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BASIC NUTRIENTS AND MINERALS IN THE SAMPLES OF COMMON RAGWEED (*AMBROSIA ARTEMISIIFOLIA L.*) FROM DIFFERENT SITES*

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SUMMARY: The content of basic nutrients and minerals in the samples of common ragweed (A.artemisiifolia L.) from seven different sites was investigated. The investigation was performed by standard chemical methods. Test results indicate that this weed plant has good nutritional properties both in the content of basic nutrients and the content of macro and microelements. The greatest variability in the content of microelements: iron, cobalt and zinc was found. The average value of protein content (12.02±1.25%) is higher than the protein content in unshelled oats and lower than the content in dehydrated alfalfa hay. The average value of crude fiber (30.30±3.62%) in the samples of common ragweed is greater than its contents in unshelled oats and dehydrated alfalfa (with 15% protein). The average values of investigated microelements were higher than their values in oats and dehydrated alfalfa hay (with 17% protein). The same ratio is with macroelements: magnesium and potassium. In the case of calcium and phosphorus, the average values in samples of common ragweed are similar to the values of these elements in dehydrated alfalfa hay (with 15% protein). The results indicate the need for further studies of this weed.

Key words: *Ambrosia artemisiifolia L., nutrients, macroelements, microelements.*

INTRODUCTION

Ambrosia artemisiifolia L. is a weedly-ruderal plant from the family Asteraceae. It is known as common ragweed or „limundžik" – in Serbian (Konstantinović et al., 2008). This annual plant is 20-80 cm high (SANU, 1975), according to some sources

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(http://sr. wikipedia.org/sr, 2010) sometimes over 100 cm, with spindle-shaped root. The stem is erect, branched and densely covered with tiny hair. The leaf arrangement is usually opposite at the base (http://en.wikipedia.org/wiki/Ragweed, 2011). Leaves are egg-shaped and feather-like, on each side with 2-3 oblong lanceolate lobes divided. The front side is dark green, and the back side is grayish-green with thick, flattened hair. *A.artemisiifolia L.* is monoecious plant (http://en.wikipedia.org/wiki/Ragweed, 2011) with the flowers gathered in inflorescence heads on the top of the stem and branches. Male flower heads are hemispherical with short handles, hanging, about 4-5 mm in diameter, gathered in densely terminal inflorescence classes. Female flowers heads are situated below the male ones, in the leaf axils and female flowers are single. Male flowers are pale yellow, 10-15 in a head, with a tubular crown. The fruit is enclosed, with involucrum (http://bs.Wikipedia.org /wiki/ambrosia, 2010; SANU, 1975). It gets dispersed by humans or by wind (http://bs.Wikipedia.org /wiki/ambrosia, 2010). The growing season starts mid-April, blooms from mid-July until cooler weather arrives. It is not used for nutrition due to its bitter taste (http://sr.wikipedia.org/sr, 2010).

Common ragweed grows the best on untreated soil. It may usually be found near roads and railway lines, on the banks of streams and rivers, on building sites, near landfills, or along garden plots (Konstantinović et al., 2009). However, this weed plant may be found with the crop species (sunflower, soybean, corn) and has an adverse effects on crop yield. The experiments with common ragweed showed that this plant is able to use the plant extracts as a source of nutrients. The observed stimulatory effects of the donor plant extract on the *A. artemisiifolia* may have a potential to facilitate and cause the dominance of the ragweed in a field (Kazinczi et al., 2008a).

A. artemisiifolia L. has adverse effect on humans. According to some authors (Makra et al., 2004) it is generally considered the greatest allergen of all pollens. It's pollen causes 50-60% of all cases of pollen allergy (http://sr. Wikipedia.org / sr /, 2010). According to data from literature 25% of the population in Hungary has the symptoms of allergy caused by common ragweed pollen (Kazinczi et al., 2008b).

A. artemisiifolia L. contains powerful allergens, which are found in the whole grain of pollen, but also in the submicron fractions below 5μm. Out of 52 proteins that are present in the polen extract, 22 are identified as allergens on the basis of their reactions to human IgE (Bagarozzi et al., 1998).

In a humid environment, such as the mucous of the respiratory system, causes pollen allergy or polynosis with the symptoms ranging from allergic sneezing to the attacks of severe bronchial asthma. Only 20-30 pollen grains per m^3 of air are sufficient to cause alergy (Samardžija, 2003). Besides allergen activity of polen, the plant itself can cause contact dermatitis.

