

Research topic : Study the water quality of dug ponds for fish farming and using the water from the pond as an electrolyte to invent a lure insect's device with water evaporation prevention

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Abstract

The aim of the study tittle Study the water quality of dug ponds for fish farming and using the water from the pond as an electrolyte to invent a lure insect's device with water evaporation prevention 1) to observe the water quality of dug pond for fish farming. 2) using water from dug pond as an electrolyte in electrochemical cell. 3) to invent a lure insect's device with water evaporation prevention. After tested the water quality of dug ponds found meet the standard for being a fish farming moreover, there were relevent relationship between EC, value and (V),(A), Which could be used as electrolyte in electrochemical cells or battery furthermore, the 4 connecting cells 8 are the best potential for electric current then used all material to create lure insect's device After tested lure insect's device in dug pond found that the battery had a lifespan not less than 60hour which can trap insects for 15.2 grams resulting in decreasing the amount and cost on fish feeding food. In addition, this device had efficiency about 2.5% for saving water from evaporation.

Intruduction

At present, farmers in Don Chan district prefer to dig a pond for fish farming and reserve water for drought. Most fish farmers tend to feed pellet fish food. After the drought season, the water in the pond starts to decrease. The research team therefore hypothesized that the water quality in the fish pond should have lower quality. Therefore, interested to check the water quality from farmers' digging well. And observing all the fish ponds, electric lamps are opened to illuminate, to lure insects into the fish pond becoming fish food.

The researcher therefore has the idea that If the water from the fish pond is used to generate electricity to lure insects, will be able to reduce electricity consumption and also reducing the cost of fish food as well. Therefore, searching more about electrochemical cells, found that the electrolyte has acid and base properties (Institute of Science and Technology Promotion: 2010) and is a substance that when dissolved in water can conduct electricity. Because it has ions which will be positive cations or negative ions moving in the solution and if designing a device to reduce the evaporation of water in the fish pond, will help farmers use the water for longer time. Therefore, the researcher is interested in studying the quality of water from the pond, and use water as an electrolyte in electrolytes to create a device to lure insects and prevent evaporation of water.

Research objectives

1. To check the water quality of farmers that is reserved for agriculture.
2. To study certain properties of reserve water that can affect the direct current generation of electrochemical cells.
3. To test the comparison of electrochemical cells suitable for direct current generation.
4. To invent insect lure device and can reduce the evaporation rate of water in the ponds that are reserved for agriculture.

Research question

1. How is the quality of the farmers' reserved waters for agriculture
2. Does the properties of reserved water affect the invention of electrochemical cells? and how?
3. How is the metal fabricated for electrochemical electrode suitable for direct current generation?
4. Can the device lures insects and reduces the evaporation rate of the water in the fish pond?

Hypothesis

1. The reserved waters for agriculture have different quality.

2. Some properties of reserved water have different effects on electrochemistry.
3. Metals that are fabricated for electrochemistry electrode suitable for direct current generation are different.
4. The devices can lure insects and reduce the rate of water evaporation in fish ponds.

Expected benefits from research

1. Obtaining water quality data for farmers' digging wells that is reserved for agriculture.
2. Obtain information on certain properties of wells that can affect the direct current generation of electrochemical cells.
3. Get the information to use the metal that is used to make electrochemical cells suitable for direct current production.
4. Get insect lure device and can reduce the evaporation rate of water in the wells that are reserved for agriculture.

Method of research

Equipment

1. Nitrate test kit
2. Dissolved Oxygen test kit
3. pH meter
4. EC & TDS meter
5. Hydrometer
6. Secki Disk
7. Sample water storage bottle
8. 1.95 liters plastic bottles
9. 250ml plastic bottle
10. Metals, copper, zinc and aluminum (can)
11. PVC pipe
12. Blue LED

Method of research

Part 1. Monitoring of water quality from a digging well for reserving water and raising fish

1. Determine where to study from the digging wells of farmers in Don Chan district in various points as follows.

Well 1, latitude 16.4220, longitude 103.6969

Well 2, latitude 16.4215, longitude 103.6981

Well 3, latitude 16.4214, longitude 103.6990

Well 4, latitude 16.4039, longitude 103.7172.

