown not only in South America but also in other parts of the world. Nowadays, pepino is cultivated in Europe, Australia and Asia. As the pepino fruits are gaining significance throughout the world, recently this plant is grown in Turkey, also. In this study, the pepino fruits cultivated in the district of Çanakkale were sampled and analyzed for their total phenolic and flavonoid content. Methanolic and hexane extracts of the pepino samples were prepared. The methanolic pepino extracts were found to contain higher amount of phenolic (525.50±2.34 μg gallic acid / g extract) and flavonoid compounds (182.42±0.71 μg rutin / g extract). In addition to the consumption of fresh pepino fruits, these fruits are also of medicinal significance due to their use in the treatment of cardiovascular diseases, as a diuretic, and the anti-inflammatory and antitumoral effects. Therefore, the determination of total phenolic and flavonoid content of ripe pepino fruits is of significance.

Keywords: Pepino fruits, Solanum muricatum, phenolics, flavonoids

INTRODUCTION
The bioactive compounds of plant materials continue to be of interest because of their health effects. Fruits and vegetables are known to be the main sources of phenolic compounds (Kapur and Kapoor, 2001; Naczk and Shahidi, 2006). The phenolics in plants are secondary metabolites that may act as attractants for pollinators, contributors to pigmentation, antioxidants and agents acting against stress conditions such as infection, UV radiation, etc. The phenolics include a number of compounds such as phenolic acids, flavonoids, stilbenes, hydrolysable and condensed tannins, lignans and lignins. In food products, the phenolic compounds are responsible for the bitterness, astringency, color, flavor, odor and also the oxidative stability of the food materials. On the other hand, the polyphenolic compounds present in plants are known to have beneficial effects such as preventing the oxidative stress in tissues, thus leading to the prevention and/or decreasing the risk of cardiovascular diseases, cancer, diabetes, arthritis (Landete, 2012; Naczk and Shahidi, 2006; Wang et al., 2011).

The pepino (Solanum muricatum) is a crop originally grown in South America, but in the last decades is continually gaining significance in the market. Nowadays, pepino is grown successfully also in USA, Australia, Spain, France, Italy, Iran and Turkey (Rodriguez-Burruezo et al., 2011). The fruits of pepino, as exotic fruits, are mainly preferred due to their appearance as golden yellow to cream background enriched with purple stripes, and mild sweet taste and melon/pear-like aroma.
Kola (2010) analyzed the chemical characteristics of pepino fruits grown in the Marmara region of Turkey. It was found out that the ripe pepino fruits contain appreciable amounts of organic acids such as citric acid, ascorbic acid and malic acid and sugars including sucrose, glucose and fructose.

Hsu et al. (2011), suggested that the aqueous extracts of pepino fruits may lessen the progression of diabetes due to the antioxidative, anti-inflammatory and antiglycative effects. The aim of the present study was to evaluate the total phenolic and flavonoid content of ripe pepino fruits grown in the province of Canakkale, Turkey.

**MATERIALS AND METHODS**

**Chemical Reagents**

All chemicals were purchased from Sigma-Aldrich (USA), SPA (Milan, Italy), Merck (Germany) and Fluka Chemie (Switzerland).

**Plants Materials**

Fruits of pepino (Solanum muricatum) were collected from the province of Canakkale, Turkey.

**Preparation of Fresh Fruit Sample Extracts**

The collected pepino fruits were stored at 4°C till analysis (not more than 12 hours) and fresh fruits were used for extraction. Each fresh pepino fruit sample (20 g) was extracted according to Maisuthisakul et al. (2007). Briefly, a sample (20 g) was blended with 60 mL methanol (95%) and hexane in a blender for 1 minute and shaken for 4.5 h. The supernatant was filtered through Whatman filter paper (No. 4). All filtrates were evaporated under reduced pressure using a Rotary evaporator at 40°C and weighed in order to determine the yield of soluble components. Afterwards, the extracts were immediately analyzed for total phenolics and flavonoids. Unless otherwise stated, all assays were done in triplicate.

**Analysis of Total Phenolic Content**

The amount of total phenolics in the methanol and hexane extracts of fruit samples was measured using the Folin–Ciocalteu reagent method Djeridane et al. (2006). The methanol solution of each extract (0.2 mL, 500 mg/mL) was taken in a test tube. 0.5 mL distilled water and 0.5 mL Folin–Ciocalteu reagent were added and the tubes were shaken thoroughly. After 1 min, 0.8 mL of sodium carbonate solution (7.5%) was added and the mixture was allowed to stand for 30 min. with intermittent shaking. Absorbance was measured at 760 nm using a UV–Vis spectrophotometer (Thermo Aquamate). The total phenolic content was expressed as gallic acid equivalents (GAE) in mg per g fresh fruit.

**Analysis of Total Flavonoid Content**

The total flavonoid content was determined according to Quettier-Deleu et al. (2000) using rutin as a standard. The total flavonoid content was expressed as rutin equivalents in mg per g fresh fruit. Three replicates were used for the determination of the mean total flavonoid values of the fruit samples.

**Statistical Analysis**

The results were reported as mean ± SD (standard deviation). One-way ANOVA was applied to investigate the differences among means by using Statgraphics Centurion XV software. The values were considered to be significantly different at p<0.05.

**RESULTS AND DISCUSSION**

The total phenolic and flavonoid content of the methanolic and hexane extracts of pepino fruit is given in Table 1. The methanolic extracts of pepino fruits were found to contain significantly higher phenolic and flavonoid compounds (p < 0.05) (Fig. 1 and 2).

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<th>Methanolic Ex.**</th>
<th>Hexane Ex.</th>
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<tr>
<td>Total Phenolics (µg GAE/g extract)</td>
<td>525.50±2.34&lt;sup&gt;a&lt;/sup&gt;</td>
<td>312.78±1.86&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>Total Flavonoids (µg Rutin/g extract)</td>
<td>182.42±0.71&lt;sup&gt;a&lt;/sup&gt;</td>
<td>101.22±1.29&lt;sup&gt;b&lt;/sup&gt;</td>
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*The values are given as mean ± standard deviation (n=3).
**Means with different letter within a row are significantly different at p<0.05.
Hsu et al. (2011) determined the total phenolic and flavonoid content of the aqueous and ethanolic extracts of pepino fruits. The aqueous extracts were found to have higher flavonoid content, while the total phenolics of the ethanolic and aqueous extracts were similar. The ethyl acetate extracts of pepino were also found to contain considerable amounts of phenolics and flavonoids (Sudha et al., 2011). The level of phenolic compounds in plants mainly depends on the cultivation techniques and growing conditions, type of the plants, ripening process, as well as storage conditions. Furthermore, the quantification of phenolics is done via different extraction processes and methods. Therefore, the phenolic content is also influenced by the way of extraction and also by the polarity of the solvent used for the extraction process (Naczk and Shahidi, 2006). The phenolics and flavonoids of fruits and vegetables are known to affect positively the antioxidant capacity of these materials. Therefore, the considerable amounts of total phenolics and flavonoids might lead to the potential antioxidant activity of pepino.

In this study, the fresh juicy fruits of pepino were found to have considerable amounts of phenolics and flavonoids, thus showing that this fruit might be a good source of antioxidant compounds.
REFERENCES


