International Journal of Genetic Engineering 2024, 12(6): 116-119
DOI: 10.5923/j.ijge.20241206.09

The Modern State of Algoflora of Artificial Water Bodies

Shokhsanam Kamalova

Doctoral Student of Jizzakh State Pedagogical University, Uzbekistan

Abstract The article analyses the existing state of algoflora in artificial water bodies within the Zamin district of the Jizzakh region, Uzbekistan, pointing out the role of algae as ecological indicators of water purity and as a part of the aquatic ecosystem. The paper considers the impact of human activities on the diversity of algoflora and water quality according to the classification of algae by their distribution in saprobic zones. The present study applies algological and hydrobiological methods for the identification of 522 algal species, out of which 134 are indicator-saprobic algae, to determine the water quality levels of the Sangzor River. Results have shown that there is an increase in water pollution downstream with changes in the saprobic index: from 1.26 in the upstream areas—classified as "clean"—to 1.70 in the downstream areas—"satisfactory." Seasonal changes in algal biomass and diversity were found depending on environmental and anthropogenic factors. The study has demonstrated the increased need for improved water resource management and community awareness to preserve aquatic ecosystems and public health.

Keywords Algoflora, Water quality, Saprobic zones, Sangzor River, Anthropogenic factors, Aquatic ecosystem

1. Introduction

Water is a basic resource, sustaining life and underpinning ecosystems, that faces increasing pressures from anthropogenic activities and climatic changes. The preservation of water quality and the protection of aquatic ecosystems have turned into imperative global challenges. In this respect, algoflora, photosynthetic organisms that form the base of most aquatic food chains, play very important roles in maintaining ecological balance and as indicators of water purity. Knowledge of the composition, distribution, and ecological significance of algoflora is very important for effective management of water resources.

The artificial water bodies of the Zamin district of the Jizzakh region, Uzbekistan, are one of the great ecological and economic riches. Nevertheless, they suffer from the impacts of pollution, waste disposal, and other kinds of human interferences, which seriously damage their quality and biodiversity. Being saprobic, algae reflect the changes in water quality, hence one of the major indicators of health in these ecosystems. The state of algoflora study in such water bodies provides a ground to monitor environmental changes, predict sources of pollution, and design methodologies for ecological restoration. This article analyzes the state of knowledge about the algoflora of the Zamin District with an emphasis on species diversity and distribution in saprobic zones. Also, the article researches the dynamics of water quality and algal biomass under human activity influence and seasonal changes. All this, with due regard for all the above factors, will take part in the general development of knowledge on freshwater ecosystems and give further support to protection of water resources in Uzbekistan.

Received: Nov. 2, 2024; Accepted: Nov. 22, 2024; Published: Dec. 9, 2024
Published online at http://journal.sapub.org/ijge

2. Materials and Methods

The algoflora of the artificial water bodies was studied in the Zamin district of the Jizzakh region, with the main emphasis on the study area being the Sangzor River. The sampling was seasonal to account for changes in species composition and biomass due to changes in environmental and anthropogenic conditions.

The fieldwork entails collection of algal samples from upstream, midstream, and downstream locations with the aim of assessing pollution gradients and other ecological factors. Samples were collected using plankton nets and sediment samplers; water samples for physicochemical analysis were also collected to determine factors such as pH, temperature, dissolved oxygen, and nutrient concentrations.

Identification of the algal species in the laboratory was made using microscopic examination and taxonomic keys. Special emphasis was given to the determination of indicator -saprobic algae for the water quality assessment. The estimation of algal biomass included measurements of chlorophyll-a concentration and dry weight analyses. Physiological and biochemical processes, such as photosynthetic activity, were also studied to understand the role of algae in the aquatic ecosystem.

The saprobic index was calculated from the distribution of the saprobic algae in order to classify the water quality into definite zones and categories according to the saprobic system proposed by A.S. Konstantinov. Statistical methods

such as ANOVA and regression analysis were used in analyzing the correlations between the environmental factors and distribution of algae, and also in assessing the spatial and seasonal variations in algal biomass and diversity. The standard algological and hydrobiological methods were strictly followed to make the results accurate and reliable. All sampling and analysis procedures were performed with minimum environmental impact to ensure that the integrity of the aquatic ecosystems under investigation was maintained.

