

Investigation of Some Chemical Characteristics of Wild Edible *Cephalaria schrader* ex Roemer & schultes G.C. Setosa Boiss & Hohen grooving in East Anatolia

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ABSTRACT

Nutritional value and mineral compositions of wild edible plants have been investigated for food security and human health. It is though that wild edible plants gathered from nature are cheaper food and important for human health. They are also special ingredients for distinguished taste and aroma of traditional cousins. Thus, in the present study the nutritional value and mineral composition of used parts of *Cephalaria schrader* was investigated. In laboratory analysis, dry matter, total ash, % N, crude protein, crude fiber and pH were examined as nutritional value. Useful minerals (Ca, Cu, Fe, K, Mg, Mn, Na, P, S and Zn) and heavy metals (Cd, Co, Cr and Pb) that hazardous elements for livings were also determined by Atomic Absorption spectrometry (AAS). The Dry matter, pH, ash and total nitrogen content of the plants identified as 8.22%, 6.33%, 6.3% and 1.77%, respectively. Mineral analysis showed that the wild plants' samples contained considerably high amounts of potassium (12.31 g kg⁻¹), phosphorus (1.14 g kg⁻¹), calcium (9.67 g kg⁻¹), magnesium (1.97 g kg⁻¹), iron (146.23 mg kg⁻¹), manganese (24.25 mg kg⁻¹) and zinc (18.70 mg kg⁻¹). This work contributed to the nutritional properties of some wild plants, and the results may be useful for the evaluation of dietary information.

Key words: Nutrient content, Wild plant, *Cephelelia*, East Anatolia, Nutrient content, wild plant, *Cephelelia*.

INTRODUCTION

From past to present humans have used plants abundantly in their daily life. Nutritious purposes both humans and their animals are the main user of the plants. Wild edible plants have maintained their importance in human history especially in famine periods and some drought climates. By cultivation and modern field production of some traditional crops, wild edible plants have been used in certain quantities. Because of some health problems come from unhealthy nourishment, pollution in agricultural lands, increase in hazardous chemicals in crop productions, losing

their taste and aroma in fruit and vegetables, looking for distinguished aroma and taste, opinion that wild plants are healthier, wild edible plants have reputed once again in last decades all over the world. Having great plant genetic diversity, Turkey holds a number of wild edible plants in different geographic regions. These plants have been used for different food purposes such as wild vegetable, salads, wild fruit, spice and condiments, herbal tea etc. in local cousins. Because of its distinguished climate and soil types, Eastern Anatolia has a great deal of plant variety. Hard and long winters don't permit crop

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production in large scale. Thus, inhabitants especially in rural parts of the regions have used wild plants much more than other parts of the country.

Cephalaria Schrad. (Dipsacaceae) is a genus with 94 species worldwide, which are spread out in the Mediterranean Region, Balkan Peninsula and the Middle East. Forty *Cephalaria* species, 24 of them are endemic, are widely distributed in Turkey.^{1,2}

According to literature data, this genus contains mainly iridoid, triterpene and flavonoid glycosides, and alkaloids.³ Numerous *Cephalaria* species have been used as folk medicine for many years due to their biological importance such as antimicrobial, antifungal, and antioxidant activities.⁴

Studies on chemical compositions and nutritional values of wild edible plants have recently been popular all over the world. There are a number of scientific works in Turkey and other countries in this topic.^{5,6} In this work, some nutritional value and mineral composition of *Cephalaria schrader* were determined in details. Results obtained from laboratory analysis were compared by previous scientific researches' findings.

MATERIAL AND METHODS

Cephalaria schrader was the plant species that analyzed their chemical compositions. The plants were collected from Van Lake basin in 2012, and botanical identifications were done according to Flora of Turkey¹ by Dr. Fevzi OZGOKCE at Yuzuncu Yil University Biology Department. Some characteristics of the analyzed plant species are given in Table 1.

L VAN, Özalp, A. Enternece of Dönerdere village, Yeşilkum step, 2200 m F12552

Wild collected plant material was cleaned from foreign materials, separated into used parts and washed by deionized water. After drying well ventilated place in shade at laboratory, plant parts were ground and kept in plastic bags until chemical analysis. As chemical analyses, dry matter, total ash, % N, crude protein, crude fiber and pH were examined as nutritional value, mineral composition (Ca, Cu, Fe, K, Mg, Mn, Na, P, S and Zn) and heavy metals (Cd, Co, Cr and Pb) were also determined in the plant samples. Dry matter contents were determined by drying of the plant samples at 105 °C for 24 h in electrical oven. For determination of total ash content (inorganic matter) electric muffle furnace set at 550 °C was used. Kjeldahl apparatus and method were used for analyzing of total N content. Crude protein contents were calculated by formula from total nitrogen contents. pH-meter was used for pH values of the plant samples. Crude fiber analyses were achieved by AOAC.⁷ Mineral compositions of the samples were determined as follows: dried plant samples were ashed in a furnace by nitric (AR) and hydrochloric acid.⁷ Then, distilled water (50 ml) was added to samples in a volumetric flask. All the analyses were triplicated. Standard chemical materials were used for all the analyses. Mineral contents of the plants samples were determined by Atomic Absorption Spectrometry (AAS). Mean values of the obtained data were calculated and are given in table with their standard deviations.

