Annals of R.S.C.B., ISSN: 1583-6258, Vol. 25, Issue 1, 2021, Pages. 6175 - 6185
Received 15 December 2020; Accepted 05 January 2021.

Use of Pistia Stratiotes (Araceae) in Water Quality Management in Khorezm Region (Uzbekistan)

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Abstract: In this article there is described about Khorezm region conditions Pistia water cabbage **(**Pistia stratiotes**)**scientific and practical significance and methods of plant biology, reproduction in biological pools and their use in biological treatment of waste water. The results of the study are mentioned. Research work was carried out In flowing water of the effluent from the Khiva Carpetplant in Khiva, based on the cultivation of the pistiya plant. When studying the physicochemical composition of wastewater in the mouth, the temperature of the experimental water rose from 27.50C to 33.80C, the water (Ph) medium increased from acidic to alkaline (6.8-7.6), the color changed from reddish-yellow to colorless, the odor disappeared. , decreased amount of suspended solids (107.5-72.5 mg / l), increased amount of oxygen (1.4-12.3 mg / l), decreased amount of KBS5 (123.5-28.7 mg / l), During the oxidation process, the amount of O2 decreased from 118.4 mg / l to 28.9 mg / l and the amount of ammonia to 9.0-1.8 mg / l, as well as the loss of nitrites, nitrates and sulfates 121.0-67.0 mg / l, chlorides 113.0-54.8 mg / l, phosphates 8.3-1.4 mg / land it was determined that this water could be reused.

Keywords: pistiya, biological method, biological pool, waste water, biomass allocation, growth analysis, population ecology

Introduction

Pistiastratiotes Linnaeus (Araceae) (water lettuce) is a free floatingmacrophyte capable of rapid vegetative propagation (Täckholm 1974). The morphological structure of P. stratiotes has caused it to be one of the most notorious weeds. Pistiastratioteswere listed as an invasive species in the Global Invasive Species Database (GISD)2018). It has a widespread distribution throughout tropical and subtropical regions, but it is absent in Antarctica (Chapman et al.2017). Pistiastratiotes is one of the worst weeds in the world (Holm et al.1977) and adversely aff ects the environment and biodiversity due to its capacity to form dense mats capable of blocking navigation channels, obstructing fishing and boat transport, impeding water flow in irrigation and flood control canals, and disrupting hydropower generation, in addition to creating a health hazard by sheltering disease -carrying insects and snails (Adebayo et al. 2011). However, P. stratiotes has been shown to have major potential for the management of water quality due to its ability to accumulate heavy metals from wastewater (Galal and Farahat2015; Galal et al.2018).Pistiastratioteshas a pan-tropical and subtropical distribution. Pistiastratiotes is widespread throughout Africa, where the plant was first recorded in South Africa in 1865 from KwaZulu-Natal (Hill, 2003). In North Africa, P. stratioteswas first recorded on a small multipurpose impoundment near the town of Fez in Morocco in 2012 (Hill, 2013). In Asia, P. stratiotes has a wide distribution and is recorded as invasive (CABI, 2016). The plant was recorded in the Philippines as early as 1925, floating in abundance in shallow waters (Merrill, 1925; Waterhouse, 1997).

Pista **(**Pistia stratiotes**)** Studies on the adaptation of plants to different climatic conditions of Uzbekistan, biology and ecology, importance in animal husbandry and fisheries, the role of pistachios in the bioecological treatment of industrial wastewater and the effectiveness of reproduction (Shoyakubov 1981; 1982; 1998, Buriev, 1980, Haydarova, 1991, Jumaniyazova, 1994) , Khasanov, 1995, Qutliev, 1989, Hayitov, 2001) and others. Khorezm region has a sharply continental complex climate, the level of salinity is very high. The main part of agricultural crops is irrigated. Therefore, the annual water consumption of the region is very high. At the same time, wastewater from communal and agricultural enterprises is added to the irrigation water through concrete ditches and pipes. This has a negative impact on the ecological environment of the region.Creating opportunities for biological treatment and reuse of water is one of the most important issues today.

