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# Bay Leaf Juice (Syzygium Polyanthum) And Lavender Leaf Juice (Lavandula Angustifolia) As Ae. Aegypti Adult Mosquito Control

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## ABSTRACT

Dengue fever cases in Indonesia, with a total of 71,633 cases as of July 2020, where Medan City experienced a 20% increase in cases in 2020. The main vector of dengue fever is Ae. Aegypti, usually prefers to suck human blood rather than animals (arthrophilic) and is usually active during the day. One way to control Ae. Aegypti mosquitoes is to break the mosquito life cycle by using insecticides. Reports from the Medan City Health Office and several studies have found an increase in cases due to the resistance of Ae. Aegypti mosquitoes to chemical insecticides. This resistance prevents mosquitoes from dying but has an impact on public health. People tend to use insecticides with the active ingredient Cypermethrin, which if used for a long time can cause problems with the upper respiratory tract, skin and eye irritation. Therefore, natural insecticides are needed that are relatively safe for humans and environmentally friendly, such as bay leaf juice (Syzygium Polyanthum) and Lavender Leaf Juice (Lavandula Angustifolia). The purpose of this study was to obtain a natural insecticide formula that can be found in the community environment and can be used by the community because it is cheap, easy and efficient and does not interfere with public health. This type of research is experimental, with the design of The Post Test Only Controlled Group Design. The population in this study was Ae. Aegypti mosquitoes located in the Jalan Durung area of Medan City. The sample in this study was 20 adult Ae. Aegypti mosquitoes in each of the 3 treatments and 2 controls, namely negative control (Aquades) and positive control (Cypermethrin) totaling ± 640. The results of the study that have been obtained are that there is a statistically significant effect on the number of mosquitoes that died between the Bay Leaf Juice (Syzygium Polyanthum) group and the Lavender Leaf Juice (Lavandula Angustifolia) group.

**Keywords:** Ae. Aegypti; Insecticide; Bay Leaf (Syzygium Polyanthum); Lavender Leaf (Lavandula Angustifolia).

## INTRODUCTION

Dengue fever (DHF) is a disease that is still a public health problem in many countries. IR (Incident Rate) case data for the North Sumatra province from 2015 to 2019 tends to be dynamic. In 2015

there were 5,695 cases, in 2016 there was an increase of 8,715 cases, then the cases decreased in 2017 by 5,454 cases, in 2018 cases increased again by around 5,768 cases, and in 2019 there was a drastic increase of around 7,584 cases(1).

DHF case data in Medan city from 2015-2018 is also classified as dynamic, based on the IR value. In 2015, there were 1,362 cases with a mortality rate of 9 cases (IR = 61.6 per 100,000 population), in 2016 cases increased by 1,784 cases with a mortality rate of 11 cases (IR / Morbidity Rate = 80.0 per 100,000 population), then in 2017 there was a decrease with the number of cases as many as 1,214 cases with a mortality rate of 11 people (IR / Morbidity Rate = 54.02 per 100,000 population), then cases increased again in 2018, namely 1,490 cases with a mortality rate of 13 people (IR / Morbidity Rate = 66.8 per 100,000 population) (2). DBD is still very dangerous because it greatly disrupts productivity and can even cause mortality.

The main vector of dengue fever is Ae. Aegypti, but in certain places such as the United States in this case Ae. Albopictus is the vector. Based on library researchDania (2016), that so far in Indonesia the two vectors are equally dominant in the occurrence of DHF cases. Aedes sp. usually prefers to suck human blood rather than animal blood (arthrophilic) and is usually active during the day(3).

Vector control can be done by physical control, biological control and chemical control, chemical control is the last choice in vector control because of its huge impact, but chemical control using insecticides remains the main tool in vector control (3). However, most people use insecticides not according to the rules, so that it can trigger vector resistance to insecticides (4). The development and spread of insecticide resistance is a serious threat because it can cause a decrease in the effectiveness of larvicide-based control programs, such as those aimed at the main vector causing dengue fever, namely Aedes aegypti (5). Resistance of Ae.aegypti mosquitoes to insecticides has been reported in various countries.

