

THE EFFECTIVENESS OF BIOLOGICAL TREATMENT OF DOMESTIC WASTEWATER ON THE EXAMPLE OF TREATMENT FACILITIES IN THE CITY OF BEKABAD, TASHKENT REGION

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Abstract: *The article presents the results of research work on biological treatment of domestic wastewater using aquatic plants formed at the "Bekabad city treatment facilities" in the city of Bekabad, Tashkent region. The results show that of the 4 aquatic plants tested, pistachio, eucorinia, azalea and duckweed, pistachio and eucalyptus were found to be water resistant. Experiments carried out in the laboratory showed that pistachios and eucalyptus were 100% in the water variant, 25%, 50% better than in the aquifer (even in the control variant), and had a high yield - 100%. Airborne pollutants - phosphates, chlorides, sulfates, nitrites and nitrates, was significantly reduced compared to other concentrations, and the demand for biochemical oxygen was satisfied by 90%, the color of the waste water became clear, the smell disappeared with use, and the pH became neutral. Pistachio is more water resistant than eucalyptus and has a higher absorption of pollutants. Therefore, we continued experimenting with pistachios to test wastewater treatment at the Bekabad water treatment plant. The results of testing the effectiveness of biological treatment of pistachio plants in the biological basin of the treatment facilities "Bekabad city wastewater treatment plants" show that pistachio plants contain less than 85% of the total amount of water, the chemical content of which is less than 80%. 90%, CBT was up to 92%, and the cleaning efficiency was 95%. The results of the above studies are the basis for the possibility of using pistachios in the process of cleaning domestic wastewater.*

Keywords. *Utilities, eucalyptus, pistachios, sewerage, biological treatment, cleaning methods.*

INTRODUCTION

Given the importance of protecting water resources and the rational use of these resources, Uzbekistan is taking a wide range of measures to protect nature, including the rational use of water resources. Today, new cost-effective technologies are being introduced for the protection of water resources, the introduction of a closed cycle of water use, biological wastewater treatment, the creation of environmentally friendly, economically beneficial and effective methods [12].

Pollution and deterioration of the state of water bodies leads to the accumulation of various organic, inorganic, mechanical, bacteriological and other substances in the water, the transparency of

its color, smell and taste, an increase in the amount of organic and mineral additives, the formation of harmful compounds, the absence of bacteria in the water. leading to the formation of bacteria that spread infectious diseases [1,4,11].

The most important sources of water pollution are industrial and municipal wastewater. Various acids, phenols, hydrogen sulfide, ammonia, copper, zinc, mercury, cyanide, arsenic, chromium and other toxic substances that are dangerous for living organisms in industrial wastewater-there is oil and oil products, which, along with industrial waste water, pollute rivers, lakes and water bodies [18].

Biological methods are mainly used to remove organic compounds from wastewater. These methods can be implemented in natural or artificial reservoirs. In natural reservoirs, biological water purification is carried out in filtration zones or irrigation canals. The main purpose of biological treatment is that when filtering wastewater in the fields, water passes through several layers of soil, where heavy and colloidal substances insoluble in water accumulate, which over time form a microbiological layer in the soil. This thin layer traps organic substances, oxidizes them and turns them into mineral compounds. Artificial biological treatment is carried out in specially built reservoirs with biological filters, aeration tanks and oxidizers. In addition, by growing known algae or higher aquatic plants in biological ponds, a high level of rapid treatment of various wastewater can be achieved. Due to the rapid growth of irrigated land from year to year, rapid industrial development and population growth, the need for water is increasing every year, which requires the efficient use of water resources, as well as the purification and reuse of used water [9,29,30].

At present, biological treatment facilities (aeration tank, biofilter) are widely used for wastewater treatment. The level of treatment of wastewater treated in this way is high, and it is widely used in agriculture to irrigate irrigated land. At the same time, the discharge of wastewater into rivers and reservoirs will be sharply reduced, which will save fresh water and increase the yield of agricultural products [10,11,12,13,14,31].

