A New Food Supplement: Çaşır (*PrangosFerulacea*)

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***Abstract*—We aimed to investigate the potential of medicinal/folk plants (*Prangosferulacea*) from the east region of Turkey as a natural antioxidant and new food supplement for food industry. The antioxidant potential and phenolic content (Bipiridil metal chelating (2,2′-Bipiridil µgTE/mg), 1,1-diphenyl-2-picryl-hydrazyl (DPPH IC50, (µg/ml), 2,2′-azino-bis(3-ethylbenzthiazoline-6-sulfonic acid (ABTS, (µg/ml), physical (color assay) and chemical analysis(mineral assay) of çaşır were investigated, using different in vitro antioxidant assays.The results revealed that value of total phenolic compounds(77.16±0,03 µg GAE/mg dw) and strongly antioxidan activities. Total phenolic compounds of çaşır was 77.16±0,03 µg GAE/mg dw and bipiridil chelating of ferrous ions by the extracts of çaşır was determineted 38.87±0.02 µgTE/mg. Moreover, it showed that the metal scavenging effect of the çaşır and standards decreased in the order of BHT>çaşır>trolox>BHA>α-tocopherol. These values of Çaşır's showed in ABTS; (µg/ml) BHA (27.54±0.10), α-Tokoferol (26.54±0.05), (Çaşır19.77±0.04), Trolox (16.35±0.05), BHT (16.21±0.03) and DPPH; IC50 (µg/ml) α-Tokoferol (179.31±0.03), (Çaşır 100.31±0.07), BHA (79.01±0.02), BHT (41.29±0.04), Trolox (38.82±0.01) were respectively. The color assay of dryed of çaşır that L, +a, and +b values 43.43±0.37, 4.20±0.03, 19.72± 0.41 were respectively. The highest mineral concentrations were measured 112550±3309.2 ppb for K and the lowest value were determineted as 1291±18.4 ppb for Cu. Finally, çaşır constitute a rich source in terms of the content so it played very important role in human and animal nutrition. So it can be used as a food preservative or food supplement for food industry particularly in seafood sector.**

Index terms -Prangosferulacea, Food, Nutrient,Natural antioxidant.

I. INTRODUCTION

The demand of food which microbiological safe, practical and long shelf life in food products made it necessary to develop new food preservative strategy. Expected from the adopted strategy, is that the contribution in terms of food quality as well as protection from the dangers that target food. Constantly changing consumer demand and sales trends, it makes us against new natural food preservative substances such as antioxidant. For this reason the commonly used method of plant extract which was folk-medical plant use of natural antioxidants for food industry.

Nowadays, the results of scientific researches of medicinal/folk plants, vegetables, and spices have been reported to be brillant sources of phenolic compounds and these compounds have been tested to expose good antioxidant activity [1-8]. The results of scientific studies showed that these plants, vegetables and spices have not wholly without side effects [9-10]. According to knowledge from both laboratory studies and scientific treatment, explain they commonly carry less side effects compared to synthetic medicines about the toxicity of other medicines materials [11-13].

Prangosferulacea (çaşır)a member of the Apiaceae family is distribution of ranges from East Europe to the Central Asia – Middle East and it can measure until 150 cm in length as a perennial plant. It calledÇaşır-çakşur in Turkish, Jashir in Persian and Oppoponax in French, itis one of the most widely used as medicinal/folk plants for the treatment some diseases such as antifungal, and antibacterial, anti-viral, carminative, emollient, ant flatulent, tonic for gastrointestinal disorders, sedative, anti-inflamatory, antihelminthic, for treatment of many diseases in folk medicine in Europe and Asia[14-21] . The genus Prangos have various alkaloids, coumarins, flavonoids, terpenoids and γ-pyrone derivatives on the components [22-23]. It is commonly consumes in our city and has an important place for region people food culture.

In this study, we investigated that indicates its effectiveness as natural and safety antioxidants substance for food applications with different in vitro antioxidant assays, physical and chemical analysis.

II. MATERIAL AND METHOD

A. Plant

Çaşır were collected in May (2016) from Tortum district of Erzurum province, of Turkey. The plants were

identified by scholar at the University of Ataturk and than they were deposited in the University.