Materials and Methods

2.1 Study area

Pistia stratiotes Our work on Linnaeus (Araceae) breeding and water purification research in Urgench and Khiva, Khorezm region was carried out in the wastewater of industrial and domestic enterprises. Figure 1.

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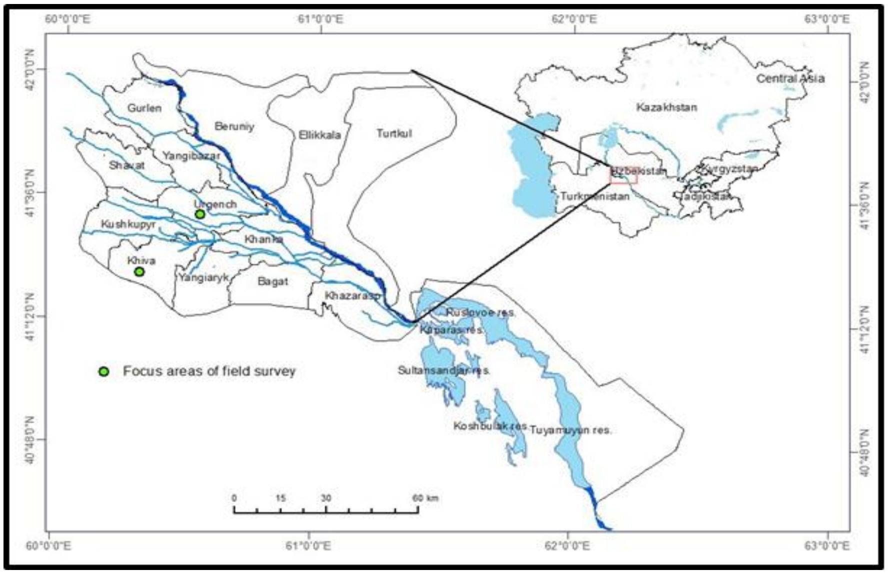

Fig.1. Map area of field survey (Urgench district, tugai forest Cholish)

The area is a lowland plant located in the NW part of Uzbekistan, along the lower reaches of the Amu darya river, between 600C-610C longitude and 410C -420C latitude, at 113-138 m above sea level. The climate is extremely continental, with an average annual precipitation of 80-90 mm. Average temperature in January is -50C, in July + 300C. Meadow, meadow marshly, marsh-sandy an typical alkali soils prevailThe climate of the oasis is greatly influenced by the deserts of Kyzylkum and Karakum (Abdullaevet al., 2019;Abdullaev**,** et al., 2020).

2.2 Plant biomass

The plant materials from each square were separated into leaves, stem-bases, reproductive structures, stolons and roots. Afterwards, the dry weight was estimated after oven drying at 85 ° C until constant weight. All biomass measures were determined as grams of dry matter per square meter (g DM m2). Total biomass (g DM m2) was calculated and divided by the total density (individual m2) to give the average dry weight of the individual (g DM individual1)The proportional biomass allocation was calculated as the biomass of a specific organ divided by the total biomass (Bazzaz & Grace 1997).

2.3 Water sampling and analysis

Physicochemical changes in wastewater during the study, ie in determining the composition of wastewater before and after sowing of higher aquatic plants (pistachios) Lure (1984), Strogonov (1980) methods, as well as geobotanical observation and biochemical methods. Each month, three

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water samples were collected near the sampling quadrats at each sampling site using plastic bottles. These samples, taken between 12 noon and 1 PM, were collected as integrated composite samples from the water surface down to 50 cm. The water temperature and dissolved oxygen were measured immediately in the fi eld using a thermometer and oxygen meter, respectively; the electric conductivity (EC) was determined using an electric conductivity meter; and the pH values were determined using a pH meter.APHA (1998).The smell of the water was determined by scoring points. The amount of dissolved oxygen in water was determined by the Winkler method (Laytinen & Harris, 1979). The biochemical consumption of oxygen (K B S) was studied on the basis of the dilution method. The amount of ammonia in wastewater is determined using Ness solution, nitrites Grissa reagent, nitrates sulfophenol reagent, chlorides 10% potassium chromium, sulfates 5% barium chloride solution. The degree of oxidation of chemicals in wastewater was determined by the permanganate method. The yield was determined by weighing the weight of the pistachio planted in the water.

