Comparative Water Quality in Azolla Ponds with Organic Additives Azolla

Wichienmatu School

Abstract

Environmental science research topic:Comparing the water quality in duckweed cultivation ponds with the addition of cow manure, photosynthetic microorganisms, and a mixture of photosynthetic microorganisms and cow manure.The objective is to compare the water quality in duckweed cultivation ponds with the addition of photosynthetic microorganisms and cow manure; with the addition of cow manure and with the addition of photosynthetic microorganisms. By proceeding as follows: water quality and the growth of duckweed were monitored in all three ponds treated with cow manure and photosynthetic microorganisms, and the results were recorded.

Research Question

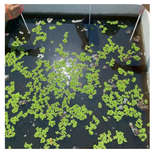
-Compare the water quality in duckweed cultivation ponds with the addition of cow manure, photosynthetic microorganisms, and a mixture of photosynthetic microorganisms and cow manure. Is there a difference?

Introduction

Red duckweed (Azolla spp.) It is a small aquatic plant that is of great agricultural and environmental importance. Because it is a plant that can live on the surface of the water and grow quickly, the red duckweed has a special ability to fix nitrogen from the air by living with the blue-green algae type Anabaena azollae, which lives inside the leaf cavity of the red duckweed. This dependent relationship allows red duckweed to increase the amount of nitrogen in the soil and water sources effectively. As a result, the red duck is widely used in agriculture, such as being used as a fresh plant fertilizer in rice fields. Soil restoration and improving water quality

Cow dung is an organic material of natural origin and contains macronutrients such as nitrogen, phosphorus and potassium, as well as micronutrients necessary for plant growth. When cow manure is fermented or dissolved in water, it will increase the amount of nutrients and promote the number of beneficial microorganisms in water sources. As a result, the aquatic ecosystem is more abundant.

Photosynthetic microorganisms are a group of microorganisms that can use light energy to create food and live. It plays an important role in the decomposition of organic matter, reducing bad smell, reducing the amount of waste in water, and helping to balance the aquatic ecosystem to be suitable for various organisms. The use of photosynthetic microorganisms with cow dung may have a positive effect on water quality and red growth. Therefore, the research team is interested in studying the quality of water with the addition of photosynthetic microorganisms and cow dung to see how it affects the growth of red duckweed. To use the information obtained as a guideline for improving and preserving water quality sustainably Including being able to apply the benefits of red duckweed cultivation and conservation agriculture in the future



Research Methods

Water quality was measured using the GLOBE method, studying water temperature, pH, transparency, and dissolved oxygen levels.

1. Three sampling points were designated: 1) in a duckweed pond treated with cow manure and photosynthetic microorganisms, 2) in a duckweed pond treated with cow manure and 3) in a duckweed pond treated with photosynthetic microorganisms. Samples were collected from all three ponds.
2. Measure the water temperature by immersing the thermometer approximately 10 centimeters deep in the water for about 3-5 minutes. Read the thermometer at eye level, ensuring the thermometer bulb remains submerged. Immerse the thermometer for another minute for the second and third measurements, switching who is reading the temperature. The unit of measurement is degrees Celsius (°C). Perform a total of three measurements.
3. Measure the pH of the water. Rinse the sample bottles three times and collect water samples from all three wells. Dip the Universal indicator strip into the water sample for 1-2 seconds, wait for the color to change, and then compare the color to the standard color chart. Read the pH value. Repeat this measurement three times.
4. Measure the transparency of the water. Scoop water from the surface and slowly pour it into the transparency measuring tube. Observe the bottom of the tube to see if you can still see the black and white areas on the plate. If you still see black and white areas, continue pouring until you can no longer see any black and white areas. While pouring, slowly rotate the tube to observe if you can still see the black and white areas. Read the transparency value in centimeters. Repeat the measurement two more times (using a different person each time) using a fresh water sample. Caution: The measurement should be taken in a shaded area. If shade is not available, use an umbrella to shield the area from the sun. The difference in the three measurements should not exceed 10 centimeters.
5. Measure the dissolved oxygen content in the water. Rinse the sample bottle with the sample water three times before collecting the sample. To collect the water, immerse the sample bottle completely under water and close the lid underwater. If gas bubbles appear when the bottle is inverted, pour out the water and begin collecting samples again. Store the water immediately and perform the test within 2 hours. Perform a total of 3 tests. The average value should be within the range specified by the test kit.

