Indonesian Journal of Medical Laboratory Science and Technology
Open Access
p-ISSN 2684-6748 | e-ISSN 2656-9825
IJMLST

Comparison of Leaves and Bark Mangkokan (*Nothopanax scutellarium*) Extracts Against the Death of House Flies (*Musca domestica*)

Darmadi[1], Harni Sepriyani[1]

[1]Department of Medical Laboratory Technology, Faculty of Health, Universitas Abdurrab, Riau, Indonesia

Correspondence:
Darmadi,
Jl. Riau Ujung No. 73, Tampan, Air Hitam, Payung Sekaki, Air Hitam, Payung Sekaki, Pekanbaru City, Riau, Indonesia
Zip Code : 28291

Email: darmadi@univrab.ac.id

Received: June 29, 2020
Revised: July 8, 2020
Accepted: August 20, 2020

Abstract

Flies (*Musca domestica*) are vectors of disease that can transmit to humans. Generally, these flies controlled by using chemical insecticides. Excessive use of insecticide causes resistance and environmental pollution. The alternative way in fly control is to use natural ingredients from the extract of mangkokan stem bark and leaves (*Nothopanax scutellaria*). This study aims to determine the ratio of fly mortality after administration of ethanol extract of bark and methanol extract of mangkokan leaves (*N. scutellarium*). The method used in this study is a post-test only control group design. The average mortality rate of house flies using ethanol extract of mangkokan stem bark (*N. scutellarium*) was 5 for 55 minutes while methanol extract of mangkokan leaves (*N. scutellarium*) was 5 for 135 minutes with a p-value of 0.374 (p>0.05). It concludes that there is no significant difference in fly mortality with the ethanol extract of stem bark and methanol extract of mangkokan leaves (*N. scutellarium*). Result of this study shows that the ethanol extract of stem bark and mangkokan leaf extract (*N. scutellarium*) are equally potential natural insecticides.

Keywords

Nothopanax scutellaria, leaves ethanol extract, barks ethanol extract, *Musca domestica*

INTRODUCTION

Flies (*Musca domestica*) are one of the common insects that are easy to found in a clean or dirty environment. Flies easily to found in homes, markets, livestock, landfills, and waste. Flies also interfere in terms of calm and cleanliness (1).

In general, flies are a vector of disease that could transmit to humans. Transmission occurred when flies carried diseases from dirty sources, for examples are garbage,

faeces, household waste and animal waste. *M. domestica* as a vector meaning that flies carry and transfer disease from one place to another place. Flies transmitted disease from the mouth or other body parts such as contaminated feet and alight on human food or animal food (2).

Flies controlled by chemical insecticides. This method of control would cause environmental pollution. Therefore, an alternative way to fly control is to use natural ingredients. Natural insecticides toxicity is low, so it did not have a negative effect and safe (3). Some plants could use as a natural insecticide, one of them is leaves and bark ethanol extract of mangkokan (*Nothopanax scutellarium*).

Mangkokan leaves extract used as larvacide, which given mortality effect on *Culex sp*, reported by Ahdiah and Purwani (4). Marina and Astuti (5), have been added that mangkokan and pandan leaves extract as a repellent in *Aedes albopictus* was able to reject it. The utilization leaves and barks mangkokan extract used as a natural insecticide on several insects. The compound of leaves and barks mangkokan extract were tannins, saponins, and flavonoids. Research carried out by Darmadi and Anita (6), *Lancium domesticum corr* methanol extract containing were flavonoids, saponins, and triterpenoids at 5, 10, 15% concentration as a natural insecticide for flies. Based on the background above, the researcher was interested in the comparison between leaves and barks ethanol mangkokan extract to *M. domestica* mortality.

