INNOVATIVE APPROACH TO WASTEWATER TREATMENT

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ABSTRACT

The potential of algae in the purification of chrome wastewater was studied and its results were presented. In addition, the culture of Azolla caroliniana, which is tolerant to high levels of chromium (Cr), was obtained, based on the chromium-adapted cultures of Azolla, the wastewater treatment processes with high chromium content were analyzed. Sorption processes of chromium in the dry mass of Azolla were carried out and the research results were analyzed.

Keywords: Wastewater, algae, ecosystem, azolla caroliniana, sorption, biodiversity, sustainability.

INTRODUCTION

In the world, the huge volume of waste water containing harmful chemicals produced in various production aspects of the economy is causing serious environmental problems. Biological treatment of wastewater is distinguished by its importance in ensuring the stability of the man-made ecosystem. In particular, the treatment of wastewater contaminated with harmful chemicals based on high algae is extremely important from the point of view of ecology and environmental protection. In the production process, effluents from tanneries, paper mills, coal mines and thermal power stations are extremely dangerous for aquatic ecosystems due to the presence of Cr.

In the world, scientific researches are being carried out on acute ecological problems of the environment due to the incomplete purification of chemical and harmful substances in the wastewater of leather processing enterprises.

In this regard, it is necessary to determine the toxic properties of chromium in wastewater, to use chromium as one of the main tools in electroplating, leather processing, metal preparation and polishing in light industry, to improve the method of biological treatment of wastewater coming out of leather processing enterprises and treated by physico-chemical methods, to reprocess leather. special attention is paid to the fact that the formation of large amounts of sulfites, ammonium nitrogen, and protein compounds in processing plants leads to a sharp change in the ecosystem.

RESEARCH METHODS

As we know from scientific sources, high algae (azolla, small ryasca, eichhornia, pistia) are very important products for many sectors of the economy, including food, feed, pharmaceutical and agricultural industries (protein-enzymatic food and feed products, plants growth regulators, biologically active substances, etc.) are noted as biotechnological objects of strategic importance in production.

In recent years, in world practice, high algae are considered as an object of great importance in maintaining the ecological balance of the environment, including the preservation of biodiversity in nature, and in environmental extremes, cleaning the chemical composition of soil and water from harmful substances. As a result of this, the residual products released into the environment increase the possibility of negative impact not only on the soil, water, atmospheric air, but also on the human body.

Leather tanning and processing enterprises can be noted as one of the similar production branches. Although there is an opportunity to fully control the activities of tanning and processing enterprises, environmental control of the activities of small business entities that organize the tanning process remains a problem in local conditions, as in all countries.

From this bios, the main focus of our research work was to study the composition of secondary, unfit for consumption, but used for irrigation of agricultural crops by leather tanning and processing enterprises, to study the processes of biological purification of various mineral salts and chromium content of these wastewaters.

This is to preserve the biodiversity of intermediate consumers (zooplankton organisms in ditches, ponds and ditches, fish, birds, livestock, poultry, plants, etc.) in the process of irrigation of agricultural crops and to protect them from various damage. is very important in preservation. It is known from scientific sources that chromium (6+) is the most dangerous chemical substance in the effluents from tanning and processing enterprises. Also, high algae were selected as a biotechnological object that biologically adsorbs chromium in wastewater.

RESEARCH RESULTS AND THEIR ANALYSIS

In preliminary experiments, the growth of higher plants was found in wastewater containing chromium. The obtained results are shown in pictures 1-2.

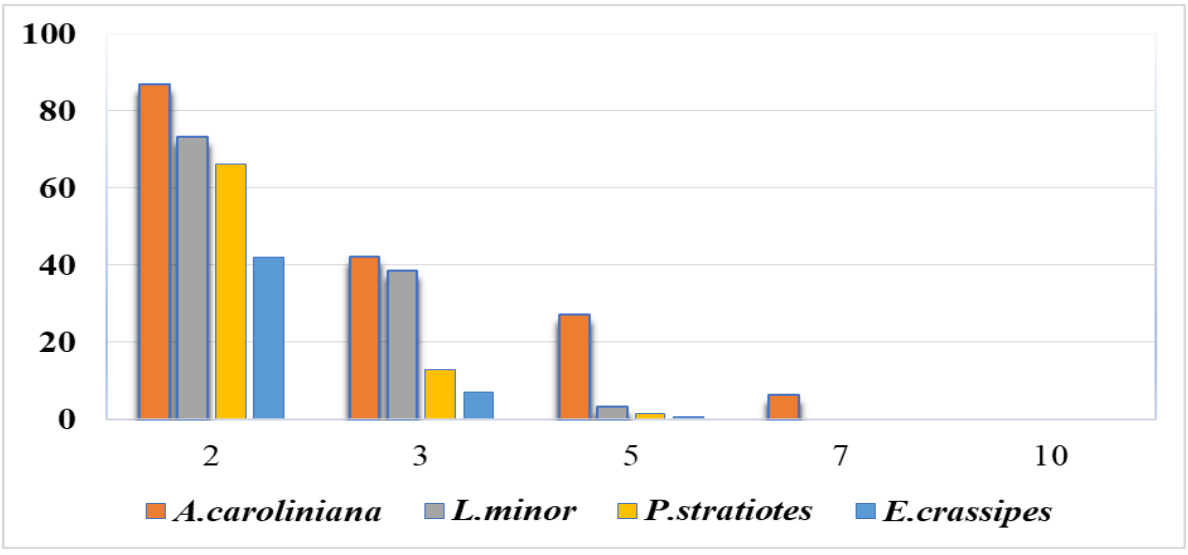

Figure 1. Chromium tolerant of some higher algae found in the conditions of Uzbekistan (Food environment (chromium (+6) content in water, 3.0 mg/l))

According to the obtained results (pictures 1-2), it was noted that the tolerance of higher algae to chromium is different. In our research work, when the tolerance of different types of higher algae to chromium was studied, it was observed that Azolla was somewhat resistant compared to the other higher algae in the experiment.

