

EFFECTIVENESS OF LEAF EXTRACT WULUH STARFRUIT (AVERRHOA BILIMBI L) IN KILLING LARVAE Aedes Aegypti

Muhammad Adrian Syah Putra¹, Rochmadina Suci Bestari², Muhamad Irfan Hidayatullah¹, Sella Felina¹ & Em sutrisna²

1. Student of Faculty of Medicine University of Muhammadiyah Surakarta

2. Lecturer of Faculty of Medicine University of Muhammadiyah Surakarta

ABSTRACT

Leaves extract of Wuluh Starfruit contains flavonoids, saponins and tannin, tannin blocking larvae in digesting food and also causing disruption of water absorption in organism, so that can kill organism, saponin plays role in decreasing food intake in larvae, hamper development, interfere growth and inhibit larvae reproduction. This research is to know effectiveness of wuluh starfruit leaves (*Averrhoa bilimbi* L) as alternative natural ingredients in killing *Aedes aegypti* mosquito larvae. Research subjects of 700 larvae *Aedes aegypti* instar 3 were randomly assigned to 7 groups (concentrations of 0%, 1%, 1.5%, 2%, 2.5%, 3% and abate 1% as positive controls). with 4 repetitions and 24 hours later checking the number of larvae performed using One Way Anova test. Furthermore, because the data obtained is not normal then the further test is Mann Whitney Result: no deaths found in the negative control group (P0 Concentration 0%). The mean percentage of larva mortality was 94%; 97%; 100%; 100%; 100% successively at concentrations of 1%; 1.5%; 2%; 2.5%; and 3% from anova test result got $p < 0,05$ meaning there is significant difference between death number of larva *Aedes aegypti* with concentration of leaf extract of belimbing wuluh given Conclusion: The extract of wuluh starfruit leaves (*Averrhoa bilimbi* L) is effective in killing *Aedes aegypti* larvae and the relationship between the increase of extract concentration and the number of dead larvae.

Keywords: killing, *Aedes aegypti*, wuluh starfruit leaves, flavonoids, larvacids.

No: of Figures: 4

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INTRODUCTION

The existence of climate change in Indonesia at this time cannot be estimated so that the environmental effect of the existence of a number of developing disease or population. As well as an increase in infectious diseases such as Dengue fever Dengue (DBD) and Malaria so that the need for the prevention and eradication of the disease. Although capable of living at the Poles, mostly mosquitoes prefer to live in tropical regions with high humidity such as in Indonesia [1]. Dengue fever is one of tropical infectious diseases are still a problem in tropical countries, including Indonesia. In 2005, reported 19,000 cases of dengue fever occur in Indonesia [2]. Noted figures in pain dengue fever Dengue year 2013 recorded 45.85 per 100,000 inhabitants (112,511 cases) with a mortality rate of 0.77% (871)[3]. This disease is caused by Dengue virus infections are transmitted through *Aedes aegypti* mosquitoes as vectors *Aedes albopictus* as primary and secondary vector [4]. The key strategy of pengend alian vector mosquitoes by larval eradication on places laying[5], the most common way used by people is to use insecticides. However, the side effects caused by the use of a chemical such as larvasida are not degraded, pollution of the environment, are toxic against the population of non-growing mosquito resistance targets and continue to increase over the last five decades [6]. Most insecticides are nonselective and can be harmful to other organisms and the environment. In addition increases the risk of pesticide residual contamination in the water when used repeatedly [7]. The essential oils of plants in general have been

known as a natural source of insecticide because some of them are selective, biodegradable, not toxic, and have little effect to environmental organisms and nontarget [8]. Star fruit wuluh leaf extract contains flavonoids, saponins and tannins [9]. And in the leaves of star fruit wuluh in addition tannin also contain peroxidase, calcium oxalate and potassium citrate[10]. Tannins deter larvae in digesting the food and also cause interference with the absorption of water in the organism, so that it can be deadly organisms [11]. Saponins have a role in lowering the intake of food by the larvae, inhibit development, disturbed the growth and inhibit the reproduction of the larvae. Alkaloids and flavonoids act as defense plants with compounds inhibit feeding larvae and also are toxic [12]. This research aims to analyze the influence of star fruit wuluh leaf extract effectiveness (*Averrhoa bilimbi* L.) as alternatif natural ingredients in killing the mosquito *Aedes aegypti* larvae.

RESEARCH METHODS

Design Research

The study is a randomized design laboratory experimental complete (Completely randomized design) posttest only with control group design. This research is expressed have met the Declaration of Helsinki 1975 and the national health research ethics guidelines of the Ministry of health of INDONESIA 2004 and expressed Ethical escape with number: 1159/a. 1/KEPK-FKUMS/IV/2018

Research on place and time

This research was conducted in the laboratory of Parasitology Faculty of

medicine University of GadjahMada in June 2018. The subject used in this study is 3 instar *Aedesaegypti* larvae.