Fig 1. Bark Mangkokan (*Nothopanax scutellarium*)

Fig 2. Leaves Mangkokan (*Nothopanax scutellarium*)

MATERIALS AND METHODS

The research was conducted at the researcher's home because the COVID (Corona Virus Disease) pandemic of research could not carry out in the Micropar

Laboratory of Abdurrab University for one month. Research is an experiment in laboratory and *Post Test Only Control Group Design*.

The population for this research was *M. domestica* from a farm field in Pekanbaru, Indonesia. Samples were 75 *M. domestica*, five flies for each extract and three times for each extract.

The equipment was analytical scales, knives, measuring flasks, measuring cups, stopwatches, Erlenmeyer, spray bottles, breeding boxes, research boxes, blenders, evaporators and dark bottle. While, the phytochemical test equipment is dropper pipette, drip plate, spatula, test tube, test tube rack, volume pipette, suction ball, filter paper, cotton.

The ingredients were leaves and barks mangkokan, magnesium, hydrochloric acid, FeCl3 1 b/v%, chloroform, sulfuric acid, major reagents, Lieberman Burchard reagents.

***Musca domestica* preparation**

M. domestica was taken from the farm field. The characteristics of the flies caught were observed to ensure that they were *M. domestica* to be put in the box.

Leaves and barks mangkokan extract preparation

Leaves and barks mangkokan washed and dried by aerated, then chopped into small pieces and blended. The 250 grams for each sample was extracted by maceration procedures in ethanol for 3 x 24 hours. The extract was filtered and separated between residue and filtrate. The filtrate put into the evaporator to separated between extract and solvent. Furthermore, viscous extract put in Erlenmeyer flask. The result of thick extract diluted to be 10, 20, and 30% extract concentration (7).

$$\text{Formula of extract (\%)} = \frac{gram}{Volume} \text{ x } 100\%$$

The preparation of various concentration of extract has conducted by adding 0.5 g; 1 g; and 1.5 g of extract then diluted in 5 mL of aquadest to produce a concentration 10%; 20% and 30% of the extract, respectively. Transfultrin 0.1% (v/v) used as a positive control. Meanwhile, aquadest applied as negative control.

Extract test

Samples extract and control put in spray bottles. As much as five test boxes were prepared and in each box were added by five flies. In addition, extract was sprayed as much as 8 – 10 spray with a distance of approximately 10 cm for each concentration. Observation every box for 30 minutes and calculated died flies and mortality time.

RESULTS

Musca domestica mortality for barks extract (*Nothopanax scutellarium*)

