

## A Comparative Analysis of the Nutritive Content of Wild and Cultivated Populations of the Edible Plant Blue Mint Bush (*Ziziphora clinopodioides* Lam.)

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### Abstract

*Ziziphora clinopodioides* Lam., commonly known as mountain basil, is an edible and medicinal plant that has been utilized in Türkiye, Iran, Asia, and Middle Eastern countries for various purposes. This study aimed to assess the nutritive content of five distinct populations of *Z. clinopodioides* Lam. under both wild-growing and cultivated conditions. Macro elements Ca, K, Mg, Na, micro elements Fe, Mo, Zn, Cu, Mn as well as heavy metals As, Co, Pb identified. On average, the macro elemental content of the samples decreased in the following order: Na>K>Ca>Mg. When comparing wild growing plants with cultivated one, K, Mg and Na content of populations higher than cultivated counterparts. The micro elemental content of the samples decreased in the following order: Fe>Mn>Zn>Cu>Mo for both wild growing and cultivated populations. The results of study revealed that the elemental content of *Z. clinopodioides* exhibit nearly identical qualitative compositions of nutritive elements for cultivation and wild growing plants.

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## 1. Introduction

The Lamiaceae family is the third largest family in Türkiye after the Asteraceae and Fabaceae families with 45 genera, 574 species and 742 taxa in total, with an endemism rate of 44.5% (Davis, 1982; Güner et al., 2000). The essential oils contained in plants belonging to the Lamiaceae (Labiatae) family are of great economic importance as they are used as raw materials in pharmacology, cosmetics, perfumery and food industries due to their therapeutic and flavouring properties. In addition, many species belonging to the family are also used as ornamental plants and cultivated (Şenkal, 2020; Oğuz, 2021; Özgül et al., 2025). Humanity's acquaintance with the therapeutic properties of plants dates back to ancient times. The oldest known source on medicinal and aromatic plants, a book written by the Chinese ruler Shin-Nong in 3700 BC, mentions more than 200 plants. The Ebers papyrus, which is considered to be the most important papyrus on medicines and treatment, containing more than 800 recipes and 77 different herbal, animal and mineral drugs, is estimated to have been written in 1550 BC (Bayramoğlu and Toksoy, 2008). It is known that the number of plant species worldwide is 422.000 and 72.000 of these plants are used for medicinal and aromatic purposes. It is estimated that there are about 7.000 plant species cultivated worldwide and about 300 of them are medicinal and aromatic plants. In Chile, 71% of the population, 65% of the rural population in India, 40% of the population in China and Colombia utilize traditional medicine methods to meet their health care needs (Faydaoğlu and Sürücüoğlu, 2011). Biodiversity has an important place in meeting the basic needs of human beings, especially the need for food. In addition to the pollution caused by the unconscious activities of humans, it is inevitable that biological diversity will be damaged day by day and species will disappear as a result of the continuous and unconscious use of natural resources. Along with the losses in biological diversity, various ecological services obtained from this diversity are affected and various losses occur. Although Türkiye is one of the

richest countries in the world in terms of plant biodiversity, it is facing a decline in biodiversity due to various negative reasons (Karagöz et al., 2010). The existence and diversity of plants collected from nature for raw materials, food and other purposes are decreasing day by day, and even some species are under the danger of extinction to different degrees. For this reason, it is necessary to carry out culture studies of the plants collected from nature and to supply them to the market by cultivating them. Blue Mint Bush (*Z. clinopodioides* Lam.) is an edible medicinal plant used as food, flavouring and in the treatment of various diseases in Türkiye, Iran, Asia and Middle East countries. In addition to its sedative effect, it is used for its anti-stomach pain and gastritis, expectorant, protective against infectious diseases and carminative, anti-vascular stiffness and antihypertensive properties. It also has flavouring properties with its rich aroma in daily food products (Beikmohammadi, 2011; Senejoux et al., 2012). It is also used in the production of herbed cheese, which is unique to the Eastern Anatolia region and contains various plants (Tunçtürk and Tunçtürk, 2020). The species, which has a wide distribution in our country, has different names from region to region such as anuk, cahtir, cahtira beige, catri, zernix, anix, merze, merzekew, mountain tea, country mint, mint spirit, mountain basil, filiskin grass, oregano, zahter, zembur, karaçay, kakuti, mouse grass and mountain thyme (Deniz, 2007; Uce and Tunçtürk, 2014; Selvi and Satil, 2020). The present study aimed to investigate the nutritive contents of *Z. clinopodioides* Lam. populations, encompassing both wild-growing and cultivated specimens, which are widely distributed throughout the flora of Türkiye and harvested from natural environments for consumption.

