Effects of Water Quality in Soil and Plastic Ponds on White Shrimp Growth

Researcher : Miss Nichamon Punyamonsri
Miss Nichanan Kaewsaeng
Miss Panpawi Napaya
Miss Sutthikan Rodsud
Grade Level : Grade11
Advisor : Miss Jiraporn Sirirat
Miss Naeriya Tonkrongchan
School : Wichienmatu Trang Province

Abstract

A study on the quality of water in earthen ponds and plastic ponds that affect the growth rate of white shrimp. at House No. 52 Moo 2 Khlong Cheelom The purpose of this project is to study the quality of water in earthen ponds and plastic ponds that affect the growth rate of white shrimp. by collecting water quality data in the study area. The size of each pond is 1 rai of 2 ponds, divided into 2 types, 1 shrimp raised in an earthen pond and 1 pond in the adjacent area which will be a shrimp pond with plastic paving by controlling the environment.

The results of the measurement showed that the quality of the water in the pond used to raise white shrimp in an earthen pond and a plastic pond for a period of 3 months. The average salinity of the water is 10.42-10.83 ppt, the average pH is 7.74-7.67 ppm, the average ammonia is 0.15 ppm, the nitrile is 0.58-0.67 ppm, and the average oxygen solubility in the water is 5 mg/L, which are similar values in both ponds, but the clay pond has an average alkaline value of 120.42-125.83 ppm,an average calcium of 140-146.67 mg/L, and an average magnesium of 279.17-310.42 ppm. The average shrimp sizeis 45 pcs/Kg, which shrimp grow better than in plastic ponds .

Research Question and Hypothesis

- How is the quality of water in earthen ponds from white shrimp farming better than plastic ponds?
-The quality of the water in the earthen pond affects the growth rate of white shrimp more than that raised in plastic ponds.

Background

White shrimp cultivation in Thailand, after the Department of Fisheries allowed the import of sterile breeders into the experiment in 2002, which was a time when black tiger shrimp farming by experiencing the problem of shrimp growth very slow to the point of loss. A number of farmers have switched to white shrimp farming and have been successful. Therefore, white shrimp farming is not very popular.This can be seen from the output from white shrimp farming in 2004 was about 250,000 metric tons, while the production from black tiger shrimp farming was about 100,000 metric tons (Slow and Pornlert., Currently, most farmers are raising more white shrimp, to increase the production of white shrimp in the future. To raise white shrimp, it is necessary to use modern technology and management as well as good care. Water quality is also a very important factor for white shrimp farming. This affects the growth rate and productivity in maintaining water quality for white shrimp farms. Generally, shrimp ponds in the southern region are built with a depth of 1.2-1.8 meters, which is an appropriate level for controlling water quality and temperature. This will reduce the stress of the shrimp and promote better growth. It also allows for easier management of waste and sludge at the bottom of the well. Therefore, the purpose of this project is to study the quality of water in clay ponds and plastic ponds to see if there is a difference in the growth of white shrimp. how to be useful and guidelines for Farmers' next plan for white shrimp farming.

Description of Study Site

Districts	Geographical coordinates	
	Latitude (N)	Longitude (E)
Shrimp pond	7.413206	99.599563

GLOBE Badges

I AM A COLLABORATOR
All research team members are listed including collaborators from other organizations, along with clearly defined roles, how these roles support one another, and descriptions of each researcher's contribution. If the researchers collaborated with others outside of their organization, describe how the collaboration improved the research.

I AM A COLLABORATOR
All research team members are listed including collaborators from other organizations, along with clearly defined roles, how these roles support one another, and descriptions of each researcher's contribution. If the researchers collaborated with others outside of their organization, describe how the collaboration improved the research.

I AM A PROBLEM SOLVER
While working on environmental investigations, researchers may learn how they can be part of possible solutions to the problems they are investigating. This badge will be awarded to projects that demonstrate how GLOBE researchers are using Earth system science for a better worl

Research Methods

Water temperature
1. Immerse the thermometer in water about 10 centimeters deep for about 3 to 5 minutes.
2 .Read the thermometer at eye level.
3. Immerse the thermometer for another 1 minute for the 2nd and 3rd measurements by changing the thermometer reader.
4.Read the temperature in degrees Celsius (°C) and make 3 repeats of the measurement.

pH Measurement pH Test Kit
1.Prepare water samples. Fill the test tube with the water you want to measure pH to the specified limit.
2.Drop Indicator Add the pH indicator solution to the sample water according to the number of drops specified in the manual (2 drops).
3.Mix well, shaking gently so that the mixture is well mixed.
4.Wait for the color to change. Leave it for a few minutes so that the color of the solution gradually changes.
5.Color Comparison and Reading Compare the resulting color to the standard color calibration plate that comes with the test kit to determine the pH that best matches the color.
6.Cleaning and Storage: Rinse the test tube thoroughly after use, and store the indicator solution in a cool place and out of direct sunlight.