Well 5, latitude 16.4051, longitude 103.7165

Well 6, latitude 16.4059, longitude 103.7170.

2. Collect data of 6 water properties according to GLOBE method by measuring water properties such as EC TDS, pH, DO, salinity, nitrate temperature and transparency the area used in the experiment. After that, submit the information that has been filled in.

<https://www.globe.gov/globe-data/data-entry>.

Part 2. Comparison of some properties of water from the digging well with the direct current generation.

Comparing some properties of water from wells dug in Don Chan district that dig for water reserves and raise fish during the dry season. By using water from the dig well as an electrolyte. Use zinc metal as a negative pole. Copper metal is anode by measuring the electric potential difference (V) and the amount of electric current (mA), comparing some properties of water suitable for direct current production.

Part 3: Study of suitable electrode for direct current production.

The third experiment selected water from the digging well according to the experimental results. Part 2 is used in the experiment with the following steps

1. Cut 6 250-ml plastic bottles and pour 100ml of water from the digging well. Separate into 2 groups.
2. Group 1 Three vials experiment using Copper metal is anode and zinc metal is used as a cathode.
3. Group 2 Three vials using Copper metal is anode and use aluminum metal from canned soft drinks as a negative electrode. Both groups measure the electric potential difference (V) and the electric current (A), compare the measured quantities and analyze the cost of both metals.

Part 4 Study of the number of cells to be connected to a battery to invent insect lure equipment

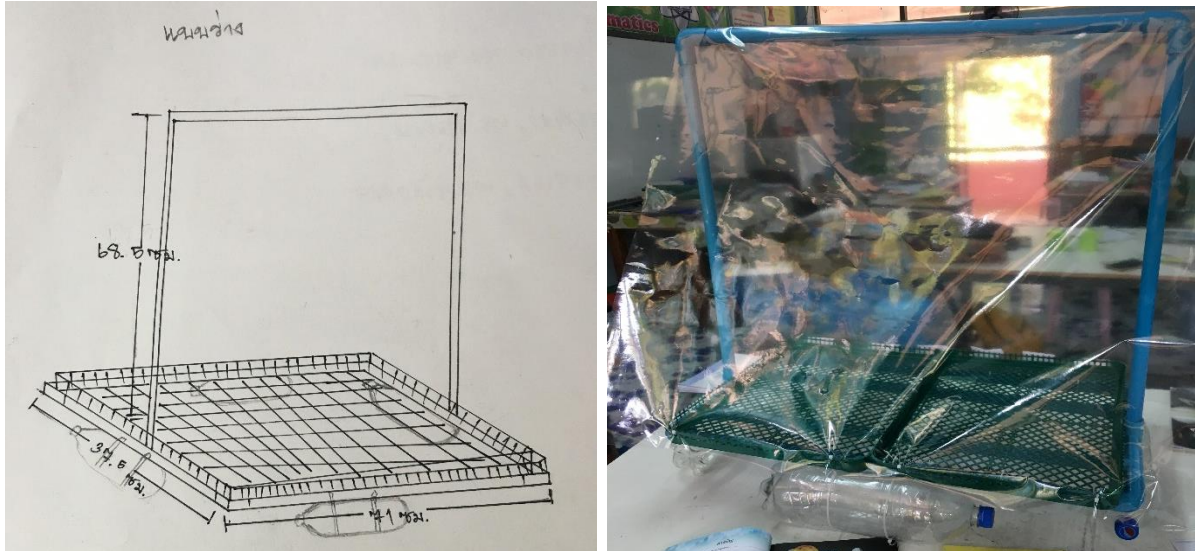
This experiment uses the experimental results from Part 3 to connect the batteries with the following steps.

