

The Physical, Chemical and Antioxidant Properties of the Leafs of *Chaerophyllum byzantinum* Boiss. Plants

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ABSTRACT

Objective: *Chaerophyllum byzantinum* Boiss. is a plant which is popularly consumed in the Black Sea Region/Turkey. In spring, the leafs of the plant are mainly used for soup making. This study was carried out in order to determine the physical, chemical and antioxidant properties of the leafs of the plants consumed by people. **Material and Methods:** The plants were obtained from 8 different locations in Samsun/Turkey. The color, pH, dry matter, ash, crude protein, cellulose, crude fat, total phenolics and antioxidant activity (FRAP and DPPH) analysis were performed to the samples. **Results:** The results of analysis performed to the leafs of the plants were found as; Lightness (*L*) 36.99 ± 2.84 , greenness (*a*) -12.56 ± 1.60 , yellowness (*b*) 15.79 ± 2.14 , dry matter $16.43 \pm 0.41\%$, ash $2.03 \pm 0.20\%$, crude cellulose $1.95 \pm 0.23\%$, crude protein $4.36 \pm 0.31\%$, crude fat $0.57 \pm 0.16\%$, total phenolics 2890.15 ± 945.33 mg/kg, FRAP 7406.68 ± 4728.03 $\mu\text{mol/g}$ and EC_{50} value 1.00 ± 0.61 mg/ml, respectively. **Conclusion:** It has been observed that the plant, which is a good dietary fiber and mineral source, also has high phenolic compounds and antioxidant activity. However, the changes in phenolic compounds and antioxidant activity were found to be quite wide. Growing conditions seem to have a significant effect on the bioactive compounds than the physical and chemical properties.

Key words: *Chaerophyllum byzantinum* Boiss, Edible plant, Antioxidant, Phenolics, Chemical, Color.

INTRODUCTION

Turkey has a great deal of plant genetic resources because of its geographical structure and different ecological conditions. Turkey is one of the most important countries in the world in terms of plant species richness and endemic plants. Turkish flora contains 10,754 plant species, 3,708 of which are endemic (Guner *et al.* 2000). Many plant species are collected from their natural habitats by indigenous people and are traditionally used for several purposes such as natural food, tea, herbal medicine and animal fodder in Turkey (Ozhatay *et al.* 1997). Among plant genetic resources, wild edible plants have been widely used as food sources by people since ancient times Turkey has a great deal of plant genetic resources because of its geographical structure and different ecological conditions. Turkey is one of the most important countries in the

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endemic in Turkey.² *Chaerophyllum* genus belongs to Apiaceae family, comprised of about 110 species widely distributed in temperate and sub temperate zones of Asia, Europe and Africa.³ *Chaerophyllum byzantium* Boiss. is generally distributed over north and northwest of Turkey. It also grows in the southeast Balkans and it was brought to Germany and consumed by Turkish immigrants as vegetables.² The leaves of the plant are mainly used for traditional soup making especially in Northern part of Turkey.⁴ This study was carried out to determine the general composition and antioxidant properties of this wild plant consumed as vegetables by people.

MATERIALS AND METHODS

MATERIALS

Fresh leaves of *C. byzantium* Boiss. were collected from Samsun (40° 59' 22.5924" N, 36° 37' 50.9844" E) at an altitude of 78 m. The plants were identified by Department of Botany, Ondokuz Mayıs University, Samsun, Turkey.

METHODS

Proximate analysis

Color measurement was made with a Minolta CR 400 (Japan) colorimeter; color, L (100, lightness, 0, darkness), a (+, redness, -, greenness), b (+, yellowness, -, blueness). Dry matter analysis was carried out by drying to a constant weight at 105°C. The ash analysis was made by burning to 550°C until the white ash was obtained in the ash furnace. Protein analysis was obtained by multiplying the total nitrogen amount obtained by the Kjeldahl method by a factor of 6.25. Crude fat analysis was performed by soxhlet extraction with diethyl ether for 8 h. The Weende method was used for the determination of crude cellulose. For this purpose, oil free samples

were boiled with 1.25% H₂SO₄ and then 1.25% NaOH, washed with alcohol, dried at 105 °C and weighted.⁵

Total phenolics and antioxidant activity analysis

The samples were extracted with 80% methyl alcohol in the refrigerator for 12 h and then filtered to remove the clarified portion. The total phenolic content (TPC) was determined by measuring the phenolic compounds with a Folin-Ciocalteu solution in alkaline medium.⁶ For FRAP analysis; extracted samples were diluted appropriately and diluted in 300 mM acetate buffer: 20 mM FeCl₃; 10 mM 2,4,6-tripyridyl-s-triazine (TPTZ) solution (40 mM HCl) and the absorbance at 593 nm in the spectrophotometer was determined.⁷ Calibration curves were drawn with the aid of FeSO₄-prepared solutions and the antioxidant activity was calculated. The free radical scavenging effect was determined by DPPH (2,2-diphenyl-1-picrylhydrazyl) method. 50 µL of the extract was taken and incubated with 1 mL of DPPH solution (100 µM). The absorbance was determined by reading at 517 nm. A control sample was also prepared and the % inhibition of DPPH was calculated by determining the absorbance. The results are expressed in EC₅₀.⁸