Dissolved Oxygen Content Measurement
Rinse the sample collection vial with sample water 3 times before collecting the sample.
2.To collect water, immerse the specimen collection bottle under water by filling it to the brim and close the lid under the water. If gas bubbles form, empty the water and start collecting the water sample again.
3.Immediately preserve the water and test within 2 hours.
4.Perform a total of 3 repeats of the test with the average value to be in the range specified by the test kit.

Nitrile Testing Procedure
1.Prepare the test tube Rinse the test tube with the sample water to be tested, and then fill the tube with sample water to the specified limit (typically 5 ml).
2.Chemical Fillings Add the chemical or reagent according to the amount of droplets indicated in the test kit (e.g., 3 drops or 7 drops) and shake gently to perform the test.
3.Read Compare the color obtained from the test tube with the color comparison plate provided in the kit to read the nitrile content.

Ammonia Testing Procedure
1 .Prepare the sample, rinse the test tube with sample water, and pour the specified amount of sample water into the tube (e.g., 5 ml).
Drops Add ammonia solution according to the number of drops and the sequence indicated in the manual.
3.Shake the tube so that the ingredients are well combined after adding each solution.
4.Set aside for the time specified by the manual (about 15-20 minutes) to allow the solution to react and color.
5.Read the results Compare the resulting water to a standard color calibration plate to read the ammonia content.

Alkaline Test Procedure
1.Sample Water Preparation Rinse the test tube with the sample water to be tested, and then fill the tube with sample water to the specified limit.
2.Add 1 drop of indicator solution and shake well. The color of the sample water will change to blue-green or blue.
3.Drops of Titrant Solution Gently drip the titrant solution into the test tube one drop at a time, shaking it as well.
4.Observe until the color of the water changes from blue-green to grayish-purple.
5.Counting the number of droplets After the color changes to grayish-purple, apply 1 more drop of the titrant solution, the color of the water will change to orange-red.
6.Read the results Compare the number of countable droplets to the table or formula attached to the test kit to convert it to an alkaline value.

Calcium Testing Procedure
1.Rinse the test tube with sample water and add sample water to the 5 cc mark.
2.Drop bottle solution #1 8 drops, shake gently
3.Filling the bottle powder #2 1 scoop Shake gently.
4.Drop bottle solution #3 One drop at a time Count the number of drops that make The water changes from pink to blue.
5.The number of drops that can be counted by 20 will give the calcium (limestone) value in the water in mg/l.

Magnesium Examination Procedure
1.Rinse the test tube with water in the aquarium to be checked several times.
2.Fill the test tube with sample water according to the mark specified by the test kit (e.g., 5 or 10 ml).
3.Drop or add the 1st and 2nd test powders as directed (e.g. pink solution) to prepare the value.
4.Use a syringe or dropper bottle to insert the 3rd reagent (Magnesium Reagent) slowly, one drop at a time.
5.Gently shake the test tube after each drop and count the number of drops until the color of the solution in the tube changes from one color (e.g., pink/red) to another (e.g., blue/blue) clearly.
6.Compare the number of drops used with the manual that came with the test kit to find out the magnesium concentration in units (mg/l).

Materials and equipment and methods of conducting research
Water Sampling Instruments and Shrimp Sample Measuring Instruments

- pH Test Kits
- Ammonia Test Kit
- Alkaline Test Kit
- Nitrile Test Kit
- Dissolved Oxygen Test Kits
- Calcium Test Kit
- Magnesium Test Kit
- Shrimp Temple Ruler
- Digital Scales

Data Collection Plan

1) Planning research activities

Activities	Sep 25	Oct 25	Nov 25	Dec 25	Jan 26	Feb 26	Responsible Person
1. Determine the topic to be studied.	■						Sutthikan et al.
2. Prepare a project proposal head.	■						Nichanan et al.
3. Determine the area to be studied.		■					Nichamon et al.
4. Survey area		■					Panpawi
5. Random water sample collection			■	■	■		Panpawi
6. Water Quality Test			■	■	■		Sutthikan et al.
7. Analyze and record the results					■		Nichanan et al.
8. Summary of Experiment Results						■	Nichamon et al.