It is known that part of the currently used water is treated, and the rest (50%) is discharged into the pools without any treatment. One of the main ways of preventing such negative consequences, that is, keeping the hygienic state of water bodies clean, is the development of scientific foundations for the construction and use of modern treatment facilities at enterprises, and the disposal of treated wastewater. One of the main factors is the study of domestic wastewater treatment using tall aquatic plants such as pistachios and eucalyptus, which is currently one of the most pressing problems in the protection of water resources [15,16,17,30].

The above data shows that an extensive research work on biological clean-up, but biological clean-up of domestic municipal wastewater poorly studied, and research work to accelerate the biological cleaning process and increase clean-up efficiency was conducted, particularly to support the cultivation of aquatic plants, in connection with which this problem is relevant and the reason for this is the development of urban construction and increasing population, given this, we have planned the research work for improving biological clean-up using aquaculture generated in the city of Bekabad Bekabad district of Tashkent region.

We selected the Bekabad city water treatment plant as the object of our research.

Bekabad city sewage treatment plants were created in 1987 and are located in the Bekabad district of the Tashkent region, with a total area of 12.47 hectares, 110 km from Tashkent, in the north-eastern part of the region.

Wastewater treatment plant belonging to UE "Beksoz" "UE" Suvsoz "is located 5 km north-east of the city of Bekabad, 5 km from the city center. Most of the site is located between the Syr Darya and the Friendship Channel. Wastewater from the northeastern part of Bekabad enters the treatment plant through collector drains. Treated wastewater from the facility is directed to an irrigated farm through a source in the Syrdarya. The design capacity of the facility is 15,000 m³.



Figure 1. Satellite image of the Bekabad city water treatment plant.

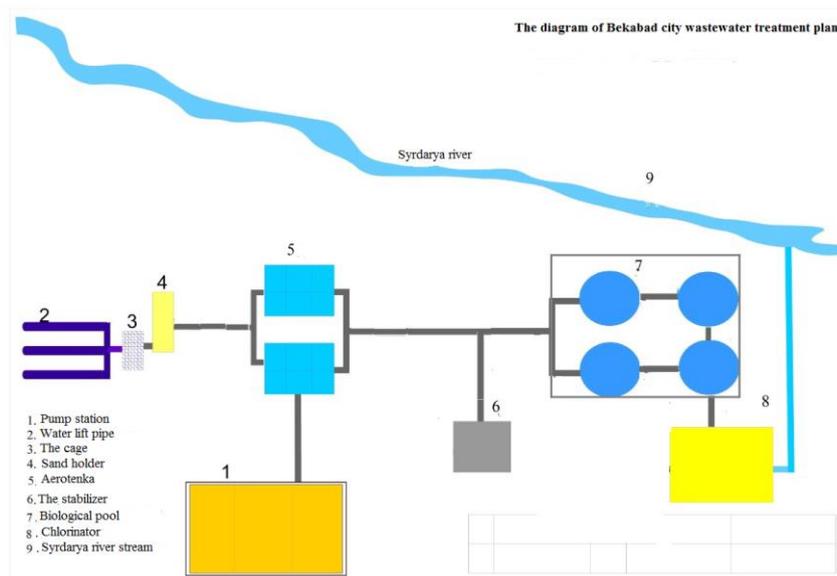


Figure 2. Drawing of the Bekabad city wastewater treatment plant

We have selected the following types of aquatic plants for water purification (species of aquatic plants from the collection of the Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan).

Pista-pistia stratiotes L. (water cabbage). Homeland - the tropics of Africa. Pistachio is a large rosette of wavy green leaves that resemble a dukhoba. The height of an adult pistachio plant in Uzbekistan is 20-40 cm. The stem is short - 5-8 cm, boat leaves (length 15-22 cm). Pistachio seeds reproduce both vegetatively and vegetatively, but more vegetatively. [12,11].

Eichornia-(Eichhornia crassipes Solms.) - water hyacinth, also called water saffron. Eichornia is native to South America. Eichornia is found in all tropical regions of the world. Eichornia forms a tube with characteristic bright green leaves. Due to the presence of an air gap (consisting of aerenchyme) at the base of the leaf strip, they enter the water. No wonder it is called water hyacinth, and the flower has a strong pleasant smell. fifteen].