3. Results

Currently, the protection of water resources, ensuring the sustainability of water bodies and especially the preservation of the natural flora of water bodies, their use as a strategic object is one of the pressing problems of our time.

Law of the Republic of Uzbekistan No. 409 of September 21, 2016 "On the Protection and Use of Flora", Cabinet of Ministers No. 82 of March 19, 2013 "Water Use and Water Demand in the Republic of Uzbekistan Decision on the order of property", the Decree of the President of the Republic of Uzbekistan dated February 7, 2017 "On the action strategy for the development of Uzbekistan in 2017-2021" aims to implement the tasks defined in other regulatory and legal documents related to this activity.

Modern algological research in the world requires the determination of the state of algoflora in the water bodies of large areas with strong influence of anthropogenic factors and different water sources, as well as an assessment of the level of their transformation. In this case, the reservoirs are of special importance among the water bodies, not only because of the richness of algoflora species, but also because of the preservation of all ecological groups that have a special place in the comparative analysis of the algoflora of the water bodies.

In this regard, one of the problems on the agenda is to assess the modern state of algoflora of water bodies, especially artificial water bodies related to human activities, and to determine the prospects for implementation. The composition of unique algoflora in the artificial water bodies of the fishing farm of the Zafarabad district of Qanoat, Sh. Rashidov district of the Jizzakh region of our republic was included in the research object.

Algae are the oldest photosynthetic organisms on Earth. They are the creators of the oxygen atmosphere, and they participate in the circulation of substances. Macrophytes are an environmental component of ecosystems, providing habitat, spawning, nutrition, and shelter for many aquatic organisms, including commercial species.

The importance of algae is not only from the point of view of ecology, but also from the point of view of phylogeny. All major groups of animals and plants are believed to have originated in the sea, and representatives of many ancient evolutionary lines can still be found in the sea today. Seaweeds were the ancestors of plants that lived on land. If we want to understand the diversity and phylogeny of the plant world, then the study of algae is very important.

Algae are increasingly used in various sectors of the economy - as food products, as feed concentrates, for the production of chemical compounds, including biologically active substances, and medical preparations. Large kelp shells provide shelter and breeding grounds for many coastal animals and small algae.

Man has learned to use algae for his needs. The chemical composition of algae is very similar to human blood plasma, therefore, algae has the ability to purify and balance the blood, and to increase the alkalinity of the blood while keeping the acidity in the norm. Algae contains 10 times more calcium than milk and 8 times more than meat. Algae contain lignans (phytohormones) that prevent the development of cancer and have antioxidant properties.

Kelp (kelp) is brown algae that are often found on ocean shores. It is often used in traditional Asian dishes. However, the beneficial effects of kelp can also be obtained from additional nutrients.

This type of red algae can be bought whole or in the form of flakes. Seaweed in the form of cereal is used in salads, vegetable side dishes and soups.

Some types of algae act as indicators. Depending on the type of algae, the level of pollution and purity of water is determined. Some of the indicator-saprobic species of algae live in dirty water, and some live only in clean water. It is possible to determine the indicator of water purity depending on their indicator properties in relation to organic substances in water.

So, it is possible to determine the level of pollution of the water basin of this area depending on the distribution of indicator - saprobic algae. Depending on the degree of pollution of water bodies or their places with organic substances, they are divided into poly – "meso" - oligosaprobic zones (A.S. Konstantinov, 1986.).

In the polysaprobic zone, that is, at the point of discharge of wastewater, organic compounds that pollute water are decomposed under aerobic conditions. In this zone, there is little dissolved oxygen in the water, hydrogen sulfide and carbon dioxide are found in the water that have not yet decomposed proteins, and biochemical processes continue. Algae species found in this zone are very few, but their biomass is very high. Examples of algae characteristic of this zone are Chlorella pyrenoidosa Chick., Ch. vulgaris Beyer.

