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# Improving the methods of increasing the efficiency of biological treatment of industrial wastewater

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**Annotation: In this article, we explore the world of industrial wastewater biological treatment and explore innovative strategies and emerging technologies to improve its efficiency. By addressing these challenges and implementing advanced solutions, the industry will not only meet stringent regulatory requirements, but also ensure a cleaner and more sustainable future for us. The treatment of wastewater from a bread production plant with the help of pistachio plant (Pistia Stratiotes L) was studied and the efficiency of biological treatment of wastewater was studied. The pistachio plant is used as an additional feed and fattening is observed in animals such as sheep and cows that are raised for consumption. The pistachio plant has been proven to be natural and harmless.**

**Keywords: Higher aquatic plants, microorganisms, wastewater treatment, microscopic algae, fouling, Pistia Stratiotes L, chemical composition of wastewater, physical composition of wastewater, treatment efficiency.**

**Introduction:**

In a world increasingly conscious of environmental sustainability and resource conservation, the management of industrial wastewater has emerged as a critical challenge. As industries continue to grow and diversify, the volume and complexity of pollutants released into our waterways have surged, posing grave threats to aquatic ecosystems and human health. In this context, biological treatment methods have risen to prominence as a sustainable and effective solution for mitigating the adverse impacts of industrial effluents [1-3].

Biological treatment harnesses the power of nature's microorganisms to break down and remove contaminants from wastewater, transforming it into a less harmful or even reusable resource. This eco-friendly approach has gained traction in recent years for its potential to not only reduce the environmental footprint of industrial operations but also to minimize operational costs. However, the efficiency of biological treatment processes remains a pressing concern, with several challenges and limitations hindering their full potential [4-7].

**Level of study of the problem:** Biological processes comprising bacteria, fungi, yeast, and algae received increasing interest for dye degradation due to their cost-effectiveness and eco-friendly nature [8]. The batik industry is the heritage of Malaysia and some Southeast Asian countries; hence, maintaining this industry is essential to sustaining this valuable asset. However, from the process involved in this industry another environmental pollution issue has emerged that needs to be resolved. Conventional and existing treatments are unable to decrease contaminant levels in batik wastewater to the permitted level. A costly problem arises from the existing treatment [9].

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When direct wastewater biological treatment is unfeasible, a cost- and resource-efficient alternative to direct chemical treatment consists of combining biological treatment with a chemical pre-treatment aiming to convert the hazardous pollutants into more biodegradable compounds. Whereas the principles and advantages of sequential treatment have been demonstrated for a broad range of pollutants and process configurations, recent progresses (2011–present) in the field provide the basis for refining assessment of feasibility, costs, and environmental impacts [10].

**Research objects:** Bread manufacturers operating in Fergana region.

**Research methods:** Effluent samples were taken from specific areas of the biological pond in accordance with the calendar plan of research in 2021-2022. Temperature, color, smell of wastewater at a depth of 10-15 cm based on Stroganov, Buzinova methods; Ph, dissolved oxygen content, KBBT5, oxidation, KBKT, nitrates, chlorides were determined according to the methods of Y.Y. Lure.

Content of the method. The method is based on the boiling of substances in 0.01 normal potassium permanganate and sulfuric acid medium. Oxidation of up to 10 mg of oxygen can be determined in 1 l of water without impurities. The interfering effect of chloride, if their concentration has increased to 300 mg/l, is eliminated by adding 0.4 g of mercury (II) sulfate. Iron, hydrogen sulfide, sulfides and nitrites are determined separately, and the result obtained from the oxidation calculation is subtracted from the oxidation of the water found: 1 mg of hydrogen sulfide requires 0.47 mg of atomic oxygen, 1 mg of nitrite-0.35 mg, 1 mg of iron-0, Requires 14 mg of atomic oxygen.

**Results and discussions.** The pistachio fruit is a dry, unopened fruit with many seeds. The seeds are long-cylindrical (1.5-3 mm) and the weight of 1000 seeds is 2.1-2.2 g.

***Figure 1. General view of pistachios grown in laboratory conditions.***

Pistia reproduces vegetatively with the help of a stolon, which is formed in the leaf axil. A new growth is formed at the edge of the stolons. A young plant usually has 4 leaves on the growth cone. During the growing season, 4-5 circles can be formed on one plant.

Different substances are biochemically oxidized at different rates. Professor V.T. According to Kaplin, easily oxidized-"biological softeners" include: formaldehyde, low aliphatic alcohols, phenol, furfural, and others. Their oxidation rate constant (K) is 1.4-0.30 sut-1. The middle place (K 0.30-0.05 sut -1) is occupied by cresol, naphthol, xylenol, resorcin, pyrocatechin, pyrogallol, anioactive PAV and others. Slow-degrading - "biologically corrosive" substances (K 0.029-0.002 sut-1) are hydroquinone, sulfanol, NP-1, nonionic PAV, etc. Taking this into account, biochemical oxidation is short (2-3 days) and 15-20 the extension to the day may last longer in some cases. Therefore, it is necessary to monitor the CBT process until the depletion of dissolved oxygen in the sample stops, and this CBT is complete (only biochemically non-oxidizable bonds remain in the water).

