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Determination of Some Cations in *Sedum album* and *Sedum sediforme* *Sedum album* ve *Sedum sediforme* İçindeki bazı Katyonların Tayini

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Abstract

Three alkaline (Li, Na, K), two earth alkaline (Ca, Mg) and two heavy metals (Fe, Ni) in different parts of *Sedum album* and *Sedum sediforme* were determined by wet destruction ($HNO_3/HClO_4$) method, using flame atomic absorption spectrophotometer. *S. sediforme* roots were found to contain K and Ca in highest ratio. Ca was recorded as the major element in *S. sediforme* in all tested materials. *S. album* leaves were found to contain Na and Fe in higher amounts.

Key words: *Sedum album*; *Sedum sediforme*; Crassulaceae, cations.

Introduction

Sedum album L. and *S. sediforme* (Jacq.) Pau .are widespread succulent plants of 40 *Sedum* species that grown in Turkey (Davis,1972 and 1988).
Sedum species are the home remedies that are mostly used as hypotensive, laxative, emetic, astringent and to treat hemorrhoids, diarrhoea and have an anti-cancer reputation. The fresh plant is an effective corn remover, a mild anti-inflammatory agent and a wound healer and can be applied to warts (Bremness 1994). On the other hand, *S. sediforme* is known as "kedi tırnağı" in Turkey and its leaves are pickled especially in Southern Anatolia. As chemical constituents of these plants, flavonol glycosides were reported from *S. album* (Wolbis 1989), whereas, flavan gallates, phloroglucinol derivatives and flavonol glycosides have been reported for *S. sediforme* (Sakar *et al.*, 1993).
Determination of oligoelements as well as the secondary metabolites is an important parameter in the evaluation of the medicinal plants. Recently, much attention has been focused on the metal contents in medicinal plants due to their detrimental consequences to human health, as well as the availability of metals as enzyme activators or inhibitors. Moreover, the knowledge about the oligoelemental composition of the medicinal plants play an important role to determine the quality of the drugs.
Controlled quantitaties of sodium and fixed potassium/sodium ratio are recommended in cases of some heart diseases. Blood plasma concentration of Na:K:Ca is in a constant ratio of 300:20:10 mg/100 g in animal organisms. Potassium is an important factor for the function of the heart and skeletal muscles and the nerves. Administration of saluretics for a long time as well as administration of laxatives and corticosteroids without K supplementation causes significant potassium deficiency. Potassium can be supplied from vegetables in 2-6 g/day. However, 30 mg/100 g K level in blood plasma causes bradycardie. Calcium is an essential

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ion for many phsiological action, like clotting of the blood and electromechanical coupling. Calcium can reduce the membrane permability and have an anti-inflammatory activity. Therefore, calcium can be regarded to have antiallergic activity (Auterhoff et al.,1991). The estimated daily requirement of calcium for adults is 1 g.
Magnesium has been identified as a cofactor in more than 300 enzymatic reactions that affect the energetic metabolism and synthesis of protein. Hypomagnesia has been associated with the development of neuropathy and abnormal platelet activity (Rodrigez-Moran and Guerrero-Romero, 2001). Intracellular magnesium may play a key role on modulation of insulin-mediated glucose uptake and vascular tone. Daily magnesium intake should be around 350 mg/day in men and 300 mg/day in women (Paolisso and Barbagallo 1997).
In this study, we planned to determine the levels of some alkaline (Li, Na, K), earth alkaline (Ca, Mg) and heavy metals (Fe, Ni) in different parts of the home remedy plants of *S. album* and *S. Sediforme* by using flame atomic absorption spectrometer in wet destruction procedures.