Leaf extract wuluhstarfruit

Leaf extract wuluhstarfruit extracts are made using the method of Maceration. The initial step does is take the star fruit wuluh leaves, and then cleaned with aquades and dried without being exposed by the rays of the Sun directly. Once dried, the leaves are cut into small and mashed using a blender. then dried in room temperature, and then weigh it weighs. Then the results blended in 96% ethanol soak in comparison with 1:5 (10 grams of powder with 50 ml ethanol) [13]. Soaking in at room temperature for up to 72 hours. Soaking process aimed at to mix the entire bioactive compounds contained in the leaves to be attracted to come out. The process of immersion using the concept of polar compounds interesting compounds polar and vice versa, as well as interesting organic compounds organic compounds and vice versa [14]. After 72 hours, the result of immersion in the filter by using a funnel in covered with filter paper at the base, and then the results of the extraction of vapor by using a Rotary evaporator until the resulting pure extract leaf star fruit wuluh are stored in the refrigerator until used for testing process. Extracts taken with measuring dropper, then inserted into the measuring cup. Extract the desired volume is taken from the leaves of star fruit wuluh taken is calculated by the formula dilution as follows [20]:

Description:

V1: the Volume of the solution first

M1: concentration of the solution first

V2: the Volume of the solution after the diluted

M2: concentration of the solution after the diluted

Calculating the dose and treatment

Sample it takes 700 larvae according to the formula of Federer and 25 larvae each cup according to standards of the WHO [15] Each concentration done 4 times repeat the formula with reference to Federer: $(t-1) (r-1) \geq 15$

$(7-1) (r-1) \geq 15$

$r \geq 3.5 = 4 \times \text{repeat}$

t: number of treatments, r: number of repetitions, 15: constants (numbers), control negatively (awarded Aquadest), positive control (given abate in 1 ml 99 ml water), 1 treatment (concentration of leaf extract of star fruit wuluh 1%: 1 ml extract plus 99ml water treatment), 2 (star fruit wuluh leaf extract concentration of 1.5%: 1.5 ml extract Plus 98.5 ml water), treatment 3 (star fruit wuluh leaf extract concentration 2%: 2 ml extract Plus 98 ml water). Treatment 4 (star fruit wuluh leaf extract concentration of 2.5%: 2.5 ml extract plus 97, 5 ml water) treatment 5 (star fruit wuluh leaf extract concentration 3%: 3 ml extract plus 97 ml water) lasted 1 day with 4 repetitions and time for 24 hours. Data analysis was done in stages, i.e., starting with a test of normality test with Kolmogorov Smirnov. If the data is distributed normally (Kolmogorov Smirnov test) and variance homogeneity (tested by Leuvene test), the difference in each variable's treatment of the death of mosquitoes will be analyzed using One Way Anova test. In case non homogeneous occurred, further tests conducted using post hoc by Mann Whitney.

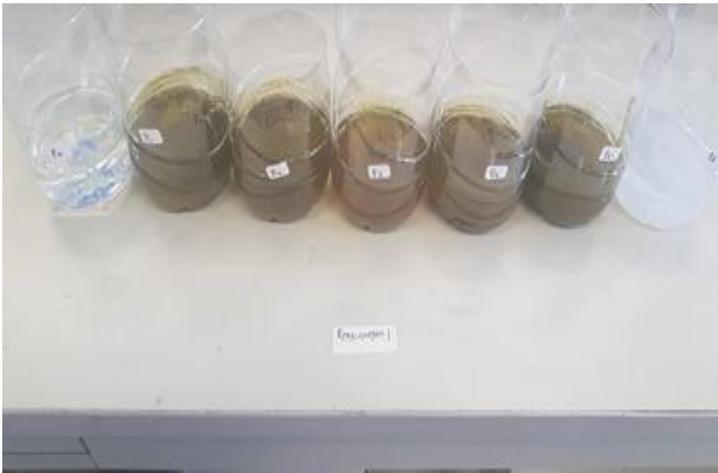
RESULT

The number of larvae mortality after exposure leaf extract wuluhstar fruit fully listed in table 1. In table 1 it looks that at the controls, not found the death of *Aedes aegypti* larvae, whereas the number the highest mortality was obtained at concentrations of 2%, 2%, 3% .5 the larval mortality experienced an increase in concentrations of 1% and 2% in accordance with the increase in the concentration of leaf extract of star fruit wuluh (*Averrhoa bilimbi* L.) is given. Based on the foregoing it can be seen that the higher the concentration of leaf extract of star fruit wuluh (*Averrhoa bilimbi* L.) given the higher mortality rate of larvae of *Aedes aegypti*. Next to analyze differences influence the granting of the concentration of leaf extract of star fruit wuluh against *Aedes aegypti* larvae mortality performed statistical tests one way Anova. Normality tests previously done, obtained a value of $p < 0.05$ which means the data distribution is not normal. As for knowing its homogeneity test done larvae mortality Levene which