Azolla-(Azolla filiculoides)- The scientific name of Azolla fillernoides is Azolla Sarolinian. The Azolla is native to Canada, from Canada to the northern regions of Argentina.

Lemna- Representatives of this plant are small perennials that usually grow in stagnant water. They are not divided into stems and leaves, and the whole body is represented by a green plate, sometimes called leaves and side pockets.

General view of aquatic plants



Figure 1.1. General view of pistachio



Figure 1.2. General view of Eichornia



Figure 1.3. General view of Duckweed



Figure 1.4. General view of azole

The physical and chemical properties of aquatic plants in aquifers before and after cultivation were determined by the following methods: Water temperature, aqueous and acidic environment, Water odor, Determination of dryness of water, Determination of total nitrogen, Method for determination of sulfate ion, Determination of phosphorus oxide Yu.Yu. Lurie [18, 19], Strogonova N.S. [12].

RESEARCH RESULTS AND THEIR DISCUSSION

In order to further increase the efficiency of cleaning domestic urban wastewater treatment plants, first of all, on the basis of improving the technology of biological treatment, experiments were carried out to select species of biological aquatic plants that are resistant to wastewater. For this, 4 species of aquatic plants were selected from the collection of the Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan. They were grown under laboratory conditions in smaller crystallizers (5-10 L) - in 100% fresh water, the morphological state and development of plants were monitored (Table 4.1.1).

Table 1: Growth and development of aquatic plants in the wastewater of the Bekabad wastewater treatment plant (wet biomass, mg).

№	Plant species	Wet Biomass, (gr, 1m ²)				
		1 st day	2 nd day	3 rd day	4 th day	5 th day
1	Azolla	50	50	54	46	45
2	Pista	60	65	110	180	350
3	Duckweed	50	60	80	63	64
4	Eichornia	50	65	100	170	310

The results of the experiments showed that in the experimental version, the state, growth and development of 4 species of aquatic plants grown in aquaculture were different, among which resistance to pistachios and eucalyptus was found. Among aquatic plants, pistachio has a high growth rate - 350 g per 1 m² (wet biomass), and eucalyptus has a yield of 310 g per 1 m², and at the end of the experiment the leaves turned yellow. The yield of other plants was 45-64 g per 1 m². When studying the morphological state of pistachio and eucalyptus plants, they did not change until the 5th day of development, the remaining 2 species, especially rye, began to change during the growing

season in the body of aquatic plants and decreased to 5 days. The same is with the azalea after the 3rd day of development. Researchers have shown that both pistachios and eucalyptus grow well in home waters [28]. According to the results of laboratory experiments, these two types of pistachios and eucalyptus, resistant to the effects of domestic wastewater, have become the basis for the continuation of scientific research on wastewater treatment.

In order to continue scientific research and experiments to determine the effectiveness of biological treatment, we need to study the growth and development of aquatic plants in the aquatic environment, as well as the physical and chemical analysis of aquatic water. The results of these experiments allow us to check the degree of purification of aquatic plants.

For the experiment in the laboratory, we grew 25 liters of aquarium water in different percentages (100.50.25%) under observation for 1 week and observed the daily growth, development and morphological state of the plant. The results of the study showed that aquatic pistachio plants were less developed in 25 and 50% nutrient media than in 100% nutrient media, but they were well developed in 100% nutrient media, and the plant yield was high. The eucalyptus plant grew poorly in 25.50% growth media, but grew satisfactorily in 100% aquatic water, but the yield of the eucalyptus plant was slightly lower than the yield of pistachio. It was observed that the growth productivity of pistachio was even higher than in the observation variant, even in 100% aquaculture, and its resistance to aquifers was high. This is due to the fact that these aquatic plants are found in bodies of water, which naturally contain many organic substances. According to the results of the obtained laboratory, during the experiments, we used 2 types of aquatic plants - pistachio and eucalyptus because of their high purifying properties of wastewater in laboratory conditions [1,2,3,4,5,6,7,19].

