

«Сейфуллин оқулары – 18: « Жастар және ғылым – болашаққа көзқарас» халықаралық ғылыми -практикалық конференция материалдары = Материалы международной научно-практической конференции «Сейфуллинские чтения – 18: « Молодежь и наука – взгляд в будущее» - 2022.- Т.І, Ч.ІІ. – Р.122-123

WASTEWATER PURIFICATION BY AZOLLA CAROLINIANA AND TOLERANCE OF MACROPHYTES TO CHROMIUM

*Azimov S.¹, doctoral student at department of Biotechnology
Khujamshukurov N. ², Professor at department of Biotechnology*

Turabdjano S.¹, Rector, Professor

¹Tashkent State Technical University, Tashkent

²Tashkent Chemical Technological Institute, Tashkent

This paper discusses the possibilities of macrophyte treatment of chromium-containing wastewater from tanneries based on macrophytes. At present, *Azolla* biomass is widely used in a number of countries for the treatment of heavy metals from industrial effluents and wastewater. [3-8].

Macrophytes (*Azolla caroliniana* Willd., *Lemna minor* L., *Pistia stratiotes* L., *Eichhornia crassipes* Solms.), as well as wastewater from a tannery containing chromium (Cr) were chosen as objects of study. The retention of chromium in water was determined by atomic spectroscopy (GOST P51309-99 Method for determining the elemental composition of natural and nutrient solution by ICP-MS). The calculation of the statistical error and standard deviations from the experimental data was carried out using the computer program STATISTICA 6.0 and standard methods. The statistical significance of the results was determined using Student's t-test.

In the course of the study, the process of treating wastewater from leather processing plants from chromium and other types of chemicals using macrophytes were studied. The tolerance of macrophytes to chromium, which was identified as the main object of study, was also studied.

According to the results obtained, the biomass of *A. caroliniana* decreases with increasing chromium concentration ((mg/l) 0,5→0,87%, 1,0→0,68%, 1,5→0,59%, 2,0→0,50%, 2,5→0,46%, 3,0→0,39%) and biomass correlations. In particular, on the 10th day of cultivation at a concentration of 0.5 mg/l, 1150.9 g of biomass per 1 m² was obtained, and at a concentration of 3.0 mg/l - only 1.79 g of biomass.

When studying the resistance of macrophytes to chromium in the amount of 1.0 mg/l *Azolla caroliniana* on the 2-7th day of cultivation was 86.7%; 42.1%; 27.1% and 6.32%, respectively, viable. Compared to control 1, it showed a decrease of 12% on the second day of growth and 26.1% on the 7th day of growth.

It was found that over the same period, the survival rate of duckweed was 3.21% at 5 days of growth compared with other macrophytes. On the 7th day of observation, it was noted that the culture was completely necrotic, the roots began to rot. *Lemna minor*, *Pistia stratiotes* and *Eichhornia crassipes* were completely necrotic on the 7th day of observation, while *Azolla caroliniana* was completely necrotic on the 10th day observations. In the course of the study, it was noted that *Azolla caroliniana* had a relative resistance among macrophytes in terms of resistance to chromium (1.0 mg/l).

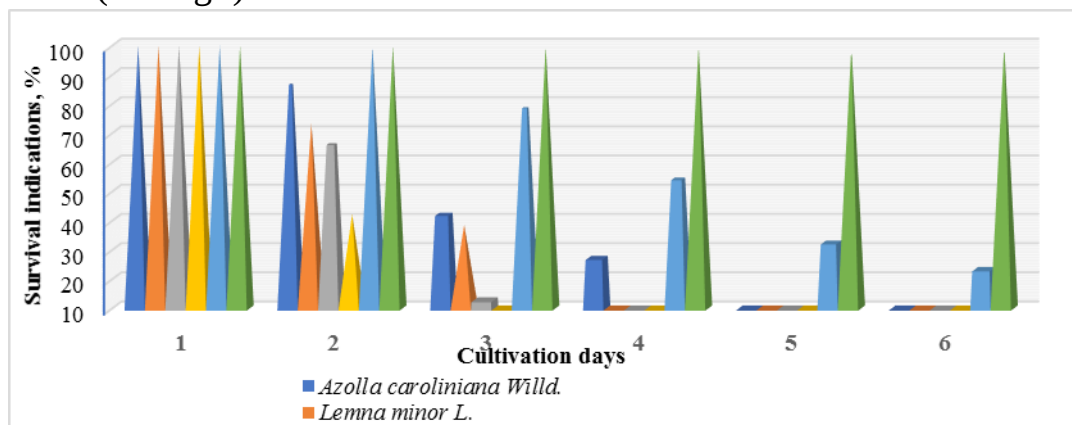


Fig.-1. Tolerance of macrophytes to chromium (1,0 mg/l)

An interesting aspect of the study was the very low biomass with a survival rate of 0.52%. The reason for this was noted in the use of tap water in the nutrient medium, to which a certain amount of chromium was added. The tolerance of *Azolla caroliniana* to high concentrations of chromium and its sorption properties for chromium can be explained by the absence of macro-, microelements and mineral salts in the nutrient medium.

Studies have showed the potential of *Azolla caroliniana* in relation to tolerance to chromium. According to the results, the photosynthesis process of a 5-day culture of *Azolla caroliniana* adapted to chromium-plated (30%) wastewater is restored by 50-80%. day of growth. The crop yield reached 78.4-82.6% and the decrease in the chromium content in wastewater was from 4.87 mg / l chromium to 2.34 mg / l. The results showed that *Azolla caroliniana* sorbs chromium in an average amount of 0.56-1.09 mg/g relative to dry weight.

List of used literature

- 1 Arora A., Saxena S. Cultivation of *Azolla microphylla* biomass on secondary-treated Delhi municipal effluents. Biomass Bioenergy 29: 2005.- 60–64
- 2 Arora, A., S. Saxena, and D.K. Sharma. Tolerance and phyto accumulation of chromium by three *Azolla* species. World Journal of Microbiology & Biotechnology 22: 2006. - 97–100

- 3 Bennicelli, R., Z. Stezpniewska, A. Banach, K. Szajnocha, and J. Ostrowski. The ability of *Azolla caroliniana* to remove heavy metals (Hg(II), Cr(III), Cr(VI)) from municipal waste water. *Chemosphere* 55: 2004. - 141–146
- 4 Mishra V.K., Tripathi B.D., Kim K.H. Removal and accumulation of mercury by aquatic macrophytes from an open cast coal mine effluent. *Journal of Hazardous Materials* 172: 2009. - 749–754
- 5 Rai P.K. Technical note: Phytoremediation of Hg and Cd from industrial effluents using an aquatic free floating macrophytes *Azolla pinnata*. *Int J Phytoremediation* 10: 2008. - 430–439
- 6 Rai P.K., Tripathi B.D. Comparative assessment of *Azolla pinnata* and *Vallisneria spiralis* in Hg removal from G.B. Pant Sagar of Singrauli Industrial region, India. *Environmental Monitoring and Assessment* 148: 2009. - 75–84
- 7 Sela M., Garty J., Tel-Or E. The accumulation and the effect of heavy metals on the water fern *Azolla filiculoides*. *New Phytol* 112: 1989. - 7–12
- 8 Stepniewska Z., Bennicelli R.P., Balakhnina R.P., Szajnocha K., Banach A., Wolinska A. Potential of *Azolla caroliniana* for the removal of Pb and Cd from wastewaters. *International Agrophysics* 19: 2005. - 251–255