Scientific name: Pistiastratiotes L.

Taxonomic position: Tracheophyta; Liliopsida; Arales; Araceae.

Common names: English: water lettuce, tropical duckweed, Nile cabbage; German: Muschelblume, Wassersalat; French: laitue d'eau, pistie; Spanish: lechuguilla de agua, lechuguita de agua, repollo de agua, Dutch: watersla, Mosselplant, Uzbek: water cabbage.

Plant type: Perennial floating aquatic macrophyte.

Uses and benefits

Water management, storage and purification have always been a topical concern. Water sources and reservoirs are contaminated primarily as a result of untreated or incomplete treatment of wastewater by businesses, cities and agriculture.. As a result of the expansion of cities, the active development of manufacturing enterprises and agriculture, they require large amounts of water, which in turn increases the amount of treated (polluted) water. Such waters contain a lot of harmful substances for human health, which makes it difficult to use for human consumption, while polluting the environment. Unfortunately, the amount of this wastewater is increasing year by year

One of the most important directions in the protection of water resources is the creation of cost-effective technologies and the creation of environmentally safe and cost-effective methods of biological treatment of various wastewater. The biofiltering properties were strong in the biological treatment of wastewaterconditioned pistachio (pistia stratiotes), ryaska (lemna minor), eichorniya

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(Eichorniya), azolla (Azolla microphylla) such as high aquatic plants.

The following results can be achieved in the process of biological treatment of wastewater:

- Sewage is cleaned of biogenic salts, ammonia, nitrite, nitrate, sulfates, chlorides, oil residues are reduced. As a result of photosynthesis, the amount of oxygen in the water increases several times. The wastewater is cleaned of pathogenic bacteria.
- The suspended solids in the water are retained and assimilated and purified. The amount of water-insoluble substances is reduced.
- During the cultivation of plants such as pistachios, ryaska, eucalyptus and azolla in wastewater, food and space (conditions for laying and reproduction of eggs) are created for fish and other aquatic animals.
- The main areas of animal husbandry are fisheries, poultry, pigs and furs, where biomass of plants such as pistachio, ryaska, eucalyptus and azolla, which are the main food units, can be used.
- The treated wastewater will provide an opportunity to irrigate agricultural crops (cotton, wheat, rice) and get high yields, as well as save water used in agriculture.

As a result of many years of research conducted by world and Uzbek scientists, agricultural enterprises (cattle fattening complexes, poultry) and industrial enterprises (hemp processing, mineral fertilizer production, biochemistry, oil and gas enterprises, silkworm enterprises, textile industry) and utilities - High aquatic plants, pistachios, which use household wastewater from organic-mineral substances, petroleum products and pathogenic microorganisms. ryaska, a new effective biotechnology of biological treatment using eucalyptus and azole has been developed (Shoyoqubov R.Sh.1993.).

In the conditions of Khorezm region, scientific research is being conducted on the use of high aquatic plants in wastewater treatment.Khorezm region has a sharply continental complex climate, the level of salinity is very high. This poses challenges in various areas of agriculture and animal husbandry. The main part of agricultural crops is irrigated. Therefore, the annual water consumption of the region is very high. At the same time, wastewater from communal and agricultural enterprises is added to fresh water through concrete ditches and pipes. This has a negative impact on the ecological environment of the region. Wastewater treatment should be carried out in simple, inexpensive, convenient and environmentally friendly biological methods.

It belongs to the group of high aquatic plants in the regional conditions Scientists of the Khorezm Mamun Academy are carrying out scientific and

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practical work for the biological treatment of wastewater under the influence of pistachios, eucalyptus and azole.In Uzbekistan, pistachios are not found naturally.The first acclimatization work was carried out by scientists of the Research Institute of Botany and Microbiology of the Academy of Sciences of Uzbekistan. Climate change of pistachio plant in Khorezm region and beyond use of municipal and agricultural wastewater for biological treatment experiments are being carried out for the purpose.

