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Original article

Determination of selected vitamin, mineral and trace element content of *Laserpitium carduchorum* Hedge & Lamond

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Summary. In our study, selected vitamin (A, E), mineral (K, Mg) and trace element (Fe, Cu, Zn, Mn) levels of the *Laserpitium carduchorum* Hedge & Lamond plant which is endemically grown in Van Lake basin were examined. When the results of the study were evaluated; Vitamin A level of *Laserpitium carduchorum* Hedge & Lamond plant was found to be 0.61±0.063 μg g^{-1} and vitamin E level was 0.77±0.067 μg g^{-1}. When the mineral and trace element contents of *Laserpitium carduchorum* Hedge & Lamond were evaluated, K (Potassium) was 868.83± 72.92 μg g^{-1}, Mg (Magnesium) 180.77±18.47 μg g^{-1}, Fe (Iron) 11.74±2.37, Cu (Copper) 9.59±1.1 Zn (Zinc) 23.69±2.46 Mn (Manganese) 34.45±5.35 μg g^{-1}. It was detected that the plant was rich in minerals and trace elements such as K (potassium), Mg (Magnesium), Mn (Manganese) and Zn (zinc).

Key words: *Laserpitium carduchorum* Hedge, mineral, trace element, vitamin

Introduction

Plants have been used in many fields including medicine, nutrition, flavoring, soft drink, cosmetics, parfumes, painting cigarettes and other industrial goals. Since the prehistorical period, plants have formed the basis of almost all medical treatments until the development of synthetic drugs in the nineteenth century (1). Oxidative stress indicates the overproduction of products called free radicals and reactive oxygen species (ROS) and imbalance of ROS and antioxidant chemicals. They are harmful when free radicals are not scavenged by endogenous systems. Normally, oxidative stress is caused by an imbalance between reactive oxygen species and endogenous antioxidant systems (2). It has been stated that reactive oxygen / nitrogen species produced in the human body may reason oxidative damage and this damage is related to many degenerative diseases (3). Antioxidants play a critical role in protective the human body against the damage of ROS (4). Most industrial and trading used pharmaceuticals are crops of secondary metabolism in microbial or plant systems (5). Most of the aromatic and spicy plants comprise chemical compounds that exhibit antioxidant properties (6). Medicinally used parts of plants are generally rich in flavonoids, phenolic acids, stilbenes, tannins, coumarins, lignins, phenols and other phenolic compounds (7). They may play an important role in adsorbing and neutralizing free radicals, singlet and triplet oxygen quenching or peroxides decomposition. Many of these phytochemicals have important antioxidant capacities associated with lower rates of human disease and lower mortality rates (4). About 35.000 of the 350.000 plant species known to date have been used all the world for medicinal purposes and less than 0.5% of them have been chemically investigated (5). For this reason, research studies to understand the effects of medicinal plants on their metabolism have increased. Apiaceae Lindl. (Umbelliferae Juss.) is an important family of flowering plants with 300-455 genus and 3.000-3.750 species (8). Members of this family are greatly distributed in tem-

perate climates (9). The Apiaceae family contains the majority of bioactive polyacetylenes and in addition to the well-known medicinal and toxic plants, food plants such as carrots, celery and parsley (10). The members of the Apiaceae family have several compounds with many biological activities. Some of the main features are apoptosis, antibacterial, hepatoprotective and vasoactive properties, cyclooxygenase inhibitory effect and the ability to induce antitumor action (11). The genus *Laserpitium* L. (Apiaceae) contains 20 aromatic species deployed in the northern hemisphere from the Canary Islands in the west to Siberia and Iran in the East. In vegetation Europaea, this genus is represented by 14 species. Some greatly deployed species of this genus such as *L. siler* L. and *L. latifolium* L. have been used in the traditional medicine of some European countries (12). *Laserpitium carduchorum* Hedge & Lamond is an important species that grows endemic in Van Lake basin (13). In addition to the use of *Laserpitium carduchorum* Hedge & Lamond as a spice has been reported to be used in folk medicine to treatment urinary tract infections in particular (14). In this study, it was aimed to evaluate selected vitamin (A, E) mineral (K, Mg) and trace element (Fe, Cu, Zn, Mn) contents of the *Laserpitium carduchorum* Hedge & Lamond plant growing endemic in Van Lake basin.