Table 1: Some traits of 3 wild edible plants from East Anatolia

Plants' Scientific Name	Family	Local Name	Used Parts	Locality	Col. No.
<i>Cephalaria schrader</i> ex Roemer & schultes G.C. setosa Boiss & hohen	Dipsacaceae	Buki, zivan pelemiri	Above ground	L	F12552

L: VAN, Özalp, A. Enternece of Dönerdere village, Yeşilkum step, 2200m F12552

Table 2: Mean values of mineral and chemical composition of *Cephalaria schrader*

Parameters	<i>Cephalaria Schrader</i> ex Roemer & schultes G.C. setosa Boiss & hohen				
	Means and Sd	Minerals	Means and Sd	Minerals	Means and Sd
Dry matter (%)	18.22 ± 0.19	Na (g kg ⁻¹)	0.86 ± 0.01	Fe (mg kg ⁻¹)	146.23 ± 4.26
Total ash (%)	6.30 ± 1.10	Mg (g kg ⁻¹)	1.97 ± 0.07	Cu (mg kg ⁻¹)	22.45 ± 0.99
N (%)	1.17 ± 0.02	K (g kg ⁻¹)	12.31 ± 0.24	Zn (mg kg ⁻¹)	18.70 ± 1.32
Crude protein (%)	7.29 ± 0.13	Ca (g kg ⁻¹)	9.67 ± 0.15	Cr (mg kg ⁻¹)	0.05 ± 0.03
pH (%)	6.33 ± 0.33	P (g kg ⁻¹)	1.14 ± 0.08	Cd (mg kg ⁻¹)	0.16 ± 0.03
Crude Fiber (%)	40.88 ± 2.10	S (g kg ⁻¹)	1.05 ± 0.10	Co (mg kg ⁻¹)	1.26 ± 0.07
		Mn (mg kg ⁻¹)	24.25 ± 1.02	Pb (mg kg ⁻¹)	0.57 ± 0.15

RESULTS AND DISCUSSION

Chemical composition of wild plant (*Cephalaria schrader*) grown in Eastern Anatolia was analyzed and the results are given in Table 2. According to chemical analysis results, dry matter contents of analyzed plant samples were determined as 18.22% (Table 2). In previous works related some other wild edible plants; dry matter contents were reported between 7.50 and 20.87 %.^{8,9} Total ash content of the plant samples was observed as 6.30 % (Table 2). Total ash contents of some different wild edible plants were reported between 7.00 and 26.70 % in previous works by Sekeroglu *et al.*⁹

Total nitrogen and crude protein contents were found as 1.77%, and 7.29%, respectively (Table 2). In previous scientific studies, total nitrogen and crude protein content of some medicinal and edible plants were found in intervals of 0.20 – 1.70% and 1.30 – 11.56 %.⁹

In the present study, pH values of analyzed plant parts was measured as 6.33, in accordance with our results, Yildirim *et al.*⁸ found that pH values of some wild vegetables vary between 3.50 – 6.50.

Crude fiber contents of the analyzed plant samples found as 40.88% (Table 2). Nutritional values of indigenous wild edible herbs used in Eastern Chhatisgarh, India were studied by Vishwakarma and Dubey¹⁰ and they reported that crude fiber contents of the analyzed plants were varied from 0.90 % (*Moringa oleifera*) to 28.59 % (*Marsilea minuta*). In conclusion here, dry matter, total ash, total nitrogen, crude protein, pH and crude fiber obtained in this study are accompanied by the previous scientific reports on wild edible plants. According to previous reports, it could be concluded that chemical composition of plants is affected by a number of internal and external factors such as plant genetic structure, growing conditions, soil properties, used plant parts etc. Table 2 shows that *Cephalaria schrader* had the highest mineral contents. Mineral compositions of the plants are affected from a number of factors such as plant genetic structure, growing conditions, soil characteristics, water availability, growing seasons etc. Thus, great variability in mineral compositions of the plants and their different parts is expected. This phenomenon has been supported by scientific reports.⁸ Mineral concentrations result of some wild edible and medicinal plants obtained from previous studies were summarized for above minerals here: Sodium (Na) concentrations varied from 0.21 to 63.32 g kg⁻¹;¹¹ Magnesium (Mg) values of medicinal