The use of synthetic insecticides (Cypermethrin) against the mosquito vector Ae. Aegypti causes resistance to mosquitoes, bioactive properties that are difficult to degrade in nature can pollute the environment, toxic substances in synthetic insecticides will also have an impact on human health. Natural insecticides are an alternative to mosquito control using more environmentally friendly plants, thereby reducing the use of synthetic insecticides and anticipating negative impacts on health (6). Aerosol mosquito repellent is considered very fast and practical in eradicating or killing insects compared to other types so that it is widely used by the community (6). However, aerosol

mosquito repellent has the largest chemical size compared to other types of mosquito repellent, which is around 0.1-500 microns so that it can have a worse effect on body health. In addition, aerosol mosquito repellent contains active chemicals that not only function to kill mosquitoes but are also proven to be toxic to the human body.

To carry out environmentally friendly control of Ae. Aegypti mosquitoes that does not harm public health and can be carried out by the community itself is to make insecticides that use natural ingredients, namely leaves, roots, stems, seeds and flowers without chemical mixtures that can threaten the health of the body.(7). Plants or herbs that have the potential as botanical insecticides generally have a bitter taste because they contain alkaloids and terpenes and have a spicy taste and an unpleasant odor.8). This type of plant or vegetation is often used as a natural pesticide in organic farming because this type of plant or vegetation is difficult to attack by pests.(9). Essential oils or etheric oils are natural commodities from plant species that come from leaves, flowers, wood, seeds and flower buds. Around 150 types of essential oils are traded in the international market and 40 types of them can be produced in Indonesia, although only a small part has developed and is being developed in Indonesia.(10). There are two plants that will be studied as natural insecticides, namely Bay Leaves (Syzygium Polyanthum) and Lavender Leaves (Lavandula Angustifolia).

Bay leaves are one of the ingredients in Indonesian cuisine used as a spice to flavor dishes that are used fresh or dried, also used as a traditional medicine for various diseases. Bay leaves contain 34.6% terpenoid compounds consisting of sesquiterpenes, namely β-cariopillen and monoterpenes, namely α-pinene, eugenol, and linalool. The compounds β-cariopillen, α-pinene, eugenol, and linalool have mosquito repellent effects. Based on researchOktiansyah (11), stated that terpenoid compounds are mosquito repellent. Meanwhile, the lavender plant (Lavandula angustifolia) is one of the plants that can be used as a natural insecticide, because it is effective in controlling insects (mosquitoes) (12). Lavender oil is one of the essential oils that has been known for many years, especially in European countries. This oil is obtained by steam distillation or solvent extraction from fresh flowers of the lavender plant or Lavandula angustifolia which is an aromatic shrub plant that belongs to the Lamiaceae family.

The experiment of bay leaves and lavender leaves in several previous studies was only directed at Culex mosquitoes. While in Medan City, the most mosquitoes are from the Ae. Aegypti mosquito

species. This research is expected to be a solution to break the chain of transmission of Dengue Fever by utilizing natural materials found around the community.

Based on the background explanation that includes several studies on the effects of bay leaves (13) and Lavender Leaves (Lavandula Angustifolia) (12) on several types of insects, researchers are interested in conducting research on adult mosquitoes Ae. Aegypti. Therefore, researchers want to compare the effectiveness of Lavender Leaf (Lavandula Angustifolia) juice with bay leaf (Syzygium Polyanthum) juice for controlling adult mosquitoes Ae. Aegypti.

