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

Research Team 1. Ms. Nisachon Wannaborwon

2. Ms. Poonyisa Jitaree

3. Ms. Nichakan Somkliang

Advisor Kwanjai Karnjanasrimek

Name of the consulting scientist Mr.Yutthapong chanasuk

Wichienmatu School, Mueang District, Trang Province

Abstract

Home electrical appliances are installed with a program to control their operation through an application.Air conditioners can control heating and cooling temperatures within the home through application.The application can command you to turn the lights on and off.In the current situation, environmental problems are a major global problem. The wastewater problem is one of the major problems, because freshwater sources are limited and those that are available have the problem of rotting water. Wicheinmatu School is one of the schools with 7 natural ponds within the school, which also have the problem of wastewater. Therefore, the research team has an idea to treat wastewater in the ponds with the following objectives: 1) To create and develop a wastewater treatment boat for use in treating wastewater in the school's water source; 2) To compare the water quality in the natural pond of Wichienmatu School before and after using the wastewater treatment boat. In the production of the wastewater treatment boat, the hull is made by a 3D printer with PLA+ fiber sheets and 10x8-inch propellers, powered by wind power and controlled by a remote control (RC). The mechanism for releasing synthetic microorganisms is demonstrated by the method of spraying mist controlled by a remote control (RC). The release of synthetic microorganisms is used in water treatment in terms of transparency, oxygen content in the water and adjustment of acidity and alkalinity. Cellulose sheets mixed with biochar are used to collect small sediments in the water. 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.

Keywords: wastewater treatment boat, water quality, photosynthetic microorganisms, cellulose sheet mixed with biochar

Introduction

Water is a compound found in 3 out of 4 parts of the earth's surface, mostly in the form of saltwater in the sea and oceans, about 97 percent, ice at the poles, about 2 percent, and freshwater in rivers and canals, about 1 percent. If our world were without water, life on earth would not be able to survive. In the current state, environmental problems are a major global problem. The problem of wastewater is one of the problems that occurs a lot because there are few freshwater sources and the ones that do have problems with water pollution. Wichienmatu School is one of the schools that has 7 ponds, which are natural water sources within the school, which also have the problem of wastewater. From the initial analysis of the water quality, it was found that the water in the ponds is transparent, has low oxygen content, and has acidic properties. Therefore, the research team had the idea of treating the wastewater in the school's natural 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 Wichaimat School before and after using wastewater treatment boats is different.

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

Materials and equipment

1. Wind Power Boat
2. Photosynthetic Microorganisms
3. Cellulose Sheet Mixed with Biochar
4. Transparency Plate
5. pH Meter
6. Oxygen Test Kit

Research Methodology

Set study points

Wichienmat School, Trang Province, latitude 7.30088, longitude 99.37449

Research work process

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

1.Check the water quality in terms of transparency using a transparency measuring plate 3 imes and find the average value.

2. Check the amount of oxygen in the water using an oxygen test kit 3 times and find the average.

3. Check the acidity and alkalinity of the water using a pH meter 3 times. Find the average and record the results.

4. Repeat the experiment in December 2024 and January 2025.

Part : 2 Improving water quality using wastewater treatment ships

1. By designing the ship structure using SketchUp 2024 to obtain a 3D structure, printing the designed ship model with a 3D Printer, installing a tray system inside the ship to support the installation of electronic equipment, connecting both sides of the buoy with aluminum pipes, assembling and installing the propulsion system consisting of the motor mount, using servos as standard radio-controlled parts, installing the electronic set, propulsion compensation and photosynthetic microorganism release system, and assembling cellulose sheets mixed with biochar.

2. Improve water quality by propelling the boat while spraying synthetic microorganisms in the form of steam to contact the water surface throughout the distance the boat travels along with cellulose sheets from the bottom of the leaves to collect sediment mixed at the water surface to help treat wastewater.

3. Study the adsorption of sediment by cellulose sheets mixed with biochar by drying the biochar sheets after adsorption in a solar oven for 24 hours or until dry, weighing, comparing the weight before and after adsorption, and calculating the sediment retention capacity.

4. Check the water quality in terms of transparency after using the wastewater treatment boat for 7 days by using the transparency measuring plate 3 times and find the average value.

5. Check the amount of oxygen in the water after using the wastewater treatment boat for 7 days by testing the oxygen kit 3 times and find the average value.

6. Check the pH value of the water after using the wastewater treatment boat for 7 days using a pH meter 3 times. Find the average value and record the results.