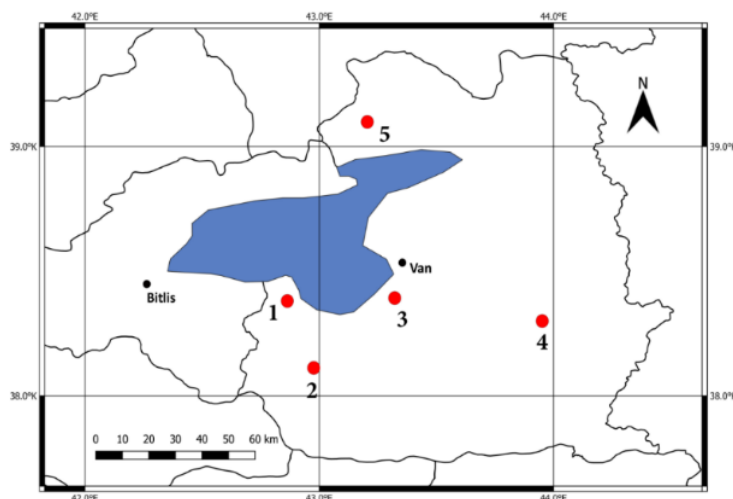
## 2. Material and Methods

### 2.1. Material

Based on flora studies, the natural habitats of *Z. clinopodioides* Lam. populations in the region were identified. Samples of *Z. clinopodioides* Lam. were subsequently collected from five distinct locations (Figure

1.) in Van/Türkiye, during May 2020 when the plants were in early flowering stage. The geographical characteristics of the collection sites are detailed in Table 1. From each site, three individual plants were selected and harvested. These plants were photographed in situ, and macroscopic measurements were recorded. Plant specimens were identified as

herbarium samples through microscopic analysis at the Herbarium of the Department of Biology, Faculty of Science, Van Yüzüncü Yıl University. The identification process primarily relied on "Flora of Turkey," supplemented by other relevant resources as needed.



**Figure 1.** Location of localities over the city map (Van/Türkiye)

**Table 1.** Geographical feature of localities

Location	City	County	Region	Latitude	Longitude	Altitude
ZC1	Van	Gevaş	Kuskunkıran passage	38°22'37.42" N	42°47'14.13" E	2236 m
ZC2	Van	Bahçesaray	Karapet passage	38° 09'19.98"N	42°54'39.86"E	2955m
ZC3	Van	Edremit	Ayazpınar village	38° 22'28.58"N	43°18'13.50"E	2144 m
ZC4	Van	Gürpınar	Murataldı village	38°12'39.27" N	43°53'24.32"E	2407 m
ZC5	Van	Erciş	Kocapınar village	39°06'09.58" N	43°12'21.11" E	1802 m

Cuttings from each population were propagated via vegetative propagation for cultivation. The cuttings were treated with 500 mg kg<sup>-1</sup> of Indole-3 butyric acid and then rooted in perlite trays under controlled greenhouse conditions. After 40 days, 20 rooted seedlings from each population were transplanted into the cultivation area (June, 2020). Each plot was fertilized with 60 kg ha<sup>-1</sup> phosphorus (P<sub>2</sub>O<sub>5</sub>) and 60 kg ha<sup>-1</sup> nitrogen (N).