## METHOD

The research design, namely the type of research used in this study is Quasi Experiment. The research design used in this study is a post-test only control group design using a Completely Randomized Design (CRD). This research was conducted at the Entomology Laboratory of BTKLPP Class I, Medan City. The population in this study were all adult Ae.Aegypti mosquitoes. The sample size in this study was 20 adult Ae.Aegypti mosquitoes in 6 experimental units and 4 controls.

Measurements on the test group were carried out after 24 hours of treatment by counting the number of adult mosquitoes that died.(14). Treatment using tobacco leaf juice and bay leaf juice was only given to the experimental group with different concentrations, namely 25gr/mL, 50gr/mL, 75gr/mL for the negative control group using distilled water, no bay leaf juice (Syzygium Polyanthum) and Lavender Leaf juice (Lavandula Angustifolia) were given, while for the positive control group using Cypermethrin.

The number of repetitions that must be done is at least four times. If A is a spraying treatment with a concentration of 25%, then the repetitions are A1, A2, A3, and A4. The number of errors is 24 consisting of 6 treatments and 4 repetitions. If entered into the total number of mosquito samples with the number of repetitions of 4 times and the number of treatments of 6 treatments, then: nxtxr = 20 x 6 x 4 = 480 adult Ae. Aegypti mosquitoes. For the positive and negative control groups, the number of mosquito samples needed is: nxtxr = 20 x 4 x 4 = 160 adult Ae. Aegypti mosquitoes. Therefore, the total number of mosquito samples needed is 480 + 160 = 640 adult Ae. Aegypti mosquitoes. Measurements in the test group were carried out after 24 hours of treatment by counting the number of dead adult mosquitoes. The data obtained were then grouped and entered

into a table and analyzed using Anova (Analysis of Variance). Meanwhile, to calculate the LC50 and LC90 values using probit analysis. Data collection was carried out in the first 5 minutes, 20 minutes, 40 minutes, 60 minutes, and 24 hours by recording the number of Ae. Aegypti mosquito mortality. Observations started at 14.00, 14.05, 14.20, 14.40, 15.00, and 14.00 the next day. Data collection was carried out after spraying bay leaf juice and tobacco leaf juice in each repetition of each treatment. In this study, the method for making leaf juice is as follows: 1. Collection of bay leaves and tobacco leaves are washed clean, then dried under the hot sun from 09.00 - 14.00 for 2 days.; 2. Make measurements for tobacco leaves and bay leaves of 25 grams, 50 grams, and 75 grams respectively using an analytical scale (to obtain precise measurements); 3. Then the leaves are blended with the addition of 100 mL (each concentration); 4. Then wrap it tightly in plastic and leave it for 24 hours; 5. After this treatment, take 50 mL of each concentration that has been made, namely 25 gr/mL, 50gr/mL, and 75gr/mL.Meanwhile, the way to carry out the experiment is as follows: the way to carry out the experiment is as follows: 1. Prepare the tools and materials used; 2. Provide test materials for each concentration that has been made, namely 25gr/mL, 50gr/mL, 75gr/mL; 3. Then prepare the Ae. Aegypti mosquitoes that are already in the treatment box as well as the control box.; 4. Measure the air temperature, air humidity at the research test site before and after the study; 5. Then spray each concentration on each treatment box containing 20 mosquitoes by shrinking the control box; 6. Then observe the mosquitoes that die 1 time 24 hours.

## RESEARCH RESULTS AND DISCUSSION

### Bay Leaf Juice Test (Syzygium Polyanthum)

The bay leaf juice test was conducted to see the effectiveness of bay leaf juice on the mortality of adult Ae. Aegypti mosquitoes which was conducted after 24 hours, the following results were obtained:

**Table 1. Mortality Rate of Adult Ae. Aegypti Mosquitoes After Treatment with Bay Leaf Juice (Syzygium Polyanthum) in Various Concentrations After 24 Hours**

| Concentration | Number of Test Mosquitoes | Number of deaths in the th repeat | | | | Total Deaths | Average Death Rate | Mosquito Mortality (%) |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | | | |
| 25% | 20 | 6 | 4 | 4 | 5 | 19 | 4.75 | 23.75 |
| 50% | 20 | 11 | 13 | 12 | 12 | 48 | 12 | 60 |
| 75% | 20 | 16 | 18 | 17 | 16 | 66 | 16, 75 | 83, 75 |
| Control (-) | 20 | 0 | | | | 0 | 0 | 0 |
| Control (+) | 20 | 20 | | | | 20 | 20 | 100 |

Based on Table 1 above, it can be seen that the average mosquito mortality in the negative control was 0%, concentration 25%, namely 5 mosquitoes (23.75%), concentration 50%, namely 12 mosquitoes (60%), concentration 75%, namely 17 mosquitoes (83.75%) while in the positive control group (Cypermethrin) mosquito deaths were 20 (100%).

Mortality of adult mosquitoes Ae. Aegypti is caused by the presence of several active compounds or chemical contents in bay leaves (Syzygium Polyanthum). Some of these active compounds are cyanide, saponin, tannin, flavonoid and essential oil compounds that have toxic properties that act as poisons against insecticides that inhibit the mosquito's respiratory tract and cause fainting or even death. The cyanide content in bay leaves causes effects on the respiratory tract and also disorders in the central nervous system which then causes convulsions, fainting, and death15. The saponin, tannin, and flavonoid content in bay leaves act as insecticides and are toxic to mosquitoes16.

**Lavender Leaf Juice Test (Lavandula Angustifolia)**

The tobacco leaf squeeze test was conducted to see the effectiveness of tobacco leaf squeeze on the mortality of adult Ae. Aegypti mosquitoes which was conducted after 24 hours, the following results were obtained:

**Table 2 Mortality Rate of Adult Ae. Aegypti Mosquitoes After Lavender Leaf Juice (Lavandula Angustifolia) Treatment in Various Concentrations After 24 Hours**

| Concentration | Amount Mosquito Test | Number of deaths in the th repeat | | | | Total Deaths | Average Death Rate | Mosquito Mortality (%) |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | | | |
| 25% | 20 | 5 | 4 | 7 | 5 | 21 | 5.25 | 26.25 |
| 50% | 20 | 8 | 10 | 12 | 9 | 39 | 9.75 | 48.75 |
| 75% | 20 | 15 | 14 | 17 | 16 | 62 | 15.5 | 77.5 |
| Control (-) | 20 | 0 | | | | 0 | 0 | 0 |
| Control (+) | 20 | 20 | | | | 20 | 20 | 100 |

Based on Table 2, it can be seen that the average mosquito mortality in the negative control was 0% concentration of 25%, namely 5 (26.25%), concentration of 50%, namely 10 (48.75%), concentration of 75%, namely 16 (77.5%) while in the positive control group (Cypermethrin) mosquito mortality was 20 (100%). Lavender plants (Lavandula angustifolia) are one of the plants that can be used as natural insecticides, because they are effective in controlling mosquitoes17.

## CONCLUSION

Based on the results of research and discussion on the comparison of the effectiveness of bay leaf juice (Syzygium Polyanthum) and tobacco leaf juice (Nicotiana Tabacum) for controlling Ae. Aegypti mosquitoes, it can be concluded that:

1. Bay leaf juice (Syzygium Polyanthum) has an average mortality percentage of 23.75% at a concentration of 25%, 60% at a concentration of 50%, and 83.75% at a concentration of 75% making the natural insecticide from bay leaf juice effective in killing Ae. Aegypti mosquitoes.
2. Lavender Leaf Juice (Lavandula Angustifolia) has an average mortality percentage of 26.25% at a concentration of 25%, 48.75% at a concentration of 50%, and 77.5% at a concentration of 75% making the natural insecticide from Lavender Leaf Juice (Lavandula Angustifolia) effective in killing Ae. Aegypti mosquitoes.

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