DISTRIBUTION OF SOME HEAVY METALS IN DIFFERENT HEALTH PROMOTING AND ECONOMICALLY IMPORTANT SPECIES AROUND COPSA MICA CITY

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Abstract

The artificial pollution sources represent the main danger of the contamination of sol, water and air.Among the most important sources of the atmosphere's contamination are the industry,transports, heating instalations ,and the use of chemicals in agriculture. The historical pollution owing to the industrial platform at Copsa Mica had as a result the contamination of the different economical and health promoting forest products .The wide spread polluting agents are disuniformily found and they are bio-accumulated in different forest products, very important for animals as well as for humans.

Key words: statistical distribution,heavy metals,health promoting species, size classes.

INTRODUCTION

Air pollution not recognize geographic borders and specific effects vary greatly depending on human cultural activities and natural climate patterns. Poorly controlled mining and industrial emissions cause heavy metal pollution, when is completed with rainfalls dispersion is minimized but local deposition is maximized (Padgett P.E., et al, 2004).

According to Wadhia K. et al., 2005 lead is often has been considered, the symbol for heavy metals. Major Pb contamination sources for environment are metal industrial sources,use of lead arsenate pesticides and phosphate fertilizers. Until recently main pollutant factor of Pb air pollution was the heavy traffic. The introduction of tetraethyl Pb as an antiknock agent in fuels causes high Pb atmospheric emissions.Today in developed countries atmospherical Pb pollution decreases dramatically due to exclusion of leaded gasoline from vehicular consumption (Ming H. Y., 2005, Skerfving H.et al, 2007). In animals and humans Pb affect nervous,reproductive, cardiovascular systems and hemoglobin biosinthesis (Sengar R.S. et al, 2008).

Cadmium is one of most dangerous trace heavy metal to plants,animals and humans.Industry and agriculture development caused widespread Cd contamination of agricultural soils and soil-plant environment mainly due to industrial emissions.High plant-soil mobilities causes easy bioaccumulation in plant tissues affecting crop yields and give rise to a threat on human health from food chain(Dong J. et al,2007). Nonessential for planth growth Cd is easy taken up by roots and transocated into aerial organs (Benavides M.P.et al., 2005). In plants cause retardation of plant growth,chlorosis and stunting, in animals and humans impair Ca and D vitamin metabolism,related with kidney damages and bone degeneration processes (Cosio C., 2004).

Zn is an essential nutrient for plant growth,but elevated amounts cause growth inhibition and exhibit toxicity symptoms such stunting of shoots,curling, rolling of young leaves,chlorosis and death of leaf tips(Rout R.G. et al.,2003). Zinc is an essential element in the nutrition of man, animals and plants. Is an integral part of numerous enzymesBecause of its essentiality, zinc is present in all plant and animal tissues (Sandstead H.H.et al, 2007, **WHO Food additives Series 17).

Cu is an essential micronutrient with the critical deficiency level between 1-5mg·kg^{-1},an adeqvate range from 6 to 12mg·kg^{-1} and toxicity from 20-30mg·kg^{-1} DW. Regarding it toxicity Cu has a high affinity for peptide and sulphydril,carboxylic and phenolic groups. Excess seems to induce programmed cell death (Polle A. et al., 2003). Copper is an essential element and adverse health effects are related to deficiency as well as excess. Copper deficiency symptoms are associated with anaemia, neutropenia and bone abnormalities but clinically evidence is relatively infrequent in humans.(Uauy R. et al., 1998) The lower limit of the acceptable range of oral intake is 20 μg Cu·kg^{-1} body weight. They are limited information on the level of ingestion of copper from food that would provoke adverse health effects (EHC 200,1998).

Characteristics of the studied plants

The common sea-buckthorn (Hippophae rhamnoides) Nutrient and phytochemical constituents of sea-buckthorn berries have potential value to affect inflammatory disorders, cancer or other diseases. Bark and leaves may be used for treating diarrhea and dermatological disorders. The fruit are high vitamin C content and are an important winter food resource for some birds, notably fieldfares (Beldeanu E.C., 2004, Gross P, 2010).

The Black locust (Robinia pseudacacia L.), In Europe it is often planted alongside streets and in parks, especially in large cities, because it tolerates pollution well (Aksoy A. et al., 2000). Major honey producer species (Beldeanu E.C., 2004).

Common Hawthorn (Crataegus monogyna Jack) – found on all soil types, hawthorn extract is sometimes used as aroma therapy and leafs flowers and fruits are known for its benefits on human organism. It is an adaptogen specific for the circulatory system and is used in numerous circulatory system problems. Hawthorn Berries also have anti-oxidant properties (Barnes J., et al, 2007, Beldeanu E.C., 2004).