Fig 3. Positive control *Musca domestica* died

Fig 4. Negative control of *Musca domestica* is still alive

Fig 5. *Musca domestica* die at a concentration of 10%

Fig 6. *Musca domestica* die at a concentration of 20%

Fig 7. *Musca domestica* die at a concentration of 30%

***Musca domestica* mortality for leaves extract (*Nothopanax Scutellarium*)**

Fig 8. Positive control *Musca Domestica* died

Fig 9. Negative control of *Musca domestica* is still alive

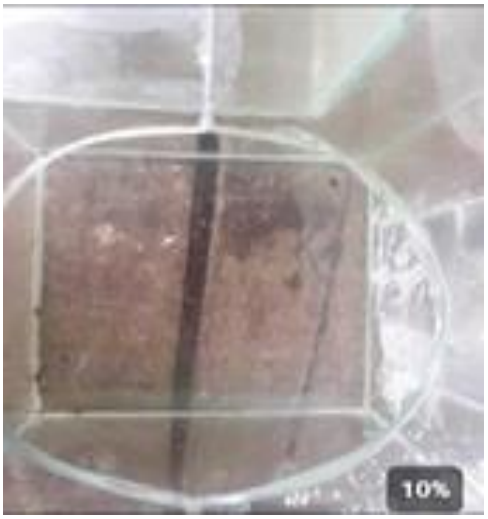

Fig 10. *Musca domestica* die at a concentration of 10%

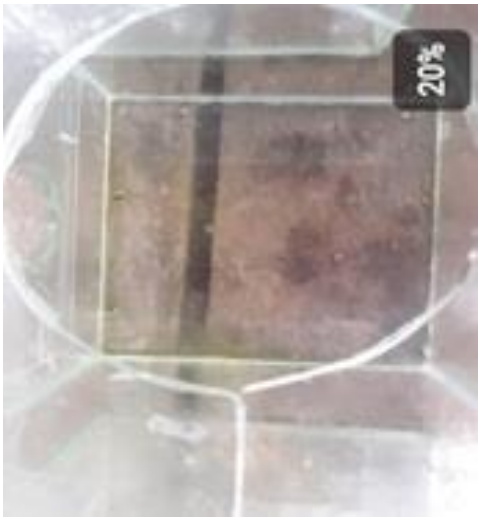

Fig 11. *Musca domestica* die at a concentration of 20%

Fig 7. *Musca domestica* die at a concentration of 30%

Observation result

Based on observation of barks extract on *M. domestica* mortality, the result of research presented on Table 1. Based on table 1, *M. domestica* mortality for barks ethanol extract at a concentration of 30% with 5 flies' deaths for 30 minutes, at 20% concentration of dead 5 flies for 45 minutes and at 10% concentration for 5 flies for 1 hour. For negative control (–) there were no flies that died.

Tabel 1. *Musca domestica* mortality for barks extract

No	Concentration	*Musca domestica* mortality			Average	Death time
		I	II	III		
1	10%	5	5	5	5	1 hour
2	20%	5	5	5	5	45 minutes
3	30%	5	5	5	5	30 minutes
4	Control (+)	5	5	5	5	1 minutes
5	Control (–)	0	0	0	0	0 minutes

Based on research of leaves extract on *M. domestica* mortality, the result of research presented on table 2. Based on table 2, *M. domestica* mortality for leaves ethanol extract at a concentration of 30% with 5 flies' deaths for 10 minutes, at 20% concentration of dead 5 flies for 20 minutes and at 10% concentration for 5 flies for 25 hours. For negative control (–) there were no flies that died.

Tabel 2. *Musca domestica* mortality for leaves extract

No	Concentration	*Musca domestica* mortality			Average	Death time
		I	II	III		
1	10%	5	5	5	5	25 minutes
2	20%	5	5	5	5	20 minutes
3	30%	5	5	5	5	10 minutes
4	Control (+)	5	5	5	5	2 minutes
5	Control (–)	0	0	0	0	0 minutes

DISCUSSION

Based on this research, it showed that there was five (5) death *M. domestica* at a concentration of 10%, 20% and 30% with a total duration of 135 minutes for barks extract and 55 minutes for leaves extract.

Based on data indicated that the death of *M. domestica* using ethanol extract from mangkokan barks and leaves have the same effect as using insecticide, even though the death time varies within 1 hour. Death of flies caused by the presence of secondary

metabolite compounds found in the ethanol mangkokan extract. Based on research conducted by Eden, et al. (5) on the phytochemical test of leaves methanol mangkokan extract contain secondary metabolites of flavonoids and saponins. While the leaves ethanol mangkokan extract contains flavonoid compounds, saponins, tannins and alkaloids (8).

The two extract types have differences content of secondary metabolites. Leaves ethanol mangkokan extract contains more secondary metabolites when compared with bark extract. Based on those contents, it concluded that ethanol extract from mangkokan leaves has the highest death rate of *M. domestica* rather than the bark extract. The total duration of death time is 55 minutes for ethanol mangkokan leaves extract while the bark extract has a period of death time of 135 minutes.

The mechanism of flavonoid compounds action is by attacking the respiratory tract and metabolic system in insects. Respiratory organs that are attacked in the form of spiracles on the surface of the body and will cause wilting of the nerves, and damage to spiracles so that the insects cannot breathe and eventually die (3). Also, flavonoid compounds will damage cell wall permeability and inhibit the work of enzymes that affect the metabolic system that interferes with eating activity and can act as a stomach poison in insects (9).