Results

1.1 Table of water results of plastic wells

Week	Salinity of water(ppt)	pH	Ammonia (ppm)	Alkaline (ppm)	Nitrile (ppm)	O2 (mg/L)	Calcium(mg/L)	Magnesium (ppm)
1	16	8	0	68	0	5	160	375
2	10	8.1	0	102	0	5	120	225
3	10	7.7	0	119	0	5	120	250
4	10	7.7	0	119	0	5	120	250
5	9	7.7	0	136	0	5	120	225
6	9	7.7	0.5	102	0.25	5	120	225
7	10	7.6	1	119	0.25	5	120	275
8	9	7.6	0	153	0	5	120	225
9	12	7.7	0	119	0	5	160	325
10	12	7.7	0.25	153	0.5	5	200	375
11	10	7.7	0	153	3	5	160	250
12	8	7.7	0	102	3	5	160	350
Average	10.42	7.74	0.15	120.42	0.58	5	140	279.17

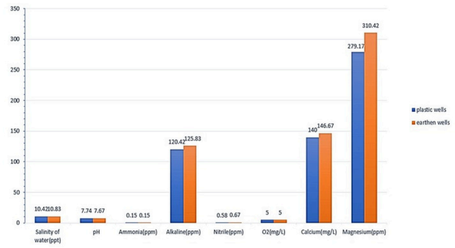
Table 1.1 shows that the average salinity of the water is 10.42 ppt, the average pH is 7.74, the average ammonia is 0.15 ppm, the average alkaline is 120.42 ppm, the average nitrile is 0.58 ppm, the average O2 is 5 mg/L, the average calcium is 140 mg/L, and the average magnesium is 279.17ppm.

1.2 Table of water results of earthen wells

Week	Salinity of water(ppt)	pH	Ammonia (ppm)	Alkaline (ppm)	Nitrile (ppm)	O2 (mg/L)	Calcium(mg/L)	Magnesium (ppm)
1	12	7.5	0	102	0	5	120	325
2	12	8	0	102	0	5	120	325
3	12	7.6	0.25	65	0	5	160	300
4	11	7.6	0	136	0	5	160	275
5	10	7.7	0	119	0	5	160	325
6	10	7.5	0	119	0	5	120	250
7	12	7.7	0.25	136	0	5	160	325
8	10	7.6	0	136	0	5	160	325
9	11	7.6	0.3	153	0	5	120	325
10	12	7.8	0.5	170	1	5	240	400
11	9	7.7	0.5	153	3	5	120	225
12	9	7.7	0	119	4	5	120	325
Average	10.83	7.67	0.15	125.83	0.67	5	146.67	310.42

Table 1.2 shows the average salinity of the water for 10.83 ppt, the average pH is 7.67, the average ammonia is 0.15 ppm, the average alkaline is 125.83 ppm, the average nitrile is 0.67 ppm, the average O2 value is 5 mg/L, the average calcium value is 146.67 mg/L, and the average magnesium value is 310.42ppm.

The bar chart shows a comparison of water quality between earthen and plastic wells.



The bar chart shows a comparison of water quality between earthen and plastic wells. It was found that the characteristics of the pond used for raising shrimp were clay ponds and plastic ponds for a period of 3 months. Salinity of water, pH, ammonia, nitrile and oxygen The value is similar to both wells, but the clay pond has an alkaline value. , calcium, and magnesium a little more.

Expected Outcomes

- To study the water quality in earthen ponds and plastic ponds from white shrimp farming on the growth of white shrimp.

Conclusions

According to the study, the characteristics of the pond used to raise shrimp are clay ponds and plastic ponds throughout the period of 3 months by salinity of water, pH, ammonia, nitrile and oxygen The value is similar to both wells, but the clay pond has an alkaline value. And in clay ponds, shrimp have a higher weight, length, and size than plastic ponds, which shows that water quality in earthen ponds affects the growth rate of shrimp more than in plastic ponds. If there is not enough, the shrimp will have a thin shell, molt slowly, and the problem of not going through the molt (molting on the head), magnesium helps the functioning of the nervous system, metabolism, and molting process to go through completely, and alkaline helps to control the pH level of the water to be stable (about 8-9) so that it does not swing too much, to affect the stress and food intake of the shrimp.

References

Pojman Choidech, Chloe Limsuwan and Niti Chuchordkarn (2006). Study on the quality of Vannamai white shrimp. Litopenaeus vannamei (Litopenaeus vannamei) reared in earthen ponds and ponds covered with polyethylene with low-salinity water. Retrieved September 30, 2025, from https://kukr.lib.ku.ac.th/kukr_es/kukr/search_detail/result/ 9732

Farming of black tiger shrimp for maximum yield: single farming, mixed with white shrimp vannamei and mixed with lobster with low salinity water. Retrieved September 30, 2025, from https://share.google/gBPMik7Y6qx3nMEAy

Supavich Chavalitpichet (2018). A feasibility study on shredded shrimp farming in commercial plastic ponds. Retrieved September 30, 2025, from https://share.google/ 8siaAWRxdRSr6u979

Somporn Yasman (2009). Appropriate Quality Studies Throughout the process of feeding Vannamai white shrimp.

Litopenaeus vammamei developed in polyethylene (PE) paving ponds in different seasons Retrieved September 30, 2025 , from https://chumphon.mju.ac.th/goverment/20111119104834_chumphon2/File20130320094251_17345.pdf

Google. (2569). Gemini (Versions 3 Flash) [Large language model]Retrieved on 30 September 2568 , From https://gemini.google.com