RESULTS AND DISCUSSION

Some physical and chemical properties of *C. byzantium* Boiss. plant leaves were given in Table 1 and the antioxidant properties of the leaves were given in Table 2.

Sekeroglu *et al.*⁹ determined the composition of some plants naturally grown in the Black Sea region (*Ornithogalum umbellatum*, *Similax excelsa*, *Trachystemon orientalis*, *Aegopodium podagraria*, *Amaranthus retroflexus* and *Urtica dioica*). Dry matter (7.5-18.5%), ash (4.1-22.8%), crude fat (0.1-2.0%) and crude protein (1.3-4.3%) content of these plants were reported by

Table 1: Some physical and chemical properties of *C. byzantium* Boiss. leaves.

Sample	DM (%)	Ash (%)	Crude cellulose (%)	Crude protein (%)	Crude fat (%)	L	a	b
1	16.38	1.88	2.27	4.27	0.67	41.97	-15.34	18.53
2	16.51	2.01	1.99	4.12	0.54	36.23	-11.80	17.53
3	16.16	1.98	1.91	4.71	0.74	35.33	-12.21	14.43
4	15.93	1.91	1.94	4.31	0.39	40.18	-14.45	18.08
5	16.45	2.02	1.49	4.13	0.38	38.22	-12.62	16.53
6	16.65	2.14	1.95	4.84	0.49	35.21	-12.09	14.42
7	16.11	1.86	2.15	4.54	0.82	34.37	-11.57	13.83
8	17.27	2.47	1.91	3.94	0.50	34.39	-10.37	12.97
Mean	16.43±0.39	2.03±0.19	1.95±0.21	4.36±0.29	0.57±0.15	36.99±2.66	-12.56±1.50	15.79±2.00

Table 2: Antioxidant properties of the *C. byzantium* Boiss leaves.

Sample	TPC (mg/kg)	FRAP (µmol/g)	EC ₅₀ (mg/ml)
1	2363.75	3923.44	1.28
2	3076.25	8735.94	0.30
3	4401.25	12548.44	1.37
4	3378.12	3163.12	0.28
5	3221.87	3388.12	1.24
6	3378.12	2225.62	2.07
7	1613.44	13126.56	0.69
8	1688.44	12142.19	0.77
Mean	2890.2±884.3	7406.7±4422.7	1.00±0.57

researchers. The dry matter and fat results of researchers are close to our findings. Bouba *et al.*¹⁰ evaluated composition of 20 edible wild plants used as spices in Cameroon. They found that the plant's ash contents were between 7.7 and 10.5% on dry weight (DW). When we evaluate the amount of ash in our samples on DW, it is seen that our study is a little higher than these results. Tunçturk *et al.*¹¹ determined the composition of three different plant species (*Capsella bursa-pastoris* (L.) Medik, *Gundelia tournefortii* L. var. *tournefortii* and *Arum elongatum* Steven subsp. *detrunctatum*) which grow wild in Anatolia. The researchers found that these crops contained 14.36-18.72% of dry matter, 6.67-15.33% of ash, 8.47-21.00% of crude protein and 19.38-36.44% of crude fiber. Similarly, when we evaluate the results of our samples on DW, they found in the same range. Kibar and Temel¹ evaluated composition of four wild edible plants (*Beta corolliflora*, *Primula auriculata*, *Bellevalia forniculata* and *Caltha polypetalá*) growing in Turkey. They determined the moisture (79.73-86.10%) and ash (7.33-17.12%) content of the plants. It appears that the ash contents of this edible plants are in range with our samples on DW. As seen in Table 2, *C. byzantium* Boiss plant's TPC, FRAP and EC₅₀ values were determined in a wide range. Özen¹² investigated the bioactive compounds and antioxidant activity of 11 edible wild plants including *C. byzantium* in Turkey. It was reported that TPC of *C. byzantium* were determined 23.2 mg/g in DW. This result are in parallel to our findings on DW. Seal¹³ determined the TPC and EC₅₀ values of some wild plants in India. It was given that TPC of the leaves ranged from 17.32 to 30.98 mg/g; EC₅₀ value was found between 0.24-3.33 mg/ml on DW. Taskin and Bitis¹⁴ evaluated the total phenolic contents and antioxidant activity of ethanol extracts from eight wild edible plants in Turkey. They found that the TPC in extracts varied between 7.00 and 68.67 mg/g. According to the results of these

plants, phenolic content and antioxidant power of our samples were found in the same range. The results of various researchers on several plants are similar to our findings but show a wide range. This is probably due to the variety of species as well as the differences in soil, climate and the part of plant analyzed.

