



Comparison of water quality in natural ponds at Wichienmatu School before and after using wastewater treatment boats

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Abstract

Wastewater in natural water sources is a significant problem, particularly at Wichienmatu School, which has 7 ponds. The researchers developed a wastewater treatment boat powered by wind and 3D printed materials. The boat releases photosynthetic microorganisms for water treatment and uses cellulose sheets with biochar to collect sediments. The study showed that the boat improves water clarity, increases oxygen levels, and adjusts pH after treatment.

Introduction

"Water covers 3/4 of the Earth's surface, with 97% as saltwater, 2% as ice, and 1% as freshwater in rivers and canals. Without water, life on Earth would not be able to survive. Environmental issues, especially wastewater, are major global concerns due to the limited availability of freshwater and pollution. Wichienmatu School has 7 ponds that are facing wastewater problems. Initial analysis showed that the water is clear, low in oxygen, and acidic, prompting the research team to focus on treating the wastewater in the school's ponds.

Research Question

Is the water quality in the natural pond of Wicheinmatu School different before and after using the wastewater treatment boat? How?

Research Hypothesis

Water quality in natural ponds at Wichienmatu School before and after using wastewater treatment boats is different.

Variables

Independent variables: Water source before and after using wastewater treatment boats

Dependent variables: Water quality include transparency, acidity, alkalinity, and oxygen content in water.

Control variables: measurement methods, measurement tools

Research period

November 2024 to January 2025

Research Hypothesis

Water quality in natural ponds at Wichienmatu School before and after using wastewater treatment boats is different.

Materials and equipment



Research Methodology

Part 1: Water quality inspection in natural ponds at Wichienmatu School on November 1, 2024.

Measure water transparency 3 times with a plate and find the average.

Test oxygen levels 3 times with a kit and calculate the average.

Measure pH 3 times with a meter, find the average, and record results.

Repeat in Dec 2024 and Jan 2025.

Part : 2 Improving water quality using wastewater treatment ships

Design and 3D print a ship, install systems, and assemble components.

Propel the boat to spray microorganisms and collect sediment. Study

sediment adsorption with biochar sheets. Check water transparency,

oxygen, and pH after 7 days. Repeat in Dec 2024 and Jan 2025.

Research Methodology

Table 1 shows the results of water quality testing before and after using the wastewater treatment boat.

Experimental results	Pre-water sampling study results					
	Transparency		DO		pH	
	Before	After	Before	After	Before	After
November 2024	25	48	5.5	6.5	6	7
December 2024	37	59	6	7	6.5	7.5
January 2025	42	66	6.5	8	7	8
Average	34.66	57.66	6	7.16	6.5	7.5

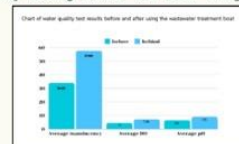
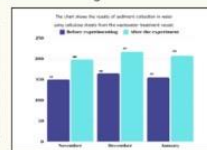


Table 2 shows the results of sediment collection in water using cellulose sheets from the wastewater treatment vessel.

Experimental results	Weight of Bio Char Cellulose Sheet (grams)		
	Before testing	After testing	Difference
	Before	After	
November 2024	150	198	48
December 2024	165	217	52
January 2025	155	206	51
Average	156.55	207	50.33



Summary of experimental results

The study found that wastewater treatment vessels can move and release photosynthetic microorganisms to treat wastewater. After water treatment, the transparency of the water and the amount of oxygen increased, while the acidity of the water decreased.

Discussion of experimental results

The study found that the wastewater treatment boat can treat wastewater because it has a mechanism for photosynthetic microorganisms to release water vapor onto the water surface, allowing the photosynthetic microorganisms to spread across the water surface while the boat is sailing on the water surface. The cellulose fiber sheets mixed with Ocha leaves, which come into contact with the water surface, can absorb the sediment mixed on the water surface from working together, resulting in increased water quality in terms of transparency and oxygen content, while decreasing the acidity of the water.

Reference documents

Korakan Koson (2023). Biochar (miracle material) synthesis, identification and application potential. Journal of Science and Technology. Ubon Ratchathani Rajabhat University Winakorn Rak (2021). The effect of using photosynthetic microorganisms with bio-fermented water on increasing the yield of rice, Khao Khao 43, grown in an organic system.; Journal of Science and Technology. Buriram Rajabhat University