Materials and Methods

Plant materials
Sedum sediforme (Jacq.) Pau.flowers (HUEF 95-001) were collected from the vicinities of Kuşadası, Aydın, in May 1995. *S. album* L. leaves (HUEF 03013) as well as *S. sediforme* roots and leaves (HUEF 03014) were collected in Iznik, Bursa, in June 2003. Voucher specimens are deposited at the Herbarium of the Faculty of Pharmacy, Hacettepe University, Ankara, Turkey.
Instrumentation: Philips PU 9100X model flame atomic absorption spectrophotometer (FAAS) interfaced with a computer for data collection was used to determine to Li, Na, K, Ca, Mg, Fe and Ni contents. Iron, magnesium and nickel contents were measured by using hallow cathode lamps operated at 10 mA optimized air-acetylene flame (30:15 L/min).Absorbance were measured at 248.3 nm for Fe, 285.2 nm for Mg and 232 nm for Ni with spectroscopic band pass of 0.5 nm. Determination of Li, Na, K, and Ca were performed with atomic emission method (AES).
*Reagents :*All reagents used are of p.a. quality. High quality water from FISTREM water purification system (Sanyo Gallenkamp PLC, Leicester LE3 2DL,UK) was used for preparing the solutions. After distillation of $HClO_4$ (Merck, 100518100), and extra pure HNO_3 (Merck, 100443) were used for wet destruction of the plant materials.
Procedures
Wet destruction with $HNO_3/HClO_4$ method: A few grams of the samples were first washed with distilled water and dried at room temperature. The plant samples were then smashed in a glass mortar and 10 g of fresh and 2 g of dried plant materials were weighed on an analytical balance (AB204-S Mettler Toledo, Switzerland) with 0.1 mg accuracy. 10 ml of distilled water, 10 ml of concentrated HNO_3 (extra pure 65 %) and 5 ml of 60 % $HClO_4$ were added on the plant samples and the suspension was stirred with a magnetic mixer in reflux condenser for 16 h. After cooling, the suspension was transferred into a 25 ml volumetric flask and diluted to the mark and kept in a refrigerator at 4 °C.
Preparing the stock solutions (1000 mg/ml): Before preparing stock solutions, all the mineral salts were dried at 110 °C for 2 h and kept in a silica gel desiccator.
Iron (3.6071 g, $Fe(NO_3)_3$ $9H_2O$, Riedel de Haen AG 12336), magnesium (4.2354 g, $MgCl_2$ $6H_2O$, Merck 5832), sodium (1.2705 g, NaCl, Merck 6400), potassium (0.9560 g KCl, Merck 104936), calcium (1.8378 g $CaCl_2$ $2H_2O$, Merck 2385), nickel (1.8631 g $NiNO_3.2H_2O$, Merck

6743) and lithium (3.0717 g LiCl, Merck 105679) were individually dissolved in a beaker containig 150 ml deionized water and 1 ml of conc. HNO_3. Each solution was then added to 500 ml with deionized water in a volumetric flask. All stock solutions were kept in a refrigerator at 4 °C in polyethylene containers. Standard solutions were prepared at appropriate dilution ratios freshly just prior to tests.

Results and Discussion

Determination of inorganic elements in organic plant materials requires removal of the organic plant materials, because it would either interfere with, or simply preclude analytical reactions. The simplest method to remove the organic matter is to ash or oxidize it. Carbon and hydrogen are oxidized to carbon dioxide (or monoxide) and water. Organic nitrogen is mainly liberated as free nitrogen (Minczewski et al.,1982). There are three fundemental methods : dry ashing, wet destruction (wet ashing) and microwave destruction (Laing et al., 2003). In our study, wet destruction procedure ($HNO_3/HClO_4$) in a reflux condenser was preferred to avoid the problem of loss during dry ashing.

In this study, three alkaline (Li ,Na ,K) and two earth alkaline (Ca, Mg) and two heavy (Fe, Ni) metals were determinated by using flame atomic absorbsion spectrometer in *Sedum album* fresh leaves, *S. sediforme* fresh leaves, fresh roots and dry flowers using wet destruction procedure. The amounts of Li, Na, K, Ca, Mg, Fe, and Ni was obtained from the average of three determinations. *S. sediforme* fresh roots were found to contain K (8743.9 mg/kg) and Ca (809 mg/kg) in highest ratios (see Table 1 and Figure 1). Calcium was recorded as the major element in all parts of *S. sediforme*. However,Na and Fe were found to be the most abundant cations in fresh leaves of *S. album* (see Table 1 and Figure 2). Only *S. sediforme* fresh roots were found to contain Li (2.335 mg/kg) among all the tested plant materials. It can be concluded that,the roots of *S. sediforme* accumulate all the cations in highest amounts.

Table 1. The amounts of cations in different parts of *S. album* and *S. sediforme*

Sample / Cation (mg/kg)	1	2	3	4
Li	-	-	2.335	-
Na	2.425	0.8085	112.0	7.441
K	1.459	3.164	743.9	16.37
Ca	1.756	7.736	809.8	123.6
Mg	0.5006	0.9650	46.76	8.707
Ni	-	-	4.307	8.707
Fe	1.836	2.316	12.92	-

1. Fresh leaves of *S. album*, 2. Fresh leaves of *S. sediforme*, 3. Fresh roots of *S. sediforme*, 4. Dry flowers of *S. sediforme*.