Desert false indigo (Amorpha fruticosa L.) It is present as an introduced species in Europe, Asia and other continents. Plants have an extensive root system and are also fairly wind tolerant; they can be planted as a windbreak and also to prevent soil erosion. Amorpha seeds are consumed by pheasant (Phasianus colchicus), (Beldeanu E.C., 2004).

Blackberry (Rubus hirtusW,et K., sin.R.fruticosus) Leaves, roots, and even berries have been employed as a medicinal herb. The most common uses were for treating diarrhea, sore throats, and wounds.(Beldeanu E.C., 2004). Blackberry antocyanins exhibit chemoprotective and cancer preventions properties (Jing P.,et al, 2011).

Sampling area

The sampling plots are placed around city of Copsa Mica (fig.1), in the most affected area (Alexa B., 2004).

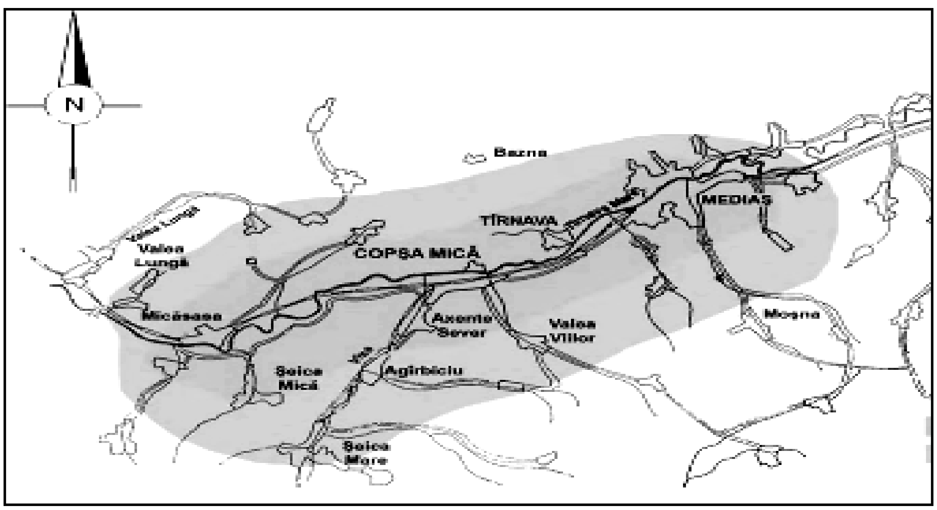

Fig. 1.Historically polluted areas around Copsa Mica city

MATHERIALS AND METHODS

Sampling procedures

Samples of aerial organs of the studied species in the forestry area surrounding the city of Copsa Mica (UP I Seica Mica, UP Micasasa,UP III Tarnava and UP VIII Valea Viilor), were collected in September-October 2009 and 2010. A total of 17 sampling sites, were selected at different distances from the main pollution source/S.C.Sometra S.A - The species and the organs used for the sampling are to be found in table 1.

Table 1

The organs of the plant species with healthy and economical importance taken for the analyses of the content of heavy metals.

Nr.crt.	Specia	Organul prelevat
1	Hawthorn	Flowers,leafs,fruits
2	Sea Buckthorn	fruits
3	Common blackberry	Flowers,leafs,fruits
4	Desert false indigo	fruits
5	Black locust	flowers

METHODOLOGY OF LABORATORY ANALYSIS

Mineralization Dried at +60°C and fine grounded sampled organs were mineralized in an acid solution, using the mineralization microwave, Berghof MWS-2.

Reagents used: - HNO_3 Merck extra pure (65% concentration)**:** H_2O_2 (30% concentration)

Procedure*:* 300 mg of plant sample have been weighed; in the mineralization containers are added 2 ml nitric acid and 3 ml of hydrogen peroxide. The mixture is carefully homogenized. Before sealing the container, the sample is left to rest for 20 minutes. After being sealed, the mineralization containers are placed in the mineralization microwave. The liquid solutions obtained have been quatitatively sloped in 25 ml volumetric flask and brought to volume with UPW of 0,05 µS/cm conductivity, freshly prepared with Direct Q 3UV Smart (Millipore). The samples which had deposition of suspended solids were filtered through 0,45 µm (Millipore) membrane filters.

Determination of metals (Pb, Cd, Zn, Cu) by the technique of flame atomic absorption spectrometry (FAAS)

After sample mineralization and dilution in flask the solution is aspirated into the flame atomic absorption spectrometer, using hollow-cathode lamp for the analyzed metal, using the conditions recommended by the equipment's manufacturer. (Perkin Elmer AAnalyst 800, acetylene-air flame).The analysis was repeated two times. The absorbance was measured at a wavelength of 283,5 nm for Pb, 228,8 nm for Cd, 213,9 nm for Zn and 324,8 nm for Cu using background correction .

The data representing metal concentration in black locust flowers were processed with StatSoft 8 software.

