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Adaptation of Microalgae to Environmental Factors

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Abstract: The algal flora of the treatment plant in Namangan city was studied. The study of the floristic composition of the bioponds of the treatment plant showed that species from the genus Chlamydomonas Ehr are dominant. The dominant species and strains of microalgae have been identified and the photosynthetic productivity of representatives of green, blue-green and euglena algae under intensive controlled conditions has been comparatively studied, and the ways of adaptation of individual species and strains to high light and temperature have been clarified.

Key words: microalgae, species, strain, algoflora, dominant, isolation, cultivation, nutrient medium, adaptation, illumination, temperature, biomass, photosynthetic productivity.

For a number of years, such traditional areas as the study of flora, biological-ecological and physiological-biochemical features of promising microalgae have remained relevant in algological science for a number of years. Researches the role in the life of reservoirs of various types and in soils. Recently, the study of the ecology of algae has also acquired great importance, which is associated with their use as phytoindicators of the state of the ecosystem.

Algae find wide practical application in agriculture, pharmacology, perfumery and other sectors of the national economy [1,2,3].

Algae contain a large amount of lipids, are a rich source of vitamins, and producers of valuable biologically active substances.

The applied value of microalgae lies in their industrial cultivation in order to obtain biomass and use them in agriculture, pharmacology, and perfumery.

The advantage of laboratory cultivation is the production of an environmentally friendly product, which is important in the current environmental situation.

Members of the genus Chlamydomonas Ehr. studied as a genetic object and partly in terms of physiological and biochemical parameters. In the conditions of Uzbekistan, chlamydomonas algae as an object of biotechnology and wastewater treatment have been little studied. (4,5,6).The purpose of this work is to study the algoflora of the Namangan sewage treatment plant and to identify the dominant species of the genus Chlamydomonas, and to comparatively study the

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photosynthetic productivity of representatives of green, blue-green and euglena algae under intensive controlled conditions and to find out ways of adaptation of individual species and strains to high light and temperature. The territory of the treatment plant in Namangan is 30 hectares. For an hour, 175 cubic meters enter the building. waste water. Consisting of household and industrial drains. Effluent entering the structure passes through metal traps, where large parts of the flow are separated. Then the drains pass through four sand filters measuring 15 meters in length and 1 meter in width. After filtration, the effluents enter the primary settling tanks consisting of eight sections with a diameter of 20 m and a depth of 2.7 m each.

After 1.5 hours of settling, the effluents enter the aeration tanks. The facility has 8 aeration tanks with a diameter of 20 meters and a depth of 3.5 meters, where biological wastewater treatment takes place. After the aerotank, wastewater is directed to bioponds, the total area of bioponds is 180 m2. The effluent that has undergone the above-described purification technology after chlorination is thrown into the Syrdarya River.

The algoflora of bioponds was studied during 2019-2022, 186 algological samples (phytoplankton and benthic) were collected and processed. Collection and processing of the material was carried out according to algological methods (4,5). For morphological study, a Carl Zeiss microscope was used.

Seasonal studies have shown that many species and strains develop rapidly in the summer, forming a "bloom" of ponds. The collected samples were identified to species. The following species are mainly found in summer: Chlorella vulgaris, Euglena gracilis G.A.Klebs, Ankistrodesmus acicularis (A. Braun) Korshikov, Scenedesmus quadricauda (Turpin) Brébisson, Oocystis lacustris Chod., Chlamydomonas patellaria WHITFORD, Chlamydomonas reinhardtii P.A.Dang., Chlamydomonas globosa SNOW , Chlamydomonas incerta PASCHER, Chlamydomonas oblonga R.A. Lewin, Navicula gracilis Ehrenberg, Navicula oblonga (Kützing) Kützing, Cymbella pediculus Kützing.

The study of the floristic composition of the bioponds of the treatment plant showed that the dominant species are from the genus Chlamydomonas Ehr.Of the dominant species of the genus Chlamydomonas Ehr. An algologically pure unstudied species of Chlamydomonas patellaria WHITFORD was isolated using the methods of Vladimirov and Semenenko (4,5,6). The study of literature data showed that these species were not found in the Republic of Uzbekistan. To introduce a new isolated species of Chlamydomonas patellaria WHITFORD into the culture, the optimal nutrient medium was selected based on the modified Sidorenko medium. In addition, it develops quite well in organic media.The strain Chlamydomonas patellaria UA-5-24 was grown on various nutrient media. The photo synthetic productivity of Chlamydomonas patellaria (by the number of cells) for 8 days of cultivation on Tamiya medium reached 97.0 million cells/ml, on Sidorenko medium up to 120 million. cells / ml., on a modified medium - 142 million cells / ml., in an organic medium with the addition of 3 microelements 95.0 million cells / ml. The results obtained show that the new isolated strain of Chlamydomonas patellaria UA-5-24 grows well on all the studied media. At the same time, the maximum increase in the number of cells is observed on the medium developed by us up to 142 million cells/ml, and the dry weight reached 7 g/l.s.b.The purpose of this work is to study the physiological properties and adaptation of representatives of various systematic groups of microalgae. The intensity of photosynthesis and respiration, the productivity of representatives of blue-green, green, red and euglena algae under intensive cultivation conditions were studied. Experiments have shown that wide temperature (18-35°C) and

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light conditions (25-200 W/m2 PAR) are favorable for all studied crops. The optimal mineral nutrient media are medium mineralized with the amount of the main components of 1-5 g/l. The exception is halotolerant strains of Dunaliella. salina Teod, and D. minula Lerche, which require an increased amount of salt. The growth of cultures in neutral pH media also simplifies their maintenance. Under favorable intensive conditions, adapted strains have shortened lag phases, the period of active growth (exponential phase) is characterized by the highest biomass growth rate, which is the result of active photosynthetic processes. The stationary phase of development is characterized by stable maintenance of biomass for several days. The intensity of photosynthesis at this stage is significantly reduced.Under favorable conditions, dark respiration can be at a low level; however, this period is mainly characterized by the activation of respiration compared to photosynthesis; there is an inverse correlation between these processes. Of great importance for the productivity of algae is the light resistance factor, because growth in high light conditions allows the use of radiation energy with high efficiency and is accompanied by a rapid accumulation of biomass in a short time. Pronounced light-resistant strains include Cyanidium caldarium. C-1, S. elongates, S-2, Chlamydomonas renhardtii Dang., 449 (growth under illumination of 200-300 W/m PAR).

In addition, a group of algae stands out, which easily adapt to increased

illumination: Chlorella vulgaris Beijer, UA -1-10 Chlamydomonas patellaria, Bracteacoccus minor (growth in illumination 100-150 W/mPAR). Among the studied algae, the productive strains are Chlamydomonas remhardtii. 449, Chlamydomonas patellaria, Chlorella vulgaris UA-10, C. caldarium, C-l, Nostoc calsicola, N-2 The growth of their biomass is 0.5-1.0 g/l of absolutely dry biomass per day.

Thus, we have comparatively studied the photosynthetic productivity of representatives of green, blue-green and euglena algae under intensive controlled conditions and found out the ways of adaptation of individual species and strains to high light and temperature.It has been established that the studied algae stably retain algological purity, do not require complex specific cultivators and large amounts of mineral salts, and are also characterized by high adaptive potentials.

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