No disease was observed during the experiment and weeds were removed manually from the experimental land without using chemicals. The following year, during the flowering stage in May 2021, 6 healthy plants from each population were harvested in 10:00 am in the morning, and the data were collected. Soil properties of cultivation area and localities shown in Table 2 and meteorological data shown on Table 3.

**Table 2.** Soil properties of cultivation area and localities

	Texture	pH	EC (dS m <sup>-1</sup> )	Lime (%)	Organic Matter (%)
Cultivation Area	52.40% sandy	7.72	0.091	18.4	1.44
	14.60% clay				
	33.00% silty				
ZC1	51.20% sandy	7.09	0.148	1.12	2.07
	15.20% clay				
	33.60% silty				
ZC2	39.20% sandy	6.87	0.164	1.12	2.18
	26.60% clay				
	34.20% silty				
ZC3	33.20% sandy	7.56	0.142	19.81	1.86
	31.20% clay				
	35.60% silty				
ZC4	55.20% sandy	8.13	0.195	32.15	1.04
	15.20% clay				
	29.60% silty				
ZC5	55.20% sandy	7.07	0.195	0.87	2.24
	15.20% clay				
	29.60% silty				

**Table 3.** Meteorological data of cultivation area and localities

	Location	Year	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Average Monthly Temperature (°C)	ZC1	2021	-4.6	-2.2	1.5	9.2	12.4	16.6	19.8	18.7	14.5	8.2	4.2	-2.0	8.03
		2022	-6.2	-2.9	-2.2	8.1	9.0	15.5	18.6	19.2	15.1	9.8	3.3	0.2	7.29
	ZC2	2021	-3.3	-2.8	-3.0	5.2	11.5	15.9	19.5	18.7	14.0	7.6	2.9	-2.1	7.01
		2022	-7.4	-3.8	-4.4	1.8	6.4	15.0	19.6	21.0	15.9	9.3	2.0	-1.8	6.13
	ZC3	2021	-0.7	0.8	3.7	11.7	16.7	21.6	24.2	23.5	18.8	12.3	7.0	1.2	11.73
		Cult.Area	2022	-3.1	0.0	1.0	10.1	12.0	20.5	23.2	24.3	20.0	14.0	6.8	3.0
	ZC4	2021	-3.5	-1.5	0.3	8.7	13.7	18.9	21.3	20.5	16.5	9.3	4.2	-2.4	8.83
		2022	-7.5	-3.7	-2.7	7.7	9.3	17.9	21.7	23.0	17.8	11.1	3.8	-0.4	8.17
	ZC5	2021	-3.2	-1.3	1.9	10.7	15.6	20.6	23.4	22.8	17.1	10.2	5.8	-0.2	10.28
		2022	-5.1	-2.0	-0.5	9.7	11.5	19.2	23.1	24.0	18.1	12.1	5.1	1.9	9.76
Monthly Average Relative Humidity (%)	ZC1	2021	84.6	89.3	80.8	64.4	69.6	53.1	60.6	58.6	60.4	76.1	90.4	84.2	72.68
		2022	87.2	88.8	86.1	68.7	80.9	69.9	59.7	56.9	59.7	77.2	86.6	92.2	76.16
	ZC2	2021	60.5	63.1	83.0	60.3	44.0	28.7	33.1	31.7	35.8	53.1	65.9	56.9	51.34
		2022	77.7	73.7	99.9	84.4	68.2	42.7	27.4	20.6	31.1	52.5	68.0	71.0	59.77
	ZC3	2021	67.1	73.3	67.0	48.8	46.4	32.0	38.4	38.0	40.6	51.0	69.6	67.3	53.29
		Cult.Area	2022	70.9	75.4	69.0	55.2	62.5	41.2	36.3	32.1	34.4	52.0	65.3	72.0
	ZC4	2021	57.0	62.3	68.1	46.8	42.2	22.5	33.8	34.2	30.1	46.7	64.7	62.0	47.53
		2022	74.4	74.4	70.9	51.5	62.1	36.4	27.6	20.7	26.6	49.9	65.7	73.3	52.79
	ZC5	2021	65.3	70.6	67.7	49.2	46.0	31.5	36.2	35.2	41.1	53.3	68.2	67.1	52.62
		2022	72.3	71.5	67.7	50.4	59.5	43.6	32.4	29.7	39.5	57.8	67.3	68.2	54.99
Monthly Total Precipitation (mm=kg m s <sup>-2</sup> )	ZC1	2021	55.0	54.3	104.0	10.8	21.3	0.0	19.5	1.8	12.4	48.0	43.8	24.5	395.40
		2022	37.2	40.0	119.7	24.6	49.1	20.2	0.0	0.0	0.6	81.6	18.1	10.8	401.90
	ZC2	2021	133.0	108.7	159.4	23.7	16.6	0.0	6.2	16.3	12.2	106.0	98.9	79.6	760.60
		2022	228.2	71.0	167.9	67.0	106.8	15.3	0.5	0.0	0.3	77.1	64.0	27.5	825.60
	ZC3	2021	13.0	12.9	39.9	5.0	20.2	0.2	4.6	1.4	6.3	50.2	23.1	29.4	206.20
		Cult.Area	2022	60.4	18.1	40.7	11.6	51.8	6.3	0.1	0.0	0.0	36.3	38.3	9.3
	ZC4	2021	5.6	16.2	38.4	17.7	22.2	0.9	15.9	15.0	0.4	22.8	14.4	13.9	183.40
		2022	34.4	13.0	14.1	20.5	45.2	10.6	0.0	2.2	1.5	34.8	11.4	2.6	190.30
	ZC5	2021	29.4	18.4	87.8	3.4	45.6	0.0	13.6	0.6	8.6	40.0	38.8	30.4	316.60
		2022	53.0	16.6	46.2	18.2	50.6	20.2	0.0	0.0	0.0	0.0	17.0	0.0	221.80

