POLLUTION OF THE FOREST AND AGRICULTURAL SOILS WITH HEAVY METALS

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ABSTRACT: *Biotope composed of ground, geographical and climatic factors, and in direct relationship with plants and animals, constitute the terrestrial, within which, by its functions, soil is a matter of importance. If only the ecological functions, soil fertility, the role of the filter and the function of the genetic reserve, can appreciate the role of the ground in growth and development of the plants, in the prevention of soil disturbance trophic chain--plants and animals-man in ensuring the conditions necessary for the existence of biodiversity dim edafic environment. If, on these eco-features, add and economical, even if they sometimes appear contradictions, arriving at the actual size of the importance of the role of the ground as the main resource of agricultural production, forestry and food for humanity. For these reasons the ground must use reasonable, protected against pollution which produces pertubari at the level of its functions, with serious consequences in the long term.*

KEY WORDS: *metallurgical plants, heavy metals, forest soil, soil for agriculture*

1. INTRODUCTION

Among the pollutant agents with the role of the various trophic chain geography which have as basic element ground, it shall be counted and heavy metals. They may reach the ground in the waters, from the dust from metallurgical plants which process mining concentrates or overburden dumps of mines, flotation, and not in the last line of the exhaust gases of motor vehicles. In the area of the investigated, the main sources of pollution are those related to the metalurgia ferrous and mining activities. The accumulation and distribution of heavy metals in the soil is determined by the factors which characterise the source of pollution, nature of the soil, local geographical and meteorological factors which contribute to the dispersion of pollutants and the nature of the chemical combinations of the metal of the pollutant.

2. THE EXPERIMENTAL

The research carried out shall comprise a first stage at which samples have been taken from the abrasions of forest soil and agriculture, from three points located on the heading west from metallurgical plants which are considered to be the main source of pollution. In these samples has caused heavy metals, Pb, with Zn, Fe, Mn, Cr and by the method of atomic emission spectrometry Flame method for this purpose, at distances of 2.5 and 8 km have been taken three samples of forest soil and agricultural abrasions, after it has been cleaned vegetable layer. The samples are dried at 120 °C and then calcined at 500^0C until constant mass, and they weigh 0,2000g and place it in the solution. The solutions obtained are entered in the 50ml volumetric flasks, brought to the mark with double-distilled water and analyzed with an ATOMIC ABSORPTION SPECTROPHOTOMETER AA 500FGPC. Before the beginning of the experimental

determinations. It is necessary to carry out preparatory operations which consist in the selection of wavelength for each item, the drawing of the calibration curves and improvement of working conditions, so that the maximum analytical performance. The wavelengths at which they have carried out the examinations are 220.275 nm at Pb, 324.754 nm at Cu, 213.856 nm at Zn, 259.760 nm at Fe, 257.300 nm at Mn, 283.563 nm at Cr and 309.27 nm to Al.

The second stage of the research shall involve the taking of samples from different distances, on the directions and the same point at different depths. The samples have been taken at depths of 10, 20 and 30 cm of points located 0.2 km NE 0,2 km E, 2 km V and 10 km V.

Table 1. The concentration of heavy metals in the soil forest and agricultural, as determined by the method spectrofotometriei.

Element	**Sample 1**		**Sample 2**		**Sample 3**	
Pb	**Forest**	**Agriculture**	**Forest**	**Agriculture**	**Forest**	**Agriculture**
Cu	562,2	498,8	475.13	498,5	174,3	125,8
Zn	297.3	369,7	251.9	210.6	211,6	236.7
Mn	1201,5	1853,5	288,7	303,4	286. I	205,9
Cr	1027,2	965,2	990.8	1100,7	916.4	873,4

Table 2. Permissible concentrations in soil and the standards of the dutch authorities (ppm)

Element	**Reference value**	**Values which require further enquiries**	**Values which requires the replacement of the soil**
Pb	50	150	500
Cu	50	100	500
Zn	200	500	3000
Cr	100	250	800

The analyzer calibration curve is drawn with solutions prepared from solid standards Pb, and Zn

3. RESULTS AND DISCUSSIONS

Concentrations of heavy metals, experimentally determined, abrasions, in the three points located on the heading west, are given in table no. 1.

