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NUTRITIONAL AND ENERGETIC VALUE OF *Eruca sativa* Mill. LEAVES

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Abstract. Vegetables are important dietary components and constitute a group of the lowest calorie raw produce with a high nutritional value. The aim of the present study was to determine the nutritional and energy potential of the leaves of rocket (*Eruca sativa* Mill.) as affected by different regimes of plant nitrogen and potassium nutrition. Plants were grown in a greenhouse in a peat substrate, using varying amounts of nitrogen and potassium: 0.3 and 0.6 N as calcium nitrate ($Ca(NO_3)_2$) as well as 0.3 K, 0.6 K, and 0.9 K in the form of potassium sulphate (K_2SO_4) and potassium chloride (KCl), with a constant level of the other macro- and micronutrients. Fresh leaf yield and the content of soluble sugars, fat, ash and dietary fibre were determined, as well as the caloric value of the plant material studied was estimated. It was shown that the nutritional value of rocket leaves could be increased by using an appropriate system of plant mineral nutrition. The use of KCl significantly increased the nutritional value of rocket leaves, as determined by the presence of fat and dietary fibre. The application of K_2SO_4 proved to be more beneficial due to the concentration of carbohydrates and available carbohydrates. An increase in the rate of nitrogen caused an increase in biomass and fat content, but also contributed to a decrease in the concentration of glucose and fructose. The higher rates of potassium had an effect on increasing the content of fat, ash and glucose. The energy value of rocket leaves was not modified by mineral fertilization applied.

Key words: vegetables, rocket, Brassicaceae, fresh biomass, carbohydrates, fiber

INTRODUCTION

The nutritional value of food is due to the energy and nutrients, necessary for the functioning of the human organism, provided by food. High health-promoting quality of food is primarily attributable to the presence of bioactive substances in its composition which stimulate the desired process of metabolic transformations and to optimal proportions of its individual components. Bioactive components of food include, among oth-

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ers, dietary fibre, oligosaccharides, amino acids, peptides, proteins, polyunsaturated fatty acids, vitamins, and mineral nutrients. Vegetables are valued by dieticians mainly due to their content of mineral compounds, vitamins and dietary fibre; moreover, some of them (Brassica and leguminous vegetables) also contain substantial amounts of protein with a favourable amino acid composition. Rocket (*Eruca sativa* Mill.) from the family Brassicaceae, a vegetable, spice, medicinal and oil-bearing plant, is characterized by a rich chemical composition and broad biological activity [Michael et al. 2011]. In Europe it is predominantly grown for its aromatic leaves which are harvested throughout the growing season. Raw plant material is also collected from natural stands [Vardavas et al. 2006]. Rocket leaves, being a valuable source of protein, carbohydrates, L-ascorbic acid, and mineral nutrients, have a high nutritional value [Nurzyńska-Wierdak 2006, 2009, Nurzyńska-Wierdak et al. 2012].

Different levels of mineral nutrition can significantly affect the chemical composition of vegetables [Nurzyńska-Wierdak 2001, 2006, Dzida et al. 2012]. The rate of nutrient uptake by plant roots varies and as a result cations and anions accumulate in the plant in unequal quantities. Plants take up more nutrients in the form of cations and therefore the chloride ions play a great role in maintaining the cation-anion balance. The use of potassium chloride in nutrition of rocket plants contributed to an increase in the leaf concentration of L-ascorbic acid, chlorine and calcium as well as to a decrease in the amount of protein, total sugars and sulphates, compared to plants fed with potassium sulphate [Nurzyńska-Wierdak 2009]. Another study demonstrates that rocket fertilized with a lower rate of nitrogen accumulated more iron and zinc, and less manganese than plants that received more of this nutrient [Nurzyńska-Wierdak et al. 2012]. Combined application of sulphur and nitrogen significantly increased lipid accumulation in oilseed rape and rocket seeds as well as the concentration of acetyl coenzyme A and the activity of acetyl coenzyme A carboxylase, soluble proteins and sugars, used as a source of carbon and energy in lipid biosynthesis [Fazli et al. 2005]. Higher nitrogen fertilization contributed to an increase in the production of dry matter, chlorophyll, protein and reducing sugars in mustard green plants [Vyas et al. 1995]. The above data show the significant effect of the content of individual nutrients in the nutritional environment of plants on their chemical composition. The aim of the present study was to determine the nutritional and energy potential of the leaves of greenhouse-grown rocket (*Eruca sativa* Mill.) as affected by different regimes of plant nitrogen and potassium nutrition. Our research hypothesis was that the two main macronutrients: nitrogen and potassium, could significantly contribute to increased nutritional qualities of rocket leaves.

