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EFFECTIVENESS OF CITRUS AURANTIFOLIA LEAVES AND PEELS EXTRACT AS AEDES AEGYPTI BIOLARVICIDE

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ABSTRACT

The use of chemical insecticides and larvicides in DHF control is still considered effective in killing insects more quickly, effectively and optimally. However, it is necessary to be aware of the condition of resistence and its residues that pollutes in the environment. Lime (Citrus aurantifolia) is easy to grow and found in Indonesia, so it can be alternatives that are safer in the environment and reduce the danger of insect resistance to larvicides. Purpose of this study was to determine the effectiveness of lime (Citrus aurantifolia) leaves and peels extract to kill Aedes aegypti larvae, as well as its optimal concentration. This experimental random study using 210 Aedes aegypti larvae instar III which were divided by 10 larvae into 6 treatments (lime leaves, lime peels, and mixed extract in concentration of 10% and 25%) and 3 replications until 360 minutes observation. The results showed that mixed lime leaves and peels extract in concentration of 10%, larvae mortality 100% in 120 minutes. Then, mixed lime leaves and peels extract in concentration of 25%, larvae mortality 100% in 90 minutes. It is concluded that the mixed lime leaves and peels extract in concentration of 25% was the most effective in killing Aedes aegypti larvae (100%) in 90 minutes. It is recommended for further studies of dose variations and other plants in making biolarvicide as vector control.

KEYWORDS: *Citrus aurantifolia, Extract, Larvicide, Aedes aegypti*

1 INTRODUCTION

Indonesia as one of the largest archipelagic countries in the world has abundant natural products such as spices that are nutritious for human health. One of them is lime (Citrus aurantifolia) which can reduce the risk of stroke and lower low blood pressure because it is rich in vitamin C which is good for health (Ekawati, et al., 2017). According to Musiam et al. (2020), leaves and peels of lime contains flavonoids by 34.43%. Flavonoids, chemical compounds that function to kill insects, can cause protein denaturation, which interferes with the passage of nutrients into insect cells.

According to Widiyanti et al. (2016), that there are more than 2500 species of mosquitoes in the world, the types of mosquitoes that dominate as the main vector in cases of vector transmission in Indonesia include Aedes, Culex and Anopheles.

Whereas in Indonesia, dengue hemorrhagic fever (DHF) which is transmitted by Aedes aegypti, first appeared in Surabaya in 1968. 58 people was infected and 24 of them

died (CFR 41.3%). Since then, dengue has spread throughout Indonesia. DHF patients in Lamongan Regency reached 585 people, 4 of whom died, while in 2017 the number of cases of DHF was 105 people, 3 of them died, in 2018 the number of DHF cases was 146 people, 2 of them died and in 2019 cases and deaths from DHF were as many as 387 people and 3 of them died (Windari et al., 2021).

The stages of the life cycle of Aedes aegypti mosquito has egg, larvae, pupa, until it becomes an adult mosquito. The Aedes aegypti mosquito is one of the insects that have complete metamorphosis. The eggs will hatch in approximately 1-2 days, then turn into larvae after 7-9 days. Four stages in the development of mosquito larvae as instars, from instar 1 to instar 4 takes approximately 5 days. Promotive and preventive actions to combat DHF cases, through banners and posters about 3M Plus (Susanti, 2017).

But most of the people use chemical insecticides to eradicate insects because they are able to kill more quickly, effectively and optimally. Indonesia has high resistance to organophosphate and pyrethroid insecticide groups, revealed that 84% districts were resistant on 0.8% malathion, 49% districts were resistant on temephos 0.02%, 98% districts were resistant on 0.05% cypermethrin, 40% districts were resistant on 0.025% alpha cypermethrin, and 65% districts were resistant on 0.025% deltamethrin (Ariati et al., 2019).

The use of synthetic or chemical insecticides, especially larvicides, has resulted in several negative effects, including causing insecticide resistance, pollute the environment, and leave residues. So, to minimize the negative impact of chemical insecticides was using natural larvicides. In general, natural larvicides are pesticides whose basic ingredients are derived from plant larvicides, which is easily degraded and the residue is easily decomposed (Pratiwi, 2013).

2 MATERIALS AND METHODS

This experimental random study using 210 Aedes aegypti larvae instar III which were divided by 10 larvae into 6 treatments (lime leaves, lime peels, and mixed lime leaves and peels extract in concentration of 10% and 25%). Each concentration was repeated 3 times, and larva mortality observed in 30 minute, 60 minute, 90 minute, 120 minute, 180 minute until 360 minutes.

The equipments used are: knife, plastic container, digital balance, rotavapor, scale pipette, 100% volumetric flask, tweezers, pasteur pipette, beaker glass, jar, gauze, plastic cup, label paper, and pen. The materials used are Aedes aegypti larvae obtained from the Institute of Tropical Disease Center (ITDC) Universitas Airlangga Surabaya, lime peels, lime leaves, 92% ethanol and aquadest.

Fresh lime leaves and peels were washed with aquadest, then drained and dried using oven so that the water content in the skin was reduced by 10%. After dried leaves were blended until they became powder, and weighed to 500 grams. That powders then macerated with 800 ml of 92% ethanol for 24 hours, repeated 3 times. After that, the rotavapor filtrate process was carried out at a temperature of 80°C, until the ethanol

solvent was lost and only thick pure extract was obtained. Each glass treatments contains extract concentration in 100 ml aquadest.