In the analysis of the data from the Table I is found high values of all concentrations of metals, which decreasing the distance to the Pb, Cu, Zn, Cr. To assess the level of pollution, are useful comparison of concentrations of heavy metals in soils polluted with those in the areas of unpolluted groundwater, with the concentration limits of national legislation, the standards of the Dutch authorities (Table 2) and the concentration deemed in literature, as normal, medium and critical. The concentrations of the metals Pb, With Mn, Zn, and Cr of samples from the forest soil and agriculture, from an unpolluted area, situated at 150 km from the area searched, is located below the maximum limits allowed by national legislation in force in the field of pollution of soil. National legislation states that the maximum permissible limits in soil100 ppm and 300 ppm Pb, Zn, 50 ppm co, Mn 1500 ppm, limits are exceeded, Pb and Cr in all samples, and Zn, in the forest soils of the samples 1 and 2 and in agricultural soils of the sample 1. The maximum permissible concentrations in soils are exceeded in all samples: in the case of Pb 1.7 - 5.6 times in the forest soils and 1.2 - 4.9 times in the agricultural, in the case of 2.1 - 2.9 times in the forest soils and of 2.3 - 3.6

times in the agricultural and, in the case of Cr, of 1,9 - 3,04 times in the forest soils and 1.4 to 229 times in the farming The maximum permissible concentration of Zn, 300 ppm, is exceeded in the forest soils of the samples 1 and 2, 1-4 times, and in the soil set-aside in the sample, 6 times. The maximum permissible concentration of Mn, 1500 ppm is not exceeded in samples of agricultural and forest soils These concentrations are determined in the forest soils can be found between the reference and which require further enquiries to Zn in tests 2 and 3 and the sample 3. Between the values which require further enquiries and those requiring replacement soil Pb concentrations, can be found in the samples 2 and 3, in all the samples, Zn in sample 1 and Cr in samples I and 2. Exceeds the amount which requires the replacement of the soil Pb concentration in the sample 1. In the agricultural soils have concentrations between the reference and which require further investigation, Pb metals in the sample 3, Zn in tests 2 and 3 and Cr in the sample 3. Between the values which require further enquiries and those which require the replacement of the soil will be found Pb concentrations in the samples I and 2, in all the samples, Zn in sample 1 and Cr samples 1 and 2. The concentrations are considered normal environments, the critical loads are shown in table 3.

In agricultural soils, in the field of Critical Values are located in the sample concentrations Pb 3 and Zn in tests 2 and 3. Over Critical Values Are Pb concentrations in the samples 1 and 2, and Cr in all samples and Zn in sample 1.

Table 3. Average concentrations, normal sl critical in soil (ppm)

Element	Concentration		
	Average	Regular	Critical
Pb	26,87	35	100-400
Cu	28,44	30	60-125
Zn	84,65	90	70-400
Cr	50,36	70	75-100

Table 4. Concentrations, Pb, with Zn at various depths in soil (ppm)

Sample	Distance km	Depth cm	Pb		Cu		Zn	
			Forest	Agriculture	Forest	Agriculture	Forest	Agriculture
1		10	6880	6820	1386	1420	3661	3593
2	0,2 NE	20	6280	6200	1417	1480	3898	3870
3		30	5895	5830	1321	1360	3440	3402
4		10	3102	3050	698	722	1831	1803
5	0,2 E	20	3010	2970	732	751	1634	1602
6		30	3398	3360	729	759	1542	1510
7		10	2781	2710	378	390	1024	990
8	0,2 SE	20	667	611	147	165	687	650
9		30	2752	2700	505	545	1141	1100
10		10	2211	2190	1067	1100	749	720
11	2V	20	315	3095	3795	3870	3622	3590
12		30	1472	1410	789	805	4010	3980
13		10	3051	3016	491	520	662	630
14	10 V	20	859	827	205	245	701	683
15		30	915	894	205	245	869	682

