

Some Chemical Contents of *Verbascum orientale* (L.) All. Species Spreading in Van Region

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Abstract

In the study, it is aimed to determine some nutrients, mineral substance and some heavy metal contents of *Verbascum orientale* L. All. which is naturally grown around the Van lake in the Eastern Anatolia Region. In plant samples, some nutrients and mineral contents such as total ash, nitrogen, crude protein, pH, crude fiber and, Na, Mg, K, Ca, P, S, Mn, Fe, Cu, Zn, Cr, Cd, Co and Pb have been investigated. As a result of the research; it has been determined as crude protein ratio 9.00%, pH 5.96, total nitrogen content 1.44 %, crude ash content 14.0% and crude crude fiber 48.56%. In addition, while some important mineral contents were determined as K 5.45 g/kg, Ca 5.80 g/kg, P 1.57 g/kg, Mn 22.74 mg/kg, Fe 225.05 mg/kg and Zn 29.81 mg/kg, heavy metal contents were observed as Cr 0.05 mg/kg, Cd 0.14 mg/kg, Co 1.54 mg/kg and Pb 0.04 mg/kg.

Key Words: *Verbascum orientale* L. All., eastern Anatolia, heavy metal, medicinal plants

1. Introduction

In perspective of the expanding interest for protein, energy and medicine to support the increasing world population, researchers have directed their endeavors at discover new and natural sources. One of the important these natural sources is the Scrophulariaceae family with about 280 genera and 3000 species worldwide, which 30 genera and 466 species of its are reported in Turkey (Huber-Morath, 1978; Karavelioğulları and Aytaç, 2008). As an important member of this family, *Verbascum* is one of the most important genera that shows a wide geographical spread in the world. In Turkey, it is commonly known as "Sığır kuyruğu" that is represented by 228 species, of which 185 are endemic (Tatlı and Akdemir, 2004).

Verbascum species are mostly annual, biennial or perennial herbaceous plants or rarely bush form plants, which contain biologically active compounds, such as phenylethanoid, flavonoids and saponins, neolignan glycosides, monoterpene glycosides and iridoid (Tatlı and Akdemir, 2004). Most of these plants are poisonous medicinal plants species (Pammel, 1911) that are used for various ailments such as hemorrhoids, expectorant, chest softener, sedative, superficial fungal infections, wounds, migraine, diarrhea, rheumatic diseases and are used to treat dry coughs, bronchitis, asthma and tuberculosis in Turkish traditional medicine (Baytop, 1999; Tatlı and Akdemir, 2004, 2006).

Verbascum orientale L. All. is an annual, 15 - 80 cm height, sparsely feathered and herbaceous plant. Flowers are yellow and brown colored spotted rarely (Isik et al., 2017). It is known as "İbrahim otu" in Turkey, whose dried or fresh flowers are boiled in milk for externally treatment of pruritic conditions in urogenital organs (Sezik et al., 2001; Süntar et al., 2010).

Most of the previous studies have focused on the *Verbascum* species except *V. orientale*. Therefore, the purpose of this study is to determine the chemical composition, nutrient contents, and to evaluate some heavy metal contents of *V. orientale*.

2. Material and Methods

The aerial parts of *Verbascum orientale* (L.) All. were collected at flowering stage in July 2013 from the Van Lake Basin Van - Turkey where it can be found naturally. Afterwards, the plants were botanically identified at Van Yuzuncu Yil University, Science Faculty, Biology Department according to Flora of Turkey (Davis et al., 1988). The plant samples were coarsely cleaned from the contaminant materials and washed with deionized water, then, dried at room temperature, grounded and kept in plastic bags for laboratory analysis.

Table 1. Some properties of wild *V. orientale* used as folk medicine in Eastern Anatolia

Plants' Scientific Name	Family	Local Name	Used Parts	Use	Col. No. - Locality
<i>Verbascum orientale</i> (L.) All.	Scrophulariaceae	İbrahim otu	Arial parts	Respiratory regulation	F 12331 - L

L: Bitlis, Tatvan, Alacabük mountain, Kesan brook, 10 km away from highway, around Sallica village, humid slopes, altitude of 1650-1750 m

Dry matter and total ash determination: The materials were dried at 105 °C for 24 hours in oven to determine the dry matter content of the samples. Three gram of the milled plant samples were taken in porcelain crucibles and 1 ml of alcohol was added and then, the total ash content was determined by burning in Electric Muffle Furnace set at 550 °C (Elgün et al., 1998).