MATERIALS AND METHODS

The study material consisted of rocket (*Eruca sativa* Mill.) plants, with seeds having been obtained from a seed production company, PNOS Ożarów Mazowiecki, grown in a detached heated greenhouse belonging to the Department of Vegetable Crops and Medicinal Plants of the University of Life Sciences in Lublin, over the period 2010–2012. Seeds were sown individually in 2 dm^3 pots filled with sphagnum peat with a pH of 6.5. The experiment was set up as a completely randomized design in 14 replicates; one pot in which 3 plants were grown was one replicate. The dressed seeds (5 g of the seed dressing Funaben T kg^{-1} seed) were sown around 20 March. The following amounts of nutrients (g dm^{-3} medium) were applied: 0.3 and 0.6 N in the form of $Ca(NO_3)_2$; 0.3 K; 0.6 K and 0.9 K as K_2SO_4 and KCl; 0.4 P as granulated triple superphosphate (20% P); 0.2 Mg as $MgSO_4$ H_2O; micronutrients (mg dm^{-3} medium): 8.0 Fe (chelate); 13.3 Cu; 5.1 Mn; 1.6 B; 3.7 Mo; 0.74 Zn, copper, manganese, zinc as sulphates, boron as boric acid, and molybdenum as ammonium molybdate. Sulphur was supplied with the application of potassium and magnesium (K_2SO_4 and $MgSO_4$ H_2O) as well as Mn, Cu, and Zn sulphates in a small amount as micronutrients; calcium as the ion accompanying nitrogen, whereas chlorine as the ion accompanying potassium. The selection of potassium salt (K_2SO_4 and KCl) resulted from the assumption that the plants would be provided with an increased quantity of sulphur required for the synthesis of S compounds and from the positive response of rocket plants to relatively high doses of chlorine, as found in an earlier study [Nurzyńska-Wierdak 2006]. Fertilizer doses were divided into 3 equal parts and provided as root-applied nutrient solution one day before sowing, 30 days from sowing, and 10 days before harvest. The other nutrients, without differentiating their quantity and form, were applied only once before sowing. The plants were watered by hand regularly and as necessary, each time with about 250 ml. Leaves were harvested 48–54 days from sowing, around 10 May. After harvest, the fresh leaf yield of rocket and the content of soluble sugars were determined by HPLC, while after drying the plant material at 70°C, the content of ash, fat and dietary fibre as well as the caloric value of the plant material studied were estimated.

Soluble sugar content. The sugars to be determined were separated on a chromatographic column filled with cation exchange resin (sulfonated polystyrene-divinylbenzene copolymer in the form of Ca^{2+}). The mobile phase consisted of an aqueous solution of calcium disodium ethylenediaminetetraacetate. The eluted constituents were detected by a refractometric detector and determined by the external standard method. The limit of detection for this method was as follows: glucose 0.00474, fructose 0.00473, while the limit of quantification for this method, respectively: glucose 0.01184, fructose 0.01182 mg ml^{-1}.

The remaining plant material was subsequently dried at a temperature of 70°C. After grinding the plant material, crude ash was determined gravimetrically, moisture content gravimetrically, fat by the Soxhlet method, and dietary fibre by the Kürschner-Hanak method, while the caloric value was estimated by the conversion method using Atwater conversion factors.

