

The Use of Natural Insecticides in the Control of The *Aedes Aegypti* Mosquito

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ABSTRACT

One of the problems that are closely related to the community is the case of dengue fever and the use of synthetic insecticides, which cause environmental, insect resistance, and health losses for the community. To reduce the use of synthetic insecticides, this research focuses on the use of natural insecticides in controlling the *Aedes Aegypti* mosquito. The method in this study is true experiment research using a completely randomized design with 6 treatments 4 repetitions with 1 aqua dest control. Natural insecticides are made from *Lemongrass* and eco enzymes, then sprayed onto *Aedes Aegypti* mosquitoes in each cage containing 10 mosquitoes, the total mosquitoes tested were 280 adult mosquitoes. The purpose of this study was to formulate a natural insecticide that is effective in killing the *Aedes Aegypti* mosquito and to analyze the public's acceptance of the natural insecticide made. The results showed that the 4th treatment, namely 2:1 (citronella: eco enzymes) had the highest killing power with a mortality rate of 92.5% with an average time of killing mosquitoes of 1 minute. More than 50% of the survey of 20 respondents accepted or liked natural insecticides made from aspects of color appearance, ease of use, availability of materials, and the desire to use natural insecticides, while the smell of natural insecticides, people did not accept because the smell was quite strong.

Keywords: Aedes Aegypti mosquito, Dengue fever, Lemongrass and eco enzymes, Natural insecticides, Public acceptance.



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INTRODUCTION

The incidence of dengue fever is closely related to environmental factors that cause the availability of breeding sites for the *Aedes Aegypti* mosquito vector (Philbert & Ijumba, 2013). Garbage can be a breeding ground for *Aedes* mosquitoes. The accumulation of garbage causes the presence of mosquitoes to increase in population (Barrera et al., 1995). This is inseparable from the increase in the volume of waste each year. Based on the statement from the Ministry of Environment and Forestry, the amount of national waste in 2020 will reach 67.8 million tons. This figure is quite high and it may increase every year. From the social, economic, and environmental conditions that have been polluted, the consequences can intersect with other problems such as health problems.

Dengue fever health problems are directly related to social, economic, and environmental problems. This condition is marked by the consumptive behavior of the people who want to be fast and practical in dealing with dengue fever cases by eradicating mosquitoes using synthetic insecticides. The result of this activity causes resistance to mosquitoes and causes health problems (Norris et al., 2015). Therefore, natural insecticides

are an effort so that the three elements, namely social, natural, and economic, can be sustainable in terms of sustainability and sustainability of environmental conditions and public health.

METHODS

The type of this research is true experimental research, with a RAL research design (completely randomized design) based on quantitative research. RAL is a research design used to study the effect of several studies. RAL is used because the sample conditions used are homogeneous, and environmental conditions are homogeneous and can be controlled (Fisher & Feynman 2007). Observations were made by calculating the mortality of the *Aedes Aegypti* mosquito. This study consisted of 6 treatments and 4 repetitions with 1 aqua dest control. 6 treatments consisted of 6 comparison formulations consisting of 4:0, 1:3, 1:2, 2:1, 3:1, 0:4.

The population in this study was the *Aedes Aegypti* mosquito obtained from the Baturaja Health Training and Development Center, South Sumatra. From 1000 mosquito eggs, samples were taken for this study, namely 280 adult *Aedes Aegypti* mosquitoes that were bred from the *Aedes Aegypti* mosquito population.

RESULTS AND DISCUSSION

1. Research results

Based on the results of the mean analysis test (Table 1), it can be concluded that treatment 4 is the treatment that kills the most mosquitoes with an average of 9.25, with an average duration of 1 minute. In other treatments, namely treatment 3 and treatment 5, the average number of dead mosquitoes was about 7 mosquitoes, these two treatments were the lowest average among all types of treatment. Meanwhile, in treatment 1, treatment 2, and treatment 6, the average number of mosquitoes that died was about 8 mosquitoes out of 10 tested mosquitoes.

Table 1. The results of the mean analysis test

Treatment (ml)	number of test mosquitoes	Replication	number of live mosquitoes	number of dead mosquitoes	Time (minute)	the average number of dead mosquitoes	death rate percentage (%)
SEco0 (0:0) aquades	10	1	10	0	5	0	0
	10	2	10	0	5		
	10	3	10	0	5		
	10	4	10	0	5		
SEco1 (4:0)	10	1	0	10	4	8,75	87,5%
	10	2	2	8	4		
	10	3	1	9	2		
	10	4	2	8	2		
SEco2 (1:3)	10	1	1	9	5	8,25	82,5%
	10	2	2	8	5		
	10	3	2	8	6		
	10	4	2	8	6		
SEco3 (1:2)	10	1	2	8	5	7,5	75%
	10	2	2	8	6		
	10	3	3	7	2		

Treatment (ml)	number of test mosquitoes	Replication	number of live mosquitoes	number of dead mosquitoes	Time (minute)	the average number of dead mosquitoes	death rate percentage (%)
SEco4 (2:1)	10	4	3	7	2	9,25	92,5%
	10	1	1	9	1		
	10	2	2	8	1		
	10	3	0	10	1		
	10	4	0	10	1		
SEco5 (3:1)	10	1	2	8	3	8,75	87,5%
	10	2	2	8	4		
	10	3	1	9	4		
	10	4	0	10	5		
SEco6 (0:4)	10	1	2	8	5	7,75	77,5%
	10	2	3	7	5		
	10	3	2	8	4		
	10	4	2	8	5		

In this study on the use of natural insecticides in controlling the population of *Aedes Aegypti* mosquitoes, 10 mosquito samples were used for each treatment. This study used 6 comparative treatments (citronella: eco enzyme) in which each treatment had 4 repetitions and quantitative data were obtained. The quantitative data obtained were described using the SPSS program and it was found that the highest value of *Aedes Aegypti* mosquitoes that died with *Lemongrass* + eco enzyme treatment was 2:1 while the lowest value was 0:4. In addition, it can be seen that the average total dead mosquito is 9.25 and the lowest is 7.25.