Figure 1. A pistachio plant grown in biological pools

Reproduction methods

It is known that the growth of aquatic plants depends not only on the characteristics of the nutrient medium, the composition and type of plant, but also on the primary density of the seedlings planted (Shoyakubov, 1993). For example, the primary seedling density at which pistachios are planted is 1-3 per 1 m2 of water surface (preferably with a water depth of 0.5-1 m) depending on the concentration of nutrient media and wastewater, and in some cases 5 kg of wet biomass. Pistachio grows well in pigweed complexes and poultry factories in wastewater (when wastewater is mixed with 50% tap or stream water). Up to 1400 g of wet biomass can be obtained from 1 m2 of water in a few days(Strogonov & Buzinova, 1980).The best of the nutrient media is a nutrient medium containing 4 g of manure per 1 liter of water. In such a nutrient medium pistachio (when the primary seedling density is 2 kg per 1 m2 of water surface) grew 590 g per day, and 448 g in a nutrient medium with 3 g of poultry manure per 1 liter of water. (Xayitov, 2001).Hemp processing plants produced 330 and 320 g in sewage, more than 290 g in 5 g of horse manure per 1 liter of water, and more than 240 g in mineral nutrient medium. The temperature of the nutrient medium and wastewater was 20-28 ° C and the pH was 6.0-9.0. In Uzbekistan, pistachios can be grown in laboratory conditions in greenhouses in glass and plastic containers and aquariums in winter, in concrete pools, and in summer in the open air in reinforced concrete trays and cemented pools (Kutliev, 1989).

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Various animal manure (sheep, cattle, pigs, horses) manure, poultry manure, livestock complexes (poultry factories, pig farms, cattle fattening farms, hemp processing plants, mineral fertilizer plants, biochemical plants) as a nutrient medium for growing pistachios. , ladder factories, meat combines, municipal household (service enterprises)) and sewage canals. Based on the experimental results, an organo-mineral nutrient medium consisting of pig manure, ammonium sulfate, magnesium sulfate and ferric chloride salts is recommended for pistachio breeding. (Kholmurodov et al., 1993).

Results and Discussion

Scientific and practical work has been carried out to increase the number of pistachios in the wastewater of communal and agricultural enterprises of Khorezm region. At the same time, special biological pools have been set up near wastewater treatment plants, agricultural and household waste disposal sites. Sewage was collected in these ponds where pistachios and other biofilter plants were grown, biologically treated, and then discharged or reused.Every ditch, drinking water and sewage was used for planting pistachios. Growing uppista25-30% of the crop was harvested daily or every 2-3 days depending on the conditions. A wire mesh strainer was used for collection.In the experimental area of Khorezm Mamun Academy, 3 pools with a depth of 80 cm, a width of 130 cm and a length of 180 cm were created, and 1 pool with a depth of 200 cm and a width of 130 cm and 180 cm was created. Gravel was laid at the bottom, and a series of baked bricks were laid on the sides and insulated.Initially, the first of the 3 biological pools was filled with tap water at a depth of 50 cm, the second with running water, and the third with drainage water, and pistachio bushes were planted and analyzed vegetatively. The artificial biological ponds where pistachios were planted were given a certain amount of organic fertilizer. The pistachio grew well in such conditions. This process indicates that the pistachio is adapted to the conditions of the Khorezm region.

In the next experiment, sewage from Khiva carpets was taken from Khiva carpets and poured into biological pools. The initial physicochemical composition of the wastewater was studied and mixed with drinking water in a ratio of 1: 1, 1: 3, 1: 4. Experiments III option (Option I, Biological Pool 1, 100% Sewage and Pistachio, Option II, Biological Pool 2, sewage + drinking water 1: 1 +pistachio, III-variant, 3-biological pool obucket water + drinking water 1: 3 + pistachio) and 28-day results were recorded. In the experiment, the biomass of the pistachio plant was in the first three days100% sewage and pistachio in the grown I variant, the wet mass was 1048 g (101,%), while at the end of the experiment the total biomass was 2014 g and the daily growth biomass was 168.7 g / m2 (201%).Sewage + tap water 1: 1 + pistachioin the grown variant II, the wet mass in the