Total ash was determined quantitatively by grinding 2 g of the sample and combusting the material in a muffle furnace at 550°C to constant weight. The total ash content was calculated using the following formula:

$$\% = \frac{A \cdot 100}{b}$$

where: A – weight of the ash in g, b – weight of the anhydrous raw material in g.

Fat content. The sample was ground in a mortar to a homogeneous mass, 40 g (± 1 mg) of the sample m_0, prepared for analysis, was weighed and then mixed with 10 g of anhydrous sodium sulphate. The sample was transferred quantitatively to an extraction thimble, together with the residue swabbed with cotton wool, filling the thimble up to ¾ of its height. The thimble was plugged with defatted cotton wool. Several glass beads were placed in a dry and clean extraction flask and then the whole was weighed with an accuracy of ± 1 mg (m_1). The flask was placed in a heated bath, pouring 350 ml of n-hexane, and connected to a Soxhlet apparatus. The extraction thimble containing the sample analysed was placed in the extractor. The sample was extracted for 2.5 hours in such a way so as to obtain 10 cycles per hour. After the completion of the extraction, the flask was cooled and weighed with an accuracy of ±1 mg (m_2). The crude fat content, expressed in grams per 100 g of sample, was calculated according to the following formula:

$$H = \frac{m_2 - m_1}{m_0} \cdot 100$$

where: m_0 – weight of the sample analysed, m_1 – weight of the empty and clean flask containing glass beads, m_2 – weight of the flask containing the extract and glass beads after it was dried and cooled to room temperature. All the weights were expressed in grams.

Some of the compounds are expressed in units of the dry weight of the leaves. This required the presentation of data on the share of dry matter in the fresh leaf, contained in previous work [Nurzyńska-Wierdak 2015]. For this reason, one of the tables shown above data. The results were statistically analysed by analysis of variance at a significance level of 0.05.

RESULTS AND DISCUSSION

The nutritional value of rocket leaves, as determined by the content of fat, dietary fibre, ash and carbohydrates, was high and significantly affected by mineral nutrition used (tab. 1). The investigated plants were characterized by the following percentages of the individual components (on average in the leaf dry weight): 3.82% of fat, 15.14% of dietary fibre, 19.65% of ash, 8.03% of moisture content, 41.49% of carbohydrates, including 26.44% of available carbohydrates. These values significantly exceeded the levels of the above-mentioned constituents in some wild growing Indonesian [Srianta et al. 2012] and African leafy vegetables [Kwenin et al. 2011] and were comparable to the nutritional value of some leafy vegetables grown in Nigeria [Iheanacho and Udebuani 2009, Onwordi et al. 2009] and Ivory Coast [Patricia et al. 2014]. Rocket proved to be particularly rich in mineral nutrients. The ash content, which is an indicator of the content of minerals, determined in this experiment ranged 15.91–21.83% DW and exceeded 7 times the mineral content determined for lettuce and nearly 3 times that found for cabbage [Januškevičius et al. 2012]. The high dietary fibre content (13.38–16.99% DW), exceeding the amounts found for other leafy and Brassica vegetables, should also be stressed [Bukhsh et al. 2007, Onwordi et al. 2009, Januškevičius et al. 2012]. Plant polysaccharides and lignins resistant to the action of digestive enzymes of the human alimentary canal (dietary fibre) do not provide energy, but perform many very important functions in the organism [Rodríguez et al. 2006, Sarriá et al., 2012]. Apart from whole – grain cereal products, vegetables and fruits, whose regular consumption improves and regulates digestion, are a source of these substances valuable for human health. Compared to mustard greens [Ng et al. 2012], rocket had higher percentages of dry matter, fat, dietary fibre and ash as well as a lower concentration of carbohydrates. The above differences are probably due to genetic and environmental variation that modifies the chemical composition of most edible plants. Rocket belongs to the group of green leafy vegetables, but also to the group of Brassica vegetables. Leafy vegetables primarily accumulate large amounts of vitamins and mineral nutrients, while Brassica vegetables are characterized by high protein content [Acikgoz 2011, Januškevičius et al. 2012]. It should be noted that the caloric value of plant products is derived from protein in more than 12% [Ali 2009] and hence it is an important building block and energy – yielding component of vegetables. An earlier study [Nurzyńska-Wierdak 2015] proves that the leaves of rocket contain more protein than the leaves of its related species and other Brassica vegetable species [Januškevičius et al. 2012, Ng et al. 2012, Saeed et al. 2012].