In the mesosaprobic zone, the level of water pollution is relatively low, where proteins are completely decomposed, hydrogen sulfide and carbon dioxide are found in small quantities. Partially dissolved oxygen is found in water, and nitrogen compounds that have not yet been completely decomposed (ammonia, amino and amido acids) are found. The mesosaprobe zone is divided into a and b - mesosaprobe subzones.

Ammonia, amino and amido acids are found in alpha mesosaprobe subzone. However, in this small zone there is dissolved oxygen in the water. Decomposition of organic matter is carried out under aerobic conditions, mainly with the help of bacteria. Among the algae characteristic of this small zone - Navicula cryptocephala Kuetz., N. cryptocephala

var. veneta (Kuetz.) Grun., Nitzschia acuta Hantzsch.

Beta - mesosaprobic zone is characterized by the presence of ammonia and its derivatives (nitric acids). In this small zone, amino acids are not completely found, hydrogen sulfide is found in small quantities, the amount of dissolved oxygen in water is high, and mineralization takes place due to the complete decomposition of organic substances. In this zone, there are many types of algae, but their number and biomass are less than in the previous sub-zone. Among the algae characteristic of this small zone - Melosira varians Ag., Stephanodiscus dubius (Fricke.) Hust such types can be cited as an example.

In the oligosaprobic zone, there is no hydrogen sulfide, the amount of carbon dioxide is low, the saturation level of dissolved oxygen in water is close to the norm, there are almost no decomposed organic substances in the water, because they are completely absorbed by algae. This zone is characterized by the abundance and diversity of algae species, but their number and biomass are low. Among the algae characteristic of this zone - Cyclotella bodanica Eulenst., C. comta (Ehr.) Kuetz., Fragilaria bicapitata A. Mayer., Gomphonema angustatum (Kuetz.) Rabenh.

If the atmosphere and water are not kept clean, the soil may be eroded, the species of plants and animals may decrease, and as a result, the national economy may be damaged, and people's health may be negatively affected.

This condition has a negative impact on the development of aquatic animals and algae. In order to study this problem, we studied and analyzed the algae flora of the Sangzor River.

4. Discussion

Taking into account the number of species in the algoflora, systematizing, studying the geography of the area, how algae live in this water body, what physiological and biochemical processes take place in their bodies under the influence of various environmental factors, and how they can be used as food for the animal world in water bodies. Not only that, but he conducted scientific research with the aim of studying issues such as how much oxygen they supply, whether they have harmful aspects for the animal world or not.

It is known that algae are important as primary forming members in the ecosystem of water bodies. Their growth and development is the food of the animal world in water bodies, a source of oxygen for their breathing, and is important in the transition of substances from one type to another in the ecosystem. Some types of algae have the ability to purify water from excess biogenic and mineral elements, that is, they act as an indicator. Depending on the type of algae, the degree of pollution and purity of water is determined. Some indicator saprobic species of algae live in dirty water, and some live only in clean water. It is possible to determine the indicator of water purity depending on their indicator properties in relation to organic substances in water.

As a result of studies, it was found that there are 522 species and species in the Sangzor river, 134 of which are indicator algae - saprobic algae. The indicator - saprobic algae identified in the Sangzor River is 25.67% of the total number of species and species identified in the river. We studied the compositional and quantitative analysis of indicator-saprobic algae of the Sangzor river, and on this basis we determined the classes and discharges according to the saprobic index of water, the saprobic zone of water, and the quality of water.

The conducted studies showed that the level of water pollution increases (1.2 - 1.7) and the number of algae species decreases (282 - 188) from the upstream to the downstream of the river. The conducted studies showed that the level of water pollution increases (1.2 - 1.7) and the number of algae species decreases (282 - 188) from the upstream to the downstream of the river. The saprobic index (Si) in the upper part of the river is equal to 1.26, in the middle part it is 1.42, these parts of the river water enter the saprobic zone a - o and are equal to class 2 "clean" water, "cleaner" discharge 2b. The saprobicity index (Si) in its downstream reaches 1.70, the water enters the ß' - mesosaprobic zone, the quality of the water falls into the 3a "sufficiently clean" water discharge of the 3rd class "satisfactory water" quality. As the river descends, the level of water pollution increases. The average purity of the water of the Sangzor River is equal to the 2b "cleaner" discharge of the 2 class "clean" water quality, and it belongs to the α - oligosaprobic zone. The average sum of saprobability index (Si) along the stream is 1.46.

