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ANALYSIS OF THE ABILITY OF AQUATIC FERN *SALVINIA NATANS* (L.) ALL. AND DUCKWEED *LEMNA MINOR* L. PLANTS TO REDUCE CHROMIUM (VI)**V. M. Zaretskyi**

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Chromium is used for ferroalloy production, oil refining, electrolytic chromizing, textile, electrotechnical and woodworking industry in order to prevent metal corrosion. The excessive discharge of chromium (VI) into environment causes the intoxication and leads to the abnormalities of functioning of the living organisms. The sewages treatment may be carried out by means of physical and chemical methods (including sorption, chemical neutralization, electrochemical physical and chemical treatment), but using of plants for the reduction of chromium (VI) to its less toxic for human health form (III) is considered one of the most promising methods.

The annual aquatic heterosporic fern *Salvinia natans* (L.) All. was chosen as the potentially promising plant object for our study. In Ukraine, salvinia is known to form the massives of 100-120 plants on 1m² still water surface and may naturally cause the ecological disaster, but the number of its unusual morphologic and physiologic characteristics make salvinia the promising object of the scientific studies devoted to the developmental morphology, comparative evolution, and functional genomics [1]. Moreover, pteridophyta (*Pteris*, *Marsilea*, *Azolla*, *Salvinia* etc) were shown to be able to bioaccumulate the heavy metals (cadmium, cuprum, nickel); salvinia plants turned out to be tolerant to the high content of aluminum, lead and chromium in aquatic environment as well [2, 3, 4, 5]. The duckweed *Lemna minor* L. plants are considered the model plant for estimation of the level of toxicant contamination and this way were taken as the control ones in our study.

The aim of our study was to analyze the ability of *L. minor* (duckweed) and *S. natans* (fern) plants to reduce chromium (VI) and to study out the effect of chromium-anion on their vital level characteristics.

The plants were cultivated on half-strength MS medium [6] with the concentration of 0 mM, 1 mM, 2mM, 4mM chromium (dichromate anion) at 22-24°C for a week. Then the chromium (VI) concentration was measured every day during 5-day-period in the media and in the studied plant tissues after the experiment being finished.

The studied fern plants were proved to be able to detoxicate chromium (VI) up to 40-70% of its initial concentration (according to diphenylcarbazide) due to its reduction to insoluble chromium (III) hydroxide within the short time period. However, the dynamics of decreasing of chromium (VI) content in the result of cultivation of the model duckweed plants in the media with 1, 2, 4 mM dichromate-anion was significantly lower.

High chromium concentration (4mM) was toxic for the studied fern plants as the four-time decreasing of their relative growth rate with the further plant death was observed in our studies. So that the accumulation level of the toxic (VI) chromium form came up to 0,0379±0,0038 mg/g plant fresh weight in case of 1 mM dichromate-anion concentration in the media with its further increasing to 0,3961±0,0049 mg/g FW and 0,8221±0,0721 mg/g FW in cases of 2mM and 4mM chromium (VI) concentrations respectively.

