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EFFECTIVENESS TEST OF COMBINATION OF CHICKEN DUNG FLOWER LEAF EXTRACT (*Tagetes erecta*) AND KITCHEN LEMONGRASS STEM (C*ymbopogon citratus*) AS LARVACIDE FOR MOSQUITO *Culex* sp

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ABSTRACT

Filariasis is an infectious disease in the form of enlarged feet (elephantiasis), enlarged hands, breasts and genitals in women and men which is transmitted by *Culex* sp mosquitoes caused by filarial worm infection. *Culex* sp mosquitoes can be controlled biologically and chemically, Biological larvicides are an alternative insecticide because larvicides with natural compounds tend to be safer. Chicken dung flower leaves (Tagetes erecta) and lemongrass stalks (*Cymbopogon citratus*) are one of the plants that contain flavonoids, tannins, and essential oils that can be used as larvicides. This study examines how the effectiveness test of the combination of chicken dung flower leaf extract (Tagetes erecta) and lemongrass stalks (*Cymbopogon citratus*) as a larvicide for *Culex* sp mosquitoes. The method used is an experimental method to determine the effects of the treatment given to the inhibitory power of the effectiveness test of the combination of chicken dung flower leaf extract (Tagetes erecta) and lemongrass stalks (*Cymbopogon citratus*) as a larvicide for *Culex* sp mosquitoes. The study was conducted at the Microbiology Laboratory of the Aceh Ministry of Health Polytechnic. The results showed that after 24 hours of contact, a concentration of 1.0% gave the highest percentage of larval mortality, which was 81.3%. The conclusion of this study is that the combination of extracts of the two plants is effective as a larvicide to control *Culex* sp mosquitoes.

***Keywords**: Culex sp, chicken dung flower leaves, kitchen lemongrass stalks, larvicide*

INTRODUCTION

Indonesia is a tropical country which means it has hot and humid weather all year round. The tropical climate makes Indonesia a good breeding ground for mosquitoes. This is because mosquitoes can act as carriers of quite dangerous diseases and even increase human mortality rates. Aedes, Anopheles and *Culex* sp are some of the species that carry dangerous diseases, these three mosquitoes can spread various viruses and filarial worms. The mosquitoes that are often found around us are *Culex* sp mosquitoes, Culex sp mosquitoes can interfere with human life activities due to their bites, *Culex* sp mosquitoes

are also one of the mosquito species that have been proven to spread diseases (Tambunan, 2021).

Filariasis is a biological infectious disease transmitted by Culex sp mosquitoes caused by filarial worm infection. This disease is chronic and if left untreated will cause permanent damage in the form of enlarged legs (elephantiasis), enlarged hands, breasts and genitals in women and men (Rahmayanti et al., 2021).

Results of the National Filariasis Situation Analysis In 2022, filariasis cases were recorded at 8,635 people, the Ministry of Health found that there were five provinces with the highest number of cases, namely Papua 3,629 cases, West Papua 620 cases, NTT 1,276 cases, Aceh 507 cases, and West Java 424 cases. Meanwhile, the global elephantiasis situation, around 1 billion people living in 72 endemic countries for filariasis, as many as 120 million of whom are positively infected with elephantiasis. With the number of people experiencing disabilities in the world as many as 36 million people (Azizah, 2023).

Culex sp mosquitoes are common mosquitoes in our environment that are active at night and are found in tropical areas, especially in Indonesia. *Culex* sp mosquitoes are often found in rice fields and slum areas. One effort to prevent the chain of transmission of *Culex* sp mosquitoes is by controlling vectors using larvicides. Larvicides are widely used, but this type of larvicide has a negative impact on the environment because it contains hazardous chemical compounds, causing environmental pollution, poisoning, and residues. The use of chemical larvicides can be replaced by using biological larvicides whose main ingredients come from plants because they are more selective, safe and easily degraded in nature (Rais et al., 2023).

Chicken dung flower leaves (Tagetes erecta) and lemongrass (*Cymbopogon citratus*) are environmentally friendly plants that can be used as natural larval insecticides. Chicken dung flower leaves contain active compounds such as alkaloids, glycosides, flavonoids, tannins, steroids, terpenoids, and essential oils, which can cause stomach poisoning in larvae and larval death. Lemongrass contains essential oils with citral, citronella, geraniol, and dipentane compounds. Citronella compounds have a dehydrating toxic effect that causes insect death due to permanent dehydration (Agatha et al., 2023).

Larvicide is a substance used to kill mosquito larvae, preventing the spread of Culex sp. mosquitoes. Research by Zulfikar et al. (2019) showed that chicken dung flower leaf extract (*Tagetes erecta*) with a concentration of 8 ml was effective in killing more than 50% of Aedes aegypti larvae (LC50). Meanwhile, research by Agatha et al. (2023) showed that lemongrass extract (*Cymbopogon citratus*) was effective as a larvicide for Culex sp. mosquitoes at concentrations of 0.8% and 1%. This study aims to test the combination of the two extracts and determine the most effective concentration in killing *Culex* sp larvae.

