Water Electric Light Trap with Water Battery Energy Source as An Technology Innovation Agricultural Brown Planthopper Control

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***Abstract*—The purpose of this experiment was to determine how to make *Water Electric Light Trap* with *Water Battery* which is water as a filled of battery it self. Determine the effectiveness of *Water Electric Light Trap* with *Water Battery* to control brown planthoppers towards self-sufficiency in rice, and the benefits of *Water Electric Light Trap* with *Water Battery* as an environmentally friendly technology. The method used is the subject of experimental research study *Water Electric Light Trap* with *Water Battery* energy research object brown planthopper. The experiment begin with the setting some tools consists of the a set of the *Water Battery* and *Water Electric Light Trap* then tested in the Village area of rice fields Rejomulyo-Madiun, East Java. The results showed the *Water Electric Light Trap* with white light lamp is most effective in water trap with electric light energy source, chargers skillet is best to water and oil as it can trap the brown planthopper most weighing 25.7 grams for 1 hour.**

***Index Terms*—*water electric light trap, water battery,* brown planthopper, nilapervetta lugens, agricultural technology**

I. Background

Indonesia is an agricultural country which is experiencing a lot of problems in the fields of agriculture, among others: changes in global climate, availability of infrastructure, facilities, and natural factors, namely: flood, drought, and disease pests of rice. Based on data from the Department of Agriculture in 2012, the production of rice (Oryza sativa L.) in 2011 amounted to 65, 39 million tons of milled rice (GKG). This production was slightly lower 1, 08 million tons of rice (1.63%) of production in 2010 amounted to 66, 47 million tons of rice. The fall in rice production in 2011 have a significant impact on the achievement of rice production. One cause of the decline in rice production is an outbreak of brown planthoppers *(Nilapervetta lugens).* Moreover, Indonesia is an agricultural country, most of the population works in the agricultural sector. However, Indonesia is currently experiencing many challenges in food security, especially toward rice self-sufficiency in rice. Rice self-sufficiency is one of Indonesia's efforts to meet the needs of targeted independently of rice in 2014 (Noor, 2012) [1].

Brown planthopper is still considered a major pest in rice plants. Damage caused by these pests is quite extensive and occurs in almost every season. Brown planthopper will directly suck the fluid cells of rice plants so the plants become dry and eventually die (Retro, 2011) [2].

Brown planthopper is not only a global pest attack rice crops in Indonesia, also attack plants rice in China, Thailand, Vietnam, India, Bangladesh, Malaysia, the Philippines, Japan, and Korea. Brown planthopper in Indonesia is an old pest that has long been known as a pest. Since 1930, has always been a constraint brown planthopper in rice production increase (Baehaki, 2010) [3].

Brown planthopper attack in the decade 1971-1980 reached 2.51068 million ha. Since 1981-1990 recorded only 54770 ha. In the decade 1991-2000 to continue its attack reached over an area of 250000 ha. In the brown planthopper attack data 2001-2010 reached 272 580 ha of which 4,598 ha puso. At the beginning of 2010 in a plantation brown planthopper attack occurred in various provinces with attack rates ranging from mild to puso damaged. In June 2010 until brown planthopper attack in Indonesia reached 23 187 ha including the puso not less than 2,917 ha (Baehaki, 2010) [4].

During this time, farmers and government use of pesticide to eradicate pest brown planthopper, but the use of pesticide can leads many new problems in agriculture,

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particularly environmental degradation. Additionally, the use of pesticides can also make brown planthopper become resistant to many pesticides. Pesticides are used continuously will lead to the emergence of pesticide-resistant populations in a relatively short time. Laboratory studies show that not more than six months of brown planthopper populations can become resistant to certain pesticides (Untung, 2013) [5].

Therefore, new solutions are needed to tackle pests more environmentally friendly and not harmful. One of the innovations that can be used is to use *Water Electric Light Trap* with *Water Battery* energy sources. This tool is able to trap the brown planthopper using light as leafhoppers have liked the nature of light (Baehaki, 2009) [6]. Leafhoppers are interested in the light of this tool will be around the lamp and then after a weary will fall in the water under the lights then die.

II. Research Purpose

The purpose of this research are:

- Knowing how to make *Water Electric Light Trap* with *Water Battery* energy source as an environmentally friendly technology innovation for sustanable agricultural pest control population brown planthopper (*Nilapervetta lugens*) towards self-sufficiency of rice.
- Examine the effectiveness of *Water Electric Light Trap* with *Water Battery* energy source to control brown planthoppers towards self-sufficiency in rice fields.
- Knowing the advantages of *Water Electric Light Trap* with *Water Battery* energy source as an environmentally friendly technology innovation for sustanable agricultural pest control population brown planthopper (*Nilapervetta lugens*) towards self-sufficiency of rice.

