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Vella Rohmayani^{1*}, Anindita Riesti Retno Arimurti², Rinza Rahmawati Samsudin²

¹Department of Medical Laboratory Technologist, Vocational Program, Faculty of Health Sciences, University of Muhammadiyah Surabaya.

Jl. Sutorejo No.59, Surabaya, East Java, Indonesia 60113

²Medical Laboratory Technology, Study Program DIII, Faculty of Health Sciences, University of Muhammadiyah Surabaya.

Jl. Sutorejo No.59, Surabaya, East Java, Indonesia 60113

*Corresponding author: vella_rohmayani@um-surabaya.ac.id

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ABSTRACT

Culex quinquefasciatus 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 quinquefasciatus* 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. quinquefasciatus* 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 three times replication. LC_{50} 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 $LC_{50} = 62.89$ g/ml and papaya leaf water extract $LC_{50} = 45.10$ g/ml. So based on the LC_{50} value, it can be concluded that papaya leaf water extract is more effective in causing mortality *Cx. quinquefasciatus* 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 larvicides that are widely used today are still synthetic larvicides 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 larvicides 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 larvicides 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 larvicides 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. quenequefasciatus* 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 (*Syzygium polyanthum*), papaya leaves (*Carica papaya*), aquades, and *Cx. quenequefasciatus* 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. quenequefasciatus* 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 analysis by formula Finney 1971). The calculating using SPSS application version 26.

RESULTS AND DISCUSSION

The deaths number of *Cx. quinquefasciatus* 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. quinquefasciatus*, the percentage of death in mosquito larvae will increase proportionally to the amount of concentration of water extract given.

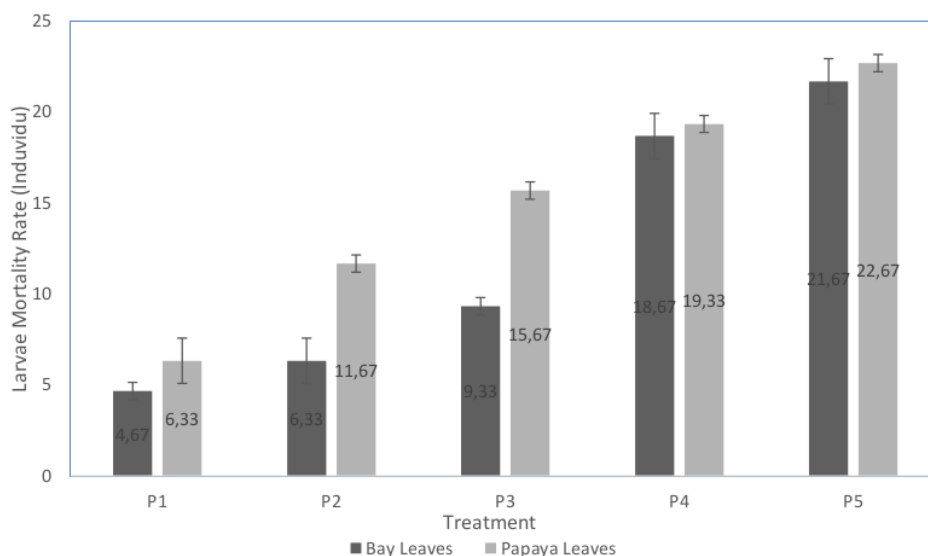


Figure 1. Death average of *Cx. quinquefasciatus* larvae after 24 hours giving a water extract of bay leaves (*Syzygium polyanthum*) and papaya leaves (*Carica papaya*)

The lowest percentage of deaths occurred in the treatment with a 10% concentration and the highest percentage of *Cx. quinquefasciatus* 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 (*Syzygium polyanthum*) and papaya leaves, the mortality rate in *Cx. quinquefasciatus* larvae will increase too.

LC₅₀ for bay leaves = 62.89 g/ml and LC₅₀ 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 hydroquinone 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 LC₅₀ of papaya leaves (*Carica papaya*) is smaller than the LC₅₀ 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. quinquefasciatus*.

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