According to reports the highest concentration of pollen in the air in Europe is in the Carpathian Basin, Serbia and Hungary. In the reports it is stated that highest concentration of pollen particles (3247/m^3 of air) was over Novi Sad in 2001. This value has never been overcome in other parts of Europe (Kazinczi et al., 2008b). In contrast to the harmful effects, that are quite well known and researched, the useful effects of this plant are not known or investigated. In the literature, however, some beneficial characteristics of ragweed are mentioned. It is known that the Indians used the leaves of this plant against insect bites and to prevent inflammatory processes from various injuries. Ragweed seeds are used as an important complementary food for game birds (pheasants and partridges), especially during the winter. These seeds are rich in oils, and nutritional value is similar to soybean. Therefore, singing birds prefer to eat ragweed seed (Kazinczi et al., 2008b).

Given all these facts related to this plant, regarding the problem of its expansion and knowing that destruction of common ragweed has not been resolved, our aim is to determine basic nutrients and minerals in the samples of ragweed. Depending on the results a conclusion will be given for the following steps in research of this plant.

MATERIAL AND METHODS

The sampling was conducted from June to October 2007, at various stages of vegetation. The samples of ragweed (*Ambrosia artemisiifolia L.*) were taken from seven different sites:

Temerin – Ilanča area, the land cultivated and planted with alfalfa. Common ragweed was in the stage of growth prior to flowering (period of early vegetation), the plant height was up to 50 cm.

Zmajevo - the area of arable land, after wheat harvest (stubble). Common ragweed was in the stage of growth prior to flowering (the period of early vegetation), height 50-80 cm.

Odžaci - from the area near the road and canal. Common ragweed was in the stage of growth before flowering (secondary vegetation), height 80-100 cm.

Novi Sad **-** the area of Sajlovo, beside the road. Common ragweed was in the stage of growth before flowering (secondary vegetation), height 80-100 cm.

Šabac **-** the area of arable land after wheat harvest (stubble), abandoned field. Common ragweed was in the stage of growth before flowering (secondary vegetation), height 50 - 80 cm.

Mali Idjoš **-** along the road, on the road Srbobran-Feketić. Common ragweed was in the flowering stage (late vegetation), woody stems, hight over 100 cm.

Palić – from picnic Palić area, near the road. Common ragweed was in the flowering stage (late vegetation), woody stems, hight over 100 cm.

The samples were pulled out of soil, together with the root, dried in air, and then cut, ground and mineralized by dry ashing at a temperature of 550±10°C. The content of Ca, Na and K was determined by flame emission spectrometry on Jenway-PFP7. The content of Mg, Fe, Cu, Mn, Zn and Co was determined by atomic absorption spectrophotometry using a Varian Spectr AA-10 instrument, and P content was determined by spectrophotometric method.

Determination of fat, crude fiber, ash and moisture in the samples was performed by standard methods, while the protein was determined by measuring total nitrogen by total combustion (according to Dumas), as the standard method (AOAC 990.03) on the instrument „Elementar Rapid N cube“. The content of nutrients and macroelements was expressed in percentages, while the content of microelements was given in milligrams per kilogram of air-dry matter. The results were statistically analyzed.

RESULTS AND DISCUSSION

The values of basic nutrients, macro and microelements are presented in Tables 1, 2 and 3. In Table 1 the variability between the values within a certain parameter is not big, which also means that the differences in values of certain parameters in ragweed samples, which originated from different sites, are not great. A slightly higher variability was found for crude fat content (29.33%) and crude ash (31.55%), but this is the result of higher values of these parameters in the samples from only one site.

The average content of crude fat in the ragweed samples (1.50±0.44%) was lower than the fat content in dehydrated alfalfa hay (with 15% prot.) or in unshelled oats: 2.3% and 4.5% respectively (Sinovec and Ševković, 1995). In available literature data it is stated that alfalfa and oats are used as a standard in comparing nutritional values of weeds (Marten and Andersen, 1975).

Table 1. Content of the basic nutrients in the *Ambrosia artemisiifolia L.* samples
Tabela 1. Sadržaj osnovnih hranljivih materija u uzorcima Ambrosia artemisiifolia L.

