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An Investigation about Antioxidant Capacity of Fruit Nectars

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Abstract: Nectars of some fruits, including orange, sour cherry, peach and apricot sold in Samsun markets were analyzed for total antioxidant capacity, total phenolic content, ascorbic acid content and total carotenoids (except sour cherry). Ferric reducing/antioxidant power (FRAP) assay was used to measure the total antioxidant power. Expressed as μmol of antioxidant power/ml of nectars, average FRAP values were as 6.54 for orange nectars, 8.01 for sour cherry nectars, 5.68 for apricot nectars and 5.19 for peach nectars.

Key words: Orange nectar, apricot nectar, sour cherry nectar, peach nectar, total antioxidant capacity, FRAP

Introduction

Epidemiological studies demonstrate a protective effect of vegetables and fruits against cancer, stroke and coronary heart disease, which may related to antioxidants in these foods. Although the majority of the evidence emphasizes the roles of vitamin E, vitamin C and β-carotene, the presence of the phenolic antioxidants may also play contributory role. Juices are besides fruits and vegetables suitable food products in terms of ingestion of health protective phytochemicals. The bioactive components may even be better absorbed from juices than from plant tissues (Netzel *et al.*, 2002). It is of general interest to measure the antioxidant capacity (activity) of fruits (Cao *et al.*, 1996; Wang *et al.*, 1996; Guo *et al.*, 1997; Kalt *et al.*, 1999; Deighton *et al.*, 2000; Kalt *et al.*, 2000; Ehlenfeldt and Prior, 2001; Prior *et al.*, 2001). Wang *et al.* (1996) measuring the total antioxidant activity of 12 fruits and five commercial fruit juices, including orange juice found that the order of antioxidant effectiveness was: grape juice>grapefruit juice>tomato juice>orange juice>apple juice.

Rice-Evans and Miller (1995) studied the relative antioxidant potentials of fruit juices, including black currant, orange and apple-juice and an apple drink in relation to vitamin C at a concentration of 30 mg/100 ml. The order of antioxidant effectiveness was given as: black currant juice>orange juice>apple juice. They reported that, the antioxidant activity of orange juice was stronger than vitamin C at a concentration of 30 mg/100 ml.

The total antioxidant activity and antioxidant composition of orange juice, apple juice and black currant drink were studied by Miller and Rice-Evans (1997). The total antioxidant activity was reported as: 2610, 840 and 5070μmol litre^{-1}, and ascorbic acid contents as: 2270, 51 and 3726 μmol litre^{-1}.

Total antioxidant activities of a total of 17 orange juices, consisted of freshly squeezed and processed blood and blond orange juices were measured by Arena *et al.* (2001). The average ascorbic acid content and Trolox Equivalent Antioxidant Capacity were reported as 518 mg litre^{-1} and 4.18 mmol litre^{-1} for commercial blood orange juice and as 262-350 mg litre^{-1} and 2.19-2.97 mmol litre^{-1} for commercial blond orange juices.

Gardner *et al.* (2000) studying the relative contributions of vitamin C, carotenoids and phenolics to the antioxidant potential of fruit juices, including orange, grapefruit, pink grapefruit, apple, pineapple and vegetable-juices found that, both vitamin concentrations and total phenolic contents strongly correlated with antioxidant capacity. Antioxidant capacities of different juices varied markedly, orange juice being 5-7 fold more active than the vegetable juice had the highest antioxidant power.

Netzel *et al.* (2002) determined the invivo antioxidative capacity of a composite berry juice. They tested the health protective potential of a special antioxidant rich juice, containing 10% sour cherry, 30% white grape, 25% black currant, 15% elderberry, 10% blackberry and 10% aronia-juice, the bioavailability of its most important bioactive compounds (anthocyanins and ascorbic acid) and the influence of juice composition on plasma antioxidant capacity and plasma malondialdehyde (MDA). The juice ingestion resulted in a significantly increased (30%) plasmatic antioxidant capacity after 2 hours and significantly decreased (18%) plasma MDA after 4 hours.

The purpose of this study was to investigate the comparative antioxidant potentials and the relationship with the antioxidant composition of orange, apricot, peach and sour cherry-nectars consumed in Samsun, Turkey.

Materials and Methods

Materials: In the present study, a total of 20 fruit nectars were analyzed. Cartons of orange, sour cherry, apricot and peach nectars, each processed by five different firms were purchased from local supermarkets.