Table 2: Physicochemical composition of wastewater from pistachios grown under laboratory conditions at different concentrations of wastewater (25%, 50%, 100%) "Bekabad city treatment plant" (7 days).

chemical indicators	Before the experiment	After the experiment (25%)	Before the experiment	After the experiment (50%)	Before the experiment	After the experiment (100%)
Smell	1.30	0.90	2.70	1.20	5	1.8
Colour	0.90	0.99	2.90	1.50	12.1	2
pH	2.30	3.45	4.70	4.50	8.4	6.5
KBS5, mgO2 / l (BPK5)	14.5	14.79	50.50	30.50	70.7	40.7
Phosphates, mg / l	0.85	1.20	1.70	1.80	3.58	2.85
Chlorides, mg / l	121.45	13 5.45	248.56	185.56	477.45	289.45
Sulfates, mg / l.	9.98	19.70	20.50	19.50	40.82	32.25
Nitrates, mg / l.	0.30	1.90	0.70	2.90	3,5	0,5
Nitrites, mg / l.	0.095	1.25	0.30	1.50	1,8	0,95

Table 3: "Bekabad city wastewater treatment plants" is the physicochemical composition of wastewater grown in various concentrations (25%, 50%, 100%) in laboratory conditions under the conditions of aquatic plants of eucalyptus (7 days).

chemical indicators	Before the experiment	After the experiment 25%	Before the experiment	After the experiment 50%	Before the experiment	After the experiment 100%
Smell	1.30	1.10	2.70	1.45	5.0	1.90
Colour	0.90	1.35	1.90	1.60	3.90	2.10
pH	2.30	4.50	4.55	3.80	9.5	7.45
KBS5, mgO2 / l (BPK5)	14.5	20.50	30.50	27.70	61.0	35.9
Phosphates, mg / l	0.85	1.60	1.70	2.0	3.60	2.90
Chlorides, mg / l	129.89	180.95	250.25	230.23	488.96	280,82
Sulfates, mg / l.	9.98	19.70	20.50	19.50	40.82	32.25
Nitrates, mg / l.	0.30	1.90	0.70	2.90	3,5	0,5
Nitrites, mg / l.	0.095	1.25	0.30	1.50	1,8	0,95



Figure 2 Grown in the laboratory a) pistachios and b) eucalyptus General form.

Experiments have shown that water does not affect the growth, development and productivity of pistachios and eucalyptus trees, and is known to accelerate plant growth. Experiments have shown that pistachios grow and develop in an undiluted version of the aquifer. This is due to the fact that the amount of organic and mineral substances in the wastewater is higher than in other variants, which means that pistachios and eucalyptus grow directly on it, without diluting the wastewater with tap water. After changing the growth, formation and yield of pistachios and eucalyptus in various percentages and in a standard culture medium, the accumulated domestic wastewater is used to determine the cleaning properties of these species before and after cultivation. Physicochemical analysis of wastewater shows that (table 4.2.1; 4.2.2) the smell of water decreased from 5 to 1.5 points, suspended particles 10 times at various concentrations of other wastewater, up to 50% dry residue, total nitrogen 90 to 100%, chlorine 45%, sulfate 80%, and oxygen demand is reduced by

90%. The same results were observed when growing aquatic plants of pistachios and eucalyptus in agricultural waters (livestock, pigs) [20,21,22,23].

The efficiency of the water plant in the treatment of wastewater from the pistachio plant "Bekabad city treatment plant" using pistachios, The need for oxygen is slightly higher than that of eucalyptus, and this difference can be seen not only in chemical indicators, but also in plant productivity. As mentioned above, the large and wide surface of the leaves of the pistachio plant, which accelerates the process of photosynthesis and, as a result, ensures the good development of the plant, as well as the fact that the roots are dense and strong, is one of the main reasons for this. It is important for the distribution of water sources that are close in composition.