1:January, 2:February, 3:March, 4:April, 5:May, 6:June, 7:July, 8:August, 9:September, 10:October, 11:November, 12: December

## 2.2. Determination of nutrient contents and heavy metals

The minerals (including macro elements: K, Ca and Mg; micro elements: Fe, Zn, Cu and Mn) and some heavy metals (As, Cd, Co, Ni,

Cr and Pb) were determined. The mineral constituents of the plant samples were investigated as follows: Dried samples were ashed in a furnace with hydrochloric acid and nitric acid (AR) (AOAC 2000). Then, distilled

water (50 ml) were added to samples in a volumetric flask. All assays were performed triplicate and the standard materials were being utilized for chemical analyses. Atomic Absorption Spectrometry (AAS) was used to estimate the K, Ca, Mg, Fe. ICP-OES (Inductively coupled plasma-Optical emission spectrometer) was used to determinate for other micro element and heavy metals constituents (Mn, Zn, Cu, Ni, As, Cd, Co, Cr and Pb).

### 3. Results and Discussion

The elemental content of *Ziziphora clinopodioides* Lam. populations, collected from both wild- growing plants and cultivated counterparts, was analyzed. The nutritional composition of populations has been classified according to geochemical parameters and cultivation area. On average, the macro elemental content of the samples decreased in the following order: Na>K>Ca>Mg. When comparing wild growing plants with cultivated one, potassium, magnesium and sodium content of populations higher than cultivated counterparts (Table 4). Calcium content of