Location *Lokalitet*	Investigated parameter (%) / *Ispitivani parametar (%)*					
	Moisture *Vlaga*	Crude protein *Sirovi protein*	Crude fat *Sirova mast*	*Crude fiber* S. *Celuloza*	Crude ash *Sirovi pepeo*	NFE[1] *BEM*[1]
Zmajevo	5.36	13.95	1.44	23.66	12.38	43.21
Mali Iđoš	8.24	10.80	1.50	34.08	9.10	36.28
Novi Sad	5.13	11.65	1.26	31.81	10.60	29.92
Temerin	5.18	13.15	1.01	28.91	18.77	32.98
Odžaci	4.90	12.70	2.42	31.46	8.23	40.17
Palić	7.18	10.80	1.41	33.70	8.97	37.94
Šabac	5.40	11.10	1.49	28.55	11.59	41.87
$\bar{X}$ ± Sd	5.91 ±1.27	12.02 ±1.25	1.50 ±0.44	30.30 ±3.62	11.38 ±3.59	37.48 ±4.80
$C_{v\,\%}$	21.49	10.40	29.33	11.95	31.55	12.81
Min–Max	4.90-8.24	10.80-13.95	1.01-2.42	23.66-34.08	8.23-18.77	29.92-43.21

[1]NFE – nitrogen free extract; *BEM – extractive substances without nitrogen.*

Our chemical studies have shown that *A. artemisiifolia* has high protein content. The average value in the analyzed samples was 12.02±1.25%, what is higher than the protein content in unshelled oats, but less than in dehydrated alfalfa hay: 11.6% and 15.2% respectively (Sinovec and Ševković, 1995). The values of protein content in the samples at some sites are quite consistent, with a low coefficient of variability. Slightly higher content was measured in the samples from Zmajevo and Temerin area, which can be attributed to soil type and agrotechnical measures, i.e. to the content of nitrogen in the soil. Hubbard and Boe, during 1984 and 1985, analyzed 27 plant species characteristic for swamp area that are located in the eastern parts of South Dakota. Among these plants were three samples of ragweed (*Ambrosia spp.*). The content of crude ash, crude protein content and *in vitro* digestible dry matter (IVDDM) were determined. The protein content in samples of ragweed (*Ambrosia spp.*) was 15.7% in relation to dry matter at 100°C. If this is applied on our dry weight, the protein content would be 14.77%, what is slightly higher from our value.This difference can be explained by another kind of ragweed, as well as the features of the soil from which the samples were taken. Marten and Andersen (1975) determined the content of crude protein, macro and micronutrients in 12 weed species, among which was *A. artemisiifolia*, from Minnesota state. The sampling and measurement was done in 3 years (1971, 1972, 1973). Over this period in the samples of *A.artemisiifolia* the average value of protein content was 26%. Such a high protein content in the samples of *A. artemisiifolia* from Minnesota was addressed by the above mentioned authors Hubbard and Boe (1988). They explain this difference in protein content by another kind of ragweed and, primarily, by application of fertilizers. This fact was also indicated by Marten and Andersen (1975), who point out that the whole field, that was under the study, was treated with 37 kg N/ha in early spring, every year before the outbreak of weeds sprout.

The tests show a high content of cellulose fibers in common ragweed. The average value in our sample was 30.30±3.62%. The values in the samples from different sites were quite close, what was indicated also by the coefficient of variation (11.95%). Crude fiber content of this weed plant was higher than in dehydrated alfalfa hay (with 15% prot.) and unshelled oats: 26.4 and 11.0% respectively (Sinovec and Ševković, 1995). High level of ash in the samples (11.38±3.59%) indicate the presence of minerals (macro and microelements). The values of ash content in samples from some sites were not so close, hence the coefficient of variation was high (31.55%). The sample from the area of Temerin have largely contributed this situation since the crude ash value was 18.77%. The variability in the crude ash content was expected because the soils on different sites differ in their mineral status. Hubbard and Boe (1988), in the aforementioned study, examined the samples of ragweed (Ambrosia spp.) and the crude ash value was 12.7% of dry matter at 100°C, which, when calculated on our dry matter was 11.95% and agrees with our data of 11.38%, although we tested another type of weed plants.