7. Repeat the experiment in December 2024 and January 2025.

Research results

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

Experimental results Trial period	**Pre-water imaging study results**					
	Transparency		**DO**		**pH**	
	before	**after**	**before**	**after**	**before**	**after**
November 2024	**25**	**48**	**3.5**	**6.5**	**6**	**7**
December 2024	**37**	**59**	**4**	**7**	**6.5**	**7.5**
January 2025	**42**	**66**	**4.5**	**8**	**7**	**8**
average	**34.66**	**57.66**	**4**	**7.16**	**6.5**	**7.5**

Chart of water quality test results before and after using the wastewater treatment boat

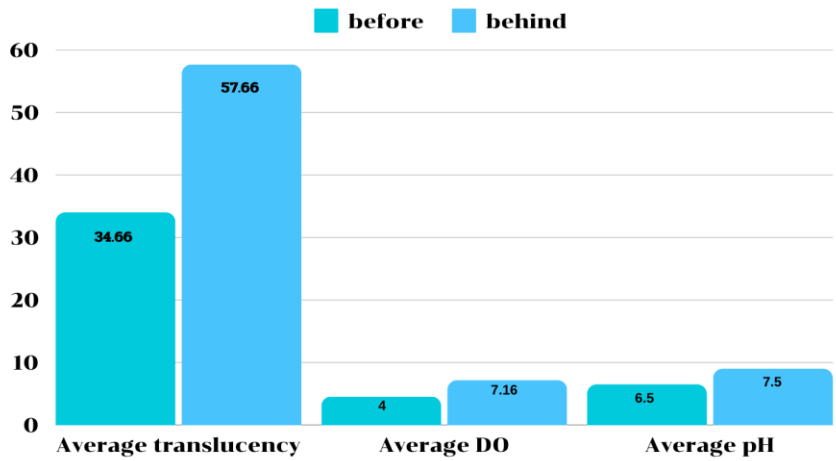
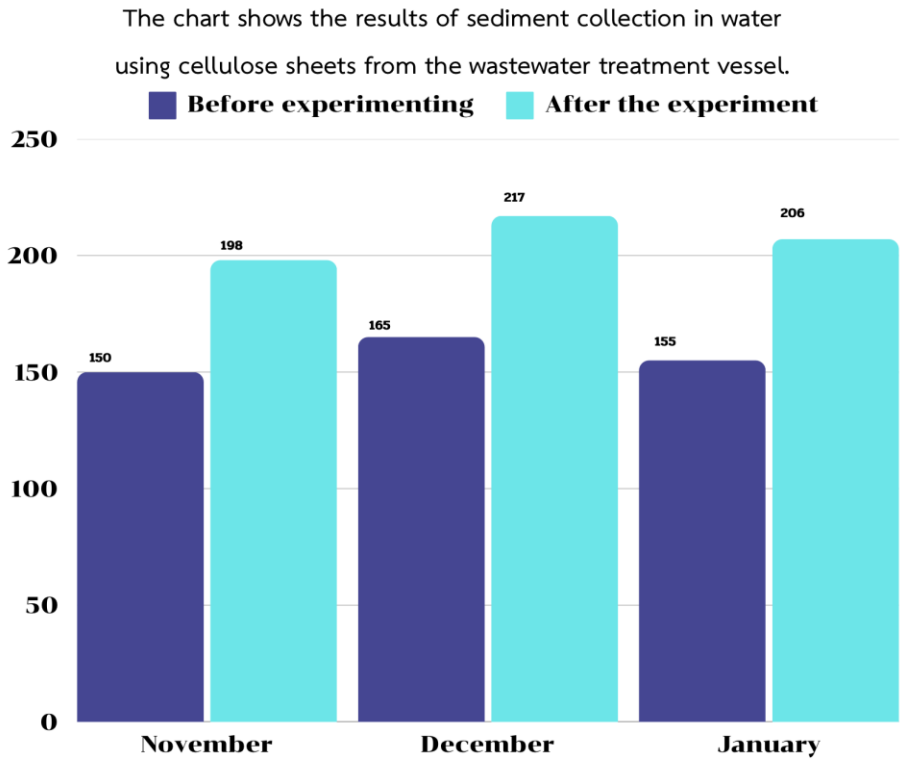


Table 2 shows the results of sediment collection in water using cellulose sheets from the wastewater treatment vessel.

Experimental results	Weight of Bio Char Cellulose Sheet (grams)		
Trial period	Before testing	After testing	Difference
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.

Suggestions

Developed a wastewater treatment vessel by adding a water turbine to the components to increase the amount of oxygen in the water and developed a cellulose sheet mixed with biochar to be able to absorb more sediment.

Acknowledgements

The research on the comparison of water quality in natural ponds of Wichianmat School before and after using wastewater treatment boats was successfully completed because of the support and encouragement from Mr. Sakda Paisomboon, Director of Wichianmat School.

I would like to thank Mrs. Khwanjai Kanchanasrimek and Mr. Yutthaphong Chanasuk, the advisors, for their kindness and assistance, providing advice, suggestions, and checking and correcting various defects in the preparation of this research. The research team would like to express our deepest gratitude on this occasion.

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

Appendix



Procedures for checking water quality in Wichaimat School pond before using wastewater treatment boats



Ship construction and development process



Ship performance testing procedures



Water quality testing process in Wichaimat School pond after using wastewater treatment boat