study varied 11.84 to 16.76 g kg<sup>-1</sup> among the wild growing and 16.05 to 22.27 g kg<sup>-1</sup> for cultivated plants. Potassium content of populations varied 14.99 to 19.07 g kg<sup>-1</sup> for wild growing, 11.94 g kg<sup>-1</sup> 16.48 g kg<sup>-1</sup> for cultivated plants. Magnesium and sodium content of study found for wild growing between 2.92-5.93 g kg<sup>-1</sup> and 27.65-27.92 g kg<sup>-1</sup>, for cultivated plants 1.68-2.86 g kg<sup>-1</sup> and 26.35-27.22 g kg<sup>-1</sup>, respectively. Previous study, which conducted with 14 different location reveals that calcium content of *Z. clinopodioides* differs from 13.5 to 27.7 g kg<sup>-1</sup>, potassium content varied 8.5 to 13.8 g kg<sup>-1</sup> and magnesium content varied from 2.1 to 4.1 g kg<sup>-1</sup> (Taheri et al., 2022). Another study also conducted with *Z. clinopodioides* plant, reported calcium content 26.64 g kg<sup>-1</sup>, potassium content 18.27 g kg<sup>-1</sup>, magnesium content 3.51 g kg<sup>-1</sup> and sodium content 8.96 g kg<sup>-1</sup> (Masrournia and Shams, 2013). The study conducted 18 different population of species, reported the macro element content calcium between 1.08-3.57 g kg<sup>-1</sup>, potassium between 7.93-13.36 g kg<sup>-1</sup> and magnesium between 0.95-5.60 g kg<sup>-1</sup> (Zhang et al., 2015).

**Table 4.** Macro elemental content of wild growing and cultivated populations

Populations	W/C	Ca (g kg <sup>-1</sup> )	K (g kg <sup>-1</sup> )	Mg (g kg <sup>-1</sup> )	Na (g kg <sup>-1</sup> )
ZC-1	W	15.07 ± 4.54	17.62 ± 4.08	3.24 ± 0.76	27.74 ± 0.74
	C	16.08 ± 1.07	13.11 ± 0.60	2.29 ± 0.24	27.22 ± 0.05
ZC-2	W	16.76 ± 2.98	19.06 ± 1.67	5.93 ± 1.00	27.92 ± 0.20
	C	20.25 ± 0.80	16.47 ± 1.25	2.86 ± 1.26	26.57 ± 0.15
ZC-3	W	11.83 ± 4.16	17.80 ± 2.84	3.27 ± 0.64	27.69 ± 0.06
	C	17.45 ± 0.97	13.54 ± 1.61	2.06 ± 0.21	26.39 ± 0.13
ZC-4	W	13.27 ± 0.81	17.29 ± 2.08	2.91 ± 0.45	27.65 ± 0.33
	C	22.27 ± 2.97	11.94 ± 1.72	2.10 ± 0.16	26.34 ± 0.11
ZC-5	W	14.37 ± 2.13	14.98 ± 1.17	3.06 ± 0.16	27.69 ± 0.72
	C	16.04 ± 0.15	15.93 ± 1.13	1.68 ± 0.12	26.96 ± 0.05

Values expressed with standard deviation for three replications (n = 3), W: Wild growing, C: Cultivated

The micro elemental content of the samples decreased in the following order: Fe>Mn>Zn>Cu>Mo for both wild growing and cultivated populations. Iron content of wild growing plant varied between 668.71-3682.51 mg kg<sup>-1</sup>, while cultivated plant content varied between 618.25-1334.90 mg kg<sup>-1</sup> (Table 5). These enormous difference between results for wild growing could be explain by iron content of localities, while difference for cultivated populations could be explained by

absorption of iron element shows difference by populations. Manganese content of study varied 66.24 to 146.41 mg kg<sup>-1</sup> for wild growing plants and 44.32 to 79.63 mg kg<sup>-1</sup> for cultivated plants. Wild growing plants manganese content is higher than cultivated plant except ZC-1 populations. Zinc content of both group shows similar results, except ZC-4 populations. Zinc content of wild growing and cultivated populations varied; 19.03 to 36.08 mg kg<sup>-1</sup> and 22.80 to 45.92 mg kg<sup>-1</sup>,

