BIOTECHNOLOGY OF WASTEWATER TREATMENT USING MACROALGAE IN THE FERGANA REGION.

Dadabayeva Ozodaxon Savriddin kizi
Trainee-researcher at the Institute of Microbiology
of the Academy of Science
https://doi.org/10.5281/zenodo.15803711

Abstract. This article presents information on the biotechnological basis and diluted comparative analysis of the biotechnological purification of water from higher algae of the enterprises of the Fergana region with Pistia (Pistia stratiotes L.) and Lemna minor L.

Keywords: Wastewater, Pistia stratiotes L., Lemna minor L., tap water, dissolved oxygen in water, biochemical consumption, macrophyte, biomass, nitrates, sulfates, tap water, useful nutrients, biotechnological purification of water.

Introduction

Today, environmental problems associated with the optimal use of world water resources, the prevention of pollution of water bodies with various wastes, and the increasing level of re-pollution of clean waters as a result of the increasing expansion of production are having an impact on the environment and public health. Therefore, water discharged from residential areas, industrial and agricultural enterprises into natural and artificial water bodies is becoming wastewater without direct treatment.

Due to the disruption of the ecological balance, scientific research is being conducted to purify water using biological methods and create opportunities for the reuse of purified water, to increase the productivity of fish in fishery farms, to study their feed rations, and to study the biomass of aquatic plants. The use of highly cost-effective methods of wastewater treatment by reducing fresh water consumption, the determination of the degree of purification of such waters using macrophyte plants rich in biologically active substances and their properties, the effective reuse of such waters in the national economy, the reproduction of high-yielding species of plants and their biomass, the use of the obtained biomass as additional feed for fish, and the increase in fish productivity are of great scientific and practical importance.

Research materials and methodology:

Water discharged into natural and artificial water bodies from residential areas, industrial and agricultural enterprises is becoming directly wastewater without treatment. In this regard, further improvement of effective wastewater treatment methods and the creation of a system for the effective use of such waters and its implementation in practice are becoming an urgent issue.

After our republic gained independence, certain achievements were made in the optimal use of wastewater resources, their protection and maintenance of water sources in a clean and hygienic state, and biological treatment of wastewater. In particular, methods and technologies for wastewater treatment have been improved to reduce the negative impact on the environment when circulating water that is polluted to various degrees and is unsuitable for drinking.

Due to the high content of harmful compounds in water polluted by waste, public health and disruption of the ecological balance, it is necessary to purify water using biological methods and create opportunities for reuse of purified water, increase fish productivity in fisheries and their feed ration. Scientific research is being conducted to study and study the biomass of aquatic plants. Reducing freshwater consumption, using highly cost-effective methods, determining the level of such water treatment, and studying the process of producing wastewater and the properties of macrophyte plants rich in biologically active substances. The effective reuse in the economy, the reproduction of nutritious higher plant species and obtaining biomass from them, the use of the obtained biomass as additional feed for fish and increasing fish productivity are of great scientific and practical importance. After our republic gained independence, certain achievements were made in the Fergana region in the field of efficient use of wastewater resources, its protection, keeping water sources clean and hygienic, and biological treatment of wastewater. In particular, in order to reduce the negative impact on the environment, methods and technologies for wastewater treatment are being improved. In the Strategy of Actions for the Further Development of the Republic of Uzbekistan, it is established "... further strengthening the country's food security". Based on these tasks, it established the physicochemical composition of wastewater from the cultivation and reproduction of higher aquatic plants (Pistia stratiotes L.) and small duckweed (Lemna minor L.), agricultural enterprises. Such a correlation was also noted in the control and experimental variants planted with pistia (Pistia stratiotes L.) and small duckweed (Lemna minor L.).

Research results

We consider the treatment of wastewater from poultry farms in the Fergana region using the algae Pistia (Pistia stratiotes L.).