The values of macroelements: Ca, P, Mg, Na and K in the samples of *A. artemisiifolia* from different locations are given in Table 2. Greater variability in the values of macroelements, comparing to the fundamental nutrients is obvious, which was expected.These differences are a result of various factors such as the content of minerals in soil, pH value, the use of mineral and organic fertilizers, plant protection and other. This variability in the values has been particularly emphasized in the case of magnesium, calcium and sodium, and slightly lower in phosphorus and potassium.

The average calcium (Ca) value in the samples of *A.artemisiifolia* was 1.12±0.47% what is almost equal to the content of Ca in alfalfa hay (with 15% prot.) and ten times higher then of calcium in unshelled oats: 1.21% and 0.10% respectively (Sinovec and Ševković, 1995). Low calcium content in the samples from Mali Iđoš area can be explained by the place where the sample was taken (besides the road).

Table 2. Content of the macroelements in the Ambrosia artemisiifolia L. samples
Tabela 2. Sadržaj makroelemenata u uzorcima Ambrosia artemisiifolia L.

Location *Lokalitet*	Investigated parameter (%) / *Ispitivani parametar (%)*				
	Ca	P	Na	K	Mg
Zmajevo	1.43	0.12	0.02	3.08	0.59
Mali Iđoš	0.62	0.22	0.03	3.34	0.26
Novi Sad	0.88	0.26	0.04	3.44	0.23
Temerin	1.80	0.23	0.04	3.21	0.78
Odžaci	0.83	0.24	0.02	2.67	0.20
Palić	0.70	0.24	0.02	2.69	0.16
Šabac	1.58	0.28	0.02	3.42	0.35

$\bar{X} \pm Sd$	1.12 ±0.47	0.23 ±0.05	0.03 ±0.009	3.12 ±0.33	0.37 ±0.23
$C_{v\,\%}$	42.17	21.74	33.33	10.58	62.16
Min – Max	0.62 – 1.80	0.12 – 0.28	0.02 – 0.04	2.67 – 3.44	0.16 – 0.78

Marten and Andersen (1975), in the aforementioned paper, measured significant differences of minerals in grassy weeds and broad leaf weeds. Grassy weeds contained half less calcium comparing to the broad leaf weeds. The average value of calcium (in three year period), in the samples of *A.artemisiifolia* amounted to 2.6% of dry matter which is higher than in our case, due to fertilizers, what has already been mentioned. Bosworth et al., (1985), report that in 20 weed species, that have been studied in England, had similar calcium content as well as legumes. Franco-Hernandez et al., (2010), measured the concentrations of metals in different plants, among which was the *A. artemisiifiolia*, which were grown on waste field (tailings) in the vicinity of the mine in central Mexico. The calcium concentration measured in *A.artemisiifolia L.* from the area of Villa de la Paz, was 9209 mg/kg in root and 14244 mg/kg in shoots (branches) of ragweed. The percentage is equal to 0.92% and 1.42%. Calcium content in dry matter of plants moves in a wide range of 0.2 to 3% (Petrović and Kastori, 1992), and the land it has about 1.37% (Ubavić and Bogdanović, 2001).

The mean value of phosphorus (P) in the samples was 0.23±0.05%, what is in agreement with the content of phosphorus in dehydrated alfalfa hay (with 15% prot.), but lower than in unshelled oats: 0.21% and 0.31% respectively (Sinovec and Šević, 1995). The sample from Zmajevo should be pointed out, in which the phosphorus content was half than the average, although the sample was taken from arable land, after wheat harvest, what may indicate that the fertilizers were not sufficently applied on the given field.

Marten and Andersen (1975) measured phosphorus content in *A.artemisiifolia* and it was 0.4%, which is two times higher than in our case and which is explained in the same way as in the case of calcium. The phosphorus content in plants usually ranges from 0.1 to 1.0% of dry matter (Petrović and Kastori, 1992), and in the soil varies between 0.03 and 0.3% (Ubavić and Bogdanović, 2001).