respectively. Copper content of wild growing populations quite higher than cultivated plants for all populations. Wild growing plants copper content varied between 6.14 to 11.99 mg kg<sup>-1</sup>, while cultivated plants 2.33 to 5.42 mg kg<sup>-1</sup>. Molybdenum content of research shows similar results within groups; wild growing plants results varied 0.39 to 0.83 mg kg<sup>-1</sup>, while cultivated plants results varied 0.28 to 0.59 mg kg<sup>-1</sup>. In a previous study conducted with 18 *Z. clinopodioides* Lam. populations, Zhang et al. (2015) reported iron content between 421-2674 mg kg<sup>-1</sup>, while iron content in populations obtained from 14 different locations ranged from 220 mg kg<sup>-1</sup> to 2400 mg kg<sup>-1</sup> reported by Taheri et al. (2022). The fact that the large difference in iron values obtained in our study is also seen in these studies shows that there may be large differences in iron values depending on the population and environmental conditions. Looking at the molybdenum values reported in the same study by Taheri et al. (2022), it is reported that the molybdenum content values of 13 populations are below 1 mg kg<sup>-1</sup>, while the molybdenum value of one population is reported as 2 mg kg<sup>-1</sup>

<sup>1</sup>, which is largely similar to the results of our study, where we found values between 0.4-0.8 mg kg<sup>-1</sup>. Zinc contents were reported by Taheri et al. (2022) to range between 17-230 mg kg<sup>-1</sup>, while Zhang et al. (2015) reported values between 13.16-117.11 mg kg<sup>-1</sup>. Although the zinc values obtained in our study show a wide spectrum, the same situation has been observed in the results of previous studies, and the zinc values obtained in our study are consistent with them. Copper contents were reported to be between 2-10 mg kg<sup>-1</sup> by Taheri et al. (2022) and between 47.25-83.26 mg kg<sup>-1</sup> by Zhang et al. (2015). The copper contents obtained in our study are largely similar to the values reported by Taheri et al. (2022), but differ from those reported by Zhang et al. (2015). This situation may be due to Zhang et al. (2015) conducting their study in a very different geography. While Taheri et al. (2022) reported manganese contents between 34-91 mg kg<sup>-1</sup>, Zhang et al. (2015) reported contents between 14.71-72.21 mg kg<sup>-1</sup>. The manganese values obtained in our study, although partially high, are consistent with the results obtained in these studies.

**Table 5.** Micro elemental content of wild growing and cultivated populations

Populations	W/C	Fe (mg kg <sup>-1</sup> )	Mo (mg kg <sup>-1</sup> )	Zn (mg kg <sup>-1</sup> )	Cu (mg kg <sup>-1</sup> )	Mn (mg kg <sup>-1</sup> )
ZC-1	W	710.82 ± 263.68	0.39 ± 0.19	24.62 ± 7.78	6.14 ± 1.43	66.24 ± 35.19
	C	1110.95 ± 154.71	0.28 ± 0.09	28.87 ± 6.94	2.33 ± 0.80	78.77 ± 8.84
ZC-2	W	3682.51 ± 395.98	0.83 ± 0.18	36.08 ± 13.77	11.99 ± 2.14	146.41 ± 8.98
	C	1334.90 ± 653.49	0.59 ± 0.22	39.64 ± 2.03	3.54 ± 0.65	79.63 ± 33.45
ZC-3	W	888.10 ± 24.96	0.67 ± 0.14	24.45 ± 16.17	9.72 ± 1.06	91.66 ± 8.81
	C	659.65 ± 69.46	0.38 ± 0.10	23.87 ± 4.13	3.27 ± 1.15	44.32 ± 14.59
ZC-4	W	668.71 ± 281.22	0.49 ± 0.00	19.03 ± 13.68	6.31 ± 2.40	75.12 ± 24.92
	C	1221.15 ± 26.16	0.40 ± 0.13	45.92 ± 2.22	5.42 ± 1.05	61.74 ± 15.14
ZC-5	W	1031.53 ± 65.83	0.50 ± 0.06	24.66 ± 2.02	9.68 ± 0.04	83.76 ± 6.54
	C	618.25 ± 115.50	0.56 ± 0.09	22.80 ± 4.51	2.70 ± 0.14	51.38 ± 0.91