Total nitrogen determination and crude protein ratio: Kjeldahl apparatus and method were used to find of total nitrogen content of the samples as % (AOAC, 2000). After total nitrogen content determination, crude protein ratio was calculated by the follow formulas.

$$- \% \text{ Nitrogen} = \frac{(V1-V2) \times 0.014}{m} \times 100 \longrightarrow \% \text{ Protein} = \% \text{ Nitrogen} \times F$$

pH determination and Total crude fiber determination: pH values of the samples were determined by pH-meter according to the method 981.12 of AOAC (1996). The crude fiber analyses were performed due to the method 962.09 of AOAC (2000).

Determination of some mineral contents: An Atomic Absorption Spectrometry (AAS) was used for determination of samples' mineral contents according to Hanlon (1992) procedure.

The phosphorus content was determined by the molybdate-vanadate method and the sulfur content was observed by UV-spectrophotometer (Shimadzu UV-1201 V, Shimadzu, Kyoto, Japan) according to the method reported by Mitchell (1992). The all analyses were performed in triplicate and the data obtained from all analyses, mean values and their standard deviations were calculated for best evaluation.

3. Results and Discussion

In the present study, *V. orientale*, one of a medicinal wild plant species that mostly used in Eastern Anatolia for folk medicinal purposes was investigated based on the study aim. The results of analyzed some nutrient parameters of *V. orientale* are given in Table 2. The mineral and some selected heavy metals' contents of the samples are monitored in Table 3.

According to chemical analyses' results presented in Table 2, the total ash content, which is the mineral element content index of the plant samples, was determined as 14.03%, while the nitrogen, crude protein, pH and crude fiber ratios of the samples were 1.44%, 9.00%, 5.96% and 48.56%, respectively. In different previous scientific researches, total ash and crude protein contents of some medicinal and edible wild plants were reported as 0.20 – 1.70 % and 1.30 – 11.56 % (Yıldırım et al., 2001; Turan et al., 2003; Sekeroglu et al., 2006; Tuncturk et al., 2015), and Yıldırım et al. (2001) observed that pH values of some wild plants were varied between 3.50 – 6.50. As can be seen, the results of this study were observed among the reported min-max levels, previously.

Table 2. Mean values of chemical composition contents of *V. orientale*

Parameters	<i>Verbascum orientale</i> (L.) All.
Total ash (%)	14.03 ± 1.71
N (%)	1.44 ± 0.06
Crude protein (%)	9.00 ± 0.35
pH (%)	5.96 ± 0.32
Crude Fiber (%)	48.56 ± 0.31

In this study, with a permissible level, some important minerals that have useful effects on living organisms such as sodium (Na), magnesium (Mg), potassium (K), calcium (Ca), phosphorus (P) and sulphur (S) were studied. In Table 3, the amount of Na, Mg, K, Ca, P and S contents of *V. orientale* were given as 0.32, 1.40, 5.45, 5.80, 1.57 and 1.40 mg kg⁻¹.

In some previous studies, wild medicinal plants have been studied for their mineral compositions. In these studies, Na concentrations varied among 0.21 - 63.32 g kg⁻¹ (Koca et al., 2009; Akgunlu, 2012; Tuncturk et al., 2015); Mg levels of studied medicinal and edible plants were monitored between 1.17 and 86.43 g kg⁻¹ (Corlett et al., 2002; Koca et al., 2009; Tuncturk et al., 2015); K contents were ranged from 245.78 to 557.91 g kg⁻¹ in some wild plants (Akgunlu, 2012; Tuncturk et al., 2015); Ca levels were found in a wide range of 0.03 to 777.52 g kg⁻¹ (Koca et al., 2009; Akgunlu, 2012); P concentrations were varied from 34.92 to 69.13g kg⁻¹ (Akgunlu, 2012; Tuncturk et al., 2015); S contents were reported in the range of 12.34–108.01 g kg⁻¹ (Koca et al., 2009; Akgunlu, 2012; Tuncturk et al., 2015).

