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Effectiveness of Curry Leaf Extract (Murraya koenigii) as a Natural Larvicidal Against Culex Sp Mosquito Larvae Mortality

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ABSTRACT
The Culex genus of mosquitoes makes up the majority of the mosquitoes in our area. The West Nile virus, filariasis, Japanese encephalitis, and St. Louis encephalitis are only a few of the illnesses spread by this mosquito. Culex quinquefasciatus, a mosquito in the genus Culex that is known to transmit the diseases chikungunya and filariasis, is a significant mosquito species. The study's objective was to ascertain whether Culex Sp mosquito larvae died after receiving doses of curry leaf extract (Murraya koenigii) of 2 ml/200 ml, 4 ml/200 ml, and 8 ml/200 ml. Three hundred Culex species larvae served as the study's subjects. The One Way ANOVA test was employed for data analysis. The outcomes shown that Culex sp. larval mortality in the treatment Curry leaf extract (Murraya koenigii) doses of 2 ml/200 ml of water were 16.7%, 4 ml/200 ml of water were 21.7%, and 8 ml/200 ml of water were 25%. One way ANOVA analysis yielded a p value of 0.003 (0.005), indicating that curry leaf extract (Murraya koenigii) is effective as a natural larvi The dose that is most successful, with a p value of 0.001, is 4 ml/200 ml of water. It is envisaged that the community will be able to employ and make use of curry leaf extract (Murraya koenigii) as a substitute for killing Culex sp. larvae.

Keywords: Curry leaves (Murraya koenigii), extraction, Culex sp. larvae

BACKGROUND

Mosquitoes are blood-sucking insects that spread a variety of illnesses to people and animals all over the world. There are more than 2,500 different mosquito species in the globe, yet the majority of them do not spread disease. One of the species that still remains and is regularly encountered is Culex sp[1].

The Culex genus of mosquitoes makes up the majority of the mosquitoes in our area. The ability of several of these mosquito species to spread disease has been demonstrated. Culex works as a vector of major diseases such as West Nile Virus, filariasis, Japanese encephalitis, St. Louis encephalitis. An important mosquito in the genus Culex is Culex quinquefasciatus which is known as a vector for filariasis and chikungunya[2].

As an effort to eliminate filariasis by 2020, the World Health Organization (WHO) developed a global agreement (The Global Goal of Elimination of Lymphatic Filariasis as a Public Health issue by The Year 2020). (The Global Goal of Elimination of Lymphatic Filariasis as a Public Health problem by The Year 2020). In the world there are 1.3 billion people who are at risk of getting filariasis or also known as elephantiasis in more than 83 nations and 60% of cases are in Southeast Asia. A total of 34 Provinces in Indonesia reported 12,677 cases of filariasis in 2017; Aceh came in fifth with 591 cases[3].

The government has made different attempts to address diseases caused by mosquitoes, mainly filariasis, such as breaking the chain of transmission of filariasis by distributing Mass Prevention Drugs (POPM) for filariasis in endemic areas once a year for five consecutive years. Filariasis was not present in Banda Aceh City's Health Profile (0 cases)[4].

Breaking the chain of the primary illness source is where control efforts for the Culex sp vector must begin. At present, the community is reluctant to work together to clear the polluted water gutters which are regarded the main source of breeding of Culex Sp mosquito larvae. Contrary to Aedes aegypti larvae, which prefer to live in areas with clean water, such as a bathtub, Culex sp. larvae prefer the gut as their primary breeding location or habitat. Therefore, insect vector control can be done mechanically, biologically or chemically[2].

However, thus far Indonesian people have largely solely employed insecticides to control vectors. The use of synthetic insecticides is known to be quite effective, reasonably inexpensive, easy and practical but can have a harmful influence on the environment[5]. In addition, insect life grows resistant to insecticides. One approach to tackle this challenge is to hunt for biological elements that are more selective and safe[6]

Botanical insecticides are one of the alternative pesticide controls that are viable to produce because insecticidal substances from these plants are easily degraded (bio-degradable) in the environment and are largely harmless for humans and the surrounding environment[7].