Values expressed with standard deviation for three replications (n = 3), W: Wild growing, C: Cultivated

Importantly, all analytical samples displayed no detectable levels of Cd, Se, and Ni indicating the environmental purity of the raw materials. Arsenic content of study found between 1.09 to 2.97 mg kg<sup>-1</sup> for wild growing and 0.35 to 0.70 mg kg<sup>-1</sup> cultivated plants. Cultivated plants arsenic and cobalt levels are much lower than wild growing plants for all populations (Table 6). Cobalt levels of research varied 0.53 to 3.06 mg kg<sup>-1</sup> for wild growing and 0.03 to 0.37 mg kg<sup>-1</sup> for cultivated plants. Lead content of study for wild growing

and cultivated plants; 0.27 to 0.97 mg kg<sup>-1</sup> and 0.43 to 1.86 mg kg<sup>-1</sup>, respectively. In a previous study conducted with the plant *Z. clinopodioides* Lam. to determine heavy metal content, the heavy metal content of 14 different populations was determined. It was reported that the lead content of heavy metals ranged from 5-9 mg kg<sup>-1</sup>, while the cobalt content ranged from 0.8-2 mg kg<sup>-1</sup>. The World Health Organization (WHO) has determined the maximum tolerable limits for heavy metals in medicinal plants, stating that lead should not

exceed 10 mg kg<sup>-1</sup> and arsenic should be between 2-5 mg kg<sup>-1</sup>, varying from country to country, while no limit has been specified for cobalt (Anonymous, 2007). The heavy metal

values obtained in our study are consistent with those of a previously conducted study and are below the World Health Organization limits.

**Table 6.** Heavy metal content of wild growing and cultivated populations

Populations	W/C	As (mg kg <sup>-1</sup> )		Co (mg kg <sup>-1</sup> )		Pb (mg kg <sup>-1</sup> )	
ZC-1	W	1.09	± 0.02	0.53	± 0.10	0.42	± 0.19
	C	0.61	± 0.13	0.31	± 0.13	0.88	± 0.01
ZC-2	W	2.97	± 0.08	3.06	± 0.14	0.97	± 0.16
	C	0.40	± 0.34	0.37	± 1.35	0.60	± 0.27
ZC-3	W	1.34	± 0.31	0.81	± 0.00	0.28	± 0.15
	C	0.41	± 0.14	0.08	± 0.06	0.43	± 0.16
ZC-4	W	1.96	± 0.56	0.64	± 0.11	0.27	± 0.44
	C	0.70	± 0.57	0.12	± 0.06	1.86	± 0.08
ZC-5	W	1.24	± 0.33	0.80	± 0.00	0.35	± 0.12
	C	0.35	± 0.08	0.03	± 0.08	0.50	± 0.05

Values expressed with standard deviation for three replications (n = 3), W: Wild growing, C: Cultivated

#### 4. Conclusions

The results of the research demonstrated that the analyzed material samples not only serve as a valuable source of conditionally essential elements crucial for human health but also act as a geochemical indicator for *Ziziphora clinopodioides* Lam. The results of study revealed that the elemental content of *Z. clinopodioides* exhibit nearly identical qualitative compositions of nutritive elements for cultivation and wild growing plants. Differences in the quantity of element content are primarily attributed to the natural climatic growth conditions and the specific methods of cultivation. Importantly, none of the samples investigated contained toxic metals such as Pb, As, or Co, underlining the ecological safety of *Z. clinopodioides*. Further studies should be determining other properties of *Z. clinopodioides* Lam. to clarify consumption and other use in case of cultivation opportunities.

#### Declaration of Author Contributions

The authors declare that they have contributed equally to the article. All authors declare that they have seen/read and approved the final version of the article ready for publication.

#### Declaration of Conflicts of Interest

All authors declare that there is no conflict of interest related to this article.

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#### Ethical Committee Approval

This study did not involve human or animal subjects; therefore, ethical approval was not required.

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