LC 50 of Rind Durian (*Durio zibethinus murr*) Extract to Mortality of *Aedes aegypti* Larvae

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Abstract. One of durian parts is its rind which contains essential oil, flavonoid, saponin, cellulose, lignin, as well as 11 starch content. Those content can be used as a larvacide against *Aedes aegypti* larvae. The aim of this research is to analysis LC\(_{50}\) of durian rind extract to mortality of *Aedes aegypti* larvae. In this research, we used the experimental method. *Aedes aegypti* larvae are 440 larvae instar III divided into 12 groups which are negative control, positive control, durian rind extract with a concentration of 1%-10%. To identified the influence of durian rind extract to mortality of *Aedes Aegypti* larvae, data were analyzed using Probit Analysis with the program IBM SPSS Statistic 21.0. On the Probit Analysis, durian rind extract that could kill larvae 50% (LC\(_{50}\)) is at concentration 7.76%. Based on that analysis, durian (*Durio zibethinus murr*) rind extract has an influence to mortality of *Aedes aegypti* larvae.

1. Introduction

*Aedes aegypti* mosquito is the main vector of Dengue virus which is transmitted through mosquito bites and causes Dengue Hemorrhagic Fever (DHF). Dengue Hemorrhagic Fever (DHF) is one of the main health problems in Indonesia. Prior to 1970, there were more than 1.2 million cases in 2008 and more than 2.3 million cases in 2010. In 2013 there were 2.35 million cases in America, where 37,687 cases were severe DHF, World Health Organization (WHO) noted Indonesia as the country with the highest DHF cases in Southeast Asia. According to the Ministry of Health of the Republic of Indonesia (2015) states that as many as 126,675 people suffered from dengue and 1,229 people died from the disease. This number increases when compared to 2014.

Seeing the importance of the role of mosquitoes, it is necessary to control the larvae of *Aedes aegypti*. How to control this can be done by protecting yourself from the risk of dengue transmission, can by using clothing that reduces mosquito bites such as long sleeves and long pants can reduce contact even temporarily. The use of insect repellent spray, mosquito coils, an electric repellent that is applied must contain insecticides some chemical compounds. One of the world programs to suppress mosquito transmission is by eradicating larvae. Since 1976 Indonesia has implemented the use of larvacide such as abate which is a basic chemical material as a way to eradicate the growth of larvae [1]. Therefore an alternative is needed to reduce the risk of dengue transmission. Various types of plants and fruits in Indonesia have been known to contain bioactive compounds that are used as biopesticides.
Biopesticides can disrupt the life cycle of mosquitoes, usually in the form of repellents, inhibit eating, inhibit egg laying (antioviposition), inhibit their growth and reproduction [2].

One plant that is thought to be an alternative to reduce the risk of dengue transmission is durian fruit (*Durio zibethinus murr*). This fruit is one of the fruits that are widely consumed in Indonesia because it has a delicious taste and a distinctive smell. This research is an effort to utilize local durian rind which is quite abundant around us and tends to only end up as waste. Mentioning that the Montong type of durian has a total level of polyphenols and flavonoids as well as the highest antioxidant activity and among the Chani, Kan Yao, Pung Manee and Kradium durian types [3].

Mention that the most phenolic content can be obtained from durian that has been cooked. Phenolic content found in durian fruit is apigenin, p-hydroxybenzoic acid, vanillic acid, caffeic acid, ferulic acid and quercetin [4] states that durian skin contains essential oils, flavonoids, saponins, cellulose elements, lignin, and starch content [5]. Based on this, the researchers are interested in developing the use of rind durian (*Durio zibethinus murr*) as a repellent against *Aedes aegypti* larvae.

2. Methods
2.1 Preparation of *Aedes aegypti* larvae
Mosquito eggs are hatched for 5-7 days in a container containing well water and fed with a boiled chicken liver. When it has grown into III instar larvae, confirmation of third instar larvae is confirmed by observing the morphology of the larvae under a microscope with the condition of the dead larvae. Larvae that have reached instar III are transferred into a container containing the test solution.

2.2 Sample Preparation
Durian rind is obtained from durian rind waste in the old market area, Tasikmalaya. After being cleaned from the spines, then cut into small pieces and dried by drying until completely dry. Then the sample is mashed with a grinding machine to become a powder.

