EFFECTIVENESS DIFFERENCE OF SWEET ORANGE PEEL EXTRACT (*CITRUS SINENSIS*) AND LIME PEEL EXTRACT (*CITRUS AURANTIFOLIA*) AS BIOLARVASIDA FOR *AEDES AEGYPTI* LARVAE

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ABSTRACT

Dengue virus causes dengue fever (DHF), the type of mosquito carrying the virus is Aedes aegypti. One indicator of the high incidence of DHF cases is Aedes aegypti larvae as a vector of dengue disease. To suppress the insect population of the carrier vector by using safer natural larvacides which can be obtained from various types of plants. Orange and lime has chemical compounds that can kill larvae namely limonoida. Therefore, research will be conducted to prove the effectiveness of sweet orange (Citrus sinensis) and lime (Citrus aurantifolia) as Aedes aegypti biolarvasida. This research was conducted at the Ministry Health Polytechnic of Mamuju Integrated Laboratory in March - August 2018. The object of this research was peel extract of Sweet Orange (Citrus sinensis) and Lime (Citrus aurantifolia) which will be exposed to instar III and IV Aedes aegypti larvae. This study included the type of experiment with a completely randomized design. Primary data obtained from the calculation of the number of deaths of Aedes aegypti larvae. Then analyzed using descriptive analysis and Kruskal-Wallis. Observations were carried out for 24 hours which observed in three observation times, namely 8, 16 and 24 hours. The results were the number of larval deaths exposed to the extract of sweet orange peel (Citrus sinensis) and on the extract of lime peel (Citrus aurantifolia) with an average mortality of 48% and 97.3%, respectively. Lime peel extract can kill more than 50% of Aedes aegypti larvae. The conclusion is that lime peel extract (Citrus aurantifolia) is most effective as Aedes aegypti biolarvasida compared to sweet orange peel extract (Citrus sinensis).

Keywords: *Aedes aegypti larvae, sweet orange, lime, mortality*

INTRODUCTION

One of the diseases that cause health problems in Indonesia is Dengue Hemorrhagic Fever (DHF). Indonesia has end dengue fever, this disease occurs throughout the year. DHF is a disease that must be watched out by the public by intensifying the mosquito nest eradication program (1). To prevent transmission of the dengue virus is to eradicate *Aedes aegypti* mosquito both physically, biologically and chemically eradication (2). Examples of chemical control are spraying insecticides in the focus area and distributing abate powder. The best and most effective way is through eradicating mosquito larvae called larvasidation using Abate powder (3).

However, the many negative impacts of using synthetic pesticides have encouraged research on natural larvacides, one of which is citrus fruits of various species. Citrus fruits are chosen because they have chemical compounds that have biological activities, such as flavonoids, carotenoids, and limonoid.(4)

Limonoida is a substance that is known to be toxic to the larvae of *Aedes aegypti* mosquitoes. Limonoida compounds are juvenille hormones in insects that function as regulators of larval cuticle growth. As limonoida stomach poison can enter the body of *Aedes aegypti* mosquito larvae In addition to affecting the peel turnover process in larvae, limonoida which spreads to nerve tissue will affect other nerve functions and cause seizure larvae which will result in sudden activity in the central nerve causing death in larvae (5).

Many studies have been conducted on the use of citrus plants, Bilal et al., Who have utilized lemon as a larvacide of the Aedes albopictus mosquito with LC50 values at ppm and the value of LT50 at 31st hour (6).

Indonesia has many varieties of plants and has been used by many people for various purposes, one of which is the development of active ingredients for vegetable insecticides as an alternative to chemical insecticides. There are 25 species of plants that produce several essential oils as larvae of Aedes aegypt(7), among them are tembelekan leaves (*Latana Camara Linn)*(8) and uses sweet orange peel (7).