Carrying Out Investigations

Deseribes what happened

Table 1 shows the geographical coordinates of Wichienmatu School

latitude	longitude
7.50437	99.62847

GLOBE Badges

Be a Collaborator

This research was conducted through scientific teamwork, with team members collaboratively designing the experiment, monitoring water quality and duckweed growth, and recording data across all treatment ponds to ensure reliable and comparable results.

Be a Data Scientist

This study applies data analysis to compare water quality parameters and duckweed growth across different pond treatments, using recorded measurements to identify patterns and evaluate treatment effectiveness.

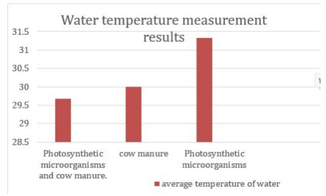
Be a STEM Storyteller

Clean water is not just a resource—it is a living system where microorganisms, nutrients, and plants interact in complex ways. In environmental science, understanding these interactions helps us design more sustainable food and water systems. One small but powerful plant at the center of this research is duckweed, an aquatic plant known for its rapid growth and ability to improve water quality.

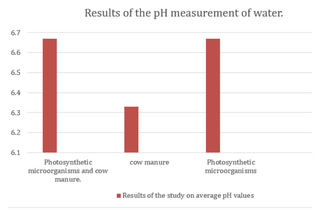
Results

Based on the study comparing the water quality in duckweed cultivation ponds with the addition of cow manure, photosynthetic microorganisms, and a mixture of photosynthetic organisms and cow manure, as follows:

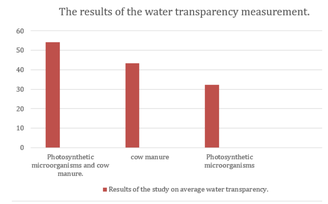
The results of a comparative study of the average water temperature between ponds containing duckweed mixed with cow manure and microorganisms



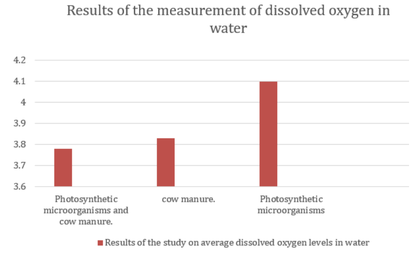
The results of a study comparing the average pH of water in duckweed ponds containing cow manure and microorganisms



The results of a comparative study of the average water transparency values between water in duckweed ponds containing cow manure and microorganisms.



The results of a comparative study of the average dissolved oxygen levels in water between ponds containing cow manure and microorganisms



Discussion

It was found that the water quality in the Red Duckweed pond was filled with photosynthetic microorganisms. There is better average water quality in the red duckweed pond that is filled with cow dung and photosynthetic microorganisms mixed with cow manure. The reason why the red duckweed pond filled with photosynthetic microorganisms is of the best quality is because the photosynthetic microorganisms improve the water without increasing the waste burden. While cow manure is a source of waste, it is useful. If it is not well controlled, it will deteriorate the quality of water.

Conclusions

According to a study of the water quality of red duckweed with the addition of cow manure. replenishment of photosynthetic microorganisms added photosynthetic microorganisms and mixed with cow manure at Wichienmatu School, It was found that the temperature of the water for the acidity of the water, the transparency of the water, and the amount of dissolved oxygen in the water are different.

Bibliography

The Soil Science Research Group, Agricultural Production Factors Research and Development Division, Department of Agriculture, is the main agency studying the use of azolla as green manure and biofertilizer.

The Department of Livestock Development and Rajamangala University of Technology Srivijaya focus on managing farm waste to produce organic fertilizer for plant nourishment and environmental improvement, such as using cow manure to enhance quality.

Daniel Gabriel Fahrenheit (1714), invented the mercury thermometer (commonly used today) – switching from water/alcohol to mercury, resulting in greater accuracy

Pietro Angelo Secchi, an Italian astronomer and clergyman, is credited with inventing the most widely used and basic instrument for measuring the transparency of water. He developed the transparency plate known as the "Secchi disk" in 1865

Ludwig Alexander Winkler, a Hungarian chemist, developed a standard method for testing dissolved oxygen (DO) in water in 1888. This method, known as the "Winkler Method," uses the principle of titration to measure the amount of oxygen in water.

Research report on water quality from Srinakharinwirot University: http://thesis.swu.ac.th/swuthesis/Sci_Ed/Sudaporn_T.pdf.

Studying the relationship between transparency and dissolved oxygen in waterhttps://www.repository.rmutsv.ac.th/bitstream/handle/123456789/2141/FullText.pdf?sequence=1&isAllowed=y