

The Concentration of Pb and Cd to *Medicago sativa* L. along Lipjan-Prizren Highway and their Influence on Biomass

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Abstract: The concentration of Pb and Cd is searched to 60 plants of *Medicago sativa* L. along Lipjan-Prizren highway in different distances from the road. While searching, it is used the plant growth on the ground. Based from the searching results, it is noticed that the concentration of Pb and Cd on three searched places has been higher in the locations near the road, except point three which the quantity of Cd has been higher in distance of 10 m far from the road. On all tested plants the highest biomass has been found to the plants which are located in distance of 10 m far from the road. On all three searched points, there are noticed negative correlations among the concentration of Pb, Cd and biomass.

Key words: *Medicago sativa*, concentration of Pb and Cd, biomass, pollution, localities, Lipjan-Prizren

INTRODUCTION

Historically, at the very beginning human is faced with pollution of the environment, but recently the problem of polluted environment is much more evident. The modern industrial, urban and traffic pollution is permanent and very universal. The universal character of modern pollution is presented on a form of wide front of the polluted air, water, soil and plants. One of the kinds of the polluted environment to which is dedicated a particular importance on the modern period, is pollution from the traffic, which is increasing rapidly and contributing on the matter of pollution of the environment. Different sorts of aerosol have the origin from the particles of carbon and Pb and Cd components and burning products of petrol.

There is a lot of information related to the heavy metal influence on physiological param of the plant *Medicago sativa* L. whereas their influence on morph anatomic parameter is less searched. So, there are necessary detailed searching concerning to the concentration of Pb and Cd on *Medicago sativa* L. in different distances from the road and their influence on some morph-anatomic param which can be presented in this studying.

MATERIALS AND METHODS

Entirely, there are 60 plants of *Medicago sativa* L. searched. They are collected in three different locations along Lipjan-Prizren road (in distance of 10 m from the

road). For searching it is taken the main stem together with leaves which is cut on its base. In every location, the plants are collected in two different distances from the road (Fig. 1).

- Location 1 at the entry of Lipjan
- Location 2 at the entry of Shtime
- Location 3 at the exit of Suhareka

All these samples are milled and put in thermostat on temperature of 105°C for 3 h. There were taken 3 g of the plant from every sample and put in the glass dish.

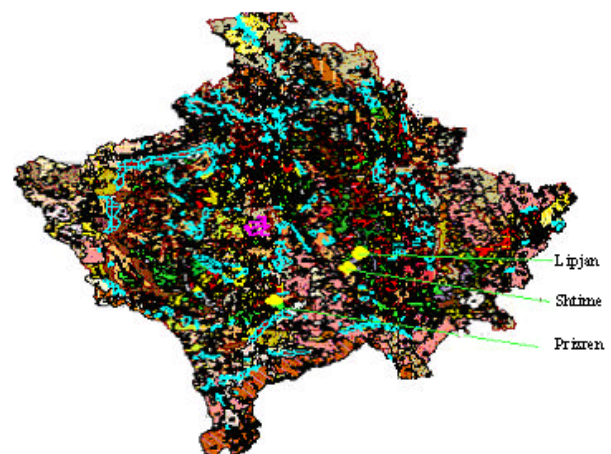


Fig. 1: Cartographic representation of the three localities examined along Lipjan-Prizren highway (Kosova map-obtained from Prizren Municipality)

There was added 30 mL solution of the substance to this prototype: HNO_3 , HClO_4 , H_2SO_4 on report (20:2:1). Samples are put in the apparatus for burning and they get burnt until the white color appears and the sample is stick to the dish. After that the sample becomes cold and filters in a dish of 100 mL. While filtering, the dish with the sample clears several times with HCl and distilled water on the report 1:9.

The distilled sample is put on the table and it can be read on the apparatus ICP where there can be found the concentration of Pb and Cd for each sample. The biomass is defined to 60 units of the plants *Medicago sativa* L. taken in three above-mentioned locations. All these units are cut on the part of the base and then they are put in thermostat for about 3 h on the temperature of 105°C and then they are weight on the analytic scale.

