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Phenolic and Antioxidant Diversity Among Fruit Species Grown in Turkey

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To identify promising sources of antioxidants, 22 fruit species were studied for total phenolic contents and antioxidant activity. The total phenolic content in fruits estimated as gallic acid equivalent (GAE) ranged from 2.64 mg per g dry weight (DW) for kiwifruit to 90.64 mg per g GAE for walnut. The highest antioxidant activity was observed in rose hip as 92.31 %, while the lowest was in orange (32.43 %), respectively. The antioxidant activity of butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) were found 90.7 and 89.9 %, respectively. There was no correlation (R = 0.788) between total phenolic content and antioxidant activity among species. The results indicate the presence of significant antioxidant activity, which strongly affected by species in fruit families.

Key Words: Fruits, Antioxidants, Phenolic content.

INTRODUCTION

Fruit culture has played an important role in Turkey's history. Over 85 fruit species including almost all the deciduous, most of the subtropical and some tropical fruits are grown[1].

The growing interest in the substitution of synthetic food antioxidants by natural antioxidants and in the health implications of antioxidants as nutraceuticals has fostered research on plant sources and the screening of raw materials for identifying antioxidants. It is known that among crops, consumption of fruits and vegetables is essential for normal health of human beings[2].

Plant foodstuffs are a treasure house of antioxidant constituents like polyphenols, antioxidant vitamins, carotenoids, minerals, *etc*. These antioxidant phytochemicals when included in human diet offer protection to human being against a variety of oxidation-related diseases like cancer

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and cardiovascular diseases. They are therefore an important class of nutraceuticals. Phytochemicals act as potent antioxidants in both fat-soluble and water-soluble body fluids and cellular components[3]. The role of antioxidant phytochemicals is to arrest the free radical chain reaction and thus they possess biological characteristics like anti-carcinogenicity, antimutagenicity, antiaging activity and anticholesterol activity. The sources of antioxidants include foods of plant origin such as fruits, vegetables, cereals, pulses, nuts, oilseeds, spices, tea, *etc*. Some of the compounds possessing antioxidant activities are polyphenols such as flavonoids, bioflavonoids, isoflavones and tannins. Some of the vitamins *e.g.*, vitamin C, vitamin A and vitamin E also possess antioxidative activity[4].

The accumulated literature suggests that a substantial part of the genetic variation in physicochemical characteristics of fruits is associated with the species[5-7].

There are studies on pomological properties of different fruit species in Turkey[7-9]. On the other hands, to our best of knowledge there has been no comparative study on antioxidant and total phenolic content of different fruit species naturally grown in Turkey. Therefore the aim of this study is to provide a knowledge of compositional and quality parameters of different fruit species found in Turkey.

EXPERIMENTAL

Fruits belong to 22 different species were bought from supermarket in Erzurum. Approximately, 20 fruits for each species were used for analyses. The soft parts of fruit (peel) are used for analysis. The antioxidant activity of ethanol extracts of fruits was determined according to the β-carotene bleaching method[10] with some modifications. The concentration of total phenolics in the ethanol extract of different fruit species was determined by the Folin-Ciocalteau colourimetric method[11]. Measurements were carried out in duplicate and the calibration curve was performed with gallic acid and the results were expressed as mg of gallic acid equivalents per g (mg GAE/g) dry weight basis.

RESULTS AND DISCUSSION

Antioxidant activity in fruit species is shown in Fig. 1. The fruit species were grouped high, medium and low in terms of antioxidant activity. According the classification, 13 (almond, banana, cornelian cherry, grape, hazelnut, kiwifruit, mandarin, olive, pear, persimmon, pistachio, rose hip and walnut) out of 22 fruit species were found high, 6 species (apple, chestnut, elaeagnus, fig, plum and quince) were found medium and 3 species (apricot, grapefruit, orange) were found low in terms of antioxidant activity (Fig. 1).