III. Methods of Research

A. Research Design

This type of research is chosen in this research is an experiment.

B. Subject and Research Object

The research subject in this experiment is a set of *Water Electric Light Trap* with *Water Battery* energy source and the object of this experiment is the brown planthopper stuck on this tool.

C. Time and Place Research

The research was started from June 2012 to July 2013 in the area of rice fields Rejomulyo Village-Madiun East Java.

D. Variable

The variables in this research are:

1) Independent variables

The independent variables in this study are that the color yellow and white lights, the type of water tank filler that are just water and the mixture of water plus oil.

2) Fix variables

The fix variables are *Water Battery*, size and shape of *Water Electric Light Trap*, and then time testing the use of tool.

3) Dependent variables

The dependent variable to be studied is the number of brown planthoppers were trapped.

E. Procedure Research

1) Make water battery

a. Tools and Materials

- Scissors
- AVO Meter
- Place used car batteries 1 piece
- Zinc plates 21 pieces with measuring 13 cm x 18 cm
- 21 pieces of copper plates with measuring 13 cm x 18 cm
- Water Irrigation (at field)
- Brace crocodile
- Cable
- Small water hose

b. Setting of *Water Battery*

Figure 1. Zinc plates 21 pieces with measuring 13 cm x 18 cm

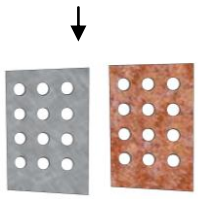


Figure 2. Put on glue stick burn

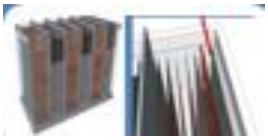


Figure 3. Set in parallel on each cell

Figure 4. Set in series on the between cells

2) Setting of water electric light trap

Figure 5. Installing lights in place with facing down of WEL-T

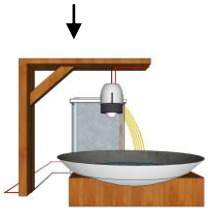
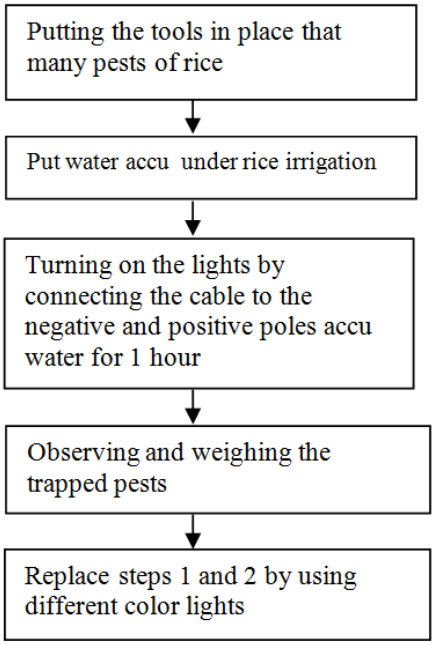


Figure 6. Installing the skillet and fill it with water

3) Testing tool



IV. Results and Discussion

This research was done in the area of rice fields Rejomulyo Village, Madiun, East Java. We took Rejomulyo fields area because brown planthopper attack this place with severe. Joewono (2011) stated that the brown planthopper attack in Madiun in 2011 led to crop failure and farmers has lossed in billions of rupiahs [7]. While in June 2013, has brown planthopper attack rice fields covering 47, 42 ha (Sihaloho, 2013) [8].

Water Electric Light Trap utilize water as an energy source. *Water Battery* to generate electrical energy and if desired a larger voltage can increase the number of cells and varying the size of the plates of copper and zinc. Water can be used as a substitute for water electrolyte solution can dipisahkanmenjadi ions H^+ and OH^- . As stated by Gurumuda (2004) that the electrical conductivity associated with ions in solution [9].

The flow of electric current in the form of particles such as electrons or ions particles. When passed into the electrolyte solution, the electrical current delivered by the ions in solution so that the lamp can be lit. Water will damage the wing leafhoppers and planthoppers die making.

These lights will make brown planthopper planthopper naturally interested because it is attracted to light brown (Baehaki, 2009) [10]. Leafhoppers are interested will then surround the lamp and after running out of power, leafhoppers will fall in a water tank.

Water Battery-voltage measurement results before being connected on the appliance *Water Electric Light Trap* is shown in Table I.

