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Short Communication

Mineral content of the rocket plant (*Eruca sativa*)

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Rocket (*Eruca sativa*) is an endemic species of the Brassicaceae family which is produced mostly in Mediterranean countries such as Italy, Greece and Turkey. Historical research has shown that rocket was used both as a garden plant and as a kind of herb or spice (Yaniv et al., 1998). According to data from the Turkish Statistics Foundation (TUIK) for the year 2010, Turkey's rocket production in a year amounted to 4058 tonnes, and was used either raw in salads or cooked in various dishes. Apart from its use in nutrition, it is also used in the health and cosmetics industries as a result of the effectiveness of its phytochemical content. There have been few studies of these beneficial effects or of the mineral content of rocket; therefore, this study was performed as a survey, in which plant samples were collected from the province of Aydin in Turkey and evaluated for mineral content (N, P, K, Ca, Mg, Na, Fe, Cu, Mn and Zn). After chemical analysis of the samples by standard known methods, statistical analysis was performed using the statistics package SPSS 15.0. According to the results of these analyses, the average content of nutrient elements in rocket (*Eruca sativa*) was found as 4.32% N, 0.25% P, 5.13% K, 2.95% Ca, 0.58% Mg, 799.88 mgkg^{-1}Na, 350 mgkg^{-1} Fe, 5.36 mgkg^{-1}Cu, 40.58 mgkg^{-1} Mn and 64.86 mgkg^{-1} Zn. Minimum and maximum values are given together with average values. The aim of this study was to determine the mineral content of samples of rocket (*E. sativa*) grown by conventional methods in the province of Aydin, and to correlate this to previous studies.

Key words: Rocket, arugula, *Eruca sativa*, rocket growing, mineral composition.

INTRODUCTION

Rocket (*Eruca sativa*) is an endemic species of the Brassicaceae family which is produced mostly in Mediterranean countries such as Italy, Greece and Turkey. It is a dark green annual plant, about 20 to 50 cm in height, with a spicy-pungent taste (Morales and Janick, 2002). Since ancient times, the rocket plant has been a source of nutrition, an herb, an aphrodisiac and a medical plant, and has other uses (Yaniv et al., 1998).

According to data from 2010, the annual production of rocket in Turkey was 4058 tonnes (Anonymous, 2010), but because most production is carried out by amateur gardeners or on small plots, it is difficult to know how much is actually produced (Eşiyok, 1996).

Many studies of vegetable foods have shown that many plants of the Brassicaceae family contain phytochemicals such as flavonoids and glycosinolates (Jin et al., 2009; Bogani and Visioli, 2007; Schaffer et al., 2005), which have beneficial health effects such as cancer prevention (Ambrosone and Tang, 2009; Traka et al., 2008; Higdon et al., 2007; Tang et al., 2008; Thomson et al., 2007). In addition, it has been extensively reported in the literature that rocket has astringent, diuretic, digestive, emollient, depurative, laxative, rubefacient, tonic, stomachic, anti-inflammatory for colitis and stimulant properties (Uphof, 1968; Yaniv et al., 1998; Perry and Metzger, 1978; Bianco, 1994). In the cosmetics sector, it has uses such as, for promoting hair regrowth, the treatment of oily scalp (Ellison et al., 1980), and as a facial tonic (Anonymous, 1988). In addition, the aphrodisiac characteristics of rocket have been attested since ancient Egyptian and Roman times (Fernald, 1993; Michael et al., 2011). With all these qualities, it is also an easy plant to grow, and has often been chosen as experimental material by researchers (Germ and Osvald, 2005).The aim of this study was to determine the content of minerals in the rocket plant and the statistical relationships between them.

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MATERIALS AND METHODS

This study was conducted as a survey, in which the mineral nutrient

Table 1. Contents of nutrient materials in rocket (*E. sativa*).