2.3 Sample extraction
2.3.1 Maceration
The dry powder of rind durian weighed as much as 100 grams and macerated using 96 liters of ethanol as much as 1 liter. Each maceration is carried out for 3 x 24 hours, with 2 stirring variations namely stirring once (at least every 3 hours) and stirring every 1 hour, then filtering with a funnel coated with filter paper. The filtrate obtained was then evaporated with a Rotatory evaporator at 79 °C until a concentrated extract was obtained.

2.3.2 Phytochemical test
Extracts that have been obtained are then tested for the content of active compounds such as alkaloids, flavonoids, saponins, phenols, and tannins [6].

2.3.3 Making Positive Control Test Solution
By using the formula for calculating % weight-volume percent concentration

\[ V = \frac{\text{gram zat terlarut}}{\text{mL larutan}} \times 100\% \] (1)
3. Results and discussion

The results of observations on the number of larval deaths tested were presented in Table 1.

| Groups | Mortality of larvae Repeatable |
|--------|-------------------------------|
|        | I    | II   |
| NC     | 0    | 0    |
| PC     | 20   | 20   |
| 1      | 1    | 0    |
| 2      | 1    | 1    |
| 3      | 1    | 0    |
| 4      | 1    | 1    |
| 5      | 4    | 4    |
| 6      | 8    | 7    |
| 7      | 10   | 9    |
| 8      | 10   | 11   |
| 9      | 12   | 11   |
| 10     | 13   | 14   |

NB:
NC = negative control (aquadest)
PC = positive control (abate)
1-10 = various concentration of durian rind extract (%)

![Figure 1. Mortality of Aedes aegypti larvae after exposure durian rind extract](image)

Based on the results of the concentration test of the test solution in table 1, it describes the average number of larval deaths in each treatment group. In this study, the negative control used was distilled water which was not added with durian extract, and positive control using abate. Based on the data in
Table 4.1 shows that the LC50 at concentration 7% to 8%. After obtaining the research data, then the research data was tested using Probit Analysis with a 95% confidence level to obtain the LC50 value using the IBM SPSS Statistics 21.0 program. Based on Probit Analysis, a large estimate of concentration was obtained which resulted in the death of larvae at LC50 values at a concentration of 7.76%, meaning that the concentration could kill larvae half of the population of larvae. These results are presented in Figure 1.

Dead larvae are characterized by the absence of larval movements both by being stimulated by the movement of water and with sticks. In addition, the physical characteristics of the larvae look pale and larger in size, this is due to the osmosis process, namely the movement of solvent molecules from dilute solution to a more concentrated solution where the test solution is more dilute into the larval body through a semipermeable membrane, due to this movement, the volume of concentrated systems that are more concentrated in the body of the larvae will swell and the larval body pigments dissolve so that the body of the dead larvae looks large and pale.

The group of test solutions at the test concentration of the test solution using extracts of durian with a concentration of 1% to 10% and negative control using distilled water and positive control using Abate 0.001% in accordance with the recommended use on the packaging. Based on table 4.1 on the results of testing the concentration of test solution obtained results that extract durian bark with a concentration of 1% to 10% can kill larvae up to 90% while at concentrations of 7% and 8% can kill larvae up to 50%, in addition to the negative control of death 0% larvae and in positive control larval mortality reached 100%.

The results of the research were carried out on testing the concentration of the test solution where the test solution was made in a smaller concentration. In the durian bark extract test, larvae were found dead. This shows that durian bark extract has a larvicide effect. In addition, the data prove that at different concentrations of durian bark extracts have different effects on larval mortality, where the higher the concentration, the more number of larvae die to a certain level of concentration. Based on the test results, the LC50 is estimated to be in the concentration range of 7% and 8% which can be ascertained by analyzing Probit.

The estimation results of LC50 through Probit Analysis are the concentration of durian skin extract 7.76%. The determination of LC50 is based on [7] in the Guidelines for Laboratory and Field Testing of Larvacides. Based on the results of this study, the authors concluded that durian rind extract affected the death of III instar larvae of *Aedes aegypti*. The essential oil content as the main substance in durian rind extract acts more as a larvicide against the III instar larvae of *Aedes aegypti*.

4. Conclusion
The LC50 of durian rind (*Durio zibethinus murr*) extract to mortality of *Aedes aegypti* larvae is 7.76%.

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**Acknowledgment**

We thanks to Pusat Penelitian dan Pengabdian Masyarakat (P3M) STIKes Bakti Tunas Husada Tasikmalaya that was funding this research.