B. Extract preparation

Plants were air dried at room temperature for 21 days to get consistent weight. The dried plants were later ground to powder. 25 grams of ground plant material were shaken separately in boiling water for 48 hours on an orbital shaker at room temperature. Extracts were filtered using a Whatman No 1 filter paper. The filtrates were frozen at -84 °C in an ultra-low temperature freezer and lyophilized in a lyophilizator at 5 mmHg pressures at -50 °C. Extracts were placed in a plastic bottle and then stored at -20 °C until used. In this study water was used as solvent because it is safety than the other solvent for food industry [24-25].

a) Dryedçaşır **b) Powder of çaşır**

c) Extract of çaşır with water

Figure 1. Different form of çaşır

C. Determination of total phenolic content

Total phenolic contents was determined according to the Gülçin et al., (2010). Extract was diluted with distilled water. Then Folin- Ciocalteu reagent was added and after 3 min, 1.5 mL of sodium carbonate (2%) was added and the mixture were shaken vigorously and incubated at 25 °C for 40min at which time the absorbance was taken at 760 nm and the phenolic content was expressed as Gallic acid equivalents GAE/g of sample [25-26].

D. Total reduction capability

Different concentrations of extract (25-100 µg mL-1) in distilled water were mixed with phosphate buffer (0.2 M, pH 6.6) and potassium ferricyanide (1%) than the reaction mixture was incubated for 20 min at 50 °C. Aliquots 2.5 mL of trichloroacetic acid (10%) were added to the mixture and the absorbance was recorded at 700 nm in a spectrophotometer [26].

E. Chelating activity of ferrous ions (Fe^{2+})

The chelating activity of ferrous ions by extract, and the standards was performed according to the method of Re et al.[27] as previously described by Şerbetçi and Gülçin[28]. The reaction was performed in an aqueous medium. Different concentrations (25– 200 µg/mL) of extract in 0.4 mL was added to a solution of 0.2 mL $FeSO_4$ (2 mM). The reaction was initiated and then Tris–HCl buffer and 2,2′-bipyridine added 1 mL and 1 mL respectively. Then the mixture was vortexed vigorously and left at 25 °C for 10 min and was measured spectrophotometrically at 522 nm.

F. Evaluation of free radical scavenging activity

a. Diphenyl-2-picrylhydrazyl (DPPH) radical scavenging assay

The free radical scavenging activity of prepared samples was determined according to ability of extract to bleach to stable DPPH radicals. 0.5 ml of DPPH was added to 0.5 ml aliquots of standard or test solution in different concentrations(15-250µg/ mL). All mixture were vortexed thoroughly and left at 37 °C in the dark for 30 min. After incubation, the absorbance was recorded at 517 nm. DPPH free radical scavenging activity was indicated via decrease in absorbance. IC50 represents the level where 50 %of radicals scavenged by test or standard sample [25-26].

b. ABTS radical scavenging assay

The method according to Gülçin [29] was adopted. For ABTS assay, the ABTS•+ solution was diluted for absorbance treatment with phosphate buffer (pH 7.4). Then 1 mL of ABTS•+ solution was added to 3 mL of extract solution in ethanol at different concentrations(15-250µg/ mL). After 30 min, at 734 nm was recorded for each concentration concerning a blank absorbance.

G.*Physical and Chemical Analysis*

Mineral element analyses Mertens [30] were performed by reading an ICP OES spectrophotometer (Inductively Couple Plasma spectrophotometer) (Perkin-Elmer, Optima 2100 DV, ICP/OES, Shelton, CT 06484-4794, USA) and identified as macro and micro elements [30-31]. For color density measurement, Minolta (CR-200, Minolta Co, Osaka, Japan) calorimeter equipment was used [32]. The data are expressed as the mean ± standartdevition (SD)of replicates. For antioxidantanalayse results were expressed as µmolgallicacide (GAE) /g dry weight for total phenolic content and the other parameters µmolTrolox/g dry weight of plant material.

H.Statistical analysis

The SPSS 20.0 software was used to perform all analyses. One-way ANOVA test was used to determine the differences of controls.

III. RESULTS& DISCUSSION

The extracts composition and conditions of the test system is effective on antioxidant capacities of the plant. Many factors are affected on antioxidant capacities therefore; it has to be performed more than one type of antioxidant capacity measurement to take into account the different mechanisms of antioxidant action [33]. In this paper, the extracts of çaşırwere evaluated for the antioxidant capacities using the different assays.