1. Select the metal to make the cathode from the experimental result part 3, still using copper metal as an anode, connect cells together in series and measure the electric potential difference (V) and the amount of current (mA).
2. Follow experiment 2, but increase the number of cells until able to measure the electric potential of 2.5 v because the blue LED will give the blue light 510 - 560 nm. It works because the insect's eye will respond to the light at the wavelength between 253 - 700 nm. (Alongkorn, 2009).

Part 5 Study of the invention and working time of the insect lure

From this experiment, we have invented a device to lure insects by using various information from the initial experiment and then invented the device to lure insects with the following steps.

1. Cut 4 size PVC pipes into 9 pieces and then assembled as shown.



Picture 5 The invention of insect lure device

2. Put all cells in 4 rows, each row in series, and between the rows arranged in parallel like in the picture



Picture 6 Connecting the battery cells

3. Use clear plastic to cover the top, then assembled with parallel LED lamps to reduce the resistance of 4 lamps.
4. Turn on the lamp continuously for 12 hours and then record the usage hours.

5. After 12 hours, measure the mass of insects that fall into the tray water that prepared.

Part 6 Design the shape of the device to lure insects and reduce the evaporation of water.

Cut the 600 ml bottle as shown and stick around all sides of the device. Then add 4 liters of water, then put it outdoors for 24 hours to measure the amount of water lost. Compared with the device that was not stick with the bottle, then recorded.

Research result

From the study of water quality from wells dug for fish farming of farmers, and use water as an electrolyte in Electric cell to create a device to lure insects and prevent evaporation of water. The experimental results are as follows.

Part 1 Monitoring of water quality from a digging well for reserving water and raising fish

Table 2 Shows the water quality from the digging well for reserving water and raising fish.

Water sources	Water quality from various sources							
	DO (mg/L)	EC ($\mu\text{S.cm}^{-1}$)	TDS (ppm)	pH	Salinity (ppt)	Temperature ($^{\circ}\text{C}$)	Nitrate (ppm)	Transparency (cm)
Well 1	8.50	104.00	49.00	8.10	3.20	28.00	0.50	3.00
Well 2	6.00	158.00	73.00	8.00	2.80	27.00	0.00	10.00
Well 3	5.00	112.00	52.00	7.70	2.50	26.00	0.00	8.00
Well 4	5.00	72.00	35.00	8.00	2.80	27.00	0.00	14.50
Well 5	6.00	46.00	23.00	8.10	2.80	27.00	0.00	3.50
Well 6	5.50	74.00	34.00	7.70	2.80	27.00	0.00	30.0

From the table, it is found that all 6 wells are of good quality. There is only low water transparency. The water in the well is quite turbid. In the first well, there is the most turbidity. Therefore, the water quality in the digging well used for fish farming and reserved for agriculture quite good quality.

Part 2 Comparison of some properties of water from the digging well with the direct current generation.

Table 3 Comparison of some properties of water from dredging well with DC electricity generation.

Water sources	Water quality from various sources							
	EC ($\mu\text{S.cm}^{-1}$)	TDS (ppm)	pH	ความเค็ม (ppt)	Salinity (ppt)	Temperature ($^{\circ}\text{C}$)	Electric potential (V)	electric current (mA)
Well 1	104.00	49.00	8.10	3.20	28.00	3.00	0.60	1.70
Well 2	158.00	73.00	8.00	2.80	27.00	10.00	0.70	1.90
Well 3	112.00	52.00	7.70	2.50	26.00	8.00	0.60	1.30
Well 4	72.00	35.00	8.00	2.80	27.00	14.50	0.50	1.20
Well 5	46.00	23.00	8.10	2.80	27.00	3.50	0.50	1.20
Well 6	74.00	34.00	7.70	2.80	27.00	30.0	0.50	1.20

From the table, when analyzed in some properties of water, EC values have an effect on the occurrence of electric potential. In the second digging well, the electric potential is 0.70 volts and the electrical current is 1.90 milliamps, while the 5th well has the smallest amount of electricity, which is 0.5 volts and 1.2 milli amps.