Materials and Methods

Plant Material

Laserpitium carduchorum plant examples used in the research were gathered from B9 Bitlis: Kotum (küçüksu) Karz mountains Kerner locality at 2.200 m. Plant samples were dried in room conditions without exposure to direct sunlight after collection. The identification of *Laserpitium carduchorum* Hedge & Lamond was carried out by Assoc. Prof. Dr. Fevzi Özgökçe. *Laserpitium carduchorum* Hedge & Lamond plant samples are kept in Van Herbarium with the code of VANF F13882.

Vitamin A, E Analysis

Laserpitium carduchorum Hedge & Lamond plant aerial parts were dried and grinded for Vitamin A (Retinol) and E (α-tocopherol) determination (15-17). Plant samples were extracted with a mixture of n-hexane and ethanol. 1% BHT was added and kept in a dark environment for one day. At the end of this period, centrifugation was carried out at 4000 rpm (+4°C) for 10 min. The obtained supernatant was filtered by the help of whatman filter paper and 0.5 mL of n-hexane was added. Drying was then performed using nitrogen gas. The residue in the tubes was dissolved in a methanol + tetrahydrofuran mixture. Analyzes were carried out in Thermo Scientific Finnigan Surveyor model high performance liquid chromatography (HPLC) and in amber glass vials on Tray autosampler using PDA array detector. Results were expressed as μg g^{-1}.

Determination of Minerals and Trace Elements

The levels of minerals and trace elements of the *Laserpitium carduchorum* Hedge & Lamond plant were measured using dry ashing method (18). 5 g of dry plant samples were kept in the stove at 105°C for approximately 4-5 hours. Then 2 mL of ethyl alcohol-sulfuric acid mixture was adding to the samples taken from the oven. The temperature of the plant samples added to the mixture of ethyl alcohol and sulfuric acid was increased from 250 °C to 550° C. The ash samples were removed from the furnace and added to the samples at a 3 N concentration of hydrochloric acid solution. Analysis of the Fe, Cu, Zn, Mn, K and Mg elements of the samples, which were adjusted to 12.5 mL with the final volume of double-distilled water, was evaluated using the inductively coupled plasma optical emission spectroscopy (ICP-OES) (Thermo iCAP 6300 DUO). Results were expressed as μg g^{-1}.

Statistical Analysis

The results are expressed as mean ± the standard error of the mean ($\bar{X}$± SEM).The descriptive statistical analysis was performed by using the SPSS®, version 22 statistical software (SPSS Inc. Chicago Illinois).

Results

Laserpitium carduchorum Hedge & Lamond. vitamin A and vitamin E levels were evaluated and given in Table 1 and Figure 1. The vitamin A content of the plant was 0.61±0.063 μg g^{-1} and vitamin E levels was

Table 1. Vitamin A and E levels of *Laserpitium carduchorum* Hedge & Lamond.

Sample	Vitamin A (μg g^{-1})	Vitamin E(μg g^{-1})
Laserpitium carduchorum Hedge&Lamond.	0.61 ± 0.063	0.77 ± 0.067

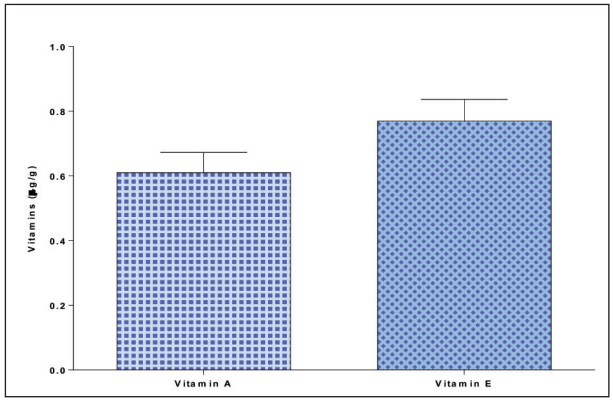

Figure1. Vitamin contents *Laserpitium carduchorum* Hedge & Lamond

0.77±0.067 μg g^{-1}. Vitamin E levels of the *Laserpitium carduchorum* Hedge & Lamond plant was found to be in a high level.