The results were expressed as µg of total phenolics in mg of extract as GAE. Results obtained in the present study revealed that the highest value of total phenolic compounds of çaşır was 77.16±0.03 µg GAE/mg dw. These results show correlation with antioxidant activity results, which is a confirmation of previous data[34]. Among the member of the Apiaceae family plants studied, çaşır extract exerted the highest antioxidant capacities. On the other hand, the amount of total phenolic compounds of extracts of çaşırwas showed the lowest capacity in some study [35-37]. According to Çoruh et al.,[5]considerably high antioxidant activity of çaşır extracts could be attributed to its content of various coumarins, alkaloids, flavonoids and terpenoids.

The FRAP of the çaşır was 170.81±0.02 µgTE/mg. Determining of the antioxidant capacities of these plants is an important factor high phenolic content. The phenolic compounds contribute significantly to the antioxidant capacities of the different region plants, this study results were similar with Fejes et al [38]; Caiet al [39]; Tang et al [40], Li et al [33].

Table1. Some antioxidan parameters of çaşır (*P. ferulacea)*

	Bipiridil metal chelating (µgTE/mg)	DPPH IC50 (µg/ml)	ABTS (µg/ml)
Çaşır	38.87±0.02	100.31±0.07	19.77±0.04
BHT	8.60±0.02	41.29±0.04	16.21±0.03
BHA	82.21±0.02	79.01±0.02	27.54±0.10
Trolox	56.94±0.04	38.82±0.01	16.35±0.05
α-Tokoferol	84.67±0.14	179.31±0.03	26.54±0.05

Results are mean±S.D. of five parallel measurements

The bipiridil chelating of ferrous ions by the extracts of çaşır was determineted 38.87±0.02 µgTE/mg. It was reported that chelating agents, which form σ-bonds with a metal, are effective as secondary antioxidants because they reduce the redox potential thereby stabilizing the oxidized form of the metal ion [41-42]. The data obtained present study reveal that the extracts of çaşır demonstrate an effective capacity for iron binding, suggesting that its action as peroxidation protector may be related to its iron binding capacity. The metal scavenging effect of the çaşır and standards decreased in the order of BHT>Çaşır>Trolox>BHA>α-tocopherol. As shown in Table 1, metal chelating capacity was significant since they reduced the concentration of the catalyzing transition metal in lipid peroxidation [42].

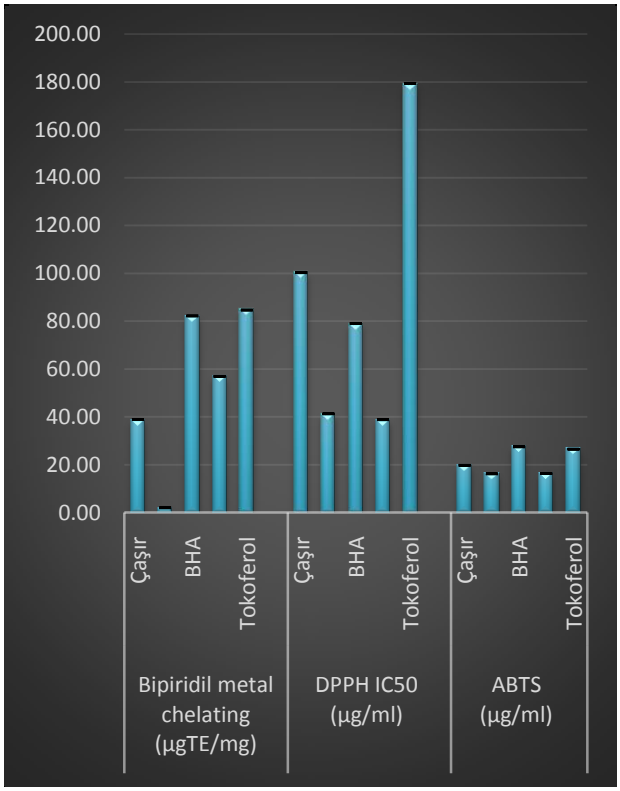

Figure 2. Some antioxidan parameters of çaşır (*P. ferulacea*)

In order to evaluate radical scavenging capacities DPPH and ABTS assays were using. The antioxidant potential of çaşırwas evaluated by the DPPH assay. In the quantitative DPPH assay, trolox was the most active among all compounds, and displayed a significant antioxidant activity (Table 1). Our results, 50% inhibitory concentrations given for DPPH radical scavenging for çaşır are not consistent of Mavi et al. [35].