RESULTS AND DISCUSSION

Based on the results gained related to the concentration of these heavy metals, it is observed that at the location 1 (at the entry of Lipjan), the greatest quantity of Pd has been to the units taken near the road where the average amount of the concentration has been (0.814 ppm). In the same place, the smallest quantity of concentration of Pd has been to the units taken in the distance of 10 m far from the road (0.21 ppm) (Table 1 and 2). Also, the quantity of units in this location has been higher to the units taken near the highway (1.38 ppm), compared with average amount of concentration of Cd to prototypes, which are taken in distance of 10 m far from the road (0.61 ppm) (Table 3 and 4). The metal concentration in both different distances from the road, there are observed positive correlation. The leaves of dandelion plants growing on lawns along communication arteries contain more iron, zinc, lead and copper as compared with the plants sampled in parks (Czarnowska and Milewska, 1999). Based on the results of point 2 (at the entry of Shtime), it is observed that the concentration of Cd and Pb in this point has been higher to the units taken near the highway (0.29, 1.47 ppm). Significant correlation was noted between the number of passing petrol vehicles and the lead concentration in the particulate deposits collected from different designated sites (Aydingalp and Marinova, 2003) (Table 5 and 6). The lowest concentration of these two similar metals, like in location 1 has been found to units taken in 10 m distance far from the road. (0.24, 1.05 ppm). It is found that *Medicago sativa* L. has the ability to heavy metals accumulation probably due to the presence of any chemical functional group, which is responsible for accumulation of metals (Sékara *et al.*, 2005).

In the location 3 (on the exit of Suhareka) distinguished from the two first locations, the results show that the highest quantity of Cd has been found to the units taken in 10 m distance far from the highway. The lowest quantity of Cd is observed to units taken in 10 m distance far from the road (2.29 ppm). The lowest quantity of Cd is observed to units taken in 1 m distance far from the highway (1.52 ppm) (Table 1). Based from the results, we can conclude that the quantity of Pb at this location the same like in two other locations has been greater near the highway (0.79 ppm), whereas it's the lowest quantity is observed to botanical units taken in 10 m distance far from the road (0.16 ppm). The positive and negative correlations are noticed among the metal concentration to units searched in different distances of the highway.

The influence of Pb and Cd on the biomass *Medicago sativa* L. In three specified locations, it is searched the quantity of biomass expressed on grams. There are taken 60 prototypes from these locations and 30 of them are searched near the highway, whereas 30 of the units in 10 m distance far from the highway. After drying and weighing, these prototypes are among the tested prototypes in all three locations, there aren't noticed great significant differences. Figure 2 shows the influence of Pb and Cd concentration on biomass in all three tested locations. Weight on analytic scale and there are found results shown on the charts. Based from given results, we can say that in all three locations there are negative correlations among the metal concentration and the quantity of biomass. Metals are among the most prevalent forms of contamination found at waste sides and their remediation in soils and sediments are among the most technically difficult (Chhotu and Fulekar, 2008). The highest quantity of biomass for the prototypes taken near the highway is location 3 (3.2 g). In all tested prototypes which are taken in 10 m distance far from the road, the quantity of biomass has been higher than 8 g. The results denote that the Pb and Cd taken near the road, compared with other prototypes taken in 10 m distance far from the road are different. Environment contaminated with heavy metals (Pb, Zn, Cd) had decreased biomass at *T. pretense* and *C. tinctorium* (Tlustos *et al.*, 2006).

In all three tested locations, the quantity of biomass to prototypes which are near the road has been found lower (2.9, 2.4 and 3.2 g), in comparison with other prototypes the Cd has influenced on the decreasing of biomass to prototypes taken near the road, in comparison with other prototypes taken in distance of 10 m far from the road and they are taken in the same location, but in 10 m distance of the road (3.2, 2.5 and 3.8 g).

Table 1: The Pb concentration (ppm) at three localities examined near the road

Individuals examined and localities	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	X	S	±sx	V	Lsd	Lsd
Locality I 1 m	1.78	1.61	0.75	0.92	0.73	1.05	0.51	0.23	0.25	0.26	0.81	0.54	0.17	0.67	0.580	0.080
Locality II 1 m	0.28	0.29	0.26	0.09	0.72	0.39	0.23	0.03	0.09	0.49	0.29	0.2	0.06	0.70	0.003	0.004
Locality III 1 m	0.39	0.82	0.66	0.84	0.61	0.95	1.02	0.58	1.61	0.43	0.79	0.35	0.11	0.44	0.020	0.030

Table 2: The Pb concentration (ppm) at three localities examined 10 m distance far from the road

Individuals examined and localities	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	X	S	±sx	V	Lsd	Lsd
Locality I 10 m	0.45	0.19	0.13	0.32	0.23	0.26	0.03	0.12	0.09	0.32	0.21	0.1	0.04	0.58	0.580	0.080
Locality II 10 m	0.16	0.19	0.29	0.41	0.22	0.45	0.13	0.16	0.25	0.12	0.24	0.1	0.03	0.47	0.003	0.004
Locality III 10 m	0.06	0.09	0.16	0.43	0.09	0.03	0.22	0.13	0.19	0.23	0.16	0.6	0.03	0.68	0.020	0.030

