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Larvicides Activity of Krokot Extract into Aedes aegypti Mortality

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Abstract

Dengue Hemorrhagic Fever (DHF) is transmitted by Aedes aegypti, one of controlling vectors which is larvicides. Synthetic larvicides cause several problems so that alternative natural larvicides are used. One of which is the krokot (Portulaca oleracea, L.), the content such as flavonoids, tannins, alkaloids, and saponins can be used as larvicides. This study aims to determine the larvicides activity of krokot extract on mortality of Aedes aegypti. The study was conducted using experimental quantitative research. The study was conducted by pouring the ethanol extract on 25 larvae and repeated 3 times, for 24 hours. The result of larvae mortality test at concentrations of 4%, 5% and 6%, namely 39%, 57% dan 72%. LC50 value from krokot extract on the larvae mortality, that is equal to 9.294%. Based on the study, it can be concluded that the krokot ethanol extract is able to kill 50% of the Aedes aegypti larvae population.

Keywords: krokot, ethanol extract, Aedes aegypti, mortality

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1 Introduction

Dengue Haemorrhagic Fever (DHF) is an infectious disease caused by dengue virus from Flavivirus genus and Flaviviridae family and spread by Aedes aegypti mosquitoes in the tropic and subtropic environments including Indonesia. In 1953, this disease was found for the first time in Manila, Philippines and spread to many countries. In Indonesia, the first case happened in Surabaya in 1968. Dengue haemorrhagic Fever commonly happens in every age and every year, especially during the rainy season [1].

A way to reduce the number of DHF mortality is to control the vector mosquito. The attempt to control mosquitoes vectors that haven been accomplished including control of the environment, biological, chemical, and physical. Control attempt vectors chemically is the most widely used in society. The practical uses, fast result, and availability in large quantities are the reasons society takes advantage of synthetic chemical larvicides. Although long term use can cause negative impact including environmental pollution, it can cause un-decomposed residues, non-target organisms, and resentencing larvae [2].

Problems happen because of the synthetic chemically larvicides long term uses, therefore need alternative ways to develop naturally larvicides. Naturally larvicides generated by toxic plants that are sensitive to target animals without giving the environment side effects and non-dangerous for humans. One of the plants could be used for naturally larvicides is Portulaca oleracea L. Portulaca sp as purslane (English) and Krokot (Indonesia) is one of the Portulacaceae family that has more than 100 species. The Bioactive compounds include flavonoid, tannin, alkaloid, and saponin are the phytochemistry that have larvicides effects [3].

Flavonoid, tannin, alkaloid, dan saponin are the toxic compounds for larvae especially Aedes aegypti. Based on a previous report by Redo on 2019, states fraction Terminallia cattapa (Ketapang) leaves with 1800 ppm concentration reveals presence of bioactive compounds including tannin, saponin, and flavonoid have significantly larvicides effects comparable with temephos. Probit analysis shows LC50 with number 1563.082 µg/ml [4]. Based on the previous introduction, the researcher would like to know the larvicides effectiveness of krokot ethanol extract as Aedes aegypti larvae.

2 Methods

2.1 Sample preparation

Aedes aegypti eggs are placed in water filled in a plastic tray to incubate the larvae. After 1-2 days of incubation, eggs would change to be larvae. Larvae grow to be instar I to Instar III around 4-5 days. Prepared the plastic cup with aquadest and moved the larvae as a negative control, abate as a positive control and krokot extract solution with various different concentrations [5].

Krokot was sorted, washed, and dehydrated. Way to dried the simplicia is under sunlight covered by black veil. The simplicia were crushed to small particle and checked the moist with moisture balance at 105ºC temperature. The requirement of water rate in simplicia no more than 10%. Simplicia powder of krokot was macerated with submersion in solvent of ethanol 70% with ratio 1:6 for five days. The maceration filtered and isolated between the residue and macerate. The macerate evaporated with rotary evaporator at 55°C temperatures until the macerate extract thickened.

