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## EFFECTS OF HEAVY METAL ACCUMULATION ON WILD MEDICINAL PLANTS GROWN ON RESIDENTIAL PART OF SARAJEVO

UČINCI AKUMULACIJE TEŠKIH METALA NA LJEKOVITE BILJKE  
KOJE RASTU U REZIDENCIJALNOM DIJELU SARAJEVA

*Ahmet KARATURK*

International Burch University, Sarajevo, Bosnia and Herzegovina  
e-mail: akaturk@ibu.edu.ba

### ABSTRACT

Air pollutants are obviously the foremost contributors influencing human health very profoundly. Of course, increasing advance of technological improvements could be the main reason behind uncountable, some detected and even some undetected yet, side effects of air pollutants on our health. PM is rich in terms of nickel and chromium metals together with aldehydes that greatly inhibit the nucleotide excision repair (NER). In addition to this, air pollutants also induce the pulmonary diseases and cardiovascular diseases. Ozone, sulfur oxides, nitrogen oxides, carbon monoxide and particulate matters are the major air pollutants in special concern. Heavy metals have also great potential for many diseases. However, nature hinders some sorts of medicinal plants which are to serve as curing agents against certain diseases. In this study, we tried to figure out heavy metals' accumulation on some wild medicinal plants along the motorway from Ilidža to Skenderija. This route is the main route for automobiles and vehicle circulation in Sarajevo, capital of Bosnia And Herzegovina. The plants in concern are *Malva sylvetris*, *Polygonum aviculare*, and *Achillea millefolium* grown on pedestrian part or parking sites just on the same route.

**Key words:** *PM, Heavy metals, Malva slyvetris, Polygonum aviculare, Achillea millefolium, Atomic Absorption Spectrometer*

## SAŽETAK

Zagađivači zraka su očito najvažniji faktori koji izrazito utječu na ljudsko zdravlje. Naravno, rastući tehnološki napredak mogao bi biti glavni razlog bezbrojnih, nekih otkrivenih, čak i nekih još neotkrivenih, nuspojava zagađivača na naše zdravlje. PM je bogata niklom i hromatskim metalima, zajedno s aldehidima koji uvelike onemogućavaju nukleotidno ekscizijski oporavak (NES). Osim toga, zagađivači zraka također uzrokuju plućne bolesti i bolesti kardiovaskularnog sistema. Ozon, sumporni oksidi, dušikovi oksidi, ugljični monoksid i čestice su glavni zagađivači zraka koji posebno zabrinjavaju. Teški metali su također potencijalni uzročnici mnogih bolesti. Ipak, u prirodi postoje neke vrste ljekovitog bilja koje mogu poslužiti kao prirodna odbrana od određenih bolesti. U ovom istraživanju pokušali smo otkriti nakupine teških metala u nekim vrstama divljeg ljekovitog bilja uz cestu od Ilidže do Skenderije. Ovo je glavna cesta, kojom se odvija većina saobraćaja u Sarajevu, glavnom gradu Bosne i Hercegovine. Posmatrane su biljke *Malva slyvetris, Polygonum aviculare* i *Achillea millefolium* koje rastu pored parkinga na samoj cesti.

**Ključne riječi:** *PM, teški metali, biljke Malva sylvestris, Polygonum aviculare, Achillea millefolium, atomska apsorpcija spektrometar*

## INTRODUCTION

Heavy metals are one the foremost contributors in the increase of human diseases. Even being exposed to relatively minor level some metals such as copper and iron could play very important and irrisible side effects such that these two elements could inhibit some important enzymatic activities and they could behave as if inhibitors to certain enzymes (Michael McCally, 2002). In this study Copper, Zinc, Iron and Lead were observed in these plants and the soil on which those wild medicinal plants were grown. Heavy metals' toxicity could be hard to be diagnosed by doctor at first glance, since first sympstons of heavy metal exposure are common not very unique and detectable. For instance, a patient suffering from long exposure of heavy metal could show symptoms like weakness and headache.

*Malva slyvetris, Polygonum aviculare* and *Achillea millefolium* Epidemiological studies being used very widely by the local people living in Bosnia and Herzegovinia. Traditional herbal medicine has played an important role in the life of the Bosnian and Herzegovinian population. This is

especially true for Herzegovinian population (Redzic, 2006, 2007), whose geographical area is generally very rich in medicinal plants.

Table 1. Nomenclature of used plant species  
Tabela 1. Nomenklatura upotrijebljenih biljnih vrsta

Scientific name of the plant	Local name	English name	Part(s) used
<i>Achillea millefolium</i>	Kunica, sporis	Yarrow	Aerial
<i>Polygonum aviculare</i>	Troskat	Knotweed	Aerial
<i>Malva slyvetris</i>	Sljez crni	Common mellow	Aerial

Redzic 2010, www.wikipedia.com

*Achillea millefolium* is used especially to cure the disease related to wound, leucorrhoea, chapped breast nipple, liver, stomach, heart palpitation, liver inflammation, gall disorder, purify of blood, strengthen of spleen and pancreas, hard diabetes, (Redzic, 2007, 2010). These medications are prepared in the form of fresh juice, infusion and oil (Redzic, 2010). *Polygonum aviculare* is used to cure the diseases such as Vaginal infections, prostate gland, urinary infection, kidney inflammation, spleen, ulcer, hard cough, bleeding of lung (Redzic, 2010) and these medicines are applied in the form of infusion (Redzic, 2010). *Polygonum aviculare* also showed a remarkable anti microbial activity against both Gram positive and Gram negative bacteria and also against fungal inflammation except the fungus *Candida albicans* (Marraiki et al, 2009). In addition to them, “hexane and n – BuOH extracts of *Polygonum aviculare* revealed a distinctive vasorelaxant activity” (Lee Ho Sub et al., 2005).