Table 1. Nutritional value of rocket leaves upon the different plant nutrition (2010–2012)

K source (A)	N dose g dm^{-3} (B)	K dose g dm^{-3} (C)	Fresh matter g $plant^{-1}$	Dry matter* (DM) %	Fat	Fiber	Ash	Moisture
					% DM			
K_2SO_4	0.3	0.3	31.8	9.36	4.20	16.08	19.26	8.06
		0.6	34.7	9.44	3.56	13.38	21.47	7.85
		0.9	31.5	8.45	3.40	13.68	19.53	8.14
	0.6	0.3	33.3	7.56	3.17	15.60	19.38	8.33
		0.6	38.6	12.10	3.68	13.85	18.64	7.88
		0.9	46.9	7.85	4.14	15.61	18.88	8.03
	mean (A)		36.1b	13.33a	3.69b	14.70b	19.53a	8.05a
KCl	0.3	0.3	35.5	9.78	3.71	16.99	15.91	8.44
		0.6	38.7	9.17	3.76	15.82	19.41	8.04
		0.9	33.4	10.16	3.67	15.60	18.58	8.24
	0.6	0.3	34.5	8.82	4.36	14.50	21.34	7.66
		0.6	43.7	7.95	4.22	15.70	21.48	7.74
		0.9	42.1	8.20	3.86	14.80	21.83	7.87
	mean (A)		38.0a	9.01b	3.93a	15.57a	19.76a	8.00a
	Mean (B)	0.3	31.7b	9.39a	3.72b	15.26a	19.03a	8.13a
		0.6	39.9a	8.75b	3.91a	15.01a	20.26a	7.92a
	Mean (C)	0.3	33.8b	8.88b	3.86a	15.79a	18.97b	8.12a
		0.6	39.0a	9.67a	3.81a	14.69b	20.25a	7.88a
		0.9	38.4a	8.67b	3.77a	14.92b	19.71ab	8.07a

* – Nurzyńska-Wierdak [2015]

The different levels of nitrogen and potassium nutrition of rocket plants had an effect on the content of some nutrients. The plants fed with potassium chloride had a higher content of fat and dietary fibre as well as a lower concentration of carbohydrates compared to those fed with potassium sulphate (tabs 1, 2). Similar relationships regarding carbohydrates were shown in an earlier study [Nurzyńska-Wierdak 2009]. The form of potassium was not demonstrated to have a significant influence on the level of ash and moisture content in the dry plant material analysed. Likewise, the above-mentioned earlier study [Nurzyńska-Wierdak 2009] did not find the form of potassium to have an effect on the content of most mineral nutrients in rocket plants. This may suggest that the rate of nutrient uptake from the nutritional environment through the plant roots was similar in the case of both potassium forms used.

Table 2. Energetic value of rocket leaves upon the different plant nutrition (2010–2012)

