THE ANTIOXIDANT CAPACITY OF PEPINO (*SOLANUM MURICATUM*) CULTIVATED IN THE ÇANAKKALE REGION, TURKEY

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ABSTRACT

Pepino (Solanum muricatum) also known as pepino dulce or pear melon is a plant that is originally grown in South America, mainly for its juicy fruits. Recently, pepino is successfully cultivated not only in South and North America, but also in Australia, Europe, Asia and the Middle East countries such as Turkey. In Turkey, the pepino crops were found to be well adapted to grow well and with high productivity. The fruits of pepino are preferred not only due to their attractiveness because of colorful appearance, taste and juiciness but also due to their medicinal significance. Therefore, in this study, the antioxidant capacity of the ripe fresh pepino fruits cultivated in the region of Çanakkale was determined by using the free radical 1,1'-diphenyl-2-picrylhydrazyl (DPPH) scavenging method. For this purpose the methanolic and hexane extracts of the ripe pepino fruits were prepared. Furthermore, the DPPH free radical scavenging activity of the pepino fruits were compared with that of butylated hydroxytoluene (BHT), ascorbic acid, and α-tocopherol. The % inhibition level of the methanolic extract (96.46±0.53) was found to be similar to that of BHT, ascorbic acid and α-tocopherol, while the hexane extract of the pepino fruits (74.46±0.38) exhibited significantly lower % inhibition levels. Furthermore, the methanolic extracts of pepino showed very good EC_{50} inhibition values (defined as the concentration of the compounds that was able to inhibit 50 % of the total DPPH radicals) (41.79±0.12 µg/mL).

Keywords: *Pepino fruits, Solanum muricatum, antioxidant activity*

INTRODUCTION

The free radical oxidative stress is mainly related to the onset of clinical disorders such as cardiovascular diseases, cancer, diabetes, arthritis, sclerosis and Alzheimer's disease (Adly, 2010; Aruoma, 1998, Dhalla et al., 2000). The free radicals, that are compounds with an unpaired electron are very reactive and are formed by radiation or metabolic reactions. They are known to be the precursors of chain reactions leading to the breakdown of compounds such as lipids, proteins and nucleic acids. An increase in the free radicals contents affects the antioxidant defense system leading to oxidative stress. The oxidative stress is known to be responsible for the aging process of living cells and is considered to be related with cardiovascular diseases, cancer and diabetes (Adly, 2010). Studies about the relationship of such diseases with the nutritional status, showed out that the intake of food products rich in natural antioxidants decreases the incidence of diseases. Therefore, recently the research about the antioxidant potential of food products has gained significance.

Fresh fruits and vegetables are known to contain a number of compounds effective against oxidative stress. These compounds include phenolics, vitamins, some free amino acids and peptides with antioxidant activities (Wang et al. 2011).

The pepino (Solanum muricatum) crop, which is recently gaining an interest in the fruit market, especially as an exotic fruit due its appearance and mild melon/pear-like aroma. On the other hand, the attempts of introduction of exotic fruits into the world market led to the studies of cultivation of the plant in countries like USA,

Australia, Spain, France, Italy, Iran and Turkey (Rodriguez-Burruezo et al., 2011). In recent years, the cultivation of pepino in Turkey is successfully done in the Marmara, Aegean and the Mediterranean regions of Turkey. Cavusoglu et al. (2009) reported that the growing of pepino fruits in terms of yield, fruit weight and diameter, is mainly dependent on the climatic conditions.
In the present study, the antioxidant properties of the methanolic and hexane extracts of fresh pepino fruits grown in the region of Canakkale were investigated for their antioxidant potential via the DPPH radical scavenging method.

MATERIALS AND METHODS

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

Plant Materials
Fruits of pepino (Solanum muricatum) were collected from the province of Çanakkale, Turkey.

Preparation of Fresh Fruit Sample Extracts
The collected pepino fruits were stored at 4^{o}C till analysis (not more than 12 hours) and fresh fruits were used for extraction. Each fresh fruit sample (20 g) was extracted according to Maisuthisakul et al. (2007). Briefly, a sample (20 g) was blended with 60 mL methanol (95%) or 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^{o}C and weighed in order to determine the yield of soluble components. Afterwards, the extracts were immediately analyzed for DPPH free radical scavenging activity and all analyses were done in triplicate.