Part 3: Study of suitable electrode for direct current production.

Table 4 Shows the appropriate electrode for direct current production.

Choose metal to make electrode.		Volume Measured		Cathode price
Anode	Cathode	Electric potential (V)	electric current (mA)	
Copper	aluminum	0.70	1.80	35 baht per kilogram
Copper	zinc	0.80	1.80	500 baht per kilogram

The table shows that the use of copper metal as an anode of electrical cells and use zinc metal as a negative electrode, resulting in an electrical volume greater than the use of copper metal as the anode of the electrolytic cell and the use of aluminum metal. But when comparing the unit price in buying, it was found that aluminum metal has a lot lower price.

Part 4: Study of the number of cells in the battery which has an effect on the generation of electric potential for the creation of insect lure devices.

Table 5 Shows the number of cells in the battery that have the potential to create electric potential for insect lure devices.

Cell number (Cell)	Volume Measured	
	Electric potential (V)	Electric current (mA)
1	0.80	1.40
2	1.00	1.60
3	1.20	1.90
4	1.65	1.90
5	2.15	2.00
6	2.40	2.20
7	2.50	2.20
8	3.20	2.20

From the table found that when connecting cells in the battery, when the electric cells are connected, the electric potential increases but the rate of increase in the electric potential decreases. The electricity that can be measured when Increase the number of electric cells causing the current to increase during the first 4 cells but when adding more electric cells The measured current is no different.

Part 5 Study of the invention and working time of the insect lure device.

Table 6 Results of the performance test of insect lure device.

Date	Time (hours)	Mass of insects (grams)
1	12	20
2	12	15
3	12	18
4	12	10
5	12	13
Total / Average	60	15.2

From the table, it is found that the battery has a life of not less than 60 hours and has an insect measured from the tray that has water trapping insects on average 15.2 grams.

Part 6 Design the shape of the device to reduce water evaporation.

Table 7 Results of testing of the efficiency of water evaporation-reducing devices

test	Amount of water remaining		Percentage of water lost (%)
	Before experiment (Liter)	After experiment (Liter)	
Tray with evaporation reduction device	4	3.90	2.5
Controlled tray	4	3.65	8.75

From the experiment found that a tray equipped with a water evaporation reduction device can control the evaporation of water by 2.5%, which is different from not being a device with 6.25%. Therefore, if the equipment is installed, it can reduce the water evaporation.

Summary and discussion

Experimental result

Farmers in Don Chan district prefer to dig a pond to raise fish for agriculture and reserve water for use during the drought season. Fish farming is often preferred to feed pellet fish food which may affect some properties of the water. From the water quality measurement, all 6 wells have relatively good quality. There is only low water transparency. The water in the pond is quite turbid. In the first pond, there is the most turbidity. After analyzing certain properties of water, it is found that the EC value affects the occurrence of electric potential. In the second digging pond, the electric potential is 0.70 volts and the electric current is 1.90 milliamps, while the fifth dig is the smallest electricity, which is 0.5 volts and 1.2 mil electricity. When copper metal is used as an anode of electrical cells And use zinc metal as a negative electrode Resulting in an electrical volume greater than the use of copper metal as the anode of the electrolytic cell and use aluminum metal. But when comparing the unit price in buying, it was found that aluminum metal is much lower than zinc metal. When connecting cells in the battery, the more electric cells, the more the electric potential, but the rate of increase of the electric potential is decreasing. The electrical current that is measured when increasing the number of electric cells causing the current to increase during the first 4 cells. But when adding more electric cells, the measured current is no different. The battery has a lifespan of not less than 60 hours and has an insect measured from a tray that has an average water trap of 15.2 grams, and when attached with a device to reduce water evaporation, can control the evaporation of water by 2.5%, which is different from lack of equipment 6.25%.

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