The use of several species and parts of oranges as larvacides is based on various content of chemical compounds, such as flavonoids and limonoid. In addition, orange peel contains tannins, saponins, phytate oxalates, flavonoids, and limonoid which has been phytochemically studied. The content of tannin compounds in orange peel can prevent insects from digesting food and ultimately disrupt insect growth (9). So that researchers are interested in seeing the

effectiveness of sweet orange peel (Citrus sinensis), lime (Citrus aurantifolia) as *Aedes aegypti* biolarvasida.

METHODS

Extraction on the peel of sweet orange and lime and effectiveness tests were carried out at Mamuju Kalukku Poros Health Polytechnic Integrated Laboratory of Km. 16 Tadui West Sulawesi. The study took place in March - August 2018.

The tools used are Flashlight, 50 contents Filter Paper, Cutting Board, 100 ml Measuring Flask, Stirring Rod, Smooth Lap, Blender, Rough Lap, Glass Funnel, Chemical Glass 250 ml, Erlemeyer 250 ml, Dropper Pipes, Scissors, Scales, Label Paper contents 10, Filters, Knives, Cidukan, Basins and Aluminum foil. The ingredients used were Aquadest (H20), sweet orange peel, lime peel and Instar *Aedes aegypti* III & IV Larvae.

How the Research Works by means of Infundation Extraction (10), namely:

1. Prepare samples to be used, namely sweet orange peel and lime peel
2. Considering the weight of each material with the ratio of material weight and water is 1:10
3. The ingredients are blended to powder
4. The powdered material is heated in a pan with enough water for 15 minutes starting from the temperature reaching 90 ° C while stirring occasionally
5. Filtered using flannel cloth while hot, if the amount of liquid needed is still lacking add hot water to the pulp until the amount of liquid needed is fulfilled
6. After the liquid is cold, put it into the sample bottle and then insert the instar III and IV larvae as many as 25 heads per section.
7. Observations were carried out for 24 hours three observations, namely 8 hours, 16 hours and 24 hours.
8. Record the results of observations,
9. Repeat 3 times
10. Calculate the average mortality of larvae (11)

$$Mortality = \frac{(x - y)\ \mathrm{X}\ 100}{x}$$

Note :
X = the number of controls that are still alive
Y = the number of treatment samples that are still alive

Data collected in the form of primary data obtained from the calculation of the number of deaths of *Aedes aegypti* larvae during the study. Data Analysis using Microsoft Excel and SPSS 20. Then analyzed using descriptive analysis and *Kruskal-Wallis*.

RESULTS

Table 1
Distribution of Average Value of Death of Aedes aegypti Larvae Based on Treatment Type and Exposure Time

Peel Extract	Average larva mortality (3 times repetitions) based on exposure time (SD)			
	Time (on the hour)			
	0	8	16	24
Control	0 (0,000)	0,33 (0,577)	0,33 (0,577)	0,33 (0,577)
Sweet orange (*Citrus sinensis*)	0 (0,000)	8,67 (7,505)	11,33 8,505)	12,00 (8,544)
Lime (*Citrus aurantifolia*)	0 (0,000)	10 (4,000)	22,33 (2,309)	24,33 (0,577)

In table 1. shows that the average number of deaths of *Aedes aegypti* larvae at the third time showed that the highest mortality was in the solution of lime peel extract. At the 16th and 24th hours the number of larval deaths using lime peel extract was twice as much as the Citrus sinensis peel extract.