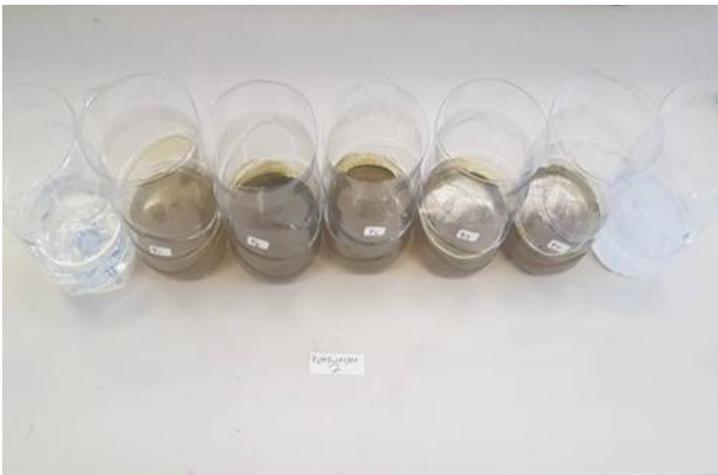
can be seen in table 2, the obtained $p < 0.05$ meaning larval mortality data are not homogeneous. Anova tests to find out the average difference of the death of the larvae of *Aedes aegypti* that occur at each treatment, from one way anova test results obtained $P < 0.05$ which means that there is a meaningful difference between the number of Larval mortality at concentrations of 1%, and. The next 5% done data transformation and because his results remain then performed a test of post hoc used is the Mann-Whitney Test results. based on Mann Whitney seems most group treatment namely star fruit wuluh leaf extract concentration P0 compared to P1, P2, P3, P4, P5, P6 shows a meaningful difference by ($p < 0.05$), for P1 compared to the P2, P3, P4, P5, P6 shows a meaningful difference by ($p < 0.05$), At P2 compared with P3, P4, P5, P6 shows a meaningful difference by ($p < 0.05$), and for comparison of the P3, P4, P5, P6 is not obtained because of the difference in the death rate on larvae of the same.

Table 1. Number of Deaths of *Aedes aegypti* larvae after 24 Hour Exposure of *Averrhoa* extract bilimbi L

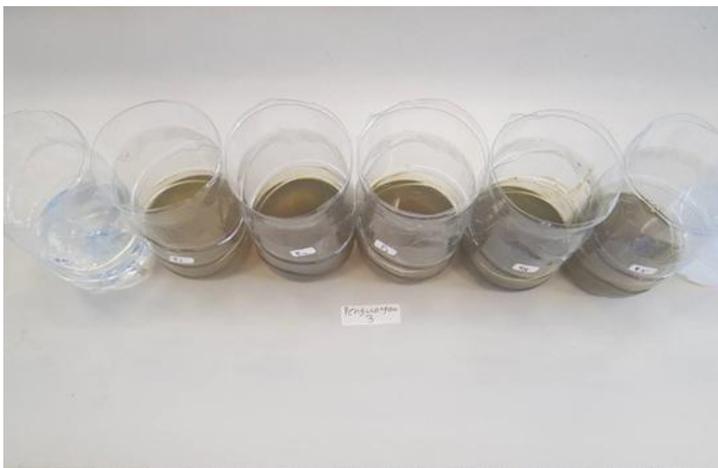
Group	The Number Of Larvae	Repetition				Average Death	The percentage of deaths
		I	II	III	IV		
Negative ControlP0	25	0	0	0	0	0	0%
P1 1%	25	24	23	23	24	23.5	94%
P2 1,5%	25	24	24	25	24	24.25	97%
P3 2%	25	25	25	25	25	25	100%
P4 2.5%	25	25	25	25	25	25	100%
P5 3%	25	25	25	25	25	25	100%
Positive ControlP6	25	25	25	25	25	25	100%



The repetition 1 of the Group P0, P1, P2, P3, P4, P5, P6



The repetition 2 of the Group P0, P1, P2, P3, P4, P5, P6



The repetition 3 of the Group P0, P1, P2, P3, P4, P5, P6



The repetition 4 of the Group P0,
P1, P2, P3, P4, P5, P6



DISCUSSION

Based on the results of research and data analysis, On the larvae of *Aedes aegypti* control negative treatment groups not obtained treatment for the Group of death, P1 and P2 obtained the death rate on larvae of *Aedes aegypti* high and almost equals the death rate of the positive control i.e. Abate 1gr and in the treatment group P3, P4, P5 and highest death rates the same mortality rate with control group. Star fruit wuluh leaf extract contains flavonoids, saponins and tannins [9]. And in the leaves of star fruit wuluh in addition tannin also contain peroxidase, calcium oxalate and potassium citrate [10]. Compounds of flavonoids contained in extracts of leaves also are insecticides because it is a respiratory toxin causing the larvae can't breathe because of damage to the respiratory system and finally cause death the larvae. [16] Besides flavonoids as well as CYP6Z2 inhibitors of cytochrome P450 family, who hold an important role the occurrence of insecticide resistance in mosquitoes. [17] In addition, saponins also damage the membranes of Larval cuticle so that the larvae can lead to death. [18] Results of the study showed A dkk Bagavan saponins isolated from plant *Achyranthes aspera* has the effect of larvasida against *Aedes aegypti* and *C. Quinquelifasciatus*. [19]

CONCLUSION

Based on the results of this research can be known that leaf extract wuluh star fruit (*Averrhoa bilimbi* L.) have A fairly high Effectiveness and apparent potential as a larvasida against the larvae of *Aedes aegypti*.

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