K source (A)	N dose g dm^{-3} (B)	K dose g dm^{-3} (C)	Carbohy-drates % FM*	Digestible carbohy-drates % FM	Glucose g 100g^{-1} FM	Fructose g 100g^{-1} FM	Energetic value kJ 100 g^{-1}	Energetic value kcal 100 g^{-1}
K_2SO_4	0.3	0.3	39.97	23.89	2.06	1.68	1046.20	247.40
		0.6	33.54	20.16	1.26	1.40	1045.30	247.00
		0.9	46.24	32.56	2.18	1.78	1065.05	251.60
	0.6	0.3	47.64	32.04	0.93	0.77	1027.13	242.61
		0.6	53.61	39.76	2.01	1.76	1087.31	256.92
		0.9	44.25	28.64	0.86	0.94	1059.96	250.62
	mean (A)		44.21a	29.51a	1.55a	1.39a	1055.16a	249.36a
KCl	0.3	0.3	49.43	32.44	1.36	1.43	1071.42	253.19
		0.6	36.14	20.32	1.93	1.72	1039.61	245.72
		0.9	37.92	23.32	2.10	1.72	1052.26	248.67
	0.6	0.3	34.85	20.35	1.00	1.32	1047.70	247.80
		0.6	36.67	20.97	0.93	1.28	1020.76	241.42
		0.9	37.59	22.79	0.85	0.65	1020.70	241.30
	mean (A)		38.77b	23.36b	1.36b	1.35a	1042.08a	246.35a
	Mean (B)	0.3	40.54a	25.45a	1.82a	1.62a	1053.31a	248.93a
		0.6	42.44a	27.43a	1.10b	1.39b	1043.93a	246.78a
	Mean (C)	0.3	42.97a	27.18a	1.34b	1.30b	1048.11a	247.75a
		0.6	39.99b	25.30b	1.53a	1.54a	1048.25a	247.77a
		0.9	41.50ab	26.83a	1.50a	1.27b	1049.49a	248.05a

* – FM – fresh matter

The higher rate of nitrogen contributed to an increase in fat content in the rocket leaves, at the same time causing a decrease in glucose and fructose content (tab. 2). The other parameters related to the nutritional value were not affected by the increased amount of nitrogen applied. The study showed significant differences in the accumulation of fat, dietary fibre, ash and carbohydrates in the case of increased potassium nutrition of the studied plants (tabs 1, 2). The higher rate of potassium promoted ash accumulation, while opposite relationships were found for dietary fibre. The plants receiving more potassium were characterized by higher fresh biomass and glucose concentration compared to the other ones. The fructose content, on the other hand, was significantly the lowest at the medium rate of potassium (0.6 g K dm^{-3}), similarly to the carbohydrate concentration. The earlier research [Nurzyńska-Wierdak 2009] reveals that an increase in potassium rate caused a decrease in the concentration of total sugars and calcium as well as an increase in the content of chlorine and potassium in rocket leaves. These results confirm the great importance of a single dose of potassium due to the antagonistic effects of this nutrient on the uptake of other cations by the plant.

The energy value of 100 g of dry rocket leaf material was on average 1048.62 kJ and was not dependent on the plant nutrition level used (tab. 2). Some leafy vegetables can be a good source of energy [Kanchan and Veenapani 2011, Ng et al. 2012]. 100 g of leafy vegetables can provide from 142.61 to 305.19 kcal [Patricia et al. 2014]. The determined energy value of rocket (on average 247.86 kcal) is within the above-mentioned range, being in agreement with the general finding that vegetables have a relatively low level of energy [Lintas 1992, Patricia et al. 2014].

CONCLUSIONS

To sum up, it can be concluded that rocket leaves are a rich and promising source of nutrients, being distinguished by a high energy value among other vegetables. The presented results concerning the accumulation of fat, dietary fibre, ash and carbohydrates suggest that it is possible to increase the nutritional value of rocket leaves by using an appropriate system of plant mineral nutrition. The use of potassium chloride significantly increased the nutritional value of rocket leaves, as determined by the presence of fat and dietary fibre. The application of potassium sulphate in turn proved to be more beneficial due to the concentration of carbohydrates and available carbohydrates. An increase in the rate of nitrogen caused an increase in biomass and fat content, but also contributed to a decrease in the concentration of glucose and fructose. Potassium used at a higher amount caused an increase in plant biomass and modified the content of some nutrients. The higher rates of potassium had an effect on increasing the content of fat, ash and glucose. The energy value of rocket leaves was not modified by mineral fertilization applied.

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REFERENCES

Acikgoz, F.E. (2011). Mineral, vitamin C and crude protein contents in kale (*Brassica oleraceae* var. *acephala*) at different harvesting stages. Afr. J. Biotech., 10, 17170–17174.