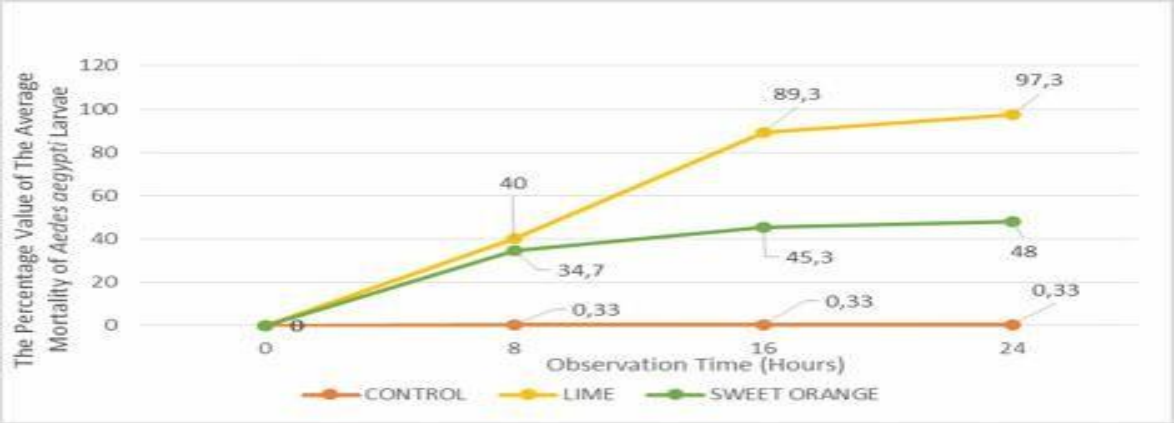

Figure 1. Distribution of the percentage value of the average mortality of *Aedes aegypti* larvae based on the type of treatment and exposure time

In Figure 1. shows that the lime extract has the most larval deaths at 16th hour which is more than 50% of larval deaths compared to sweet orange extract does not arrive at 50% mortality both at 16th hour and 24th hour.

This is also supported by Nurdianti's (2014) study of lime leaf extract (Citrus aurantifolia) against the death of *Aedes aegypti* mosquito larvae which showed an influence with p = 0,000. The smallest concentration of 0.55% of lime leaf extract (Citrus aurantifolia) can kill as many as 100% of larvae (1).

Table 2
Mortality Rate Distribution in Some Treatments of Orange Bark Extract

Orange peel extract solution	Replication			Mortality Rate (%)
	y			
	I	II	III	
Sweet orange (*Citrus sinensis*)	4	21	11	47,3
Lime (*Citrus aurantifolia*)	24	24	25	97,3

In table 2. shows that the largest mortality rate of the two treatments is a solution of lime peel extract with a difference of a mortality rate of 50.0% with a solution of sweet orange peel extract.

Citrus plants are one of the essential oils producing plants. The essential oils produced by citrus plants contain mostly terpenes, aliphatic sisquiterpenes, oxygenated hydrocarbon derivatives, and aromatic hydrocarbons. Composition of compounds contained in essential oils produced from the fruit peel of the plant of the Citrus genus based on the research carried out include limonen, citronelal, geraniol, linalol, α-pinen, mirsen, β-pinen, sabinen, geranil acetate, nonanal, geranial, β-karyophilene, and α- terpineol (13). Essential oils produced from citrus plants have the potential as natural insecticides which can be used as mosquito control. Insecticides produced from a plant can kill mosquito larvae, adult mosquitoes, or protection against mosquito bites (14).

The total compounds in essential oils of lime (C. Aurantifolia) amounted to 18. These compounds include limonen (33.33%), β- pinen (15.85%), citral (10.54%), mineral (7,94%), γ-terpinen (6.80%), α- acetate (0.56%) and trans-β-osimen (0.26%) (15).

According to Megawati (2015) the content of β-pinene in sweet orange peel is only 3.31% (17). The larval mortality that is thought to be caused by β- pinene is in line with the research conducted by Maman

(2016) which states that the β- pinene compound is thought to act as larvacide against *Aedes aegypti* (18). Research conducted by Lucy et al (2007) also states that β-pinene in turpentine functions as the main component of larvacide (19). According to Ali, et al. (2014) showed that the dose of LC50 β-pinene as larvacide was 35.9 ppm (20).

CONCLUSION

Lime peel extract (Citrus aurantifolia) is most effective as *Aedes aegypti* biolarvasida compared to sweet orange peel extract (Citrus sinensis).

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