When the mineral and trace element amounts of the *Laserpitium carduchorum* Hedge & Lamond. plant are evaluated; K (potassium) was 868.83±72.92 μg g^{-1}, Mg (magnesium) was 180.77±18.47 μg g^{-1} and trace element levels Cu (copper) was 9.59±1.1 μg g^{-1}, Fe (iron) was 11.74±2.37 μg g^{-1}, Mn (manganese) was 34.45±5.35 μg g^{-1} and Zn (Zinc) was 23.69 ± 2.46 μg g^{-1} (Table 2). Mineral and trace element content was found to be ranked as potassium (K)> magnesium (Mg)> manganese (Mn)> zinc (Zn)> iron (Fe)> copper (Cu) (Figure 2 and Figure 3).

Table 2. Mineral and trace element levels of *Laserpitium carduchorum* Hedge &Lamond.

Minerals and Trace Elements μg g^{-1}	*Laserpitium carduchorum* Hedge&Lamond
K	868.83 ± 72.92
Mg	180.77 ± 18.47
Cu	9.59 ± 1.1
Fe	11.74 ± 2.37
Mn	34.45 ± 5.35
Zn	23.69 ± 2.46

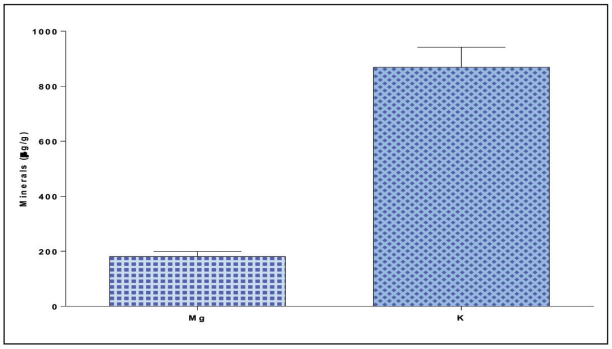

Figure2. Mineral contents *Laserpitium carduchorum* Hedge & Lamond

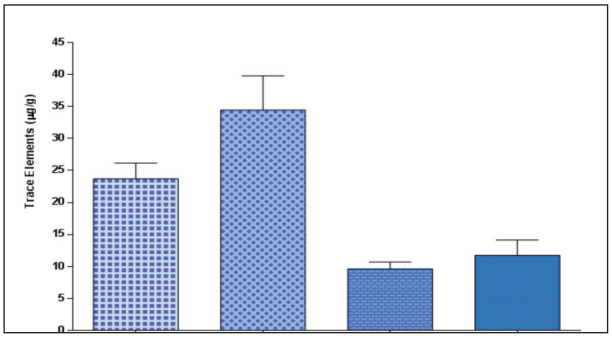

Figure3. Trace element contents *Laserpitium carduchorum* Hedge & Lamond

Discussion

Medicinal herbs play an important role in traditional medicine and are broadly used up as home remedies. In recent years has seen a considerable rise in the use of herbal medicines due to its least side effects, availability and acceptability to the majority of third-world countries (19). Today, the use of medicinal plants to weaken and cure the disease by a lot of people is quite widespread in the world because of its mild properties and low side effects (20). The plants are abundant in natural antioxidants such as phenolic compounds tochopherols, carotenoids and ascorbic acid (21). Epidemiological studies have shown that the intake of natural antioxidants reduces the risk of many diseases (22). In general, vitamins such as tochopherols, carotenoids and ascorbic acid are bioactive components that show protective effects (23). It has been shown that there is a correlation between the consumption of fruit in the diet and the reduction of the risk of chronic disease (24). It has been