METHODS

This study uses an experimental research type (Notoatmodjo, 2018). The study was conducted in April 2024. Culex sp mosquito larvae were obtained from Culex sp mosquito egg cultures. Furthermore, an examination will be carried out at the Microbiology Laboratory of the Department of Medical Laboratory Technology, Poltekkes Kemenkes Aceh. The materials used include chicken dung flower leaves (Tagetes erecta), lemongrass stalks (*Cymbopogon citratus*), Culex sp larvae, 96% ethanol, distilled water, abate and water. The tools used in this study were blenders, analytical scales, measuring cups, volume

pipettes, maceration containers, stirring rods, glass funnels, beakers, water baths, measuring pipettes, dropper pipettes, volume pipettes, Erlenmeyer flasks, egg filters, label paper, filter paper, plastic containers, markers, gauze, flannel, object glass, cover glass, paper lans, and microscopes.

Making simplicia and extract of chicken dung leaves (*Tagetes Erecta*), samples of chicken dung leaves (*Tagetes erecta*) are picked directly from the plant as much as 100 grams, washed and dried by airing. The dried chicken dung leaves (*Tagetes erecta*) are then blended until smooth. Then soaked using 500 ml of 96% ethanol in a closed container then stored in a dark room for 3x24 hours while stirring occasionally. Then filtered using filter paper. After that, extraction was carried out using a water bath until good results were obtained thick (Fitriani, 2020).

Making Simplisia and Extract of kitchen lemongrass stalks (*Cymbopogon citratus*), samples of kitchen lemongrass (*Cymbopogon citratus*) were picked directly from the plant as much as 100 grams, washed, cut into small pieces and dried by airing. The dried kitchen lemongrass stalks (*Cymbopogon citratus*) were then blended until smooth. Then soaked using 500 ml of 96% ethanol in a closed container then stored in a dark room for 3x24 hours while stirring occasionally, then filtered using filter paper. After that, extraction was carried out using a water bath until the results were thick (Rokimah, 2019).

Making a combination of chicken dung leaf extract (*Tagetes erecta*) and kitchen lemongrass stalks (*Cymbopogon citratus*), prepare a macerate of chicken dung leaves (Tagetes erecta) and kitchen lemongrass stalks (*Cymbopogon citratus*). The thick extract obtained from chicken dung leaves (*Tagetes erecta*) and kitchen lemongrass stalks (*Cymbopogon citratus*) is made in a ratio of 1:1. Then mix the chicken dung leaf extract (*Tagetes erecta*) and Kitchen Lemongrass Stalks (*Cymbopogon citratus*) into a container and mix until homogeneous. The results of the extraction combination that have been obtained are diluted using distilled water with concentrations of 0.2%, 0.4%, 0.6%, 0.8 and 1%.

Treatment and observation of *Culex* sp larvae, prepare 7 containers measuring 150 ml, then label each container. Container 1 is filled with 100 ml of a combination of chicken dung flower leaf extract (*Tagetes erecta*) and kitchen lemongrass stalks (*Cymbopogon citratus*) with a concentration of 0.2%. Container 2 is filled with 100 ml of a combination of chicken dung flower leaf extract (*Tagetes erecta*) and kitchen lemongrass stalks (*Cymbopogon citratus*) with a concentration of 0.4%. Container 3 is filled with 100 ml of a combination of chicken dung flower leaf extract (*Tagetes erecta*) and kitchen lemongrass stalks (*Cymbopogon citratus*) with a concentration of 0.6%. Container 4 is filled with 100 ml of a combination of chicken dung flower leaf extract (*Tagetes erecta*) and kitchen lemongrass stalks (*Cymbopogon citratus*) with a concentration of 0.8%. Container 5 was filled with 100 ml of a combination of chicken dung flower leaf extract (*Tagetes erecta*) and kitchen lemongrass stalks (*Cymbopogon citratus*) with a concentration of 1%. Container 6 for positive control was filled with 100 ml of abate, container 7 for negative control was filled with 100 ml of distilled water. Then 25 Culex sp larvae were put into each container and covered with gauze. Observations were made at 1 hour, 4 hours, and 24 hours as many as 2 repetitions (Melati et al., 2023).

RESULTS AND DISCUSSION

The results of the research testing the effectiveness of the combination of chicken dung flower leaf extract (*Tagetes erecta*) and lemongrass stalks (*Cymbopogon citratus*) on the death of Culex sp larvae are shown in Table 1.