In poultry farms, poultry are fed products with various chemical additives, artificial lighting, and artificial heating methods are used. The scientific significance of the research results is observed by planting the plant Pistia (Pistia stratiotes L.) in wastewater from poultry farms. The plant actively develops and produces a large amount of plant biomass, as well as the degree of purification from organomineral substances.

The growth and development of the plant Pistia (Pistia stratiotes L.) in wastewater and the degree of wastewater purification are explained by its scientific basis.

As a result of the study, dissolved oxygen in water increased by 95%, ammonia, nitrates decreased by 94-97%. As a result of biochemical treatment, water was purified, and the purification efficiency increased by 96%.

Pistia (Pistia stratiotes L.), Eichhornia (Eichhornia srassipes Solms. Poptederiatseae) and Azolla (Azolla sarolipiapa Willd., sem. Azollatseae) are perennial plants that grow on the surface of the water and are widespread in tropical and subtropical regions. Currently, these plants have been successfully introduced to the conditions of Uzbekistan.

According to the results of our hydrochemical and microbiological studies, various wastewaters can be completely biologically purified in 12-15 days. During this time, the number of saprophytic microorganisms increases by up to a thousand times, and E. coli bacteria do not appear at all after three to four days. The amount of microflora in the water decreases sharply, microscopic fungi that are pathogenic for plants and animals disappear. The physical and chemical characteristics of water improve, that is, the degree of oxidation of water decreases, nitrogen and phosphorus ions in water are almost completely absorbed by

plants, the amount of dissolved oxygen in water increases, wastewater becomes clearer and, if used, its odor disappears.

Water purified with the help of Pistia, Ryaska can be used for technical purposes, namely, for washing livestock, watering agricultural crops, soaking hemp stalks, or discharged into fish ponds and open water bodies.

The results of hydrochemical and microbiological studies show that various wastewaters can be completely biologically purified in 12-15 days.

The creation of environmentally safe, economically affordable and effective methods of biological wastewater treatment is one of the important factors in protecting water resources. There are various methods of wastewater treatment. Currently, biological methods of wastewater treatment, i.e., using high water and wetland plants, are recommended.

During the study, comparative analyses were conducted on diluted options in addition to wastewater. As a result of the studies, it was found that if the amount of suspended solids in water diluted with sewage and tap water was 79.5 mg/l (1: 1), then the indicator of seeds in water planted with pistachio (Pistia stratiotes l.) was -26.2 mg/l, and in water planted with small duckweed, the indicator decreased to -15.8 mg/l.

Biotechnological basis of purification of higher algae with Pistia (Pistia stratiotes L.) and Lemna minor L. After determining the composition of wastewater, 100 grams of Pistia (Pistia stratiotes L.) were planted per square meter of water in each aquarium, and its growth, development and reproduction were monitored for 8 days. Due to the absorption of mineral substances, its biomass per square meter of water surface was -800. In a 3:1 ratio, -715 and in a 1:1 ratio, 570 grams. The amount of dissolved oxygen in the water increased to 7.8 mg/l in the first variant; 8.9 mg/l in the second variant; 9.2 mg/l in the third variant. The biochemical consumption of oxygen was 19.8; 15.3; and 10.5; mgO2 /l, the oxidation level decreased to 27.5; 23.6; and 20.7; mgO2/l, respectively. Ammonia, nitrites, nitrates contained in wastewater were completely absorbed by the plant. Chlorides were also found to decrease to 80.4; 69.4; and 62.3; mg/l, respectively; sulfates to 77.8; 58.3; and 41.4; mg/l.

Biological treatment methods involve the use of special bacteria in soil and water for the decomposition (oxidation) of organics. For these purposes, special aerobic and anaerobic microorganisms are used. Bacteria clean drains during their life, then they are discharged into the ground.

