PROSPECTS FOR OBTAINING VALUABLE PRODUCTS FROM CYANOBACTERIA BIOMASS

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Relevance. The construction of a thread of reservoirs on the Dnieper River in the middle of the twentieth century allowed to solve a number of important issues related to navigation, supply of water and electric power to industrial facilities, etc. At the same time, the hydrological regime of the river ecosystem underwent radical changes, which significantly affected the species composition of the river. Heating of significant water masses and a high level of their eutrophication made the problem of the Dnieper's "blooming" actual due to the mass development of representatives of photosynthetic cyanobacteria. In the middle course of the Dnieper, the main species, which accounts for the bulk of the organic matter from the “blooming spots” is *Microcystis aeruginosa*. Subsequent dying of the biomass of cyanobacteria involves a significant part of oxygen dissolved in water in the destruction processes, which leads to its even greater shortage in heated water. This, in turn, provokes the fish and other hydrobionts to be killed. This problem is especially acute for the past 10 to 15 years.

Goals and objectives. The urgency of the surplus organic matter accumulation problem in the thread of reservoirs due to the “blooming” of the river makes the scientific community set the goal of developing methods for collecting and utilizing excess biomass. Among the priority tasks, it is necessary to provide a comprehensive study of the chemical composition of microorganisms causing “blooming” and the search for effective ways to extract the most valuable of them.

Methods. In the course of laboratory studies conducted on the basis of the Department of Biotechnology and Bioengineering of the Kremenchug National University, biological methods were used, in particular microscopy to determine the species composition of microorganisms from “blooming” spots, as well as physical-chemical methods: sedimentation, centrifugation, extraction, etc. Laboratory and industrial models of biogas reactors were also constructed, where the organic substance selected directly from “blooming” water bodies was used as a substrate.

Results. The literary sources and direct analysis of the chemical composition of bacterial biomass generally confirmed the feasibility and prospects of its economic use. The simplest way to recycle excess organic matter from aquatic ecosystems can be its biotechnological processing in order to obtain as a main product a gas mixture based on methane – the so-called biogas. Conducted at a temperature close to natural one in the summer months (+35 °C), laboratory experiments proved the possibility of obtaining volumes of biogas comparable to the volumes of organic substrate from which it is synthesized. The content of methane in the obtained samples was close to 75%, while the content of hydrogen sulphide was minimal, which is one of the advantages of this technology. Also, as a by-product, a spent substrate containing a high percentage of nutrients can be considered. In experiments with biotesting on seeds of rye and mustard, the phytostimulating effect of the preparation on the basis of the spent substrate in a dilution of 1:100 was noted. Concentrated biomass of cyanobacteria itself is the source of a number of valuable substances potentially having a fairly wide range of applications. So in a number of experiments, lipid extraction was performed, from which it is possible to extract hyaluronic acid, a valuable raw material for pharmacology and cosmetology. In the course of the destruction of the *Microcystis aeruginosa* cell walls, together with their internal contents, phycocyanins also enter the water – substances that are used in the preparations for HIV diagnostics and on the control of oncological diseases. These pigments can also be used as food colorings.

Conclusions. A quite effective biotechnology for the processing of excess organic matter from blooming reservoirs has been developed. It assumes the production of a biogas mixture based on methane as the final product, as well as an organo-mineral fertilizer from the substrate used in the methanogenesis process. Being primarily environmental, the proposed technology may be profitable in the conditions of small farms located in close proximity to the places of biomass accumulation. The development of other methods of utilization of cyanobacteria and other hydrobionts mentioned above requires additional studies aimed at finding the most efficient and economical ways of their industrial implementation.