IMPACT OF A FERTILIZING- AMELIORATING COMPOST MIXTURE ON THE TRANSLOCATION OF HEAVY METALS

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Heavy Metals (HM) are among widespread and very toxic substances polluting the environment. Arsenic, mercury, lead and cadmium are most dangerous to a biota even in small quantities.

The object depositing the main amounts of heavy metals is the soil. In this regard, as long as heavy metals are in a soil system, in an indissoluble and inapproachable state, their negative effect will be negligible. The danger arizes on condition of HM transition from insoluble into soluble state, in such a case there is a probability of a translocation from soil solution into plants, and further in a human body and in animals, respectively, consuming these contaminated polluted plants.

One of the main topical areas of detoxification and re-cultivation of the soils contaminated by heavy metals is to develop ways to decrease/ reduce the mobility of HM, fixing them in the soil for the purpose of reduction the availability to plants, reducing the toxicity and less accumulation in plant biomass.

The goal of the work was to conduct a comparative study of heavy metals (As, Pb, Cd, Cu) in different types of soil and to develop ways to manage the HM translocation processes on the basis of changes in the composition and properties of a soil fertile layer.

As it is known one of the perspective directions is the use of waste materials for creation of artificial geochemical barriers. In this regard, we have conducted researches with application of a new fertilizing ameliorating compost mixture (FMC) consisting of a bio humus and filtration withdrawal of vitriolic production (FWS), including perlite, gypsum and slaked lime in its structure. For the experiments, the soils of black earth and grey earth exposed to various technogenic impact are used. The quantity of artificially deposited FWS is 100 g/kg (granulometric composition is1mm or less) and bio humus – 1 g/kg of the soil. Heavy metals were brought in the form of nitrates. A clover was used as a test of culture. The experiments were conducted in wooden boxes without a bottom 50 cm high, with an area of 30 x 50 cm. Frequency of experiences is 4-fold.

The obtained experimental data are presented in the table.

Table - Characteristics of heavy metals in the soil-plant system (the numbers are the data for gray soil and the denominator for the black earth soils).

Metals	The content of metals, mg/kg in dry weight				
	Without insertion of the FMC mixture		In inserting in a clover		
	In the soils	In a clover	FWV	Bio humus	FW + biohumus
Pв	60,2/77,8	16,4/0,5	1,4/0,2	0,4/0,2	not revealed
	150,5/168,1	69,1/1,3	0,6/0,5	0,6/0,4	0,1/0,02
	200,5/218,1	72,6/1,3	0,6/0,4	0,7/0,4	0,2/not revealed
Cd	2,5/2,7	1,1/0,4	0,05/0,03	0,04/0,03	0,01/ not revealed
	5,0/5,0	1,7/0,4	0,06/0,03	0,03/0,03	0,01/ not revealed
Cu	100,0/120,5	20,5/19,1	16,6/15,7	9,8/15,2	0,3/0,2
	250,0/270,6	22,8/19,2	9,1/6,8	5,9/6,6	4,2/1,2
As	2,2/2,2	1,9/0,7	0,06/0,03	0,05/0,03	not revealed
	40,0/10,3	17,7/8,9	6,9/2,7	5,5/2,5	not revealed

The insertion of bio humus and FWV mixture led to significant fixation of heavy metals. The quantity of HM entering into the experimental culture of clover, when applied to the soil test mixture did not exceed the specified level even in highly contaminated soil (the permissible levels of lead in food plants - 0.5 mg / kg, of cadmium - 0.1 mg / kg, of arsenic - 0.05 mg / kg, copper - 10.0 mg / kg). In entering this mixture of an arsenic translocation in a clover it was inhibited completely as in the grey soil, and in the black soil. This can be explained by the oxidation of arsenic (III) to arsenic (V) and the insoluble form of Ca3 (AsO4) 2 arsenate in the soil solution.

The application of the bio humus and filtration withdrawal mixture as a fertilizer-ameliorating agent showed the possibility of the simultaneous decision of the following important tasks:

- ecological, aimed at creating artificial geochemical barrier to inhibit the translocation process of lead and other heavy metals in the soil-plant system;
- technological, allowing to expand the list of the sorption materials possessing high sorption activity in relation to ions of heavy metals and other ecological toxicants;
- to restore the productive properties of contaminated agricultural lands adjacent to industrial sites, and to obtain ecological pure products.