The value of magnesium (Mg) was 0.37±0.23% in average, with the highest coefficient of variation 62.16%. This was particularly the case with the sample from Temerin area (0.78%), and the sample from Zmajevo area (0.59%). Magnesium content was higher than in the unshelled oats and slightly higher than in dehydrated alfalfa hay (with 15% prot.): 0.16% and 0.28% respectively (Sinovec and Šević, 1995). In three years work Marten and Andersen (1975), measured 0.8% in *A.artemisiifolia* samples comparing to dry matter. Franco Hernandez et al., (2010), in the aforementioned paper, measured the value of magnesium in the samples of *A.artemisiifolia* from the same area and it was 985 mg/kg in roots and 2494 mg/kg in the branches, calculated on dry matter. In percentage it is equivalent to 0.0985% and 0.25%. If these values are added up, the result is 0.3485% which is in agreement with the average value for this mineral in our investigation. Magnesium content in dry matter of plants usually ranges from 0.15 to 0.6%, with an average of 0.2% magnesium in feed (Petrović and Kastori, 1992). The content of this mineral in soil varies between 0.1 and 1.5% (Ubavić and Bogdanović, 2001; Džamić and Stevanović, 2000).

Potassium (K) in *A.artemisiifolia* samples showed the least variation (10.58%), with an average 3.12±0.33%. The amount of potassium in the tested samples was higher than in oats and dehydrated alfalfa hay (with 17% prot.): 0.40% and 2.40% respectively (Glamočić, 2002).

Marten and Andersen (1975), in the aforementioned paper, in *A.artemisiifolia* samples measured the value of 3.9% potassium of dry matter, which is in agreement with our results. It can be concluded that potassium content is high in this weed plant. The total content in dry matter of plants varies in a wide range, from 0.3 to 6% (Petrović and Kastori, 1992), and the variability in soil is between 0.5 and 3.0% (Ubavić and Bogdanović, 2001).

Unlike the contents of potassium, sodium (Na) shows a higher variability of 33.33% in the samples of ragweed. The average value of sodium is 0.03±0.009% and was lower than in the hay dehidrated alfalfa (with 15% prot.) and oats: 0.07% and 0.06% respectively (Glamočić, 2002). Sodium content in dry matter of plants ranges from 0.01 to 2.0% (Džamić and Stevanović, 2000).

In Table 3 the values of microelements: Co, Mn, Fe, Zn and Cu are given, measured in the *A.artemisiifolia* samples taken from different sites. The contents of microelements shows greater variability than the macro elements content in the samples of ragweed taken from different sites, which largely provides an information on the presence of microelements in the soil on some locations.

The average content of cobalt (Co) in the samples of ragweed was 0.55 ± 0.48 mg/kg, with a high coefficient of variation of 87.27%. We should note the locations in Odžaci and Novi Sad. In the samples from these localities the lowest cobalt content was measured: 0.07 and 0.17% respectively, which can be explained by the position where the samples were found (near the road). The average value of cobalt was greater than in oats and alfalfa hay (with 17% prot.): 0.06 and 0.10 mg/kg air-dry matter, respectively (Glamočić, 2002). Otherwise, the content of cobalt in dry matter of plants ranges from 0.12 to 0.4 ppm (Petrović and Kastori, 1992), while the amount of easily accessible cobalt in the soil of wine growing regions of Vojvodina is from 0.24 to 0.47 ppm (Ubavić and Bogdanović, 2001).

Table 3. Content of the microelements in the Ambrosia artemisiifolia L. samples
Tabela 3. Sadržaj mikroelemenata u uzorcima Ambrosia artemisiifolia L.

Location *Lokalitet*	Investigated parameter (mg/kg) / *Ispitivani parametar (mg/kg)*				
	Co	Mn	Fe	Zn	Cu
Zmajevo	0.48	61.25	351.67	166.67	7.43
Mali Iđoš	1.35	45.83	277.92	460.42	14.52
Novi Sad	0.17	37.50	376.67	260.83	14.23
Temerin	1.07	110.83	2.122.50	78.33	9.92
Odžaci	0.07	41.67	201.25	47.92	11.53
Palić	0.32	58.33	120.00	43.33	27.22
Šabac	0.42	123.33	309.17	46.67	9.47
$\bar{X} \pm Sd$	0.55 ±0.48	68.39 ±34.52	537.02 ±704.69	157.74 ±156.05	13.47 ±6.58
$C_{v\%}$	87.27	50.47	131.22	98.93	48.85
Min – Max	0.07 – 1.35	37.50 – 123.33	120.00 – 2.122.50	43.33 – 460.42	7.43 – 27.22

