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Effectiveness of Clover Oil (Szygium Aromaticum) and Citraf Oil (Cymbopogon Citratus) as Removal of Culex Sp Mosquito Larms

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ABSTRACT: Filariasis control is carried out on a regional basis by implementing environmental management, vector control, curing or treating sufferers, providing medicine to healthy people infected with filarial worms and as a source of transmission of Filariasis as well as mass administration of preventive medicine. This study aims to evaluate the effectiveness of clove oil (Syzygium aromaticum) and lemongrass oil (Cymbopogon citratus) as natural larvicides against Culex sp mosquito larvae. The method used in conducting this research is the experimental method. Based on the research results, it shows that the results of clove leaf oil are more effective at concentrations (0.14 ml, 0.16 ml, 0.18 ml, and 0.20 ml) which can eradicate 50 Culex sp mosquito larvae with a percentage value of 50% compared to citronella oil (Cymbopogon citratus) which can only eradicate Culex sp mosquito larvae with the ability to eradicate not reaching 50 mosquito larvae. With a percentage value below 50%. It is hoped that this research can be the basis for developing natural mosquito control that is safe for the environment while supporting the prevention of vector-borne diseases in the community.

Keywords: Natural Mosquito, Larva Repellent, Ingredients.

INTRODUCTION

According to WHO data, in 2021, 882.5 million people in 44 countries live in areas that require preventive chemotherapy to stop the spread of infection. The global baseline estimate of people affected by lymphatic filariasis is that 25 million men suffer from hydrocele and more than 15 million men suffer from lymphedema. At least 36 million people still suffer from manifestations of this chronic disease (Who, 2023).

Based on data collected in 2022, the Ministry of Health reports that there are 8,635 people in Indonesia who suffer from elephantiasis or filariasis. The Ministry of Health found that the five provinces with the most cases in the 2022 National Filariasis Situation Analysis were Papua with 3,629 cases, West Papua with 620 cases, NTT with 1,276 cases, Aceh with 507 cases, and West Java with 424 cases (Health., 2022).

Tojo Unauna 4.3% (2009), Morowali 1.17% (2009), Banggai 1.1% (2009), Bangkep 1.16% (2002), Parigi Moutong 2.14% (2004), Poso 1.66% (2004), Sigi Regency 1.14% (2003), Donggala 1.14% (2003), and Buol. 1.52% (2015) are nine endemic districts in Central Sulawesi Province with Microfilaria Rates > 1%. Thus, filariasis is still a public health problem in Central Sulawesi Province (Department, 2022).

The use of chemical insecticides from the mosquito larval stage is one of the methods currently used to control and eradicate mosquitoes. Continuous use of chemical pesticides can harm humans and may make mosquito larvae more resilient. Therefore, to reduce the negative impacts caused by synthetic insecticides, it is necessary to control methods that are effective in reducing mosquito populations and are safe for the environment. It is known that clove plants have the potential to be an insecticide because they contain eugenol and (vi) anti-insects (eugenol as a lavaricide can be used to control insects such as Aedes aegypti and Anopeles stephensi mosquitoes (Kelana, 2022).

Control of adult mosquito vectors is also carried out using nebulization techniques. Continuous use of chemicals can harm living things, including humans, animals, plants and the environment. In addition, chemical control has apparently created resistance to mosquitoes and requires a lot of energy and money. Regarding the dangers of using chemicals to control mosquito vectors, mosquito vector control methods must use controls made from natural extracts or plant essential oils which are more environmentally friendly and safe for the survival of humans, animals, plants and the surrounding environment (Budiman et al., 2024).

One plant that is considered to be able to be used as a natural insecticide is clove leaf oil (Syzygium aromaticum) because it contains eugenol, flavonoids, saponins, and tannins and (vi) anti-insects (eugenol as lavarside can be used to control insects such as Aedes aegypti and Anopeles stephensi mosquitoes (Screening et al., 2021).

A natural ingredient that can also reduce mosquito larvae is the Lemongrass Leaf plant (Cymbopogon ciratus). Lemongrass contains essential oil components with components of geraniol (20-40%), citronellal (25-50%), and citronellol (10-15%) which produce an aroma, so it can be used as a mosquito repellent. Citronellol and geraniol are active ingredients that are disliked and avoided by insects, including mosquitoes, so using these ingredients is very useful as a mosquito repellent (Huda et al., 2022).

It is hoped that this research can help reduce the spread of filariasis. And diseases resulting from disability caused by firasiasis every year. So with this the researcher took the research title about lemongrass leaf oil (Cymbopogon ciratus) and clove leaves (Syzygium aromaticum) as a repellent for Culex sp mosquito larvae(Jabeen et al., 2024; Sherif et al., 2023).

METHOD

The type of method used in this research is an experimental method using observation tests to determine the effectiveness of clove oil (Syzygium aromaticum) and lemongrass oil (Cymbopogon citratus) as a repellent for Culex sp mosquito larvae.