It is well known that many factors affecting plant compositions, such as plant genetic structure, growing conditions, soil characteristics, water availability, growing seasons, and etc. affect the mineral composition of the plants to a significant extent

(Vishwakarma and Dubey, 2011; Sekeroglu et al., 2012; Tuncturk et al., 2015). In this study, there was a wide variation for macro element contents between the previously reported results and *V. orientale* results. Therefore, the findings of this study were monitored under the minimum levels of macro element concentrations of some medicinal and wild plants that previously reported.

Table 3. Mean values of mineral compositions of *V. orientale*

Minerals	<i>Verbascum orientale</i> (L.) All.
Na (g/kg)	0.32 ± 0.002
Mg (g/kg)	1.40 ± 0.015
K (g/kg)	5.45 ± 0.420
Ca (g/kg)	5.80 ± 0.030
P (g/kg)	1.57 ± 0.110
S (g/kg)	1.40 ± 0.070
Mn (mg/kg)	22.74 ± 1.080
Fe (mg/kg)	225.05 ± 4.370
Cu (mg/kg)	18.26 ± 1.020
Zn (mg/kg)	29.81 ± 1.910
Cr (mg/kg)	0.05 ± 0.022
Cd (mg/kg)	0.14 ± 0.032
Co (mg/kg)	1.54 ± 0.370
Pb (mg/kg)	0.04 ± 0.009

As can be seen in Table 3, manganese (Mn), iron (Fe), copper (Cu) and Zinc (Zn) contents of *V. orientale* were observed as 22.74, 225.05, 18.26 and 29.81 mg kg⁻¹.

In some previous researches, Mn, Fe, Cu and Zn contents of some medicinal and edible plants were reported in a wide range of 5 – 244 mg kg⁻¹; 1.7 – 975.0 mg kg⁻¹, 0.05 – 18.40 mg kg⁻¹ and 10 – 97 mg kg⁻¹, respectively (Bahemuka and Mubofu, 1999; Işiloğlu et al., 2001; Kabata-Pendias and Pendias, 2001; Yıldırım et al., 2001; Turan et al., 2003; Başgel and Erdemoğlu, 2006; Sekeroglu et al., 2008; Jabeen et al., 2010; Akgunlu, 2012; Tuncturk et al., 2015). The results obtained in this study were found to be in parallel with some results reported in previous studies of some medicinal plants.

Some heavy metals such as chromium (Cr), cadmium (Cd), cobalt (Co) and lead (Pb) that has hazardous effects on living organisms in certain quantities were studied in this study. As can be seen in Table 3, Cr, Cd, Co and Pb contents of *V. orientale* were observed as 0.05 mg kg⁻¹, 0.14 mg kg⁻¹, 1.54 mg kg⁻¹ and 0.04 mg kg⁻¹.

The levels of these minerals (Cr, Cd, Co and Pb) in the previously published data of some other medicinal plants are as follows: 0.65 – 19.10 mg kg⁻¹, 0.012 – 0.440 mg kg⁻¹, 0.047 – 1.69 mg kg⁻¹ and 0.04 – 1.40 mg kg⁻¹ (Akgunlu, 2012; Sekeroglu et al., 2012) (Łozak et al., 2002; Başgel and Erdemoğlu, 2006; Koca et al., 2008; Koca et al., 2009; Tuncturk et al., 2015). Considering previous studies on heavy metal concentrations of some medicinal and wild plants, our findings are in harmony with the researchers' results, except Cr because of its low level.

4. Conclusion

In this study, we presented chemical composition of *V. orientale* species, which is a toxic medicinal plant, used for various treatments. Some precautions about these plants should be well investigated before use it for medicinal purposes. Additionally, this work

reveals that wide numbers of phytochemical constituents can be isolated from this species which possess some important activities. Thus, this results present significant information for pharmaceutical companies.

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