3 RESULTS AND DISCUSSION

Number of Aedes aegypti Larvae Mortality on Infusion Treatment of Leaves, Peels, Mixed Leaves and Lime Peels

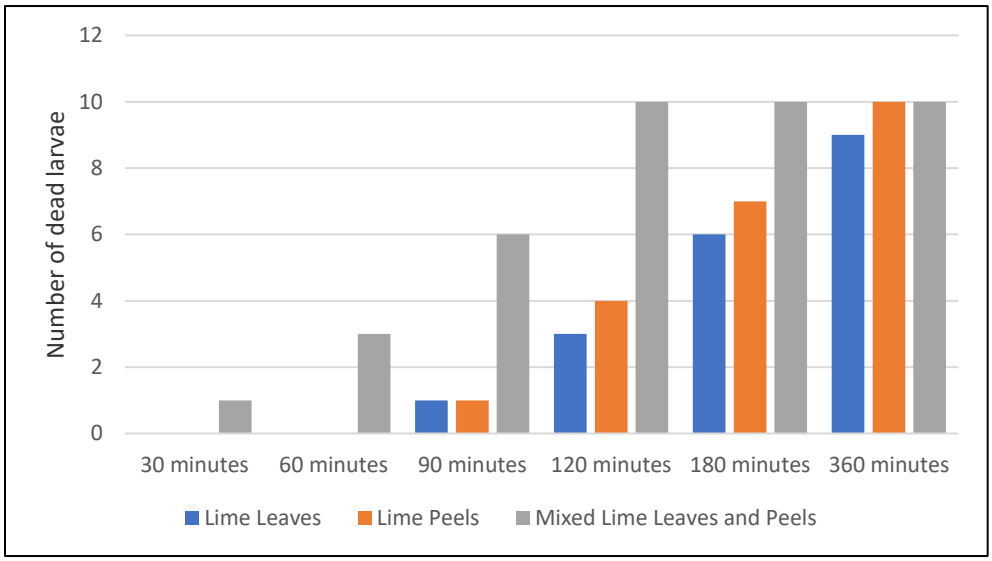

Figure 1. Number of Aedes aegypti Larvae Mortality in Citrus aurantifolia Leaves, Peels, and Mixed Extract 10%

Figure 1 explained that the extract of leaves, peels, and mixed lime leaves and peels in 10% concentration is in line with increment of dead larvae for 3 treatments. The most effective extract concentration in killing larvae was mixed lime leaves and peels in 10% concentration, with 100% larval mortality percentage in 120 minutes.

Similar to the research of Hayana, et al.. (2020), the effectiveness of lime leaf extract with a concentration of 4%, 6%, 8%, and 10% with control of 10 larvae The most effective concentration is a concentration of 10% by causing growth retardation. Aedes aegypti larvae were 32, whose growth was stunted in 4 repetitions.

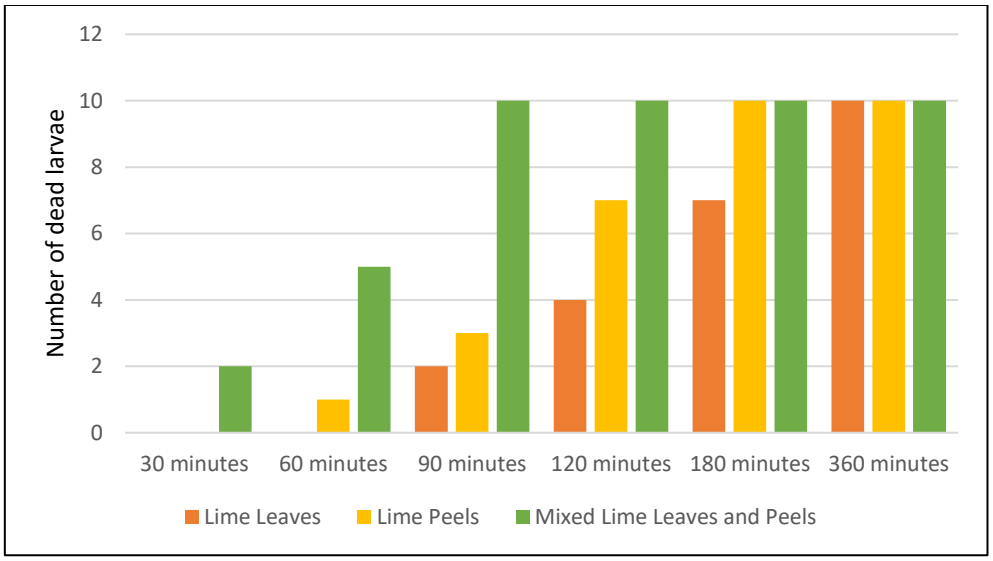

Figure 2. Number of Aedes aegypti Larvae Mortality in Citrus aurantifolia Leaves, Peels, and Mixed Extract 25%

Figure 2 explained that the extract of leaves, peels, and mixed lime leaves and peels in 25% concentration is in line with increment of dead larvae for 3 treatments. The most effective extract concentration in killing larvae was mixed lime leaves and peels in 25% concentration, with 100% larval mortality percentage in 90 minutes.

Similar to study of Auliaputri, et al. (2022), the effectiveness of the combination of Swietenia mahagoni seed extract with Morinda citrifolia as larvacide can kill as many as 10 Aedes aegypti larvae that cause dengue hemorrhagic fever. The longest larval death time was at a concentration of 20%, where the initial time of death was recorded at the 267.53 second minute and the final time of death was recorded at the 288.76 second minute.

4 CONCLUSION

It is concluded that the mixed lime leaves and peels extract in concentration of 25% was the most effective in killing Aedes aegypti larvae (100%) in 90 minutes. It is recommended for further studies of dose variations and other plants in making biolarvicide as vector control.

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