Table 1 Number of Culex sp Mosquito Larvae That Died With Variations in the Concentration of Chicken Dung Leaf Extract (*Tagetes erecta*) and Lemongrass Stems (*Cymbopogon citratus*) Combinations Within a 24-Hour Observation Period.

Concentration (%) of combination of chicken dung leaf extract and kitchen lemongrass stalks	Number of test larvae	Number of larval deaths per treatment (tail)			Number of larvae deaths (tail)	Average mortality (tail)	Percentage of larval mortality (%)
		P 1	P 2	P 3			
0,2	25	16	8	7	31	10,3	41,3%
0,4	25	22	12	10	44	14,67	58,67%
0,6	25	22	16	12	50	16,67	66,7%
0,8	25	23	17	15	55	18,3	73,3%
1,0	25	24	20	17	61	20,3	81,3%
Control +	25	25	25	25	75	25	100%
Control -	25	0	0	0	0	0	0%

Lethal Concentration (LC) is a standard measurement of toxicity of a medium that can kill a test animal. LC50 is the concentration required to kill 50% of the test animal population. The following are the results of a probit analysis to determine the LC50 per hour.

Lethal Concentration	Estimation	Lower Limit	Upper Limit
LC50	0,393	-0,035	0,570

The LC50 table above shows the estimated LC50 value of 0.393. Therefore, it is concluded that 50% of test animals can be killed at a concentration of 0.393%.

Based on the research results, the combination of chicken dung flower leaf extract (Tagetes erecta) and lemongrass stalks (*Cymbopogon citratus*) has a larvicidal effect on Culex sp larvae because it can cause the death of test larvae by 10-95%. The death of test larvae in this study has been able to reach more than 10% of the population, namely 81.3% with a concentration of 1%, indicating that the combination of chicken dung flower leaf extract (Tagetes erecta) and lemongrass stalks (*Cymbopogon citratus*) is effective as a larvicide against Culex sp larvae. Because natural larvicide is considered effective if it causes 80-90% larval death, (Afina, 2016).

The results of the analysis showed that the combination of chicken dung flower leaf extract (*Tagetes erecta*) and lemongrass stalks (*Cymbopogon citratus*) was effective as a larvicide against Culex sp mosquitoes, with varying effectiveness at each concentration. At a concentration of 0.2%, this extract killed 41.3% of larvae, while at a concentration of 1%, it killed 81.3% of larvae. The increase in extract concentration was directly proportional to the increase in larval mortality, indicating that the higher the concentration, the more effective the extract was as a larvicide.

The study showed that the combination of chicken dung flower leaf extract (*Tagetes erecta*) and lemongrass stalks (*Cymbopogon citratus)* was effective in killing Culex sp larvae, with the LC50 value achieved at a concentration of 0.393%. Larval death was caused by the flavonoid, saponin, and tannin content in the extract, which inhibited respiratory function and disrupted the larvae's digestive system. Giving a combination of chicken dung flower leaf extract (*Tagetes erecta*) and lemongrass stalks (*Cymbopogon citratus*) caused behavioral changes in Culex sp larvae. Larvae that were initially active became sluggish and eventually died. After 24 hours, the larval mortality rate increased along with the increase in extract concentration, from 41.3% at a concentration of 0.2% to 81.3% at a concentration of 1%. Dead larvae were seen sinking to the bottom due to the sedimentation of the easily decomposed extract at the bottom of the cup, showing differences in the condition of the larvae before and after the administration of the extract.

In the study of Zulfikar, et al., (2019) showed that chicken dung flower leaf extract (*Tagetes erecta*) with a concentration of 8 ml effectively killed more than 50% of Aedes aegypti larvae (LC50). Flavonoids in the extract cause damage to the respiratory system of larvae, while essential oils interfere with the digestive system, both of which lead to the death of larvae. Lemongrass (*Cymbopogon citratus*) also contains compounds such as essential oils, citronella, flavonoids, and saponins, which each function as stomach poisons,

dehydration poisons, respiratory poisons, and cell membrane destroyers, all of which are effective in killing larvae (Tsany, 2022). Control of larval populations is often carried out with chemical larvicides such as temephos (Abate), but its use can cause resistance, environmental pollution, and chemical residues. Therefore, this study is needed to find alternative natural insecticides. One of the proposed solutions is a combination of chicken dung flower leaf extract (*Tagetes erecta*) and lemongrass stalks (*Cymbopogon citratus*) as a natural larvicide (Berliani et al., 2021).

CONCLUSION

Based on the results of the study, it was shown that the combination of chicken manure leaf extract and lemongrass stalks was effective in killing Culex sp larvae, with mortality increasing as the concentration increased. At a concentration of 0.2% to 1%, the mortality rate of larvae ranged from 41.3% to 81.3% after 24 hours. The LC50 value, at which 50% of larvae were killed, was achieved at a concentration of 0.393%.

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