Another important microelement, which was measured in the samples of common ragweed was manganese (Mn). The average value of manganese in examined samples was 68.39±34.52 mg/kg, with a slightly smaller coefficient of variation (50.47%) compared to cobalt. Two sites (Temerin, Šabac) should be pointed out as the localities where the content of manganese was higher comparing to the samples from other locations. In both cases it was arable land where the amount of easily-accessible manganese was obviously high. Otherwise, in fruit and wine-growing regions of Vojvodina, the amount of easily-accessible manganese ranges from 37 to 91 ppm (Ubavić and Bogdanović, 2001). The average value of manganese in ragweed samples was higher than the value of manganese in oats and alfalfa hay (with 17% prot.): 40 mg/kg and 30 mg/kg respectively (Glamočić, 2002). In the study of Marten and Andersen (1975), in *A.artemisiifolia* samples the values for manganese were 78 mg/kg, which is in agreement with our measurements. The content of manganese in dry matter of plants ranges from 50 to 250 ppm (Petrović and Kastori, 1992).

The greatest variability of microelements was found in iron (Fe), as a result of the measured values in the ragweed sample from Temerin area (2122.50 mg/kg). This high value could be explained by the presence of alfalfa on the given lot, which is known for its high content of this element. The average value of iron, measured in the ragweed samples was 537.02 ± 704.69 mg/kg, with a coefficient of variation of 131.22%.

The measured iron content in ragweed was higher than in oats and alfalfa hay (with 17% prot.): 70 mg/kg and 300 mg/kg respectively (Glamočić, 2002). Determining the nutritional value of 12 weed species in the three-year investigation in *A.artemisiifolia* samples Martin and Anderson (1975) were given a value of 387 mg/kg of dry matter. Franco-Hernandez et al. (2010), in the aforementioned paper, measured the iron content in roots and shoots of *A.artemisiifolia* and got values of 516 and 312 mg/kg, respectively. The amount of this microelement in plants depends on its content in the soil, which is variable and ranges from 1.0 to 10.0% and the average value is about 3.8% (Ubavić and Bogdanović, 2001). Iron concentration in plant dry matter ranges from 50 to 200 ppm (Petrović and Kastori, 1992).

The average value of zinc (Zn), measured in the samples of ragweed was 157.74±156.05 mg/kg, with a high coefficient of variation of 98.93%. A sample from the area of Mali Iđoš should be pointed out. In this sample the measured value was 460.42 mg Zn/kg air-dry matter. Also, a group of samples from four locations (Temerin, Odžaci, Palić and Šabac) can be noted for their quite uniform values of zinc. The average value of zinc in the samples of ragweed, and individually measured values were higher than the amount of zinc in oats and dehydrated alfalfa hay (with 17% prot): 20 mg Zn/kg in both nutrients (Glamočić, 2002). In *A. artemisiifolia* samples Marten and Andersen (1975), measured the value of zinc of 32 mg/kg dry matter, during their three-year investigation. Franco-Hernandez et al., (2010), measured the highest concentration of zinc in *A. artemisiifolia* samples from the area of Villa de la Paz, which amounted 405.7 mg/kg in the plant shoots, and in roots 54.9 mg/kg of dry matter. Based on this it can be conclude that *A. artemisiifolia* could be used for recovery of the land contaminated with zinc. Tóth et al., (2005), analyzed three different soil types regarding their composition, metal content and the origin of soil, the content of cadmium, copper, nickel and zinc in roots, leaves and flowers of ragweed (*Ambrosia elatior L.*) from these sites. They concluded that the increase of these elements in the soil increases the content in plants. Common ragweed accumulated analyzed metals mainly in roots. The measured zinc content in the soil outside the ruderal area was 40 mg Zn/kg, and zinc content in the root of ragweed from this soil was 30.5 mg/kg. The content of zinc in ragweed samples from ruderal land, which was not contaminated with analyzed metals, amounted to 73.3 mg/kg in the leaves and 71.70 mg/kg in the inflorescence. Zinc content in dry matter of plant on average ranges from 20 to 50 ppm (Petrović and Kastori, 1992).

Table 3 displayes measured values of copper (Cu) in ragweed samples with less variability comparing to other microelements. The sample from Palić area should be pointed as the sample with slightly higher value of 27.22 mg/kg. The average copper content in samples was 13.47 ± 6.58 mg/kg of dry matter, which is higher than the copper content in oats and alfalfa hay (with 17% prot.): 5 mg/kg and 10 mg/kg, respectively (Glamočić, 2002).