Table 1: Ascorbic acid, total carotenoids and total phenolics contents of fruit nectars

	Dry matter ($g\ kg^{-1}$)	Ascorbic acid ($mg\ kg^{-1}$)	Total phenols ($mg\ l^{-1}$)	Total carotenoids ($mg\ l^{-1}$)	Total anthocyanin ($mg\ l^{-1}$)
Orange	115.8±3.2	589.8±391.7	194.20±33.49	3.43±1.87	n.d
Apricot	133.9±4.1	105.2±62.3	457.51±86.14	3.32±1.20	n.d
Peach	134.4±2.9	83.6±56.5	413.72±37.78	1.90±0.78	n.d
Sour Cherry	129.5±5.2	25.3±23.7	475.69±50.12	n.d[a]	24.56±6.18[a]

[a]nd, not detectable. Result as mean ± standard deviation of measurement

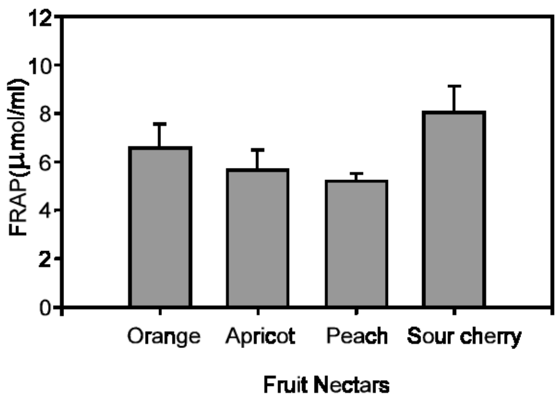

Fig. 1: FRAP (Ferric reducing/antioxidant power) of fruit nectars

Methods: Dry matter was determined by heating in a vacuum oven at 70 °C until a constant weight was obtained (AOAC, 1984). Total carotenoid determination was carried out on an aliquot of petroleum ether by spectrophotometric method. Total carotenoid contents were calculated as β-carotene equivalents as mg per litre (Chan and Cavaletto, 1982). Total anthocyanins in sour cherry nectars were determined by the pH-differential method as described by Wrolstad (1976). Anthocyanin pigments were calculated as mg cyanidin-3-glucoside per liter using the extinction coefficient of 29600. Ascorbic acid contents were estimated spectrophotometrically by metaphosphoric acid extraction of 2,6-dichlorophenol indophenol dye (Regnell, 1976). The amount of total phenolics was measured at 720 nm by the Folin-Ciocalteu reagent and expressed as catechin (AOAC, 1965). For antioxidant power determination, samples were mixed with 0.95 ml of ferric-TPTZ reagent (prepared by mixing 300 mM acetate buffer, pH 3.6, 10 mM 2,4,6-tripyridil-*s*-triazine in 40 mM HCl, and 20 mM $FeCl_3$ in the ratio 10:1:1) and measured at 593 nm. $FeSO_4$ was used as a standard and antioxidant power expressed as µmol ml^{-1} FRAP (Gao *et al.*, 2000).

Results and Discussion

Table 1 gives the content of analyzed components of the investigated fruit nectars. As can be seen in Table 1, orange nectars had the highest concentration of ascorbic acid and followed by apricot and peach nectars. Ascorbic acid contents of fruit juices and nectars were reported by many researchers. In orange juices the content of ascorbic acid varied from 20.4-54.2 mg/100 ml (Behrens and Madere, 1994; Schobinger, 1988; Arena *et al.*, 2001; Farnworth *et al.*, 2001) and according to Schobinger (1988), in apricot nectars the average content of ascorbic acid was 15.09%. The determined level of ascorbic acid for orange juices are higher and for apricot nectars are lower than these values.

The nectars except sour cherry were analyzed for total carotenoids. Orange juices contained 16-41 mg/l total carotenoids (Bauernfeind *et al.*, 1962), and Gardner *et al.* (2000) reported 3.0 μg ml^{-1} total carotenoids and 755 μmol ml^{-1} total phenolics from orange juices. Present results are in agreement with the values of Gardner *et al.* (2000) but lower than the values reported by Bauernfeind *et al.* (1962).

Sour cherry nectar had the highest total phenolic content followed by apricot nectar, peach nectar and orange nectar. The determined level of total phenolics in orange nectars are distinctly lower than that given by Gardner *et al.* (2000).

FRAP values of fruit nectars are given in Fig. 1. As can be seen in figure, the order of antioxidant effectiveness was: sour cherry nectar>orange nectar>apricot nectar> peach nectar. Among the fruit nectars investigated sour cherry nectars with high contents of total phenolics and anthocyanins had the highest antioxidant power. Orange nectar rich in ascorbic acid content followed sour cherry nectar. As can be seen from the results, the relation between antioxidant composition and antioxidant activity varies with respect to the kind of fruit processed into nectar. For example, ascorbic acid is the major antioxidant in orange nectars while total phenolics and anthocyanins are the major antioxidant in sour cherry nectars.

The results of this investigation shows that, being more readily digestible than the other plant tissues, fruit nectars are good sources of antioxidants and the antioxidant capacities of them are comparable with the other research findings (Rice-Evans and Miller, 1995; Miller and Rice-Evans, 1997; Arena *et al.*, 2001; Netzel *et al.*, 2002).

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