reported that the intake of large amounts of fruits and vegetables has protective effects against various diseases, especially cardiovascular diseases (23). Vitamin E acts as a chain-breaking antioxidant that prevents the spread of free radical reactions in various disease processes (25). The concept vitamin A defines a group of retinoid compounds with the biological activity of all-trans retinol. Vitamin A plays an important role in many physiological functions including vision, growth, reproduction, hematopoiesis and immunity (26). In particular, vitamins A and E (a-tocopherol) have been shown as chemopreventive agents for some types of cancer (27). Considering the important effects on metabolism, *Laserpitium carduchorum* Hedge & Lamond vitamin A and vitamin E contents were 0.61±0.063 μg g^{-1} and vitamin E content as 0.77±0.067 μg g^{-1}, respectively. Vitamin E content of the plant was found to be better than vitamin A. Minerals in general; Ca, Mg, K, Na and P are known as macro elements and are generally included in anatomical structures, but they are also in the ionized active form (28). Trace elements; in living organisms, plants and soil, low concentrations are defined as molecules (29). Trace elements have important effects on vital processes for vitality. Many studies have revealed that trace elements are associated with many diseases (30). The trace elements that have been extensively studied during the last decade contain copper (Cu), zinc (Zn), iron (Fe), manganese (Mn), molybdenum (Mo), boron (B), cobalt (Co), nickel (Ni) (29). When the minerals are evaluated; Potassium is the main cation in the intracellular fluid and acts in the acid-base balance, arrangement of osmotic pressure, delivery of nerve impulse, muscle contraction, especially cardiac muscle, cell membrane function and Na+/K+ -ATPase. Potassium is needed during glycogenesis (31). The Mg mineral is the second dominant component, which is the co-factor of more than 300 basic metabolic reactions, including those that produce or utilize the Mg-ATP complex, an important regulator of cellular processes in the intracellular compartment. However, its functionality is related to tissue components, growth and thermogenesis and tyrosine kinase activity in glucose metabolism (32). Zinc (Zn), which has an important take place among trace elements, is widely distributed in plant and animal tissues and is seen in all living cells (31). It functions as a cofactor and forms the component of many enzymes such as lactate dehydrogenase, alcohol dehydrogenase, glutamic dehydrogenase, alkaline phosphatase, carbonic anhydrase, carboxypeptidase, superoxide dismutase, retinene reductase, DNA and RNA polymerase. Zn-dependent enzymes are involved in macronutrient metabolism and cell replication (33). Manganese (Mn), which is effective in the growth of skeletal growth, nucleic acids, proteins and hemoglobin, and the metabolism of lipids and carbohydrates, also has anti-allergic properties. It acts as a calcium antagonist to the nervous system and is as effective as Mg^{2+} to inhibit the release of neuromediators into the synaptic area (28). Copper (Cu), one of the important trace elements, is essential for the development of connective tissue, nerve coatings and bone. Cu tasks as a reductant in superoxide dismutase, cytochrome oxidase, lysyl oxidase, dopamine hydroxylase and many other oxidase enzymes that diminish molecular oxygen. The protein is transported by ceruloplasmin in the organism (34). Iron (Fe) is required for electron transfer reactions, , binding and transport of oxygen, gene regulation and cell differentiation and arrangement of cell growth. Iron is a crucial component of enzymes that produce peroxide and nitrous oxide (35). In our study we evaluated *Laserpitium carduchorum* Hedge & Lamond. The mineral levels of the plant were found as K (potassium) 868.83±72.92 μg g^{-1}, Mg (magnesium) 180.77±18.47 μg g^{-1} respectively and trace element levels were found as Cu (copper) 9.59±1.1 μg g^{-1}, Fe (iron) 11.74±2.37 μg g^{-1}, Mn (manganese) 34.45±5.35 μg g^{-1}, Zn (Zinc) 23.69±2.46 μg g^{-1} respectively. It was found that the plant was rich in potassium and magnesium and was also very good in manganese and zinc content. Literature records show that studies related to the *Laserpitium carduchorum* Hedge & Lamond which is endemic to Lake Van basin are very limited. In some studies the essential fatty acid components of the plant was reported to be in good level. It has been reported that the phenol ingredient of the plant and its antioxidant capacity are high. Again *Laserpitium carduchorum* Hedge & Lamond essential oil content and extract of the plant was reported to have antimicrobial activity (14). There is no study on the vitamin and mineral content of the *Laserpitium carduchorum* Hedge & Lamond. In this sense, the study is very important. When the studies about different types of *Laserpitium* are evaluated; two different types of endemic *Laserpitium* have a good chemical content and have a cytotoxic effect. Again, two different types of

Balkan endemic *Laserpitium* species have been found to have good essential oil content and have antinociceptive and anti-dementia effects (36, 37). *Laserpitium garganicum* has been reported to show strong antifungal activity (38).

As a result; The endemic species *Laserpitium carduchorum* Hedge & Lamond plant vitamin E content is higher than vitamin A content, the plant is examined in the mineral (K, Mg) and trace element (Fe, Cu, Zn, Mn) levels and is found to have good K (potassium), Mg (magnesium), Mn (manganese), Zn (zinc) content. These results are thought to be a reference to future studies.

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