This research was conducted at the Laboratory of the Faculty of Public Health, Muhammadiyah University of Palu, Jalan Rusdi Toana, No. 01 Talise Village, Mantikulore District, Palu City, Central Sulawesi. The location for sampling Anopheles sp mosquito larvae is in a rice field area that is still in the irrigation stage which can be a breeding habitat for Culex sp mosquito larvae. The location of the rice fields is in the Sigi Biromaru District and Kalukubula Village, Sigi Regency. This location was chosen because when making initial observations for the first time, the researcher found the location of the rice field area. And after observing many Culex sp mosquito larvae were found that were breeding. This research was carried out from August to November 2024.

The research object used was 600 Culex sp mosquito larvae which were divided into two ingredients, namely clove leaf oil (Syzygium aromaticum) and citronella oil (Cymbopogon citratus) with a total of 300 each. Then 150 individuals were observed in six test containers by placing 25 Culex sp mosquito larvae in six test containers, namely five larva observation test containers in which doses were added, namely 0.12 ml, 0.14 ml, 0.16 ml, 0.18 ml, 0.20 ml and one control container(Al-Janabi et al., 2023; Don et al., 2024). This observation was carried out in the same form in each repetition, namely in repetition I and repetition II which were observed once every hour for 24 hours. Observations on each material contained in the six treatment test containers were carried out twice.

The data presented in this research is in the form of calculating the results of observations of the number of dead larvae and calculating the percentage value of larval death in each concentration and treatment dose of the test container which is made in the form of tables and narratives.

Data analysis in this research was carried out using descriptive research. Where, the research method was carried out in a gradual observation process and using time calculations by counting the number of larvae that died. In determining the percentage of killing power of clove leaf oil (Syzigium aromaticum) and lemongrass leaf oil (Cymbopogon citratus) against Culex sp mosquito larvae, create an observation table for each ingredient from the five treatment doses to calculate each larva death in each hour of observation and determine the results of the total level of effectiveness(Abdullah et al., 2023; Khanem et al., 2025; Mao, 2024).

RESULT AND DISCUSSION

This research was carried out from August to November 2024 at the Laboratory of the Faculty of Public Health, Muhammadiyah University, Palu. This research used clove leaf oil (Syzigium aromaticum) and lemongrass leaf oil (Cymbopogon citratus) as a repellent for Culex sp mosquito larvae. With 5 different treatment doses in each container, namely 0.12 ml, 0.14 ml, 0.16 ml, 0.18 ml, 0.20 ml and one control container(Du et al., 2024; Sawadogo et al., 2025). Then it was observed once every 1 hour of observation. This was done continuously for 24 hours of observation and repeated twice.

The samples of Anopheles sp mosquito larvae that were observed were 600 individuals, divided into two ingredients, namely clove leaf oil (Syzygium aromaticum) and lemongrass stem oil (Cymbopogon ciratus) with a total of 300 individuals each. Then 150 individuals were observed in

six test containers by placing 25 Anopheles sp mosquito larvae in six test containers, namely five larva observation test containers that were dosed and one control container. This observation was carried out in the same form in each repetition, namely in repetition I and repetition II which were observed once every hour within 24 hours of observation.

The following are the results of observations from the two materials used in the research and each treatment in table form as follows:

Table 1. The number of Culex sp mosquito larvae used was 300 and divided by 150 in each repetition I and II by inserting 25 larvae into each test container.

Concentration Dose	Number of Larvae Per Treatment Container				Number of Dead/Repetitive Larvae	
	Die Everytime	Treatment Flat	Average Value	Total flick	Presentation Death (50%)	
					150 Repetitions I	150 Repetitions II
0,12 ml	25 tails	25	23	48 heads	24	48%
0,14 ml	25 tails	25	25	50 heads	25	50%
0,16 ml	25 tails	25	25	50 heads	25	50%
0,18 ml	25 tails	25	25	50 heads	25	50%
0,20 ml	25 tails	25	25	50 heads	25	50%
Control	25 Tail	0	0	0	0	0%

Source: Primary Data 2024

Based on the results of observations in the table above, it shows that the control treatment using Clove Leaf Oil (Syzigium Aromaticum) in treatments I and II with a dose of 0.12 ml can kill 48 mosquito larvae with a percentage value of 48%. At a concentration of 0.14 ml, it can kill 50 mosquito larvae with a percentage value of 50%. At a concentration of 0.16 ml, it can kill 50 mosquito larvae with a percentage value of 50%. At a concentration of 0.18 ml, it can kill 50 mosquito larvae with a percentage value of 50%. And a concentration of 0.20 ml can kill 50 mosquito larvae with a percentage value of 50%. within 24 hours of observation of Culex sp mosquito larvae.