TABLE I. THE VOLTAGE OF WATER BATTERY BEFORE CONNECT WITH WATER ELECTRIC LIGHT TRAP

No.	Cell	Volt
1	1	0,9
2	2	0,9
3	3	0,9
4	4	0,9
5	5	0,9
6	6	0,9
7	Total	5,4

Based on the data in Table I it is known that if in every cell battery not happen then the voltage of 0.9 volts per cell and total voltage of 5.4 Volts. Increasing the number of cells and the size of the magnification of copper and ferrous metal plates can add tension.

While the water mains voltage battery if connected on the appliance *Water Electric Light Trap* is 2.4 volts with a current of 2 mA. Electrical voltage is used to power the lights. If water is used in the battery that does not flow to tank of *Water Electric Light Trap*, long life time of the lamp is 24 hours / day for 1 month, whereas if the water used is water, light life time is up in every cell depleted zinc.

Testing water with electric light trap water source accu energy to control brown planthoppers done at night because the brown planthopper attack at night. The test results are shown in Table II.

TABLE II. OBSERVATIONS AGAINST NUMBER OF INSECTS TRAPPED IN TOOL

Time Observation	Number of insects are trapped and die	
	White Lamp	Yellow Lamp
1 hour (water)	5,2 gram	-
1 hour (water+oil)	25,7 gram	3,2 gram

The advantages of this tool is the waste water from *Water Battery* will not pollute the environment because zinc is dissolved in water is a mineral needed by the plants in the metabolism system. To meet the expected demand for food without significant increases in prices, it has been estimated that we need to produce 70–100 per cent more food, in light of the growing impacts of climate change, concerns over energy security, regional dietary shifts and the Millennium Development target of halving world poverty and hunger by 2015 (Pretty, 2010) [11]. *Water Battery's* cesspit are zinc (Zn) and copper (Cu) is an essential element needed by plants. Copper is deficient in many soils around the world, and addition of Cu fertilizer is required for productive crop growth (Parker, 2013) [12]. So in addition the *Water Battery* as an alternative source of electrical energy can also be used

for fertilizer plant. With the use of the tool then plant, water, and land will be free of pesticides that are harmful to health and environmental sustainability.

The cost of making of the *Water Battery* is cheaper than the accumulator on the market because it can take advantage of thrift. Besides, it is known that the life time of *Water Battery* indefinitely for zinc in each cell is still there. So *Water Battery* is a cheap source of electrical energy, without limit, and environmentally friendly.

Based on the data in Table II it is known that the type of water tank is more effective filler containing a mixture of water with oil because if the tank is only filled with water, caught pests are able to fly again. However, if water is added to the oil then the pests will get into the oil and can not get back out because the wings of the planthoppers damaged due to exposure to the oil that is in the water.

More striking lights planthoppers is a white light because of the experiments that have been carried out by comparing the yellow light to white light amount planthoppers caught far more when using white light. While the yellow light is much less than the pests that caught white lights. The number of pest trapped numbers are still small compared to the population in the fields because the current lack of precise data retrieval time is when the pest season is almost gone, so the next observations research should be done at the right time.

V. Conclusions and Recommendations

From this research it can be concluded that:

- To make *Water Electric Light Trap* with *Water Battery* energy sources as an environmentally friendly technology innovation for sustanable agricultural pest control population brown planthopper (*Nilapervetta lugens*) towards self-sufficiency of rice consist of two stages, making *Watter Battery* and *Water Electric Light Trap*. Firstly, make *Water Battery* by cutting zinc and copper plates measuring 13 cm x 18 cm respectively were 21 pieces, let blockers and plug the cable at an angle, insert alternating in each cell, each cell strung together series. Secondly, Preparation of *Water Electric Light Trap* with how to connect lamp around the reflector, then put on the spot lights located above the former aluminum pans as *Water Electric Light Trap* with downward facing position. Put the *Water Battery* under water irrigation fields or "Grojogan" in the Java language. Connect the negative and positive poles of *Water battery* to lamp or fill the tank with water.
- The most effective lights on of *Water Electric Light Trap* with *Water Battery* energy source to control brown planthoppers towards self-sufficiency in rice fields is white light and charger skillet is best to water and oil as it can trap the brown planthopper most weighing 25.7 grams for 1 hour.
- The advantages of *Water Electric Light Trap* with *Water Battery* energy source as an environmentally friendly technology innovation for sustanable agricultural pest control population brown planthopper (*Nilapervetta lugens*) towards self-sufficiency of rice is the waste water from this tool can be used as fertilizer for crops that do not harm the environment and cost of manufacture reasonably priced instruments.

Suggestion that we recommend for this experiment in further research is to test this tool when developing phase planthoppers that the results obtained are much better. As well as to test the effectiveness and efficiency of the agricultural area with distance *Water Electric Light Trap* placement right so that more effective and efficient.

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