In addition to flavonoid compounds, saponin is one of the secondary metabolites. Saponins are compounds that are toxic to insects because they can enter the body of insects which can be toxic to the stomach, which causes decrease absorption of digestive enzyme activity and can interfere with the body's metabolic processes (9). Saponin compounds also interfere with the physical exterior (cuticles) that are similar to detergent properties. This content can disrupt the process of changing the skin (moulting) and can reduce the surface tension of the skin so it damages the surface of the skin and can cause death in insects (10).

Tannin is the highest content after Alkaloids. Tannins are polyphenol compounds that can form complex compounds with tannin proteins which cannot be digested by the stomach and have a binding ability to protein, carbohydrates, vitamins, and minerals. Tannins can interfere with insects in digesting food because tannin will bind to proteins in the digestive system that are needed by insects for growth, it predicted that the digestion process of flies (*M. domestica*) becomes disrupted due to these tannins (4).

CONCLUSIONS

The conclusion of this research is there was five (5) death *M. domestica* at a concentration of 10%, 20% and 30% with a total duration of 135 minutes for barks extract

and 55 minutes for leaves extract. There is no significant difference in the death of *M. domestica* by added barks and leaves ethanol mangkokan extract. Given those points, the extract of mangkokan leaves and barks are both capable as natural insecticides.

CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Ahdiah, I., and Purwani, I. K. 2015. Effect of Mangkokan Leaf Extract (*Nothopanax scutellarium*) As Mosquito Larvasida *Culex sp*. Journal of Science and Art in ITS, 3(1) : 32-36.
2. Aseptianova., Fitri., W. T. and Nurina., N. 2017. Efectiveness of Utilization Plant Conservation As Electrical Insectiside For DBD. Bio-experiment: Journal of Biological Research, 3(2) : 10-19.
3. Azizah., Adnan, M. R., and Su'udi, M. 2018. Potential of Sengor Wood Sawdust As a Botanical Insecticide. Journal of Bioscience, 4(1) : 45–54.
4. Darmadi., and Anita, D. 2018. Mortality Test for House Flies (*Musca domestica*) After Giving Duku Skin Ekstract. Clinical Journal Science, 6(1) : 18-23.
5. Eden, W. T. *et al.* 2016. Antioxidant Activity of Mangkokan Leaf Methanol Extract (*Polyscias scutellaria* (Burn. F.) Fosberg). *Indonesia* Pharmaceutical Media, 11(2) : 1126–1135.
6. Marina, R., and Astuti, E. P. 2012. Potential of Pandan Leaves (*Pandanus amaryllifolius*) and Mangkokan (*Nothopanax scutellarium*) as Repellent of Aedes Mosquitoes Albopictus. Aspirator, 4(2) : 85–91.
7. Mirnawaty., Supriadi., and Jaya, B. 2012. Test the Efectiveness of Lansat Skin Extract (*Lansium domesticum*) as an Electrict Anti Mosquito against *Aedes aegyipti*. Academic Journal. 1(4) : 147–152.
8. Poedji, H., and Enggar, F. L. 2007. Potential of *Musca domestica* Linn. As a vector Some Disease. Briwijaya Malang Health Journal, 23(3).
9. Sadiah, S., Herlina, N. and Indriati, D. 2015. The effectiviness of a ethanol extract emulsion 70 percent of transplant leaves (*Nothopanax scutellarium* (Burm.F) Merr) as Hair Growth stimulants, The Journal Fitophyhence, 4(1).
10. Sembel, D. T. 2009. Entomology of Medicine. CV Andi Offset. Yogyakarta.
11. Yuliana, V., Yamtama., and Kadaruso, A. H. 2016. The Inflamed Applications of Cambodian Leaves (*Plumeria acuminata*) Againts the Death of House Flies (*Musca domestica*). Ward Health Journal, 13(1) : 300-306.