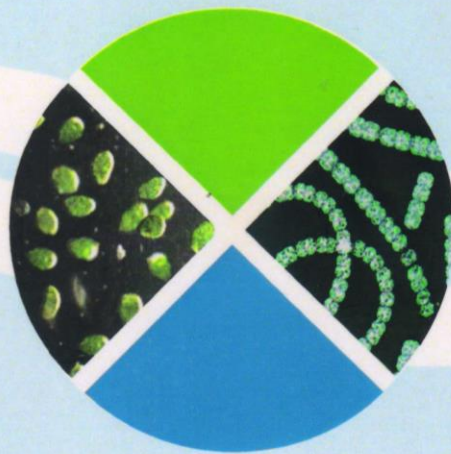Department of Hydrobiology
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Mass development of algae: biodiversity, ecology and management prospects

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Bioremediation of wastewater from heavy metals on the basis of consortium of aquatic plants and microalgae

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Today the pollution of aquatic environment has become a global problem. One of the source of pollution of aquatic ecosystems is byproducts of metallurgy, engineering and other fields of industry which contain a significant amount of polluting agents with various organic substances in composition like spirits, acids, surfactants and high concentrations of heavy metal ions such high concentration of Zn, Fe, Mn, Ca, Co, Cu, Cd, Pb, where the most toxic are Cd, Cu, Pb, Zn.

For accelerating of treatment and renewal processes of destroyed aquatic ecosystems it is necessary to use not only biological reserves of microbial cells, but also another biocenoses including organisms with various biochemical abilities. Natural associations have a significantly large set of these functions, because they are always include photosyntetics – the higher plants, eukaryotic algae and cyanobacteria.

The aim of current investigations is a the treatment of wastewater polluted by ions of heavy metals with the help of consortium of higher water plants and microalgae.

The objects of investigation: the natural strain of microalgae *Ankistrodesmus* sp. BI-1 and the higher water plant *Pistia stratiotes*.

For studying the treatment effect of consortia in wastewater containing various mineral substances the salts of heavy metals (Cd^{2+}, Cu^{2+}, Pb^{2+}, Zn^{2}) were added in 20 mg/l concentration and during mixing the prepared biomass of higher water plant *Pistia stratiotes* (10 pieces on 10 liters) and *Ankistrodesmus* sp.BI-1 microalgae ($2{,}5 \cdot 10^{7}$c/ml) were introduced.

Cultivation was carried out during 72 hours. Then biomass of higher water plant *Pistia stratiotes* and *Ankistrodesmus* sp.BI-1 microalgae strain were separated from solution by filtration method and centrifugation. After that the supernatant was analyzed for composition of biogenic elements and ions of investigated heavy metals.

For studying the ability of consortium to remediation we created a model of water polluted by heavy metals in laboratory conditions. Obtained wastewater was characterized by biochemical oxygen demand index (BOD_5) 62,2 mg/O_2/l, ammonium concentration was 13,7mg/l, nitrites - 0,4 mg/l, nitrates – 0,8 mg/l and phosphates – 4,46, the concentration of heavy metal ions (Cd^{2+}, Cu^{2+}, Pb^{2+}, Zn^{2}) made up 20 mg/l in counting on ions of each metal. After 72 hours of cultivation in wastewater of higher water plant and microalgae consortium the BOD was equal to 4,6 mg/O_2/l, cadmium ion concentration- 2,2 mg/l, copper- 3,62, lead- 2,0, zinc- 1,4 mg/l. In result of analysis the ammonium, nitrites, nitrates and phosphates were not detected. The high efficiency of treatment of model wastewater with the use of consortium was detected experimentally, while the level of treatment from biogenic compounds made up 98 %, from heavy metal ions 89–93%.

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