*Malva slyvetris* is another common wild medicinal plant that is being used by public to cure the diseases related to cold, cough, burn and cut wounds healing (Abdollah Ghasemi et al., 2010). The research done by Abdollah Ghasemi and his colleagues clearly showed that *Malva s.* has a great potential, when applied, in succession of healing of wound parts of experimentally diabetes rats such that the wounds are totally disappeared 18 days after *Malva slyvetris* treatment on the wounded part of the rat (Abdollah Ghasemi et al., 2010). Fortunately, human being is able to manage the nature for his own benefit and tries to make use of as much as possible whatever bestowed to him. However, in this study we aimed at attracting people’s attention to the point that as botanists or pharmacists are intending to cure people using certain wild medicinal plants in any form, they should take this fact into account that they should collect those plants from unindustrialized regions rather than gathering them in city centers.

## MATERIALS AND METHODS

In this study, we collected the mentioned medicinal plants and the soil on which they were grown up. All the samples collected to a distance varying between 30 cm and 150 cm inside the main and the most used highway of Sarajevo which extends from Ilidža to Bašćaršija. The localities of samples' collection shown below. After collecting the samples, they were allowed 5-7 days to dry at room temperature and grinded to powder. Next, all samples were taken to the Federal institute of Agriculture of Sarajevo. In this Institute, soil samples and plants were subjected to heavy metal accumulation measurements by using Atomic absorption Spectrometer with unit mg/kg. Copper, Iron, Lead and Zinc were the metals in our subject of the study. The results are as follows in result part of the study.

## RESULTS

The content and concentration of heavy metals (Pb, Cu, Fe and Zn) in the studied plant species, the area of Sarajevo, is shown in **Table 2** (Number of laboratory protocols: 135-154/10 of 23. August 2010).

Table 2. The concentration of investigated heavy metals in selected medicinal plants and soil  
Tabela 2. Koncentracije istraživanih teških metala u odabranim ljekovitim biljkama i tlu

Number of Laboratory Protocol*	Name of Sample	The results of lead concentration (mg/kg)	The result of copper concentration (mg/kg)	The results of iron concentration (mg/kg)	The results of zinc concentration (mg/kg)
135/10	Otoka – soil	39,02	27,80	21.590,00	105,00
136/10	Fakultet – soil	370,70	74,10	20.580,00	228,00
137/10	Fakultet – soil	97,55	145,20	24.720,00	147,00
138/10	Hrasno – soil	117,06	67,40	28.490,00	175,00
139/10	Skenderija – soil	97,55	50,40	15.370,00	122,00
140/10	Otoka C – <i>Plantago</i>	Not detected	18,29	660,171	39,77
141/10	Otoka B – <i>Achillea</i>	Not detected	21,56	887,23	39,74
142/10	Otoka A – <i>Polygonium</i>	Not detected	12,00	1.039,00	52,00
143/10	Hrasno A – <i>Polygonium</i>	Not detected	14,40	964,90	82,00
144/10	Hrasno B – <i>Achillea</i>	Not detected	21,08	953,18	36,62
145/10	Hrasno C – <i>Plantago</i>	Not detected	20,98	1.216,51	105,38
146/10	Skenderija A – <i>Polygonium</i>	Not detected	17,70	1.071,99	61,62
147/10	Skenderija B – <i>Achillea</i>	Not detected	14,44	647,09	49,78
148/10	Ilidža A – <i>Polygonium</i>	Not detected	15,66	1.026,20	46,29
149/10	Ilidža B – <i>Achillea</i>	Not detected	25,57	778,44	61,78
150/10	Ilidža C – <i>Plantago</i>	Not detected	28,97	1.732,39	77,95
151/10	Fakultet A – <i>Polygonium</i>	Not detected	28,71	3.430,69	116,43
152/10	Fakultet B – <i>Achillea</i>	Not detected	21,35	758,54	44,68
153/10	Fakultet C – <i>Plantago</i>	Not detected	24,12	2.013,39	91,56
154/10	Fakultet C – <i>Plantago</i>	Not detected	27,68	1.989,09	94,25

\* Official protocol of the Federal Institute of Agriculture Sarajevo.

## DISCUSSION

As we analyse the results, it is not surprising that the Iron is the highest amount and the lead is mostly not detected. For the Lead, it could be better to use the standards micro gram per gram instead miligram per kilogram, since lead is trace amount. As we compare Ilidža with other parts of the study areas, since Ilidža is not center of the city and neither exist any heavy industrial manufactory located in Ilidža, and also the number of automobiles is not as many as the number in central regions of the city, the level of heavy metals is less than in other residential parts of the city. All mentioned plants *Malva slyvetris*, *Polygonum aviculare* and *Achillea millefolium* are commonly used in BIH, the only attempt we could advice to those who are planning to use these plants in any form to recover his/her health, he or she must be very carefully where these plants are obtained.

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