According to the results of the received information, it was found that this river, which is the main source of drinking water for the residents of Bakhmal, Gallaorol, and Jizzakh districts, is losing its purity.

Another factor that affects the Sangzor River is the movement of vehicles that come to get construction materials from the river with the arrival of spring. In addition, it was observed that the residents threw all kinds of garbage, water used in the communal economy, and waste water into the river. These situations also lead to water pollution.

There is no doubt that this situation affects not only the pollution of Sangzor river water, but also the pollution of Aydarkol water, the development of algae and animal world in this water basin, because the water of Sangzor river flows to Aydarkol through Tuzkon lake.

The amount and biomass of algae are also affected by seasonal changes that occur with changes in the environmental conditions in the reservoir, the algae of Bacillariophyta, Cyanophyta, Chlorophyta, and some heat-loving Dinophyta and Euglenophyta divisions are found in the reservoir. It is stated that it developed dominantly at the end of the spring season, summer and the beginning of the autumn season. In the development of algoflora, the maximum level of their quantity and biomass corresponded to the summer season, then to spring and autumn, and the minimum to the winter season relationship with nutrient depletion and other environmental factors is stated.

Due to the sewage and various garbage thrown into the river is not only the quality of water changes, but it can also create the basis for the emergence of various diseases.

5. Conclusions

The study of the algoflora in artificial water bodies of the Zamin district in the Jizzakh region underscores the ecological and environmental significance of algae as indicators of water quality and contributors to aquatic ecosystems. Findings highlight the detrimental impact of anthropogenic activities, such as improper waste disposal and construction material extraction, on the Sangzor River and its associated water bodies. The results demonstrate a decline in water quality downstream, as evidenced by changes in saprobic indices and reductions in algal diversity and biomass. Seasonal variations further influence the algoflora's composition and productivity.

These insights emphasize the urgent need for comprehensive water management strategies and public awareness campaigns to mitigate pollution and preserve water resources. Sustaining the ecological health of water bodies is not only critical for biodiversity but also essential for the well-being of local communities that rely on these resources for drinking water and other needs. This study serves as a call to action for policymakers, researchers, and the general public to prioritize the protection and sustainable use of aquatic ecosystems.

REFERENCES

[1] Ismatova, Z. A. (2011). History of the study of water bodies of Central Asia. *Bulletin of the National University of Uzbekistan. Specialized VIP*, 215–216.

[2] Ismatova, Z. A. (2018). Influence of environmental factors on the distribution and development of algae in the Sangzar River. In *Study of various areas of modern science* (pp. 25–29). Proceedings of the XXXVI International Scientific and Practical Conference, Moscow.

[3] Ismatova, Z. A., & Kamolova, S. N. (2023). Distribution and importance of algae in the geographical environment. *Journal of Geography and Natural Resources*, *3*(2), 8–12.

[4] Ismatova, Z. A. (n.d.). Development of the algae flora of the middle Sangzor River under the influence of environmental factors. *Journal of Geography and Natural Resources*. https://doi.org/10.37547/jgnr-01-03.

[5] Ismatova, Z. A. (2020). Floristic and systematic analysis of the composition of algoflora of the Sangzar River. *International Journal of Advanced Science and Technology*, *29*(8), 3449–3453.

[6] Ismatova, Z. A. (2018). Systematic analysis of indicator saprobic species of algae of the Sangzar River. In *The Tenth European Conference on Biology and Medical Sciences*. *European Science Review* (No. 3–4, p. 39–42). Vienna.

Copyright © 2024 The Author(s). Published by Scientific & Academic Publishing
This work is licensed under the Creative Commons Attribution International License (CC BY). http://creativecommons.org/licenses/by/4.0/