Table 3: The Cd concentration (ppm) at three localities examined near the road

Individuals examined and localities	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	X	S	±sx	V	Lsd	Lsd
Locality I 1 m	0.59	0.6	4.52	0.33	0.76	0.28	0.47	2.48	0.58	3.15	1.38	1.47	0.46	1.06	0.16	0.23
Locality II 1 m	0.56	0.36	0.29	3.68	3.05	0.26	0.26	3.3	2.69	0.23	1.47	1.49	0.47	1.01	0.36	0.5
Locality III 1 m	3.41	0.79	0.26	0.78	0.22	1.14	2.81	0.42	2.94	2.42	1.52	1.23	0.39	0.81	0.21	0.3

Table 4: The Cd concentration (ppm) at three localities examined 10 m distance far from the road

Individuals examined and localities	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	X	S	±sx	V	Lsd	Lsd
Locality I 10 m	0.19	0.22	3.33	0.51	0.39	0.26	0.25	0.25	0.35	0.35	0.61	0.9	0.3	1.5	0.16	0.23
Locality II 10 m	2.74	0.26	2.83	0.22	0.22	2.69	0.45	0.19	0.51	0.38	1.05	1.1	0.3	1.1	0.36	0.5
Locality III 10 m	0.42	0.19	2.87	4.90	2.82	2.74	5.21	0.19	0.29	3.27	2.29	1.9	0.6	0.8	0.21	0.3

Table 5: Biomass (g) of *Medicago sativa* L. at three localities examined near the road

Individuals examined and localities	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	X	S	sx	V	Lsd	Lsd
Locality I. 1 m	1.07	2	3.9	2.3	4.4	3.8	2.2	4.1	3.5	2.4	2.9	1.10	0.35	0.37	0.02	0.03
Locality II. 1 m	1.2	3.4	1.4	1.9	2.2	2.1	1.9	3.4	2.8	3.9	2.4	0.91	0.28	0.37	0.06	0.09
Locality III. 1 m	2.3	3.0	1.3	5.0	1.3	2.0	4.9	5.3	4.4	3.2	3.2	1.54	0.48	0.47	0.24	0.35

Table 6: Biomass (g) of *Medicago sativa* L. at three localities examined 10 m distance far from the road

Individuals examined and localities	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	X	S	±sx	V	Lsd	Lsd
Locality I. 10 m	3.3	4.2	4.3	3.8	3.1	2.5	2.7	2.1	3.1	3.7	3.2	0.7	0.2	0.2	0.02	0.03
Locality II. 10 m	1.8	3.3	2.5	2.3	1.7	2.2	3.1	2.0	2.8	3.6	2.5	0.6	0.2	0.2	0.06	0.09
Locality III. 10 m	3.9	6.2	5.8	5.0	4.1	2.0	2.1	1.8	4.3	3.0	3.8	1.5	0.4	0.4	0.42	0.35

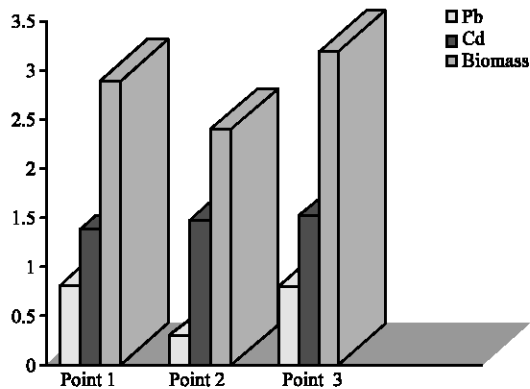


Fig. 2: The Pb Cd and biomass concentration at three localities examined in different distances from the road

The greatest influence of these metals in this parameter has been at location 2. In this location, all

tested prototypes have lower biomass in comparison with two other locations. The results of investigation show that the most effective species in cadmium bioaccumulation are *Hordeum vulgare* and *Medicago sativa* L. (Ciura *et al.*, 2004).

CONCLUSION

Botanical material for searching and the ground prototypes are taken from three different locations along Lipjan-Prizren highway. In these three locations, there are collected 60 botanical units of the plant *Medicago sativa* L. in different distances far from the road where they are tested: the concentration of Pb, Cd and biomass.

The greatest quantity of Pb and Cd in all three searching locations has been found to the units taken near the road where the average amount of concentration has been (0.814, 0.29, 0.79, 1.38 and 1.52 ppm). The lowest quantity of concentration of these metals has been taken

to units taken in 10 m distance far from the road, with exception of location 3 where the quantity of Cd has been higher in distance far from the road (0.21, 0.24, 0.61, 1.0 and 2.29 ppm).

In all three tested location the quantity of biomass in prototypes taken near the road has been lower (2.9, 2.4 and 3.2 g), in comparison with other prototypes taken in the same locations, but in a distance of 10 m far from the road (3.2, 2.5 and 3.8 g).

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