From the above results, it can be concluded that the results of laboratory experiments assimilated various substances from wastewater into Bekabad city sewage treatment plants through the roots of eucalyptus and pistachios. The results of the experiment showed that pistachio can be used for its production due to its high cleaning properties. We continued to experiment with pistachios due to the high purification properties of aquatic plants in the laboratory. Experiments at the Bekabad city water treatment plant continued from July 15 to August 15, 2019, during which morphological observations were carried out on pistachio. Observations show that in the first three days the leaves of the pistachio plant turn yellow, and from the 5th day after adaptation to this water the pistachio grows back, and from the 10th day it grows well and grows from 13 to 10 cm.) At the end of the experiment, it was noticed that the leaves grew to a size of 16-18 cm and strengthened the roots. Observation results show that during the experiment, the pistachio plant grew very quickly and covered the surface of the structure in 20 days. In addition, the volume of vegetation has increased.



Figure 3. Appearance of a pistachio plant in a biological pool

Before the experiment at the Bekabad water treatment plant to determine the chemical parameters of aquaculture, water samples were taken at the following 4 points of the Bekabad water treatment plant: These; from the inlet pipe - the first sample, before entering the aerotank - the second sample, at the exit from the aerotank structure - the third sample and from the pool - the fourth sample. Samples were taken twice at a depth of 10-15 cm from the surface of the aquifer, i.e. before and after planting the pistachio aquatic plant, and chemical analysis was performed. As can be seen from the table, the chemical composition of wastewater is practically the same at the first and second points before and after the growth of tall aquatic plants. In the third and fourth points, we see that the chemical parameters of the wastewater have changed significantly at 1-2 points before landing (65-70%) and in the next 3-4 points (90-95%).

Table 4: Pre-experimental and post-experimental physicochemical parameters of wastewater at the Bekabad wastewater treatment plant.

chemical indicators	BS HS OT	Before the experiment	After the experiment	Standards

		Exhaust water at the exit from the aerotank	BSHOSTI Outgoing Sewage	After the pistachio plant is grown	
Smell	5,0	3,0	2,5	1.0	2,0
Colour	3.5	2,2	1,89	1.2	2
pH	8.9	8,2	7,9	7.1	6-8
KBS5, mgO ₂ / l (BPK5)	80.7	44,1	39,3	7.0	30
Phosphates, mg / l	3.25	2.95	2,45	0.65	2.5
Chlorides, mg / l	51,5	47,2	43,0	10,2	350,0
Sulfates, mg / l.	175.2	148,1	110,0	34.04	350
Nitrates, mg / l.	72.5	55,4	48,7	7.5	45
Nitrites, mg / l.	5.6	4,1	3,8	0.95	3,3

As can be seen from this table, the physicochemical parameters of pre-experimental effluents at the Bekabad wastewater treatment plant were compared with the physicochemical parameters of effluents discharged from the installation, Approximately 60-65% of wastewater is treated and 90-92% of wastewater in biological ponds is treated after pistachio cultivation. It was noted that the oxygen demand of wastewater decreased by 90-92%, the phosphate content by 50-60%, the sulfate content by 40-50% and the nitrate-nitrite content by 70%. According to the results of the experiment, the efficiency of biological treatment of wastewater from Bekobod treatment facilities using aquatic plants is from 90% to 92%, depending on the type of installation.

CONCLUSION

4 types of aquatic plants have been selected for biological wastewater treatment of the Bekabad city treatment facilities. The physicochemical properties of aquatic water were determined before and after growing aquatic plants using the methods known above. Laboratory analysis showed that when growing eucalyptus and pistachios in wastewater of different concentrations in laboratory conditions, the degree of wastewater treatment in the 100% concentration variant reaches 90%. These results can serve as a basis for determining the efficiency of pistachio processing in the conditions of the "Bekabad City Sewerage Station". From the above results, it can be concluded that, according to the results of the experiment, the pistachio aquatic plant can be used in biotechnology for the treatment of domestic urban wastewater at the Bekabad urban wastewater treatment plant, after 5-7 days, it was found that 40-70% of the pollutants in the wastewater had been absorbed by the pistachio plant, 90-92% of the oxygen demand was met, and the purification efficiency reached 95%. Based on these results, it is possible to introduce a wastewater treatment technology using aquatic plants at the "Bekabad City Sewerage Station". The same technologies can be used in the wastewater treatment process in all cities of the country.

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