Parameter	N	P	K	Ca	Mg	Na	Fe	Cu	Mn	Zn
			%					mgkg^{-1}		
Minimum	2.94	0.12	3.99	2.20	0.33	552.00	183.30	2.60	25.60	47.18
Maximum	5.23	0.27	5.98	3.55	0.79	972.00	776.90	7.00	79.30	88.68
Average	4.32	0.26	5.14	2.95	0.58	799.88	350.78	5.37	40.58	64.86

Table 2. Pearson correlation coefficients for mineral composition in *E. sativa* based on combined data.

Mineral element	N	P	K	Na	Mg	Fe	Mn
P	0.759**						
Na	0.252	0.146	0.639**				
Mg	0.211	0.219	0.618*	0.500*			
Cu	0.565*	0.592*	0.568*	0.532*	0.361	0.638**	
Mn	0.082	0.276	0.356	0.356	0.555*	-0.283	
Zn	0.316	0.457	0.319	0.221	0.458	-0.313	0.804**

** Correlation is significant at the 0.01 level, 2-tailed; *correlation is significant at the 0.05 level, 2-tailed.

content of plant samples taken from 30 different gardens of conventionally-grown rocket in the province of Aydin in Turkey was determined. The leaves of rocket (*E. sativa*) used as the study material were dried under laboratory conditions and then ground, after which they were weighed and prepared for analysis of total N, P, K, Ca, Mg, Na, Fe, Cu, Mn and Zn. Samples were wet-burned in a mixture of nitric and perchloric acids, and P content was determined by spectrophotometry, K, Ca, and Na values were gotten by flame photometry, and Mg, Fe, Cu, Mn and Zn values were gotten by the atomic absorption spectrophotometric method. Total N analysis was performed by burning the sample in a Kjeldahl unit and after the distillation stage and titration, the consumed amounts was inserted into a formula (Kacar, 1972). The values obtained were analysed by means of the SPSS 15.0 package; average, minimum and maximum values were obtained and correlations were sought between the nutrient elements.

RESULTS AND DISCUSSION

According to data obtained in this study, average mineral content was 4.32%, 0.25%, 5.13%, 2.95%, 0.58%, 799.88 mgkg^{-1}, 350.775 mgkg^{-1}, 5.36 mgkg^{-1}, 40.58 mgkg^{-1} and 64.86 mgkg^{-1} for N, P, K, Ca, Mg, Na, Fe, Cu, Mn, and Zn, respectively. Analysis results for the experimental material, including maximum, minimum and average values are given in Table 1.

As a result of an insufficient number of studies classifying the mineral content of rocket according to adequacy, the data could not be evaluated for adequacy. However, Haag and Manami (1998) reported that amounts of Mg in rocket leaves varied between 37 and 41 mg/100g, Bianco (1995) reported an Mg content of 46 mg/100g, and Eşiyok et al. (2006) reported an Mg content of 0.19 to 0.23% in a study where organic fertilizer was applied, while in this study, the level was found to be 0.58%. Comparing the results of this study with that of Eşiyok et al. (2006), the content was found to be higher in the data of this study than in organically grown rocket. The basic reason may be that fertilizer is applied in a more limited and controlled way in organic growing. However, the results obtained in this study are similar to those of Eşiyok et al. (1998) except for Cu and Mn. The wide gap between the minimum and maximum values obtained in this study can be said to arise from climatic differences.

Examining the correlation data given in Table 2, it can be seen that N has a positive correlation with P at the significant level of 1%, and a positive correlation with Cu at level of 5%. As in this study, Bozokalfa et al. (2009) reported that N had a positive correlation with P and Cu, and also found that N had a positive relationship with K, Ca, Fe, Zn and Mn. Many of the other correlations found by Bozokalfa et al. (2009) also showed similarity with the findings of this study.

Finally, if we take into account the fact that certain researchers (Grusak and Dellapenna, 1999) have stated that it is possible to obtain significant human nutrition and health benefits from an increase in the mineral contents of plant products, the importance of determining and evaluating the mineral content of plants can be better appreciated. Thus, this study aimed to determine the mineral content of conventionally-produced rocket (*E. sativa*), which is widely produced and consumed in the Mediterranean area including Turkey, in order to provide motivation for further studies.

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