Plants or plants coming from nature and potential as vegetable pesticides such as curry leaves (Murraya koenigii) which include flavonoids, tannins, alkaloids, terpenes and saponins. Generally, curry leaves (Murraya koenigii) have a characteristic bitter taste due to the content of alkaloids and terpenes, have a foul smell and taste a little spicy which is considered capable of killing Culex Sp mosquito larvae, besides that they also contain lots of natural vitamins and minerals such as vitamins A, B, C, E. , amino acids, magnesium, and folic acid, which make the leaves of this spice excellent in health benefits. These plants or plants are rarely attacked by pests, hence they are extensively utilized as vegetable pesticide extracts in organic farming[8].

Research conducted by Ahdiyah (2015), evaluated mangkokan leaf extract (Nothopanax scutellarium) including flavonoids, saponins, coumarins, phenols, terpenes and alkaloids to kill Culex Sp. insect larvae. At varied concentration levels it was able to kill 50% of Culex sp larvae at a concentration of 1.338%. While the results of research by Lestari, et al (2015) regarding the use of various concentrations of ethanol extract of rambutan leaves (Nephelium lappaceum l.) on the mortality of Culex quinquefasciatus larvae at doses of 77%, 86%, 87%, 95%, 98% and 100% obtained the results that The ethanol extract of rambutan leaves has properties as a Culex Quinquefasciatus larvicidal and the effective concentration of ethanol extract of rambutan leaves as a larvicidal is 0.2%[9].

Meanwhile, Susanti et al(2015) .'s research concerning the larvicidal activity test of taro leaf extract (Alocasia indica Schott) on Culex sp mosquito larvae with parameters LC50 and LC95, which was calculated using the Reed and Muench method obtained results at an LC50 value for crude methanol extract of 0 .60 %, n-hexane fraction of 0.04%, The n-butanol percentage was 0.21%, and the ethyl acetate fraction was 0.22%. Crude methanol extract had an LC95 value of 1.06%, n-hexane fraction of 0.08%, ethyl acetate fraction of 0.11%, and n-butanol fraction of 0.44%[10].

So far no research has been identified on the biological benefits of curry leaf extract (Murraya koenigii) on the mortality of Culex sp mosquitoes, where practically all studies are related with food sources and health benefits. Based on the description above, the authors are interested in doing study to investigate the effectiveness of curry leaf extract (Murraya koenigii) as a natural larvicide against the mortality of Culex sp mosquitoes.

METHOD

This form of quasi-experimental study[11], with the subject being water Culex spinstar 3 larvae gathered from gutters or ditches as many as 300 larvae for 3 repeats with 4 treatment groups (25 larvae x 4 x 3 repetitions) (25 larvae x 4 x 3 repetitions). The stage of creating curry leaf extract (Murraya koenigii) employs maceration, the curry leaves (Murraya koenigii) are cut into small pieces and then dried without sunlight at room temperature ± for 2 days after drying the curry leaves are mixed till they crumble into powder. The blender's output was soaked for up to five days in 1,000 ml of alcohol (750 ml + 250 ml), filtered using a funnel, placed on a filter paper mat, and evaporated at room temperature at the research location (changes in extract molecules). Let stand for 30 minutes and the results are collected in the form of curry leaf extract (Murraya koenigii) (Murraya koenigii).

The experimental implementation stage is to provide 4 sample containers with a diameter of ± 15 cm (3 for treatment and 1 for control) then introduce 25 larvae into the treatment container by adding 2 ml of extract/200 ml of water. After that, put 25 larvae into the treatment container by adding 4 ml/200 ml water extract, put 25 larvae into the treatment container by adding 8 ml/200 ml water extract and put 25 larvae into the control container without adding extract. After then, observe the death of Culex Sp larvae every 1 hour to 8 hours. After 1x24 hours, note the mortality of Culex Sp larvae (who do not move when poked with a needle in the neck or siphon region because their stiff bodies prevent them from reaching

the water's surface) (treatment and control groups). Repeat the same treatment three times each iteration (treatment and control) (treatment and control)[12].