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first three days was 1186 g (115.3%), the total biomass at the end of the experiment was 2592 g, and the daily growth biomass was 262.8 g / m2 (256.5%). This is the casesewage + drinking water 1: 3 + while in option III where pistachios are grownwhile the wet mass was 1228 g (108.5%) in the first three days, the total biomass at the end of the experiment was 2367 g, and the daily growth biomass was 229.5 g / m2 (238.5%) (Table 1). It can be seen from the experiments that the growth and development of pistachio plants in the wastewater conditions of Khorezm region can be observed. This allows all three options to grow pistachios and to treat and recycle wastewater through them.

Table 1

Results of growing pistachio plants in biological ponds

Experiment options	Biomass g / m²							Growth of biomass at the end of the experiment	
	Planted at the beginning of the experiment	Three days later			At the end of the experiment				
	wet biomass sasi, g	wet biomass sasi, g	daily growth		wet biomass sasi, g	daily growth			
			g / m²	%		g / m²	%	g / m²	%
Sewage + pistachio	1000	1048	16.0	101.8	2014	321.3	192.3	168.7	201.0
Sewage + drinking water 1: 1 + pistachio	1000	1186	62.3	115.3	2592	466.3	216.0	262.8	256.5
Sewage + drinking water 1: 3 + pistachio	1000	1228	77.0	108.5	2367	382.0	194.0	229.5	238.5

When the physicochemical composition of the wastewater in the fourth pond where the pistachio plant is grown was also studied before and after the experiment, the water temperature rose from 27.50C to 33.80C, the water environment increased from acidity to alkalinity (Ph 6.8-7.6), the

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color changed from yellow to colorless. color, loss of odor, decrease in the amount of suspended solids (107.5 mg / l -72.5 mg / l), increase in the amount of dissolved oxygen in water (1.4 mg / l - 12.3 mg / l), biochemical processes of oxygen for 5-day consumption (KBS5) decreased the amount (123.5 mg / l -28.7 mg / l), the amount of O2 in the oxidation of organic matter increased from 118.4 mg / l to 28.9 mg / l, and the amount of ammonia 9 , Decreased by 0-1.8 mg / l, as well as the loss of nitrites, nitrates and sulfates 121.0-67.0 mg / l, chlorides 113.0-54.8 mg / l, phosphates 8.3- A decrease of about 1.4 mg / l was noted. (Table 2).

Table 2

Physicochemical composition of wastewater in the pistachio pond (before and after the experiment)

Indicators	Pre-experience situation	Post-experimental condition
Temperature, t°	27.5	33.8
pH	6.8	7.6
Rangi	Reddish-yellow	Colorless
Smell (in points)	5.0	No.
Suspendedsubstances, mg / l	3.8	2.2
Oxygen, mg / l	1.4	12.3
KBS5mg O2 / l	123.5	28.7
Oxidation, mg O2 / l	118.4	28.9
Ammonia, mg / l	9.0	1.8
Nitrites, mg / l	0.07	No.
Nitrates, mg / l	2.7	No.
Sulfates, mg / l	121.0	67.0
Chlorides, mg / l	113.0	54.8
Phosphates mg / l	8.3	1.4

Conclusion

Pistia during scientific research**(**Pistia stratiotes**).**When studying the composition of wastewater in the pond where the plant was grown, the water environment increased from acidic to alkaline, color changed from reddish-yellow to colorless, odorless, removed from biogenic salts, ammonia, nitrite, sulfates, chlorides, photosynthesis, oxygen content in the water the amount of substances decreased, the amount of water-insoluble substances decreased.Planting or propagation of biomass of higher aquatic plants as seedlings in biological ponds of wastewater treatment plants, as well as this biomass can be used as feed for livestock, fish and poultry as a supplement to their diets. Water treatment in fisheries, poultry complexes and industrial enterprises it is recommended to use this aquatic plant for reuse.

Acknowledgements

We thank the anonymous reviewer and the editor for their useful comments on an earlier version. This work was supported by the Khiva Carpet and Khorezm academy of Mamun

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