RESULTS AND DISCUSSION

The aim of this study is to determine the spatial distribution of certain heavy metals Pb, Cd, Zn and Cu in of selected species growth around the city of Copsa Mica in the context of the main polluter's activity stop - SOMETRA S.A.COPSA MICA in January 2009. The normal examination of the analytical variables distribution in statistical collectivity was achieved by using the Shapiro test. The table 2 shows that the distributions of Pb, Cd, Zn, Cu , do not respect the normal standards.

Table 2

The statistic signification of the distribution of analytical variables in the statistical collectivity.

Variables	*W*	*[P%]*	Significance level
Pb	0,676	<0,001	***
Cd	0,941	<0,001	***
Zn	0,862	<0,001	***
Cu	0,278	<0,001	***

The distribution of the Pb concentration present a visible exponential, the quasi-majority group of the values are placed in the first size class for Pb, being classified on the statistical basis 8 size classes.

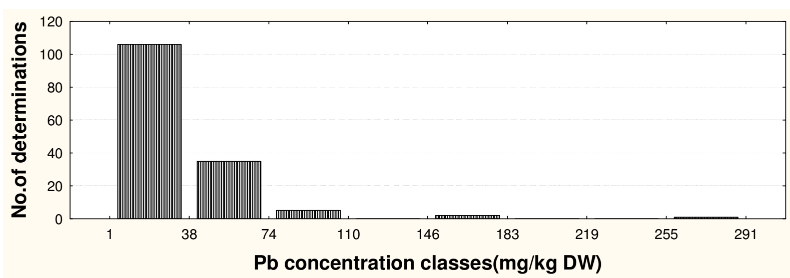

Fig.2 The distribution of the Pb concentration from the sampled organs of the plants on the size class.

The Cd distribution in fig. 3 has a left asymmetry and with a modulus (size class with a maximum frequency) between 0,15-0,71.

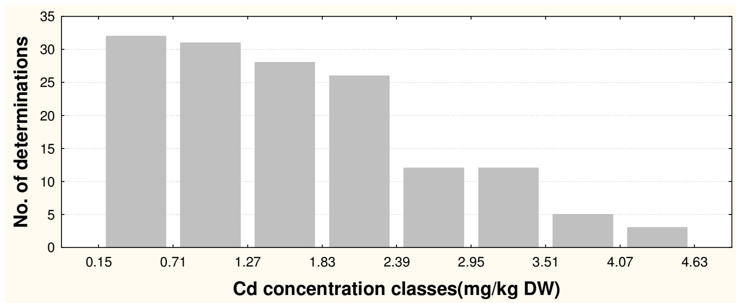

Fig.3 The distribution of the Cd concentration from the sampled organs of the plants, on the size class.

The left asymmetry and the exponential trend of the concentrations distribution of Zn encourages the size class 36-71(fig.4)

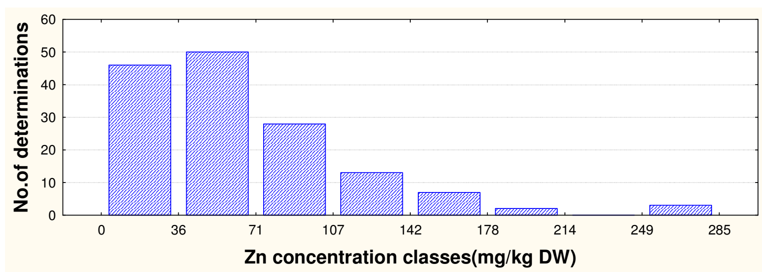

Fig.4 The distribution of the Zn concentration from the sampled organs of the plants, on the size class.

The Cu distribution shows an accented left asymmetry, being obvious the 1-4 size class.

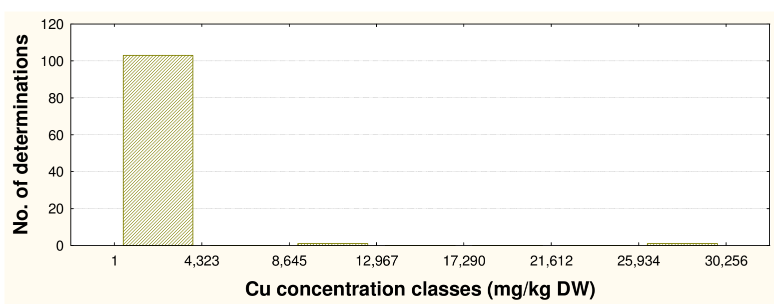

Fig.5 The distribution of the Cu concentration from the sampled organs of the plants, on the size class.

CONCLUSIONS

As shown in the 2, 3, 4, 5, figures, the experimental distributions of the heavy metals concentration's frequency on the size classes do not respect the regularity, so from this reason, in the next statistical researches will be necessary a stratification of the independent variables.

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