CONCLUSION

In the present study, the antioxidant activities and total phenolic contents of *C. byzantium* Boiss. plants growing in Turkey were evaluated. It is seen that the bioactive components of this wild plant consumed by the public as vegetable and spice are similar to other wild plants in the literature and it has the potential of contributing to the health and nutritional needs of their consumers.

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CONFLICT OF INTEREST

Authors declare no conflict of interest.

ABBREVIATIONS

-a: Greenness; **+b:** Yellowness; **DM:** Dry matter; **DPPH:** 1,1-diphenyl-2-picrylhydrazyl; **DW:** Dry weight; **EC₅₀:** Half-maximal effective concentration; **FRAP:** Ferric reducing ability of plasma; **L:** Lightness; **TPC:** Total phenolics content; **TPTZ:** 2,4,6-tripyridyl-s-triazine.

REFERENCES

1. Kibar B, Temel S. Evaluation of mineral composition of some wild edible plants growing in the Eastern Anatolia Region grasslands of Turkey and consumed as vegetable. *J Food Proc and Pres.* 2016;40(1):56-66.
2. Kürküoğlu M, Baser KHC, İscan G, Malyer H, Kaynak G. Composition and anticandidal activity of the essential oil of *Chaerophyllum byzantium* Boiss. *Flav Fragr J.* 2006;21(1):115-7.
3. Joshi RK. Antimicrobial activity of leaf essential oil of *Chaerophyllum villosum* Wall. Ex DC. From Kumaun Himalayan of Uttrakhand. *Ind Am J Pharm Res.* 2013;3(2):1503-9.
4. Gladis T, Pistrick K. *Chaerophyllum byzantium* Boiss. and *Trachystemon orientalis* (L.) G. Don-recently introduced from Turkish wild flora as new crop species among other interesting findings from immigrant gardens in Western Germany. *Genet Resour Crop Evol.* 2011;58(1):165-74.
5. AOAC. Official Methods of Analysis. Association of Official Analytical Chemists. 17th ed. USA. 2000.
6. Singleton VL, Rossi JA. Colorimetry of Total Phenolics with Phosphomolybdic-Phosphotungstic Acid Reagents. *Am J Enol Vitic.* 1965;16(3):144-58.
7. Gao X, Björk L, Trajkovski V, Ugglá M. Evaluation of antioxidant activities of rosehip ethanol extracts in different test systems. *J Agric Food Chem.* 2000;80(14):2021-7.

8. Tural S, Koca I. Physico-chemical and antioxidant properties of cornelian cherry fruits (*Cornus mas* L.) grown in Turkey. *Sci Hortic.* 2008;116(4):362-6.
9. Sekeroglu N, Ozkutlu F, Deveci M, Dede O, Yilmaz N. Evaluation of some wild plants aspect of their nutritional values used as vegetable in Eastern Black Sea Region of Turkey. *Asian J Plant Sci.* 2006;5(2):185-89.
10. Boubba AA, Njintang YN, Foyet HS, Scher J, Mbufong CMF. Proximate composition, minerals and vitamins contents of some wild plants used as spaces in Cameroun. *Food Nutr Sci.* 2012;3(4):423-32.
11. Tuncturk M, Eryigit T, Şekeroglu N, Ozgokce F. Chemical composition of some edible wild plants grown in Eastren Anatolia. *Am J Essent Oils Nat Prod.* 2015;2:31-4.
12. Özen T. *Antioxidant activity* of wild edible plants in the Black Sea Region of Turkey. *Grasas Y Aceites.* 2010;61(1):86-94.
13. Seal T. Determination of nutritive value, mineral contents and antioxidant activity of some wild edible plants from Meghalaya State, India. *Asian J Apl Sci.* 2011;4(3):238-46.
14. Taskin T, Bitis L. *In vitro antioxidant activity* of eight wild edible plants in Bursa province of Turkey. *Farmacia.* 2016;64(5):706-11.

PICTORIAL ABSTRACT

Chaerophyllum byzantinum Boiss.



SUMMARY

- *Chaerophyllum byzantinum* Boiss. is generally distributed over the north of Turkey and the south-east Balkans. The leaves of the plant are mainly used for traditional soup making and as a spice in Turkey. It is seen that this wild plant has the potential of contributing to the health and nutritional needs of their consumers.

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