RESULTS

Based on research that has been done on the usefulness of curry leaf extract (Murraya koenigii) as a natural larvicide against the death of Culex sp. insect larvae. So the following research results were obtained:

Table 1
Results of Culex sp Mosquito Larvae Mortality Study After Giving Curry Leaf Extract (Murraya koenigii) 2 ml/200 ml water, 4 ml/200 ml water and 8 ml/200 ml water

No	Treatment	Culex sp Mosquito Larval Mortality Amount Based on Dosage								
		Control	%	2 ml/200 ml water	%	4 ml/200 ml water	%	8 ml/200 ml water	%	Total
1.	I	5	20	18	72	19	76	25	**100**	**67**
2.	II	3	12	22	88	24	96	25	**100**	**74**
3.	III	3	12	10	40	22	88	25	**100**	**60**
Total		**11**	**44**	**50**	**200**	**65**	**260**	**75**	**300**	**201**
Average		**3,6**	**14,4**	**16,7**	**66,8**	**21,7**	**86,8**	**25**	**100**	**67**

2019 primary data processing source

Table 1 reveals that the findings of Culex Sp mosquito larvae mortality after administration of curry leaf extract (Murraya koenigii) were most plentiful at a dose of 8 ml/200 ml of water, namely 75 larvae (25% mortality rate), while the least was at dose 2. 50 larvae require ml/200 ml of water, or an average 16.7%. And the Culex sp. mortality rate larvae. Treatment II had the greatest impact, whereas Treatment III had the least.

Additionally, the abot adjustment table is tabulated with the aforementioned results. The abbot correction table is provided as follows:

Table 2.
Abbott Formula Correction Table

No	Treatment	Culex sp Mosquito Larval Mortality Amount Based on				
		Control	2 ml/200 ml water	4 ml/200 ml water	8 ml/200 ml water	Total
1.	I	2,99	15,99	16,99	22,99	**58,96**
2.	II	0,99	19,99	21,99	22,99	**65,96**
3.	III	0,99	7,99	19,99	22,99	**51,96**
Total		**4,97**	**43,97**	**58,97**	**68,97**	**176,8**
Average		**1,66**	**14,7**	**19,7**	**22,9**	**58,9**

2019 primary data processing source

The average correction value for the dose of curry leaf extract (Murraya koenigii) varies between doses of 2 ml/200 ml of water, 4 ml/200 ml of water, and 8 ml/200 ml of water, according to Table 2 above.

The research results that have been obtained regarding the effectiveness of curry leaf extract (Murraya koenigii) as a natural larvicide against the death of Culex sp mosquito larvae at doses of 2 ml/200 ml water, 4 ml/200 ml water and 8 ml/200 ml water respectively were then carried out statistical test ANOVA one way (one way) with (α = 0.05). The ANOVA statistical analysis produced the following outcomes:

Table 3
Results of One Way Anova Test (One Way) Curry Leaf Extract (Murraya koenigii) With Doses of 2 ml/200 ml of water, 4 ml/200 ml of water and 8 ml/200 ml of water As Natural Larvicides Against Death of Culex sp Mosquito Larvae

Variables	Mean	SD	95% CI			P - Value
Control	3,67	1,155	0,80	-	6,54	0,003
2 ml/200 ml water	20,67	3,786	11,26	-	30,07	
4 ml/200 ml water	23,67	1,528	19,87	-	27,46	
8 ml/200 ml water	19,00	7,937	-0,72	-	38,72	
Total	**16,75**	**8,946**	**11,07**	-	**22,43**	

2019 primary data processing source

Based on table 3 above, the p value (0.003) <0.05 is achieved, therefore Ho is rejected and Ha is accepted. That is, there is a substantial difference in curry leaf extract (Murraya koenigii) with a dose of 2 ml/200 ml of water, 4 ml/200 ml of water and 8 ml/200 ml of water as natural larvicide on the death of Culex sp. insect larvae. After an LSD test was carried out to find out the most significant dose, there was an average difference in the effectiveness of each dose of curry leaf extract (Murraya koenigii) between doses of 2 ml/200 ml of water, 4 ml/200 ml of water and 8 ml/200 ml water. The results of the investigation in the table above reveal that the highest effective dose as a natural larvicide against the mortality of Culex sp mosquito larvae is 4 ml/200 ml of water with a p value (0.001). (0.001).