Ali, A. (2009). Proximate and mineral composition of the Marchubeh (*Asparagus officinalis*). World Diary Food Sci., 4, 142–149.

Bukhsh, E., Malik, S.A., Ahmad, S.S. (2007). Estimation of nutritional value and trace elements 21 content of *Carthamus oxyacantha*, *Eruca sativa* and *Plantago ovata*. Pak. J. Bot., 39(4), 1181–22 1187.

Dzida, K., Jarosz, Z., Michałojć, Z., Nurzyńska-Wierdak, R. (2012). The influence of diversified nitrogen and liming fertilization on the field and biological value of lettuce. Acta Sci. Pol. Hortorum Cultus, 11, 239–246.

Fazli, I.S., Abdin, M.Z., Jamal, A., Ahmad, S. (2005). Interactive effect of sulphur and nitrogen on lipid accumulation, acetyl-CoA concentration and acetyl-CoA carboxylase activity in developing seeds of oilseed crops (*Brassica campestris* L. and *Eruca sativa* Mill.). Plant Sci., 168, 29–36.

Iheanacho, K.M.E., Udebuani, A.C. (2009). Nutritional composition of some leafy vegetables consumed in Imo State, Nigeria. J. Appl. Sci. Environ. Manag., 13, 35–38.

Januškevičius, A., Januškevičienė, G., Andrulevičiūtė, V. (2012). Chemical composition and energetic values of selected vegetable species in Lithuanian supermarkets. Vet. Med. Zoot., 58, 8–12.

Kanchan, L.V., Veenapani, D. (2011). Nutritional analysis of indigenous wild edible herbs used in eastern Chhattisgarh, India. Emir. J. Food. Agric., 23, 554–560.

Kwenin, W.K.J., Wolli, M., Dzomeku, B.M. (2011). Assessing the nutritional value of some African indigenous green Leafy Vegetables in Ghana. J. Animal Plant. Sci., 10, 1300–1305.

Lintas, C. (1992). Nutritional aspects of fruits and vegetable consumption. Options Meditérran., 19, 79–87.

Michael, H.N., Shafik, R.E., Rasmy, G.E. (2011). Studies on the chemical constituents of fresh leaf of *Eruca sativa* extract and its biological activity as anticancer agent *in vitro*. J. Med. Plants Res., 5, 1184–1191.

Ng, X. N., Chye, F.Y., Mohd Ismail, A. (2012). Nutritional profile and antioxidative properties of selected tropical wild vegetables. Internat. Food Res. J., 19, 1487–1496.

Nurzyńska-Wierdak R. 2001. Yielding of garden rocket (Eruca sativa) in dependence on differentiated nitrogen fertilization. Veg. Crops Res. Bull., 54, 2, 71–76.

Nurzyńska-Wierdak, R. (2006). The effect of nitrogen fertilization on yield and chemical composition of garden rocket (*Eruca sativa* Mill.) in autumn cultivation. Acta Sci. Pol. Hortorum Cultus, 5, 53–63.

Nurzyńska-Wierdak, R. (2009). Growth and yield of garden rocket (*Eruca sativa* Mill.) affected by nitrogen and potassium fertilization. Acta Sci. Pol. Hortorum Cultus, 8, 23–33.

Nurzyńska-Wierdak, R. (2015). Protein nutritional value of rocket leaves and possibilities of its modification during plant growth. Turk. J. Agric. For., 39 (in press).

Nurzyńska-Wierdak, R., Dzida, K., Rożek, E., Jarosz, Z. (2012). The effect of nitrogen and potassium on N-NH_4 and N-NO_3 accumulation and nutrient contents in rocket (*Eruca sativa* Mill.) leaves. Acta Sci. Pol. Hortorum Cultus, 11, 211–221.

Onwordi, C.T., Ogungbade, A.M., Wusu, A.D. (2009). The proximate and mineral composition of three leafy vegetables commonly consumed in Lagos, Nigeria. Afr. J. Pure Appl. Chem., 3, 102–107.