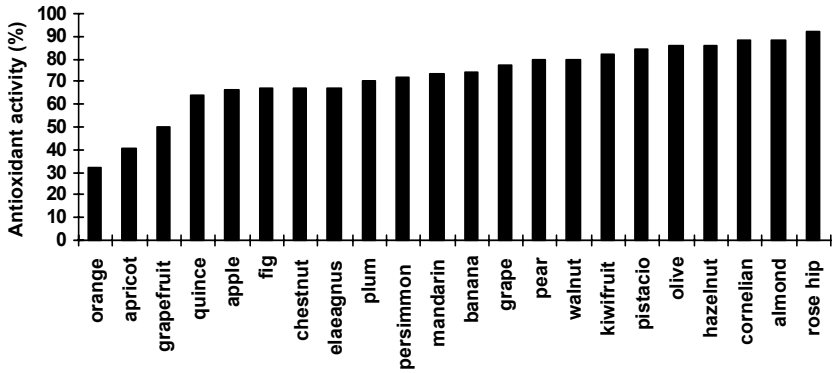

Fig. 1. Antioxidant activity of fruit species

The antioxidant activity of BHA and BHT were 90.7 and 89.9 %, respectively. In general, most samples revealed high antioxidant activity. The antioxidant activity reached nearly 100 % for rose hip (92.3 %) indicating higher value than both BHA and BHT. The almond and cornelian cherry was also found high in antioxidant activity (88.5 and 88.2 %, respectively). These values are also very close to standard BHA and BHT. The other antioxidant rich species was pistachio (84.3 %) and kiwifruit (82.5 %) (Fig. 1). This result is indicating that these species could be more important for human healthy due to higher antioxidant capacity. Overall the lowest antioxidant activity was observed in orange (32.4 %) followed by apricot (40.4 %) and grapefruit (50.2 %) (Fig. 1).

The amounts of total phenolics in the studied fruit samples are shown in Fig. 2. A great variation in terms of total phenolic content (2.64-90.64 mg GAE/g DW) was observed among species. Only 2 species (olive and walnut) were found high for total phenolic contents, 3 species (cornelian cherry, elaeagnus and pistachio) were found medium and the rest of the species were found low (Fig. 2). The highest total phenolic content was observed in walnut (90.64 mg GAE/g DW) followed by olive (70.10 mg GAE/g DW) and cornelian cherry (47.64 mg GAE/g DW), respectively (Fig. 2). Overall the lowest total phenolic content was observed in kiwifruit (2.64 mgGAE/g DW) (Fig. 2). It is previously reported that fruits and vegetables had important antioxidant and phenolic sources[12].

It is clear that the variation of phenolic compounds in the fruits depends on genetic differences. There was no correlation (R = 0.788) between total phenolic content and antioxidant activity in the fruit samples. Kahkonen *et al.*[5] reported that no significant correlations could be found between the total phenolic content and the antioxidant activity of 92 plant extracts of the studied subgroups. Some authors proceeded to comment that different phenolic compounds show different colourimetric

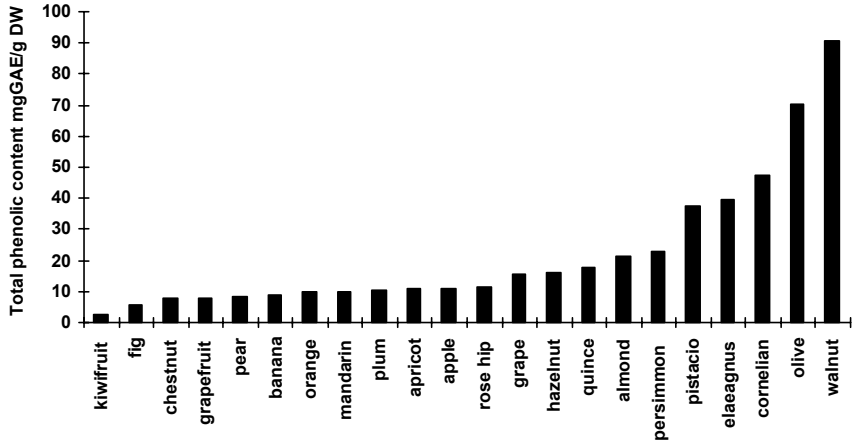

Fig. 2. Total phenolic content of fruit species

responses when using the Folin-Ciocalteu reagent. Similarly, the molecular antioxidant response to free radicals varies markedly, depending on the chemical structure and the oxidation conditions. The results for total phenolics and antioxidant activity clearly suggest that fruit species are one of the rich natural antioxidant sources among plant kingdom. The great difference of the fruit species in terms of phenolics and antioxidant activity is supposed to its genetic derivation.

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