Results are showed that çaşır's DPPH radical scavenging activities 100.31±0.07%, ıt showed the highest antioxidant capacity (100% of DPPH inhibition), followed by BHA (79.01±0.02%), BHT (41.29±0.04%) and trolox (38.82±0.01%). α-Tokoferol showed the highest antioxidant capacity (179.31±0.03%).

In the ABTS assay, as observed with the DPPH assay, α-tokoferol showed the highest antioxidant capacity (26.54±0.05%) than BHA (27.54±0.10%) and çaşır (19.77±0.04%). In this study, we determined the free radical scavenging capacities of the selected plant extracts using various methods such as DPPH, and ABTS, and FRAP assay. Those assays are widely used to indicator determination of antioxidant capacities of plant extracts as they deliver fast and reproducible results. There are interaction between phenolic

concentration of plant extracts and their free radical scavenging and FRAP. Moreover, antioxidant potential are releted to phenolic compounds concentration in plant extracts. Our results have similar to previous study [43]. Antioxidant properties of phenolic compounds are directly linked to their structure. They are composed aromatic rings bearing one or more hydroxyl groups. This hydroxyl groups are able to eliminate free radicals by forming resonance-stabilized phenoxyl radicals [34,43].

Çaşır scavenging activity Trolox against ABTS+ radical was found to be different from that against DPPH radical. Quassinti et al.[44] has reported that affect the capacity of samples to react and quench different radicals. Our results showed that the presence of various antioxidant and anti-inflammatory compounds may be the reason for the presence of strong antioxidant, free radical scavenging and chelating properties of çaşır extract [43].

Generally medicinal plants played very important role in human and animal nutrition, knowledge of proximate, micronutrients and phytochemical composition [45].The roles of micronutrients-antioxidants vitamins and minerals in management of soma diseases have extensively been reviewed by researchers [46-47]. Mineral compositions of dryed of çaşırwere presented in Table 2. The result clearly showed that çaşır constitute a rich source of mineral substance. Potasium was the abundant macro element.

Table2. Mineral substance amount of dryed of çaşır (*P. ferulacea)* (µg/kg)

Na	Mg	K	Ca	Mn
1216±45.4	24605±2166.3	112550±3309.2	68350±0	2823±1658.1

Fe	Cu	P	Zn
6371±2159.9	1291±18.4	1305±5.7	2690±17.6

Results are mean±S.D. of five parallel measurements

The highest mineral concentrations were measured 112550±3309.2 ppb for K and the lowest value were determineted as 1291±18.4 ppb for Cu.

In the present study heavy metal concentrations were found too low in *P. ferulacea*. At the same time Na, Ca, K and P were established higher than those of other minerals. Our data show minor differences when compared with other literature [48-51]. Due to plant species, growth conditions, genetic factors, geographical variations and analytical procedures might be reason of these differences [49]. Çaşır, due to beneficial biological properties (antimicrobial, anti-inflammatory and antioxidant activities) has been generally used to cure of many diseases especially as a food. L, +a, and +b values of dryed of çaşır43.43±0.37, 4.20±0.03, 19.72± 0.41 were respectively.

The L value, which is a measure of brightness has been found 43.43±0.37. The +a value which describes the density of red color is found 4.20±0.03. In a study conducted on medical plant, it is observed that the plant spicies/parts (seed, leaves, roots), drying method, temperature and collected area has caused significant changes in color values +a and +b values [52].

Medical plants are widely used food ingredients all over the world but there are few preservative foods substances. In this study, data showed that çaşır high nutritional and economic values is natural food preservation substance than other syentetic preservative for human consumption, and food indüstry. In the present study results obtained, it can be concluded that çaşır extract of Apaciae show strong antioxidant activity by FRAP, DPPH and ABTS assay. In addition, mineral substance contain of çaşır were found to noticeable amount.

IV. CONCLUSION

As a result of the study, in natural food supplement has been improved necessary based on the food product sector. Moreover, effect mechanisms of the alternative natural products used and their effects on food shelflife should be determined by chemical and microbiological based studies, thus generate a database. Based on the study results, çaşırcan be said to show a protective effect. While there is no study about the effect of çaşır on the storage time of fish or other food product, çaşır can be used effectively food preservative on food industry.

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