and edible plants were found between 1.17 and 86.43 g kg⁻¹.¹¹ Potassium (K) content changed between 245.78 – 557.91 g kg⁻¹ in wild vegetables,¹¹ Calcium (Ca) concentrations were found in a wide range from 0.03 to 777.52 g kg⁻¹;¹² Phosphorous (P) contents varied from 34.92 to 69.13 g kg⁻¹;^{11,13} Sulphur (S) concentrations were reported in the range of 12.34 – 108.01 g kg⁻¹.¹² Macro element concentrations of some medicinal and wild edible plants reported in previous studies were summarized above. When compared with the results of them, our findings are agreeing with the results of researches. Previous reports also state that mineral compositions of plant species are affected from a number of factors.¹¹ In previous scientific studies, manganese (Mn) levels of edible plants were reported in the ranges of 5 – 244 mg kg⁻¹.¹⁴⁻¹⁶ Iron (Fe) levels of analyzed plants were found in the ranges of 1.70 – 975.00 mg kg⁻¹.¹⁷ Average values for copper (Cu) content of some edible plants varied from 0.05 – 18.4 mg kg⁻¹.¹⁷ For some medicinal and edible plants zinc (Zn) values were reported between 10 and 97 mg kg⁻¹.¹⁸ These mineral are generally known as micro elements and are thought as useful for human health in certain quantities. They run in a number of physiological functions in living organisms. As seen in Table 3, the concentrations of Mn, Fe, Cu and Zn in studied samples were determined as 24.25, 146.23, 22.45 and 18.70 mg kg⁻¹, respectively. In this study, determined concentrations of the minerals are accordance with the previous studies. Analyzed plant samples had limited and trace levels of chromium (Cr), cadmium (Cd), cobalt (Co) and lead (Pb) as 0.05, 0.16, 1.26 and 0.57 mg kg⁻¹, respectively. These metals known as heavy metals and their hazardous effects on living organisms in certain quantities were reported.

Cr concentration of some edible and medicinal plants were found as 0.65 – 19.10 mg kg⁻¹.¹² Cd concentrations were reported between 0.012 – 0.440 mg kg⁻¹ for medicinal plants and wild vegetables.¹⁹ Co concentrations of some medicinal and edible plants were stated in previous studies in the ranges of 0.047 – 1.69 mg kg⁻¹.¹¹ Pb concentrations of wild edible plants were reported between 0.04 – 1.40 mg kg⁻¹.¹¹ Heavy metal concentrations of the analyzed plant samples found in this work are some lower than previous studies findings.

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CONCLUSION

In last decades, the number and variety of illnesses have scarily increased all over the world. It is thought that uses of chemicals in all sectors such as food, medicine, textile, and cosmetics etc. supports this. Thus, organic, ecologic, village crops and wild plants have gained importance in food habits recently. Besides wild collection, domestication and field cultivation of wild plants have started to increase. Moreover, distinguished taste and aroma of these kinds of plants supported their reputations. With increase in consumption wild edible plants, scientific concern on their nutritional values and probable hazardous effects have grown. In the present study, we also screened wild plant *Cephalaria schrader* for their chemical compositions. In conclusion, all the analyzed plant samples had close chemical values in comparison to previous scientific results. *Cephalaria schrader* was the richest in chemical composition compared to previous studies findings.

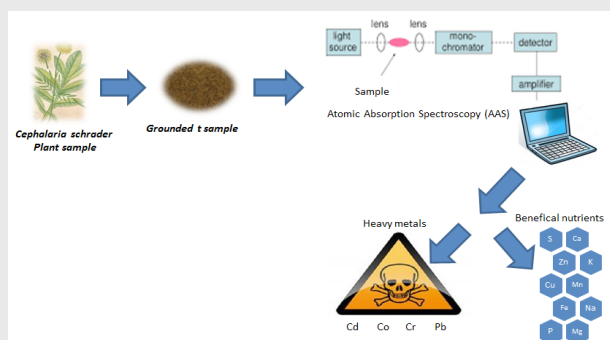
CONFLICT OF INTEREST

The authors hereby declare that they have no conflict of interest

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PICTORIAL ABSTRACT



SUMMARY

- Cephalaria schrader* mostly known as zivan, is used as folk medicine for many years due to its biological importance such as antimicrobial, antifungal, and antioxidant activities.
- The mineral analyses showed that the plant samples had high beneficial chemical composition.
- The extracts of had acceptable heavy metal contents.

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Assoc. Prof. Dr. Fevzi ÖZGÖKÇE: He graduated from Biology Department of 100. Yil University, Van. He completed his MSc. and PhD degrees also the same department and university. His main research interest in identification of plant species and economic plants. He has many publications on useful plants and their ethnobotanical uses. Now, he is Tuşba Municipal of Van city.

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