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THE POTENCY OF WATER LEAVES EXTRACT OF BAY (*Syzygium polyanthum*) AND PAPAYA (*Carica papaya*) AS LARVACIDES TO FILARIA VECTOR *Culex queinquefasciatus* (Diptera: Culicidae)

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ABSTRACT

Culex quenquefasciatus is a mosquito that acts as a vector of filariasis disease. In Indonesia filariasis is still one of the endemic diseases. This proves that the handling of vector Culex quenquefasciatus is still not done optimally. One way that can be done to control mosquito vectors one of them is to use larvacide. Larvacide which is widely used today is still synthetic. Although very efficient in causing mosquito mortality, larvacide synthesis harms the environment and can cause vectors resistance. Then another larvacide alternative is needed that is effective and does not cause negative effects. Plants can be a choice of larvacide from nature. The study aims to find out the potential of the water extract of bay leaves and papaya leaves in killing the larvae of the Cx. quenquefasciatus mosquito as well as the value of LC_{50} after 24-hour observation. The type of research used is experimental research. The concentration of the water extract of bay leaves and papaya leaves used is 10%, 30%, 50%, 70%, and 90% with trhee times replication. LC50 is calculated using the Finney formula (1971), the calculation is carried out using application SPSS statistical version 26. Based on the research conducted, the value of bay leaf water extract LC50 = 62.89 g/ml and papaya leaf water extract LC50 = 45.10 g/ml. So based on the LC50 value, ita can be concluded that papaya leaf water extract is more effective in causing mortality Cx. quenquefasciatus compared with bay leaf water extract.

INTRODUCTION

Filariasis is a disease that transmitted through mosquito vector intermediaries. In Indonesia, filariasis disease is still one of the endemic diseases that cause health problems

in the community until now. There were 10,681 cases in Indonesia in 2018 that were spread in 236 districts/cities from 28 provinces are declared as filariasis endemic. The highest cases of filariasis in Indonesia occurred in Papua Province with 3,615 cases, then East Nusa Tenggara with 1,542 cases, and followed by West Java province with the 985 cases (Indah, 2019).

The main step that can be done to prevent the transmission of transmitted diseases through vector intermediaries is controlling the disease-transmitting vector (Fouque & Reeder, 2019). One of the ways to control the disease vectors is chemical using larvicides. However, the larvacides that are widely used today are still synthetic larvacides that cause various negative effects such as causing environmental pollution, and resistance and can be toxic to non-target organisms (Kumar *et al*., 2014; Princess & Kurnia, 2018). Therefore it is necessary to develop natural larvacides that are cheaper, eco-friendly does not toxic to non-target organisms, biodegradable, and do not destroy ecosystems (Astriani & Widawati, 2016; Kumar *et al.*, 2014).

Plants that may potentially be used as natural larvacides are bay leaves *(Syzygium polyanthum)* and papaya leaves (*Carica papaya*) because they contain secondary metabolite compounds. According to Utami & Puspaningtyas (2014), papaya leaves contain essential oils, lactones, phenols, saponins, and polyphenols. According to Cahyati *et al*. (2019), papaya leaves contain the enzymes papain, saponins, tannins, flavonoids, steroids, karpaina alkaloids, glycosids, karposids, saccharides, dextrose, and fructose.

Tannin compounds, saponins, flavonoids, and alkaloids have toxic properties for animals, so they can be used as larvicides *(*Ariesta, 2013*;* Gutierrez *et al*., 2014). Tannins can damage the digestive part of insects, as well as cause disruptions in the function of organism water absorption (Mardiana *et al.*, 2009; Pradani, 2009). Saponins can inhibit growth, and development and interfere insect reproductive system. Alkaloids and flavonoids can inhibit insect-eating, besides essential oils and flavonoids can work as respiratory toxins (Pradani, 2009).

Research of potential testing by bay leaf extract and papaya leaves as natural larvacides has been done by researchers before. This research aims to increase information about the potential of bay leaves and papaya leaves using the water extract method, the use of squeeze method can be directly applied by the general public, in

contrast to extract method which must be carried out in laboratory. Therefore, it can be acknowledged the potential or effectiveness of each water extract of bay leaves (*Syzygium polyanthum*) and papaya leaves (*Carica papaya*) towards the death rate of *Cx. quenquefasciatus* mosquitoes.

MATERIALS AND METHODS

Tools and Materials

The tools used in this study are blenders, measuring cups, digital scales, beaker glass, petri dishes, filters, stirrers, rubber, stationery, and la bel paper. While the ingredients used are bay leaves (*Syzigium polyanthum*), papaya leaves (*Carica papaya*), aquades, and *Cx. quenquefasciatus* mosquito larvae. As for the leaves used are dark green leaves.

Research Procedures

First, make sharpening bay leaves (*Syzygium polyanthum*) and papaya (*Carica papaya*). Papaya leaves (*Syzygium polyanthum*) 100 grams. Second, washed thoroughly, dried, and cut into small pieces to facilitate the smoothing process. Then, papaya leaves (*Syzygium polyanthum*) are put in a blender and added 100 ml of akuades. The blender results are water extractd and filtered. Furthermore, the result of this water extract is a 100% concentration. The result of this water extract is diluted using the formula:

$$V_1 \times M_1 = V_2 \times M_2$$

Description:
V1 = Initial volume
M1 = Initial concentration
V2 = Final volume
M2 = Final concentration

(Nurhaifah & Sukesi, 2015)

The way to make a water extract of papaya leaf (*Carica papaya*) is similar to how to make a water extract of bay leaves (*Syzygium polyanthum).* Next, make a water extract on each leave with concentrations of 10% (P1), 30% (P2), 50% (P3), 70% (P4), and 90% (P5). After that, the *Cx. quenquefasciatus* instar III larvae are put into a petri dish with as many as 25 individu for each treatment. Then, the petri dish treatment was closed

and incubated for 24 hours after treatment. The experiment are repeated 3 times. After 24 hours, the number of dead larvae was calculated and recorded for each treatment on the data tabulation table. Mosquito larvae are claimed as dead larvae are larvae if the condition is not moving anymore and/or the body is destroyed.