The results obtained in the second stage of the research are presented in table 4. Pb and Zn concentrations are higher in the forest soils than in those of the agricultural and are smaller. The highest concentrations at all three metals are found in the sample from 0.2 km N-E and usually fall with increasing distance. The exceptions which appear are determined by the existence of dumps dumps in the vicinity of these points on which the dust is driven by air currents and transported to the surface of the ground. By comparing the concentrations experimentally determined with maximum permitted limits in soil, it is found that, on the three metals in all samples and at all depths, they are not exceeded by 6-68 times to Pb, 1,6-14 times with, and Zn of 2 to 12 times. These experimental findings may be explained, if the emission rates of polluting sources, geographical, meteorological factors and geologici which contribute to the dispersion and accumulation of pollutants, the nature and characteristics of the soil and of chemical combinations in which the sc metals.

If regard is had to the emission rate of a single processing of metallurgical plants at 150t mining concentrated, shall be deleted in the environment inconiurator one hour 65 kg Pb, in the course of a year arrive in the air above 1000 t powders which contain, with Zn, d, e, CR, Mn, etc. such pollutant emission rate from a single source is sufficient for a sharp pollution of the area. The polluting emissions are transported at different distances, in this area, helping the geography and the geology of the local meteorological factors: wind, precipitation, thermal inversion. Soils in the area investigated are part of those categories which are more vulnerable to acidification, pH, having regard to their average 3,5-6,5, have a texture lutoasa or luto-argiloasa and a reduced humus layer. These characteristics of the soil will determine the concentration of metals in the free state, either in the form of compounds with high degree of solubility and transformation of Pb and in Sulphides insoluble material.

Carrying out these analyzes to Pb, With Sl Zn have revealed the existence of combinations shown in table 5.

Changing the natural composition of forests soils and agricultural pollution has negative consequences for both forestry. And for agriculture, even if some metals pollutants have concentrations in the vicinity of the maximum permissible limits, because of the cumulative toxic effect may be.

Even with metals Cu and Zn, which belong to the category of trace elements and there fore are essential for plants at high concentrations, become toxic and affect the normal development. This, the changes produced by the metallic pollutants affect the increase in CREATININE, in length and in thickness. Modification of the rate of increase in the height of the trees in the polluted areas particularly affects the oak tree which is highly sensitive to contamination. Quantitative losses in the field and forest is manifested in agriculture where the estimated losses are approximately 60-70%.

Table 5. The average percentage of combinations pb, and Zn in forest and agricultural soils

The combination	Pb	Cu	Zn
Sulfur	46	20	38
Sulphate	28	4	17
Oxides + Carbonates	26	54	30
Silicate	-	22	15

CONCLUSIONS

On the basis of the investigations may be made a few general conclusions with regard to the pollution of agricultural and

forest soils. Soil pollution surveyed area is determined mainly by the two factories of the non-ferrous metallurgical material and the overburden dumps factories of preparation and of mines. The dispersion of pollutants in the environment surrounding a complex process which is determined by a large number of variable factors in time, difficult to control and impossible to be influenced. The variety of heavy metals polluting soils dm area requires the use of methods for determining which allow detection of concentrations of the order of the ppm at the order of the percentages. In the near points there are large differences in the accumulation of heavy metals in soils and in the forest. The concentrations of heavy metals in the soil exceeds the two types of most of the times the maximum permitted limits, thereby directly affecting the quantitative and qualitative, agricultural production and forestry. Remedy the situation can only be achieved by reducing the quantity of polluting emissions and by undertaking a set of measures for reconstruction, eco specific to forest soils and for those.

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