The number of Culex sp mosquito larvae used was 300 individuals and divided into 150 individuals in each iteration I and II by inserting A total of 25 larvae in each test container**.**

Table 2. Number of Deaths of Culex sp Mosquito Larvae Using Lemongrass (Cymbopogon citratus) Oil in Each Concentration for 24 Hours in Repetition I and Repetition II

Concentration Every Repetition	Number of Flicks in Each Treatment				Number of dead larvae	
	Die Everytime	Treatment Flat	Average Value	Total flick	Presentation death (50%)	
					150 Repetitions I	150 Repetitions II
0,12 ml	25 tails	1	2	3 heads	1,5	3%
0,14 ml	25 tails	2	1	2 heads	1,5	3%
0,16 ml	25 tails	2	0	2 heads	1	2%
0,18 ml	25 tails	0	1	1 heads	0,5	1%

0,20 ml	25 tails	1	1	2 heads	1	2%
Control	25 Tail	0	0	0	0	0%

Source: Primary Data 2024

Based on the results of observations in the table above, it shows that the control treatment using lemongrass leaves (Cymbopogon citratus) in repetitions I and II with doses of 0.12 ml and 0.14 ml can kill 3 mosquito larvae with a percentage value of 3%. At a concentration of 0.16 ml, it can kill 2 mosquito larvae with a percentage value of 2%. At a concentration of 0.16 ml, it can kill 2 mosquito larvae with a percentage value of 2%. At a concentration of 0.18 ml, it can kill 1 mosquito larva with a percentage value of 1%. And a concentration of 0.20 ml can kill 2 mosquito larvae with a percentage value of 2%. within 24 hours of observation of Culex sp mosquito larvae(Almutairi et al., 2024; Falcon et al., 2024).

The results of observations of the two concentration materials carried out in the research are as follows

1. The use of clove leaf oil (Syzigium Aromaticum) on the death of Culex sp mosquito larvae can be seen at concentrations of 0.14 ml, 0.16 ml, 0.18 ml and 0.20 ml within a 24 hour observation period which can kill 50 Culex sp mosquito larvae in repetition I and repetition II, with a percentage value of 50%.
2. Using lemongrass (Cymbopogan citratus) oil at a dose of 0.12 and 0.14 ml in repetition I and repetition II can eradicate as many as 3 Culex sp mosquito larvae with a percentage of 3%. At a dose of 0.16 ml and in repetition I and repetition II it can eradicate as many as 2 Culex sp mosquito larvae with a percentage of 2%. at a dose of 0.18 ml in repetition I and repetition II can eradicate 1 Culex sp mosquito larva with a percentage of 1% and a dose of 0.20 ml in repetition I and repetition II can eradicate 2 Culex sp mosquito larvae with a percentage of 2%.

Comparison with Further Research

This research is in line with research conducted by Budiman, et al in 2024 regarding the Effectiveness of Removing Anopheles Spp Larvae from Clove Leaves (Syzygium aromaticum). As an exterminator of Anopheles spp. This research used experimental methods carried out at the Entomology Laboratory of the Donggala Health Center and Development Institute using Anopheles spp larvae. The solutions used to kill Anopheles sp larvae were in different concentrations, namely 0.006%, 0.007%, 0.008%, 0.009% and 0.01%. The results of this research show the ability of clove leaf oil waste (Syzygium aromaticum) to eradicate Anopheles sp larvae with lethal power at a concentration of 0.005%. (Budiman et al., 2022).

This research is in line with previous research conducted by Christina. The conclusion of this research is that the five concentrations of the test materials did not have a significant difference in their effect as biolarvicides. This shows that the essential oils of citronella and clove leaves, whether applied singly or in combination, have the same larvicidal effectiveness as temephos in killing Ae mosquito larvae. aegypti. The death time (LT50) of lemongrass extract was 12.72 hours, clove leaf 6.71 hours and the combination was 6.38 hours (Salaki, Wungouw, and Makal 2021).

Limitations And Cautions

The drawback in conducting research was that it was hampered by rainy weather when taking samples. Then the distance from the sampling location to the research location is quite far.

Recommendations For Future Research

It is hoped that this research will develop environmental health knowledge regarding efforts to control Culex sp mosquito larvae vectors using natural ingredients derived from clove leaf oil (Syzigium aromaticum) and lemongrass oil (Cymbopogon citratus)(Alvarado-García et al., 2023; Yang et al., 2025). It is hoped that this research can be applied to researchers and the public to be able to use natural alternative materials as a Culex sp mosquito larva repellent that is safe for the environment(Baruah et al., 2023; Kaitana et al., 2023).

CONCLUSION

Based on the results of research that has been carried out on the process of observing natural ingredients for eliminating Anopheles sp mosquito larvae, it can be concluded as follows:

1. The use of clove leaf oil (Syzigium Aromaticum) on the death of Culex sp mosquito larvae can be seen at concentrations of 0.14 ml, 0.16 ml, 0.18 ml and 0.20 ml within a 24 hour observation period which can kill 50 Culex sp mosquito larvae in repetition I and repetition II, with a percentage value of 50%.
2. Using lemongrass (Cymbopogan citratus) oil at a dose of 0.12 and 0.14 ml in repetition I and repetition II can eradicate as many as 3 Culex sp mosquito larvae with a percentage of 3%. At a dose of 0.16 ml and in repetition I and repetition II it can eradicate as many as 2 Culex sp mosquito larvae with a percentage of 2%. at a dose of 0.18 ml in repetition I and repetition II can eradicate 1 Culex sp mosquito larva with a percentage of 1% and a dose of 0.20 ml in repetition I and repetition II can eradicate 2 Culex sp mosquito larvae with a percentage of 2%.

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