Data Analysis

Calculated LC50 following to Probit analyssis by formula Finney 1971). The calculating using SPSS aplication version 26.

RESULTS AND DISCUSSION

The deaths number of *Cx. quenquefasciatus* larvae after being treated by bay leaf and papaya leaves can be seen in **Figure 1**. Based on **Figure 1** it can be observed that in treatment 1, 10% of the water extract of bay leaves and papaya leaves causes the death of larvae of *Cx. quenquefasciatus*, the percentage of death in mosquito larvae will increase proportionally to the amount of concentration of water extract given.

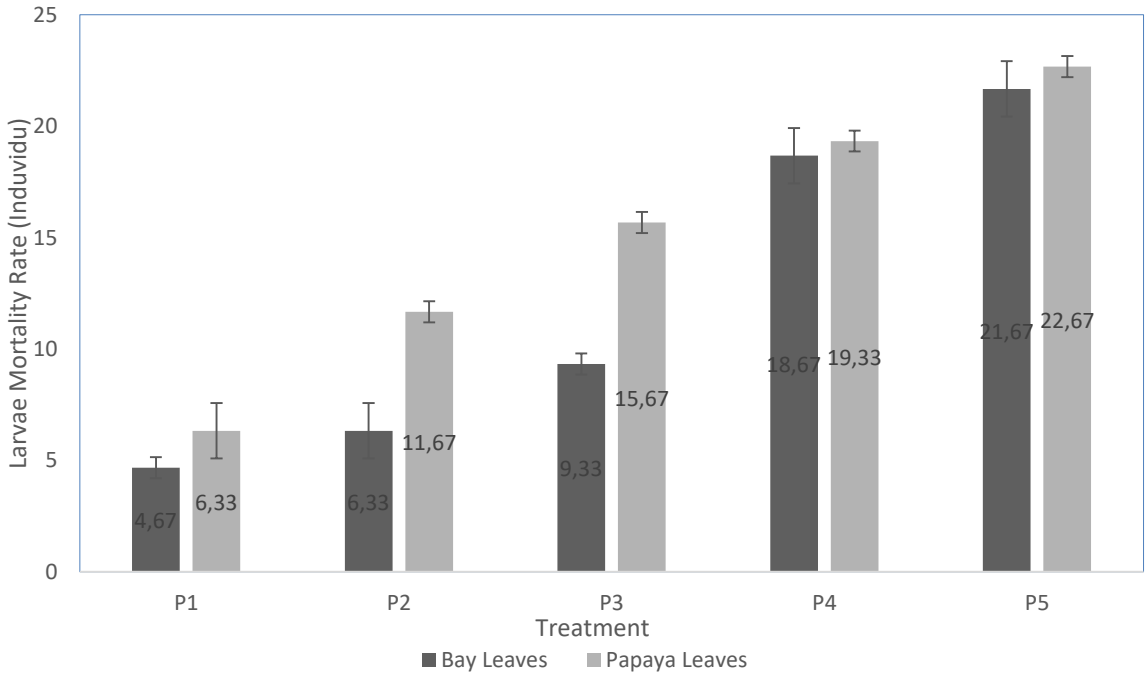

Figure 1. Death average of *Cx. quenquefasciatus* larvae after 24 hours giving a water extract of bay leaves (*Syzygium polyanthum)* and papaya leaves (*Carica papaya)*

The lowest percentage of deaths occurred in the treatment with a 10% concentration and the highest percentage of *Cx. quenquefasciatus* mosquito larvae deaths occurred in the treatment with a 90% concentration both in the treatment of bay leaf water extract or papaya leaf water extract. Based on these results, it can be seen that the higher the concentration or content of active compounds in bay leaves (*Syzigium polyanthum)* and papaya leaves, the mortality rate in *Cx. quenquefasciatus* larvae will increase too.

LC_{50} for bay leaves = 62.89 g/ml and LC_{50} for papaya leaves = 45.10 g/ml. Based on these results, the LC50 papaya leaves is smaller than the LC 50 bay leaves, it can be concluded that the papaya leaf water extract is more effective than the bay leaf water extract. Both Bay leaf *(Syzygium Polyanthum)* and papaya leaves (*Carica papaya*) contain various secondary metabolite compounds, such as flavonoids, tannins, saponins, phenolic hydroquinnon alkaloids, steroids, and triterpenoids that are toxic to animals (Cahyati *et al.*, 2019; Sulistiyani *et al*., 2014; Utami & Puspaningtyas, 2014).

Based on the results of the research, tannin compounds can damage the digestive to some parts of insects and able to make disturb the function of water absorption in organisms (Mardiana *et al*., 2009; Pradani, 2009). Saponins can cause a decrease in insect food *intake*, causing stunted growth, development, and disruption of the insect reproductive system. In addition, other active compounds such as alkaloids and flavonoids are also able to act as compounds that inhibit eating insects, essential oils and flavonoids can also work as respiratory toxins (Pradani, 2009).

CONCLUSION

The LC_{50} of papaya leaves (*Carica papaya*) is smaller than the LC_{50} of bay leaves (*Syzygium polyanthum*). It can be concluded that the papaya leaves water extract is more effective than the bay leaf water extract as larvacide to *Cx*. *quenquefasciatus*.

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