Dried duckweed contains 30% protein in natural conditions, and up to 45% when grown in special conditions. In terms of the content of amino acids (arginine, lysine), duckweed is higher than corn. Shallow ponds, empty lakes, river tributaries, artificial and natural ponds can be used to grow duckweed. The crop is harvested twice a week. It can also be dried and stored. It forms a thick layer on the water, thereby preventing the development of harmful weeds. To obtain high biomass, mineral or cultural fertilizers are added to the water in moderation. To achieve high results, it is necessary to monitor it and harvest the crop on time. These plants can be fed to animals, poultry and fish both in a wet and dried state.

Discussion

Biochemical treatment of wastewater in farms and poultry farms of the Fergana region is carried out in air filters (biofilters), aerotanks and biological ponds. Biofilters are reinforced concrete or brick tanks filled with filter material, which are placed on a perforated bottom and are watered with wastewater. Slag, gravel, plastic, etc. are used to load biofilters. Wastewater treatment in biofilters is carried out under the influence of microorganisms that

live on the surface of the load and form a biological film. When the waste liquid comes into contact with this film, microorganisms release organic substances from the water, as a result of which the wastewater is purified. Aerotanks are reinforced concrete tanks with a length of 30-100 m or more, a width of 3-10 m and a depth of 3-5 m. Wastewater treatment in aerotanks occurs due to the accumulation of microorganisms (activated sludge). Air and nutrients are supplied to the aerotanks for their normal life. The advantages of the biological treatment method are the ability to remove various organic compounds from wastewater, including toxic substances, the simplicity of the equipment design and the relative cheapness. The disadvantages include high capital costs, the need for strict adherence to the technological treatment regime, the toxic effect of some organic compounds on microorganisms, and the need to dilute wastewater with high concentrations of compounds.

The issues of wastewater treatment (wastewater from industrial enterprises, household enterprises and residential areas) and stormwater are an important part of nature protection. Sludge, colloidal and dissolved substances contained in wastewater are precipitated in clarifiers, and harmful substances are neutralized using biological and biotechnological methods. Water from enterprises is treated at special treatment facilities. There are also physicochemical, thermal and other methods of water treatment. However, the biotechnological method is considered the most harmless and natural method.

Conclusion

In short, biological methods are widely used for sewage treatment. The treatment of industrial wastewater uses more complex plants than the treatment of domestic wastewater, and similar methods are used. For this purpose, special microorganisms are used that break down complex organic compounds into simpler elements (carbon dioxide, water, and mineral deposits) during their life processes. Such treatment can reduce the concentration of organic pollutants to acceptable levels.

References:

1. T.Abdullaev. “Design of water intake structures from open water sources”, TAQI 1998.
2. T.Abdullaev “Design of urban drinking water” TAQI 2000.
3. Assoc. Prof. Zokirov U.T. Assoc. Prof. Buriev e.S. “Wastewater discharge and treatment”“Wastewater treatment” Tashkent 2003.
4. U.T.Zokirov, e.S.Buriev “Fundamentals of water supply and wastewater discharge and treatment” “Bilim” publishing house 2012.
5. QMQ 2.04.03.97. “Wastewater discharge and treatment”, “External networks and structures” Tashkent., 1997 p. 148.
6. QMQ 2.04.02.97. “Water supply”, “External networks and structures” Tashkent., 1997 148 pages.
7. QMQ 02.04.01.98. “Internal water supply and sewage of buildings”, Tashkent., 1998.
8. Yakubov K.A., Mirzaev A.B., and Boriev e.S. “Organization and use of water supply and sewage systems” Textbook. Science and Technology Printing House Tashkent, 2016 208 pages.
9. UzDSt 950-2011 State standard of Uzbekistan Hygienic requirements and quality control of drinking water

10. UzDSt 951-2011 State standard of Uzbekistan Sources of centralized household and drinking water supply hygienic, technical requirements and selection rules Tashkent 2011
11. Mirzaev A.B., Akhmedova F.I. Program and methodological manual for passing production practice. Samarkand, 2018.
12. Kholov F.M., Nurmatov P. Program and methodological manual for passing familiarization practice. Samarkand, 2018.
www.arktika.ru
www.veza.ru
www.avok.ru
uz.m.wikipedia.org.