2.2 Method and result analysis

Krokot extract with 4%, 5%, and 6% concentrations tested on 25 larvae. The mortality rate was calculated after 24 hours, and the same analysis repeated for three times. Larvicides effectiveness test was tested to know how effective the extract of krokot to inhibited Aedes aegypti larvae with the determinate the number of Lethal Concentration 50 (LC50) used probit analysis. The data of the previous study were tested using static analysis software with a regression analysis method namely LC50 probits.

3 Results and Discussions

Fresh 2 kgs of krokot were dried and achieved 1kg dried simplicia. Dried simplicia

crushed into 800 grams krokot small particles or powder. The krokot powder macerated with 4,8 litters 70% ethanol until obtained around 85 grams thickened extract with 10,6% of rendement. Based on organoleptic tests that have been studied, Thickened extract of Portulaca oleracea coloured dark brown, thick texture, and had the original smell of krokot plant. Table 1 as krokot ethanol extract.

Table 1 Krokot Ethanol Extract

Dried Simplicia	Solvent Volume	Time	Thick Extract	Rendemen	Organoleptic
800 grams	4,8 liters	5 days	85 grams	10,6%	Dark brown colored, thick texture, original smell of *krokot*

This study determined the larvicides effectiveness of krokot ethanol extract to the mortality of mosquitoes Aedes aegypti larvae for 24 hours. Krokot ethanol extract obtained that larvicides effectivity to the mortality of mosquitoes Aedes aegypti larvae based on this table 2.

Table 2 Mortality of mosquitoes *Aedes aegypti* larvae

No	Extract Concentration	Total sample	Repeated Mortality Larvae			% Average	Average ±SD
			1	2	3		
1	4%	25	9	10	10	39	9,67±0,58
2	5%	25	13	15	15	57,2	14,3±1,16
3	6%	25	18	18	18	72	18±0
4	Control (+) Temephos	25	25	25	25	100	25±0
5	Control (-) aquadest	25	0	0	0	0	0±0

Analysis probit report LC50 used SPPS method on krokot ethanol extract for mortality of Mosquitoes Aedes aegypti larvae presented in table 3.

Table 3 Value of LC_{50}

Lethal Concentration	95% Confidence Limits for Dosis		
	Estimate	Lower Bond	Upper Bond
Probability Probit	9,294	7,592	17,081

The lower mosquitoes larvae mortality showed in 4% krokot ethanol extract concentration with an average mortality around 39%, in 5% concentration reach a number 57,2%, and the highest concentration 6% krokot ethanol extract hit 72% effectivity of mortality. Extract concentration affects the mortality Aedes aegypti mosquitoes larvae, based on the evidence the higher extract concentration the higher total larvae death. Compounds that have effectiveness to inhibit Aedes aegypti larvae are flavonoid, tannin, and saponin. Flavonoids inhibit mosquitoes respiratory system, thus mosquitoes larvae could die [6]. Whereas saponin decreases mosquitoes digestion enzyme and food absorption. Besides that, could be toxic for mosquitoes larvae. Tannin has potential effects on mosquitoes larvae mortality due to inhibited larvae digest system [7].

Depending on a regression test to determine the number of probits LC50, krokot ethanol extract might kill 50% of the population of Aedes aegypti mosquitoes larvae with 9,294% concentration. Despite the fact that the ability under positive control (themepos), krokot ethanol extract as larvicides relatively acceptable for the environment than themepos, easier to degrade and not induced resistances for nature and environment. Since synthetics larvicides induced environment pollution and resistances [8].

4 Conclusions

Krokot ethanol extract that had been tested, had larvicides activity on Aedes aegypti mosquitoes larvae. The higher concentration of the extract that had use, may infer that there was an increasing Aedes aegypti larvae mortality. Krokot ethanol extract contains secondary metabolites compounds such as tannin, flavonoid, and saponin that are used as larvicides activity. Depending on probit regression test LC50, krokot ethanol extract with 9,294% concentration stated it had the ability to kill 50% Aedes aegypti mosquitoes larvae population for 24 hours.

5 Declarations

5.1 Acknowledgements

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5.3 Author contribution

The names of the authors listed in this article contributed to this research.

5.4 Conflict of Interest

The authors declare no conflict of interest.

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