In their three-year investigation Marten and Andersen (1975), in the samples of *A. artemisiifolia* measured copper and the value was 8 mg/kg of dry matter. Franco-Hernandez et al., (2010), in their work with *A. artemisiifolia* samples, measured copper from 14.6 mg/kg in the root and 30.4 mg/kg in the shoots of the plant. In the root of ragweed (*Ambrosia elatior L.*), taken from outside the ruderal area, Tóth et al., (2005), measured the value of 11.0 mg Cu/kg. In samples from ruderal areas that were not contaminated with the metals, they got the value of 8.96 mg Cu/kg in the inflorescence. The values for copper presented in the literature are in the agreement with our measurements. The average copper content in dry matter of plants ranges from 2 to 20 ppm (Petrović and Kastori, 1992).

CONCLUSION

Our study shows that common ragweed has good nutritive values regarding to the content of basic nutrients and minerals. The average crude protein content (12.02 ± 1.25%) is higher than in unshelled oats, which is used as one of the main nutrients in feed, and crude fiber content (30.30 ± 3.62%) is higher than in unshelled oats and dehydrated alfalfa hay (with 15% protein). The average fat content is lower than in oats and dehydrated alfalfa hay. When it comes to minerals, it can be stated that common ragweed is not behind almost all most frequently used nutrients, such as oats or alfalfa hay. The average content of Ca and P was similar to that in dehydrated alfalfa hay (with 15% prot.), but the amount of Ca is ten times higher than in unshelled oats. The content of Mg and K is higher than in oats and dehydrated alfalfa hay (with 17 % prot.). This also applies to microelements. The average contents of Co, Mn, Fe, Zn and Cu in ragweed samples are higher than in oats and dehydrated alfalfa hay (with 17% protein). Large variability in minerals was observed, especially for microelements, as a consequence of that location, i.e. features of the land from which the samples were taken.

Based on the results of measurements, there is a need for further investigation of this weed, especially in terms of its impact on the health of small ruminants (sheep and goats) when used in animal nutrition. It is necessary to determine whether residua may be found in the products obtained from animals fed with *A. artemisiifolia L.* , what can cause adverse affects on human health. Animals usually refuse to eat this plant. The question is whether the cause is its distinguished bitterness, allergenicity action or something else. Answer to these questions should be found in future investigations.

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SADRŽAJ OSNOVNIH HRANLJIVIH I MINERALNIH MATERIJA U UZORCIMA AMBROZIJE (*AMBROSIA ARTEMISIIFOLIA L.)* SA RAZLIČITIH LOKALITETA

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Izvod

Ispitivan je sadržaj osnovnih hranljivih i mineralnih materija u uzorcima ambrozije (*A.artemisiifolia L.*), sa sedam različitih lokaliteta. Ispitivanje je izvršeno standardnim hemijskim metodama. Rezultati ispitivanja ukazuju na to da ova korovska biljka ima dobra nutritivna svojstva, kako u sadržaju osnovnih hranljivih materija tako i u sadržaju makro i mikroelemenata. Najveću varijabilnost u sadržaju nalazimo kod mikroelemenata i to kod gvožđa, kobalta i cinka. Prosečna vrednost sadržaja proteina (12,02 ±1,25%) je veća od sadržaja proteina u neoljuštenom ovsu i manja od sadržaja u senu dehidrirane lucerke, a prosečna vrednost sirove celuloze (30,30 ±3,62%), u uzorcima ambrozije je veća od njenog sadržaja u neoljuštenom ovsu i senu dehidrirane lucerke (sa 15% proteina). Prosečne vrednosti sadržaja ispitivanih mikroelemenata su veće od njihovih vrednosti u ovsu i senu dehidrirane lucerke (sa 17% proteina). Isti odnos imamo i kod makroelemenata: magnezijuma i kalijuma. U slučaju kalcijuma i fosfora, njihove prosečne vrednosti u uzorcima ambrozije su slične vrednostima ovih elemenata u senu dehidrirane lucerke (sa 15% proteina). Dobijeni rezultati ukazuju na potrebu daljeg istraživanja ove korovske biljke.

Ključne reči: *Ambrosia artemisiifolia L.,* hranljive materije, makroelementi, mikroelementi.

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