DPPH Free Radical-Scavenging Activity Assay
The effect of the oxidized pepino fruit extracts on 1,1-diphenyl-2-picrylhydrazyl (DPPH) was estimated as described by Brand-Williams et al. (1995). Each sample was diluted in methanol prior to the analysis (1 mg/mL). The DPPH solution was added to the diluted sample, thoroughly mixed, then left for 30 min. for the reaction to occur. After that, the absorbance of the sample was measured at 515 nm using a UV–Vis spectrophotometer (Thermo Aquamate). The absorbance of DPPH solution in methanol, without any antioxidant (control), was also measured. The percentage of DPPH radical scavenging activity was calculated by using the following equation:

$$\% \text{ DPPH scavenging} = [(A_{control} - A_{sample})/A_{control}] \times 100$$

where A_{sample} is the absorbance of sample after the time necessary to reach the plateau (30 min) and $A_{control}$ is the absorbance of DPPH. Extract concentrations providing IC_{50} inhibition values (defined as the concentration of the compounds that was able to inhibit 50 % of the total DPPH radicals) were calculated from graph plotting using nonlinear regression and expressed in µg material equivalents/g for sample extracts. Butylated hydroxytoluene (BHT) was used as a positive control. A lower value of IC_{50} indicates a higher antioxidant activity and vice versa.

RESULTS AND DISCUSSION

In this study, the antioxidant activity of the extracts of fresh pepino fruits grown in the Canakkale region was determined by the DPPH free radical scavenging method and shown in Table 1. DPPH is a stable free radical, which decreases significantly when exposed to proton radical scavengers. Therefore, this method is used thoroughly in the evaluation of the antioxidant capacity of various materials (Sanchez-Moreno, 2002). The DPPH free radical scavenging activity of the methanolic and hexane extracts, were compared with that of BHT, α-tocopherol and ascorbic acid. The methanolic extract of fresh pepino was found to exhibit free radical scavenging activity close to that of α-tocopherol. On the other hand, the hexane extract of fresh pepino was found to have lower antioxidant capacity (Table 1).

Table 1. The DPPH free radical scavenging activity of the pepino extracts*

		BHT	Ascorbic Acid	α-Tocopherol	Methanol Ex.	Hexan Ex.
DPPH	IC_{50} (µg/mL)	32.94±1.52	12.42±0.91	43.29±2.17	41.79±0.18	19.57±3.41
	% Inh.	94.20±1.76	98.90±2.02	96.36±1.59	96.46±0.53	74.46±0.38

*The values are given as mean ± standard deviation (n=3).

The % inhibition level of the methanolic and hexane extracts of fresh pepino is shown in Figure 1. When compared with the % inhibition level of BHT, α-tocopherol and ascorbic acid, the lower free radical scavenging activity of the hexane extracts of fresh pepino is clearly observed. Nevertheless, the methanolic extract of fresh pepino exhibited higher % inhibition level, showing out that polar solvents are more efficient in the extraction of constituents with radical scavenging activity from pepino fruits.

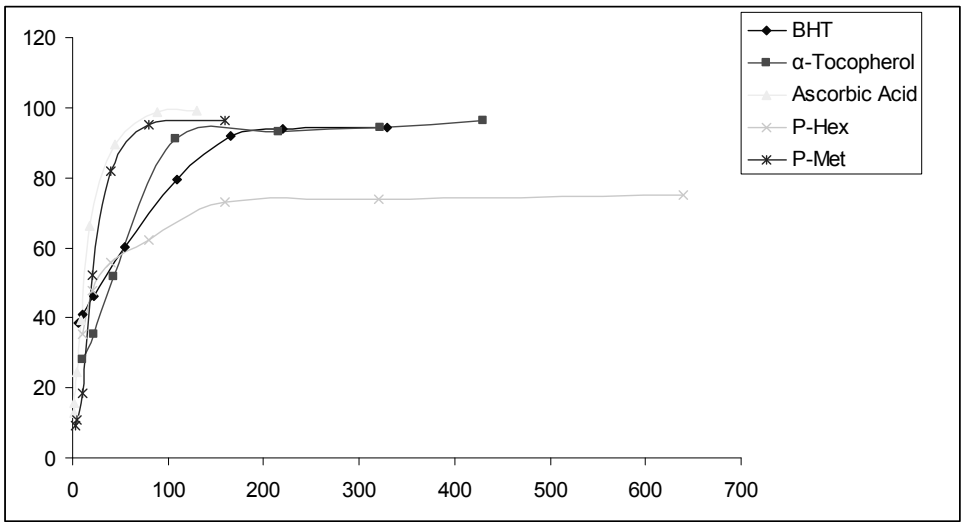

Figure 1. Demonstration of inhibition (%) of different Pepino extracts (P-Hex: hexane extract; P-Met: methanolic extract)

The results indicated that the methanolic extract of fresh pepino has a good antioxidant capacity. Similarly, Sudha et al. (2011) reported that the ethyl acetate extract of pepino fruits exhibit good antioxidant activities. The antioxidant capacity of food products of plant origin such as fruits and vegetables is mainly due to a number of bioactive products such as phenolic compounds, vitamins and peptides (Wang et al., 2011). Therefore, a more detailed study will elaborate the reasons for the antioxidant capacity of pepino fruits.

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