In particular, when Lemna minor L. was grown in a medium containing chromium at 3.0 mg/l for days, the viability indicators decreased by 26.79% on the second day compared to the first day, and by 52.6% on the third day compared to the second day, on the fifth day of observation and compared to the initial condition, it was noted that the incidence of necrosis or complete loss of viability was 96.79%. Only 3.21% of the total viability was observed to retain viability on the fifth day of observation or to lose complete viability on the seventh day of observation. Also, the regressive nature of the tolerance of higher algae to chromium, including logarithmic indicators based on statistical results, was analyzed during the research.

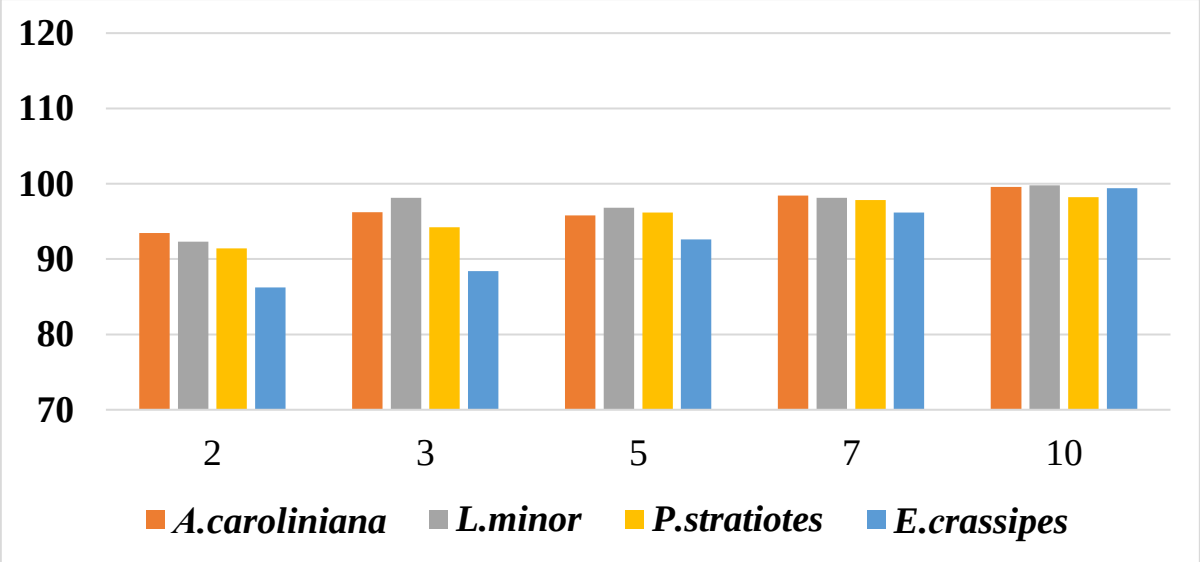

Figure 2. Chromium-tolerant of some higher algae found in the conditions of Uzbekistan (Control (artisan water of the enterprise))

According to the obtained results, it was noted that the indicators of the viability of high algae in artizan water, as mentioned in the laws, were formed in an inverse regression to each other.

In particular, the viability of the algae A. caroliniana when grown in chromium water for 7 days decreased to 6.32% in accordance with the reverse regression (A. caroliniana $y=-54.23\ln(x) + 84.391$, $R^2 = 0.9896$) character. it was noted that the viability index decreased by 13.29% compared to 100% viability on the second day of observation, and 6.53% decreased from 100% viability on the second day of observation in the correct regression.

On the 3rd day of observation, the inverse regression showed a 57.89% decrease in viability, while the forward regression showed a 3.76% decrease in viability on the

same day. Therefore, the loss of 6.53% viability index was restored to 2.77% by the third day of cultivation based on the correct regression, indicating that this tall algae has achieved some adaptation to stress conditions.

The seventh day of observation can be noted as proof of this. In particular, in the case of reverse regression, the loss of viability on the seventh day of observation, that is, the state of strong, irreversible necrosis or the state of complete nobelization of high plant cells, was 93.68% compared to the viability of the initial culture, while the index of viability lost in the case of correct regression (6.53 %) recovered to 4.96%, it was noted that the viability index was 98.43%.

It can be seen that the same indicators are recorded in all other higher algae. In particular, L. minor algae, which was recorded after A. caroliniana algae, showed partial activity (3.21% viability on the fifth day of observation) compared to P. stratiotes and E. crassipes algae in terms of chromium tolerance, but on the seventh day of observation, it was completely it was noted that it has undergone necrosis or has completely lost its viability.

CONCLUSION

When we observe the correct regressive development of this alga, it can be seen that the loss of viability was 7.69% on the first second day of cultivation, and 5.83% of the lost viability was recovered on the seventh day of cultivation.

These conditions in the regressive development of higher algae allow us to consider stress factors as adaptability.

In particular, the composition of artisanal water used for the daily needs of the tanning and processing enterprise creates a short-term stress state for the newly planted algae samples and makes them adapt to this environment. As in all Turkish organisms, adaptation to stress factors or adaptation in the organism against stress factors, including chemicals, physical parameters, in general, abiotic and biotic factors, or the emergence of mutant forms adapted to a new stress factor is one of the criteria of natural development and adaptation that is widespread in nature.

Based on this law, the concept of our further research work was developed. Therefore, the culture of Azolla caroliniana isolated from experimental variants that showed tolerance to chromium (+6) 3mg/l stress conditions (for seven days) served as the main object for our further studies.

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