

PHYTOREMEDIATION OF THE SOILS POLLUTED BY NICKEL AND THE COBALT

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Introduction. The fissile development of the industry without carrying out necessary actions for environmental protection led to extensive pollution of the soil, the World Ocean, a plant and animal life. Hundreds millions tons per year of various products of anthropogenous activity of the person jump out a surrounding medium, the most dangerous among them it is heavy metals.

So, accumulation of a cobalt and nickel in the soil leads to pollution by metals of agricultural production, ground waters and land reservoirs, their cumulation in fabrics and bodies of plants and animals. On food chains metals get to a human body that promotes development of pathological conditions of a various origins.

The most perspective method of restitution of the polluted territories the phytoremediation – weeding by means of plants is considered. The separate species of the plants growing in polluted territories, can accumulate in the fabrics particular amount of heavy metals without visible signs of depressing [1, 2, 4].

Thus, the regulation of processes of cleaning of soils from metals is an actual problem of ecology.

Subject and methods. The purpose of work is the assessment of possibility of a phytoremediation of the soils polluted by salts of a cobalt and nickel.

Researches were conducted 2013 on the basis of laboratory of chair of ecology and natural sciences of FSBEI HPE KSAU. As object of research the sunflower olive (*Heliantus annus L.*). For laboratory and vegetative experiences salts of metals were used: $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$ (metal in a dose of 5, 10 and 15 maximum concentration limits), $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ (metal in a dose of 5, 10 and 15 maximum concentration limits). Determined the mass of sprouts depending on cobalt and nickel ion concentrations, a ratio of the content of heavy metals in plants and the soil.

Results and discussion. As a result of researches it is revealed that at low, average and high levels of pollution of a plant differently reacted to presence of heavy metals in the environment of growth. At a stage of sprouts external symptoms of toxicosis which were expressed in decolourization of vegetative weight and growth rate delay were shown. At later stages of development of plants the pronounced necrosis, antotsianovy coloring of leaves and escapes, rotting of roots were noted.

Effectiveness of a fitoremediation of soils depends on efficiency of plants. With a larger biomass from the soil the larger quantity of the pollyutant who have entered in plants is removed [3]. As showed results of experiences, is more narrow at the maintenance of a cobalt and nickel of 10 maximum concentration limits in the soil at plants of sunflower olive (*Heliantus annus L.*) more body height delay is considerably observed, on larger concentration (15 maximum concentration limits) plants are oppressed and do not reach a necessary biomass.

The percentage ratio of a cobalt and nickel brought and taken out with an elevated biomass was calculated at use of sunflower olive (*Heliantus annus L.*): at phytoextraction 0,8–3,5 % of a cobalt, 1,2–4,3 % of nickel are taken.

Conclusion. Thus, it is established that nickel phytoextraction in the conditions of pollution happens more efficiently, than a cobalt. The sunflower slight absorbs a cobalt and nickel, however at the high content of these metals in the plant soil badly develop, as defines small actual carrying out of metals from the soil with a biomass. However, in view of that in laboratory and vegetative experience of a plant were artificially thinned out and since experiment was made within two months, did not reach the maximal biomass, at cultivation of plants in vivo it is possible to expect higher rates.

References

1. Baker, A.J.M. and Brooks, R.R., Terrestrial higher plants which hyperaccumulate metal elements - A review of their distribution, ecology and phytochemistry. *Biorecovery*, 1989, 1, 81-126.
2. Chaney, R.L., Land treatment of hazardous wastes. ed. J.F. Parr, P.B. Marsh, and J.M. Kla., Noyes Data Corp., Park Ridge, NJ 1983, 50-76.
3. Коротченко, И.С. Использование горчицы сарептской в качестве фиторемедианта при загрязнении почв кадмием // Наука и образование. 2013. [Электронный ресурс] URL:http://www.rusnauka.com/page_ru.htm (Дата обращения: 15.09.2013).
4. Фиторемедиация почв, содержащих тяжелые металлы / А. В. Линдиман, Л. В. Шведова, Н. В. Тукумова [и др.] // Экология и промышленность России. – 2008. – № 9. – С. 45–47.