DISCUSSION

While using a dose of 4 ml/200 ml of water extract of curry leaves (Murraya koenigii) showed that the results of the death of Culex sp mosquito larvae in the treatment were as many as 65 larvae and in the control there were 11 larvae, and using a dose of 8 ml/200 ml showed that the results of the death of Culex sp mosquito larvae in the treatment were as many as 50 larvae and

Mosquitoes of the genus Culex sp are mosquitoes that are extensively found around us. The ability of several of these mosquito species to spread disease has been demonstrated. Important diseases like the West Nile Virus, filariasis, Japanese encephalitis, and St. Louis encephalitis are spread by Culex. Culex quinquefasciatus, a mosquito in the genus Culex that is notorious for transmitting chikungunya and filariasis, is a significant mosquito[2,13].

Because chemical mosquito control has an effect on people, biological control is thought to be the most effective against Culex sp mosquito mortality because it doesn't. Curry leaves (Murraya koenigii) often have a characteristic bitter flavor due to the amount of alkaloids and terpenes, have a foul odor and have a somewhat spicy taste which are thought capable of killing Culex Sp mosquito larvae. These plants or plants are frequently used in organic farming as vegetable pesticide extracts since pests rarely attack them[14].

This is consistent with Puri's 2009 study on the impact of curry leaf extract (Murraya koenigli (L.) Spreng) on the demise of Culex sp mosquito larvae, which revealed a strong correlation between the demise of Culex sp mosquito larvae and greater doses of curry leaf extract (p value 0.005).

Curry leaves (Murraya koenigii) are widely available and may grow anywhere, which leads researchers to believe that they have a significant impact on lowering Culex Sp mosquito larvae. As a result, the composition of curry leaves (Murraya koenigii) affects how long Culex species live. mosquitoes. However, the extraction process must be carried out in line with the implementation procedure so as to

produce successful results when utilized as a natural larvicide[15]. The death of Culex sp. larvae won't be significantly affected or impacted if the extraction rate is lower than the water combination, but vice versa. The effect of each dose administered on death varies.

According to the one way ANOVA analysis's findings, where the p value (0.003) 0.05, Ho is disregarded and Ha is accepted. This indicates that there is a significant difference in the effectiveness of curry leaf extract (Murraya koenigii) against the death of Culex sp. mosquito larvae between doses of 2 ml/200 ml of water, 4 ml/200 ml of water, and 8 ml/200 ml of water. However, in this case, dose 4 ml/200 ml is the most effective dose because the results of the analysis of the research

The efficiency of employing curry leaf extract (Murraya koenigii) to lower the population density of Culex sp mosquitoes is quite significant and can be verified in the field as a natural larvicide. Researchers estimate that curry leaves (Murraya koenigii) have a major function in lowering the population density of Culex sp. mosquitoes. So that direct prevention of the chain of diseases caused by Culex sp mosquitoes is regarded the most effective with biological control. Apart from the leaves being easy to collect in the surrounding area, using the extract takes a little time because you have to go through various phases of the process to produce the liquid extract. Besides that, the spread of Culex sp larvae in dirty locations like as drains, swamps and others also requires the community to take mutual cooperation in keeping the environment clean.

CONCLUSION

The average mortality of Culex sp mosquito larvae at a dose of 2 ml/200 ml of curry leaf extract water (Murraya koenigii) was 16.7%, a dose of 4 ml/200 ml of curry leaf extract water (Murraya koenigii) was 21.7%, dose of 8 ml/200 ml of water extract of curry leaves (Murraya koenigii) was 25% and the average mortality of Culex sp mosquito larvae in the control was 3.6%. The findings of the data analysis revealed that a dose of 4 ml/200 ml of water was the most efficient amount of curry leaf extract (Murraya koenigii) to use as a natural larvicide to kill Culex sp. mosquitoes, with a p value of 0.001.

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