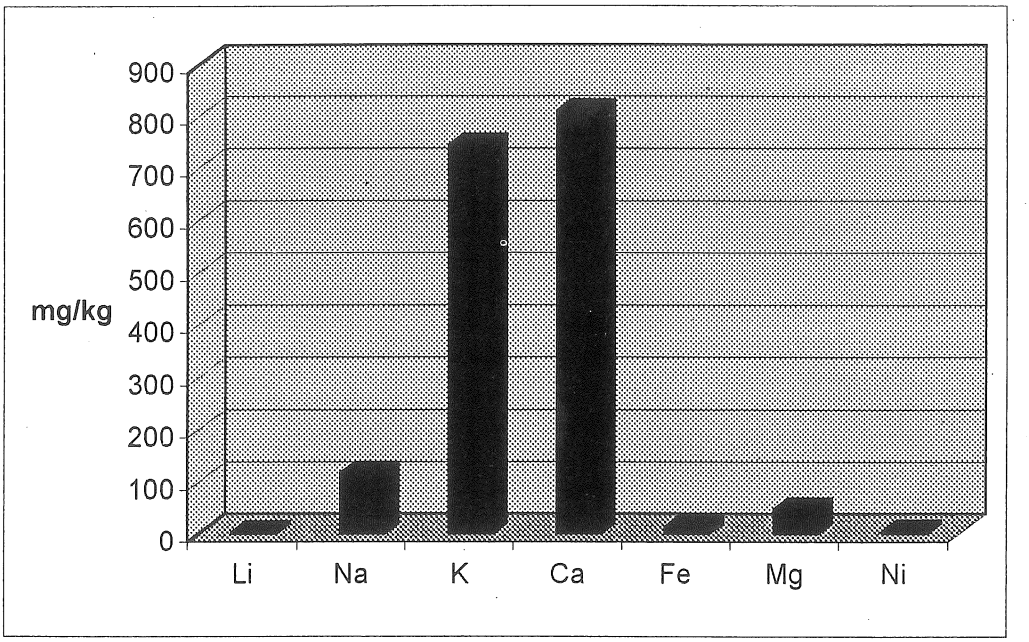

Figure 1. The amounts of cations in fresh roots of *S. sediforme*

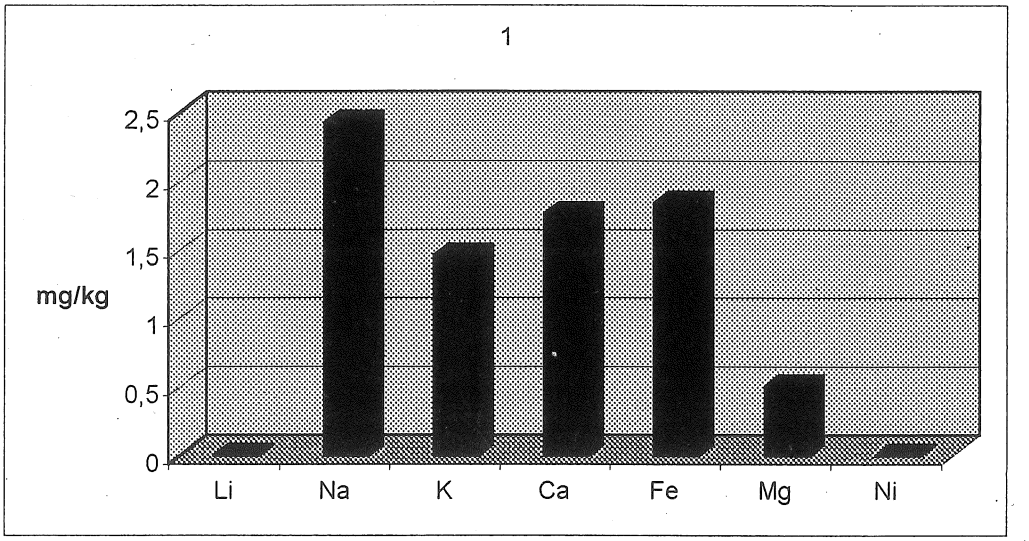

Figure 2. The amounts of cations in fresh leaves of *S. album*.

Özet

Sedum album ve *S. sediforme*'nin farklı kısımlarının taşıdığı üç alkali (Li, Na, K), iki toprak alkali (Ca, Mg) ve iki ağır (Fe, Ni) metalin miktarları, yaş yakma yöntemiyle ($HNO_3/HClO_4$) hazırlanan çözeltilerinden, alevli atomik absorpsiyon spektrofotometresi yardımıyla tayin edilmiştir. Yapılan analizler sonucunda, *S. sediforme* taze köklerinin en yüksek oranda K ve Ca taşıdığı belirlenirken,

kalsiyumun S. *sediforme*'nin bütün kısımlarında en yüksek oranda yer aldığı tesbit edilmiştir. *S. album* taze yapraklarının ise en yüksek oranda Na ve Fe içerdiği bulunmuştur.

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