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Removal of excess active chlorine is required prior to analysis of river waters treated with chlorine scavenging reagents and contaminated with sewage. In this case, the water is dechlorinated for 1 hour. If there is a lot of active chlorine in the water, it is regenerated with sodium sulfite. The required amount of sodium sulfite is determined from the fraction of water extracted separately, to which 10 ml of 10% potassium iodide, a more acidic mixture, iodine separated by adding starch is determined by titration in 0.02 normal sodium sulfite. The temperature of the analyzed water should be 200C.

The KBT indicator of water is found by the following formula: $X = \frac{(A1 - B1) - (A2 - B2)}{V} 1000$ (1)

or

$X = (A1 - B1) - (A2 - B2) \; n$ (1)

where: A1 is the concentration of dissolved oxygen in the sample at the beginning of incubation (day zero) in mg/l.

*A2 - the concentration of dissolved oxygen in the solvent water added to the sample at the beginning of incubation (day zero) mg/l.*

*B1 - concentration of dissolved oxygen in the sample at the end of incubation mg/l.*

*B2 - at the end of incubation, the concentration of dissolved oxygen in the solvent water added to the sample is mg/l.*

*V - volume of the sample to be determined, ml when distributed to 1 l.*

*n -propagation duration.*

1-jadval. Dang‘ara non ishlab - chiqarish sanoati oqova suvida o‘stirilgan yuksak suv o‘simligi biomassasining kimyoviy tarkibi (absolyut quruq massaga nisbatan % hisobida).

| Plant type | Moisture % | Protein % | Fat % | Kletchatka % | Kul % | Karotin, mg/kg |
|---|---|---|---|---|---|---|
| Pistia | 8,0± 0,3 | 21,1± 0,71 | 2,65± 0,07 | 27,5± 0,94 | 5,43± 0,13 | 23,68± 0,74 |

According to these data, pistachio biomass grown in the wastewater of Dangara bakery has an average of 21.1% protein, 2.65% fat, 27.5% fiber, 8.0% moisture, 5.43 % ash, 23.68 mg/kg. It was found that carotene is present, one kilogram of pistachio biomass contains 0.40 nutrient units (exchangeable energy is 59.13 kcal).

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Figure 2. Pistachio grown in biopondss of Dangara bread production industry.

Problems related to wastewater, polluting the environment is a big concern. This pollution is mainly caused by the high chemical oxygen demand present in dyes and wastewater. Here are some potential solutions and considerations for addressing this environmental issue:

Natural Adsorbents: Using natural adsorbents such as activated carbon, zeolites, or even agricultural waste products like coconut shells can help in adsorbing dyes and other pollutants from wastewater. These materials can be an eco-friendly and cost-effective way to reduce contaminant levels.

Constructed Wetlands: Constructed wetlands are an excellent option for biological treatment of wastewater. They are designed to mimic natural wetland ecosystems and can effectively remove pollutants through processes like microbial degradation and plant uptake. A two-stage constructed wetland system can provide enhanced treatment capabilities.

Monitoring and Regulation: It's important for governments and environmental agencies to establish and enforce regulations regarding the discharge of wastewater from the batik industry. Regular monitoring of wastewater quality and compliance with regulations can help mitigate the pollution problem.

Research and Innovation: Continual research and innovation are essential to improving treatment methods for batik wastewater. This includes exploring new adsorbents, optimizing treatment processes, and developing eco-friendly dyes and dyeing processes that generate less pollution.

Public Awareness: Raising awareness among producers and the general public about the environmental impact of the industry can encourage responsible practices. Sustainable and eco-friendly batik production methods can help reduce the pollution burden.

Collaboration: Collaboration between government agencies, the industry, environmental experts, and researchers is crucial for finding sustainable solutions to the pollution issue. Funding and support for research and development in this field can lead to innovative and effective treatment methods.

In conclusion, addressing the environmental pollution associated with the industry is essential to preserve this cultural heritage while safeguarding the environment. An integrated approach that combines natural adsorbents and constructed wetlands, along with effective regulation and ongoing research, can contribute to resolving this issue and ensuring the sustainability of the batik industry.

**Conclusions**

Scientific and practical research on the comprehensive study of aquatic plants to determine their diversity in nature and the use of their biomass in various branches and sectors of the national economy through artificial reproduction it is necessary to carry out. Before using aquatic plants in the biological treatment of waste water, it is advisable to select a type of aquatic plants that is suitable for this water, resistant and actively absorbs harmful substances in this water.

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Dangara receives wastewater from the bread factory and the volume of wastewater is 1900 m3 per day. In order to reduce the harmful effects of wastewater on nature, scientific researches were conducted using modern methods. This bakery has been accepted as an object, and further improvement of the technology of wastewater treatment from the bakery is one of the most important tasks to be fulfilled today. It is mentioned in the above literature that pistachio grows well in waters rich in organic substances, and it is also shown that these plants can be used as feed for animals. Physico-chemical parameters of wastewater were measured by known methods before and after cultivation of aquatic plants.

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