Patricia, O., Zoue, L., Megnanou, R.-M., Doue, R., Niamke, S. (2014). Proximate composition and nutritive value of leafy vegetables consumed in Northern Côte d'Ivoire. Eur. Sci. J., 10, 212–227.

Rodríguez-Sahagún, A., Del Toro-Sánchez, C.L., Gutierrez-Lomelí, M., Castellanos-Hernández, O.A. (2012). Plant cell and tissue culture as a source of secondary metabolites. In: Biotechnological production of plant secondary metabolites, IE, Orhan (ed.). Bentham Science Publishers, Turkey, pp. 3–20.

Saeed, M.K., Anjum, S., Ahmad, I., Nisa, A., Ali, S., Zia, A., Ali, S. (2012). Nutritional facts and free radical scavenging activity of turnip (*Brassica rapa*) from Pakistan. World Appl. Sci. J., 19, 370–375.

Sarriá, B., Martínez-López, S., Fernández-Espinosa, A., Gómez-Juaristi, M., Goya, L.,

Srianta, I., Arisasmita, J.H., Patria, H.D., Epriliati, I. (2012). Ethnobotany, nutritional composition and DPPH radical scavenging of leafy vegetables of wild *Paederia foetida* and *Erechtites hieracifolia*. Internat. Food Res. J., 19, 245–250.

Vardavas, C.I., Majchrzak, D., Wagner, K.-H., Elmadfa, I., Kalatos, A. (2006). The antioxidant and phylloquinone content of wildly grown greens in Recte. Food Chem., 99, 813–821.

Vyas, P., Prakash, S., Shivanna, K.R. (1995). Production of wide hybrids and backcross progenies between *Diplotaxis erucoides* and crop brassicas. Theor. Appl. Genet., 90, 549–553.

WARTOŚĆ ODŻYWCZA I ENERGETYCZNA LIŚCI *Eruca sativa* Mill.

Streszczenie. Warzywa są istotnymi składnikami diety, stanowiącymi grupę najmniej kalorycznych surowców o znacznych walorach odżywczych. Celem niniejszych badań było określenie potencjału wartości odżywczej i energetycznej liści rokietty (*Eruca sativa* Mill.) pod wpływem zróżnicowanego żywienia mineralnego roślin azotem i potasem. Rośliny uprawiano w szklarni w podłożu torfowym, stosując zmienne ilości azotu i potasu: 0,3 i 0,6 N w formie saletry wapniowej ($Ca(NO_3)_2$), oraz 0,3 K, 0,6 K i 0,9 K w postaci siarczanu potasu (K_2SO_4) i chlorku potasu (KCl), przy stałym poziomie pozostałych makro- i mikroelementów. Określono plon świeżej masy liści, zawartość cukrów rozpuszczalnych, tłuszczu, popiołu i błonnika, jak również oszacowano wartość kaloryczną badanego materiału roślinnego. Wykazano, że istnieje możliwość zwiększenia wartości odżywczej liści rokietty przy zastosowaniu odpowiedniego schematu żywienia mineralnego roślin. Stosowanie KCl istotnie podnosiło wartość odżywczą liści rokietty, wyznaczoną obecnością tłuszczu i błonnika. Aplikacja K_2SO_4 okazała się korzystniejsza z uwagi na koncentrację węglowodanów i węglowodanów przyswajalnych. Zwiększenie dawki azotu powodowało przyrost biomasy oraz zwiększenie zawartości tłuszczu, ale przyczyniło się także do zmniejszenia koncentracji glukozy i fruktozy. Wyższe dawki potasu wpłynęły na wzrost zawartości tłuszczu, popiołu oraz glukozy. Wartość energetyczna liści rokietty nie była modyfikowana zastosowanym nawożeniem mineralnym.

Słowa kluczowe: warzywa, rokietta, Brassicaceae, świeża biomasa, węglowodany, błonnik

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