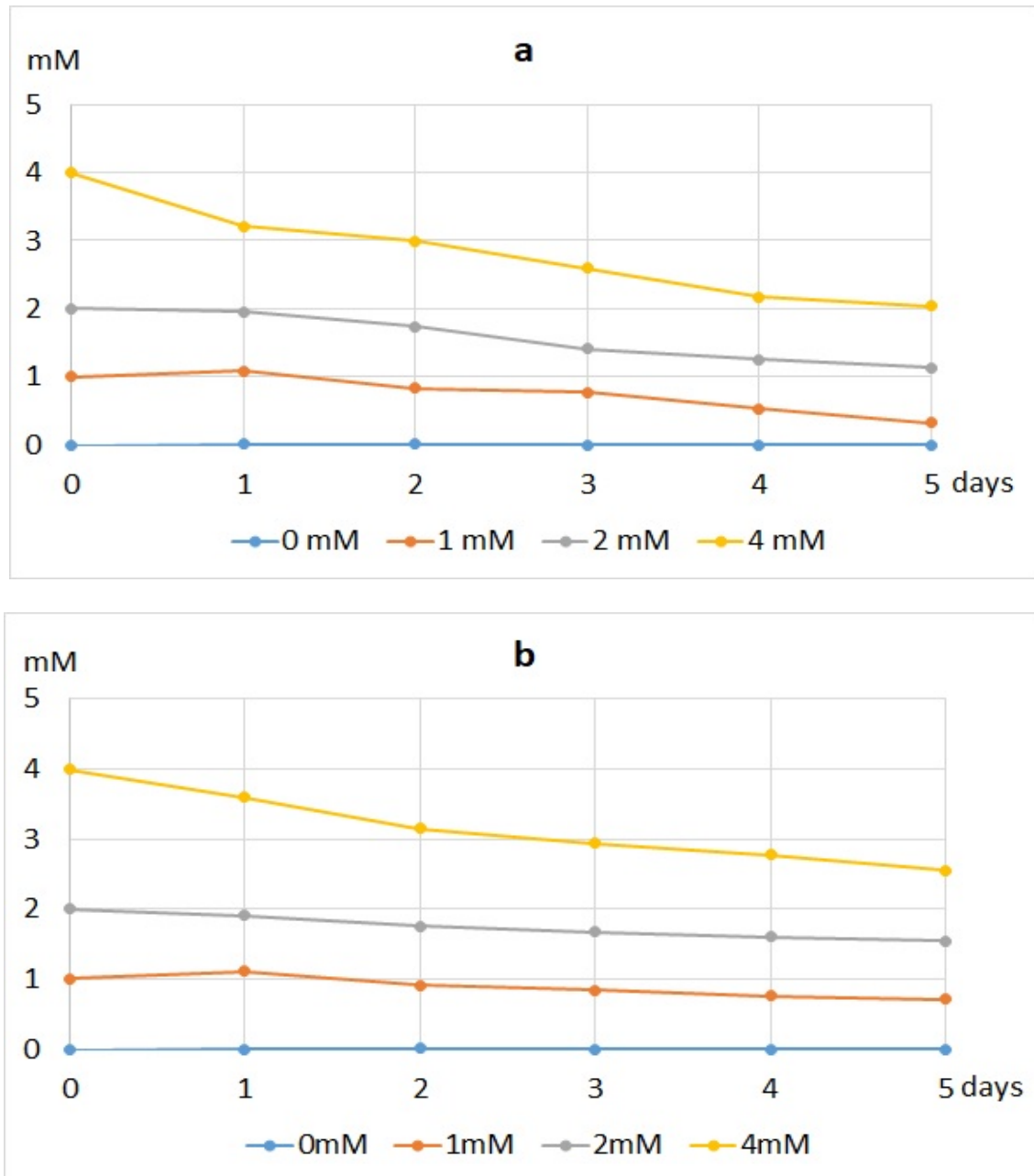


Figure 1. The dynamics of chromium (VI) concentration reducing in the medium in case of the studied fern (a) and duck weed (b) plant cultivation

At the same time the tendency of the dynamics of the dichromate-anion concentration decreasing in the media during the plant cultivation was similar for both cultivated plant species as the rate of chromium reduction was higher at the initial phase than at a later date.

References:

1. Mikuia A., Pozoga M., Tomiczak K., Rybczynski J. J. Somatic embryogenesis in ferns: a new experimental system. // Plant Cell Rep. - 2015. - Vol. 34. - P. 783–794.
2. Dhir B., Sharmila P. and Pardha S. P. Photosynthetic performance of *Salvinia natans* exposed to chromium and zinc rich wastewater // Braz. J. Plant Physiol. - 2008. - Vol.20(1) - P.61-70.



3. Mandal C., Bera S., Dey N. and Adak M. K Physiological alterations of *Salvinia natans* L. exposed to aluminium stress and its interaction with polyamine. // *Plant Science Today*. - 2016. - Vol. 3(2) - P. 195-206.
4. Mohan B.S. and Hosetti B.B. Phytotoxicity of cadmium on the physiological dynamics of *Salvinia natans* L. grown in macrophyte ponds. // *J. Environ.Biol.* - 2006. - Vol. 27(4) – P.701-704.
5. Hoitra A., Traczewska T.M., Sitarska M., Zamorska-Wojdyia D. Phytoremediation of Contaminated Aquatic Environments by the Species of *Salviniaceae*. // 15th ICHMET. 2015. - P: 541-543.
6. T. Murashige F. Skoog. A revised medium for rapid growth and bioassays with tobacco tissue cultures. // *Physiologia Plantarum*. – 1962. – Vol.15 (3). – P.473-497.



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ANALYSIS OF THE EFFECT OF THE EXTRACTS OF GENETICALLY MODIFIED PLANTS ON *ESCHERICHIA COLI*

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The usage of genetically modified crops was resulted by the intensive agriculture development in many countries around the world, but despite the large number of studies devoted to the safety aspects of their consuming, people are known for the ambiguous attitude to GMO. In particular, one of the disturbing aspects of GM plant consuming is the hypothetical possibility of transmission of the selective marker (which, in the course of transformation, is transferred along with the target gene and, for instance, may cause the antibiotic resistance of plant cells in order to enable the selection of the transformed cells) to the intestinal microflora of humans. Therefore, the selective antibiotic-independent strategies have been developed recently, as well as the strategies for the selective marker exclusion from the completed plant genome. But, as the protocols of the construction of GM plants using the traditional selective markers remain quite popular, we were interested in the analysis of the effect of genetically modified plants on human gastrointestinal microflora and to evaluate the possibilities of the transition of antibiotic resistance from GM plants to bacteria.

Thus the aim of our study was to analyze the effect of the crude extracts of genetically modified lettuce and rue plants on *Escherichia coli* (strain XL1 Blue). Transgenic lettuce and rue plants were kindly provided by Institute of Cell Biology and Genetic Engineering, NAS of Ukraine. The studied plants contained the human interferon alpha 2b gene as these edible plant species were considered potential sources of pharmaceutical protein production. Moreover, the plants contained the selective neomycinphosphotransferase gene in order to provide their resistance to the selective antibiotic kanamycin sulfate. Thus, the studied plants perfectly satisfied the purpose of our research. The study was carried out in the Laboratory of Experimental Biology of Kyiv Palace of Children and Youth.

The extracts of the transgenic and non-transgenic plants were prepared by their triturating in 1M PBS buffer with their further centrifugation and sterilization. After cultivation of *E.coli* night