Of the 20 respondents who were asked about the color of the natural insecticide made, 60% of them liked the color of the natural insecticide. Natural insecticides appear with a light brown color, so there is no need to worry. As many as 65% of respondents stated that they did not like the smell or aroma released by natural insecticides from *Lemongrass* + eco enzymes because it was quite pungent. As many as 80% of respondents or around 16 respondents stated that the spraying method was considered more practical and easy to apply. Public acceptance of the availability of materials also tend to like with a percentage of 80% and 20% of respondents do not like it. Public acceptance of the desire to use natural insecticides is quite good, there are as many as 65% of 20 respondents receive natural insecticides as insecticides to kill mosquitoes if they are commercialized.

2. Discussions

The formulation of natural insecticides in this study involved natural ingredients that are available in nature and are easily available. Natural insecticides are considered to be a solution to environmental and health problems that have occurred every year. From various kinds of literature studies that have been carried out and from the results of research obtained, it is stated that the most important point of solving problems is how to interpret nature and maintain nature in a natural way itself. Various potentials of tropical plants that can be used as natural insecticides are a way to preserve the environment and are safe for humans and animals as inhabitants of the earth.

Lemongrass natural insecticides and eco enzymes are considered to have lower levels that cause poisoning in animals because they contain low toxic compounds but can paralyze mosquitoes at the same time. This research has been carried out by Baker et al., (2018), The toxicity of plant essential oils is proven to be lower than synthetic insecticides, many bioactivity data for each essential oil in the study will serve as a valuable source for

future research. which explored the insecticidal qualities of plant essential oils. Insecticidal activity is not considered harmful to humans and pets.

The use of natural insecticides has many advantages including being environmentally friendly, and not having a bad impact on health and basic materials around settlements. Based on the many advantages, it is deemed necessary to look for natural insecticides as repellents to resist mosquito bites that transmit diseases. The results of research conducted by Boesri (2015) showed that the repellent test of several plant extracts at a dose of 100% which was able to resist mosquito bites above 80% per hour, including Zodia leaf extract was able to resist up to 2 hours as much as 88.2%. *Tobacco* leaf extract was able to resist for 3 hours as much as 84.9%, *gondopuro* leaf extract was able to resist for 1 hour as much as 83.3%, *Serai Wangi* leaf extract was able to resist for 2 hours as much as 85.1%. Clove leaf extract was able to resist for 4 hours as much as 81.7%. Chrysanthemum flower extract was able to resist for 1 hour as much as 89.6%,

In the study of natural insecticides, *Lemongrass* and eco enzymes, have advantages compared to previous studies related to natural insecticides, namely in this study the combination of the two ingredients, namely *Lemongrass* and eco enzymes, was able to kill mosquitoes more than 90% compared to *suren* leaf extract, *tuba* root and *lavender* only able to kill mosquitoes. resisting *Aedes Aegypti* mosquito bites below 80% (Boesri 2015). The effectiveness of *Lemongrass* extract has also been proven in several studies. Among them is research conducted by Aulung (2014).

CONCLUSIONS

There is an effect on each treatment of natural insecticides made. The most effective natural insecticide formulation is the 2:1 ratio formulation (SECo 4), namely 2 ml lemongrass and 1 ml eco enzyme, with a mortality rate of 92.5% with a duration of time reaching mortality of approximately 1 minute. There is an effect of the use of natural insecticides on public acceptance. Natural insecticides will not be used if the public response is less accepting. As for the community's response to natural insecticides that are made quite acceptable, especially in terms of ease of use and availability of materials, for aspects of appearance such as color and smell, people tend not to like it very much.

REFERENCES

- Aulung, A., Rahayu, S., & Haque, A. N. (2014). Pengaruh Ekstrak Serai Wangi (*Cymbopogon nardus* L) terhadap Kematian Larva *Aedes Aegypti*. *Majalah Kedokteran*, 30(2), 43-47.
- Baker, B. P., Grant, J. A., & Malakar-Kuenen, R. (2018). Citronella & citronella oil profile.
- Barrera, R., Navarro, J. C., Mora Rodríguez, J. D., Domínguez, D., & González García, J. E. (1995). Public service deficiencies and *Aedes aegypti* breeding sites in

- Venezuela. *Bulletin of the Pan American Health Organization (PAHO)*; 29 (3), sept. 1995.
- Boesri, H. B., Heriyanto, B., Susanti, L., & Handayani, S. W. (2015). Ujirepelen (dayatolak) beberapa ekstrak tumbuhan terhadap gigitan nyamuk *Aedes Aegypti* vektor demam berdarah dengue. *Vektora: Jurnal Vektor dan Reservoir Penyakit*, 7(2), 79-84.
- Fisher, R. A., & Feynman, R. P. (2007). Completely Randomized Designs. *J. Hist. Biol*, 40(2), 295-325.
- Norris, E. J., Gross, A. D., Dunphy, B. M., Bessette, S., Bartholomay, L., & Coats, J. R. (2015). Comparison of the insecticidal characteristics of commercially available plant essential oils against *Aedes Aegypti* and *Anopheles gambiae* (Diptera: Culicidae). *Journal of medical entomology*, 52(5), 993-1002.
- Philbert, A., & Ijumba, J. N. (2013). Preferred breeding habitats of *Aedes aegypti* (Diptera Culicidae) mosquito and its public health implications in Dares Salaam. *Journal of Environmental Research and Management*, 4(10), 344-351.