

UJI EFEKTIVITAS DAYA TOLAK UAP EKSTRAK KULIT JERUK LEMON (CITRUS LIMON, SWINGLE) TERHADAP NYAMUK AEDES AEGYPTI (DIPTERA : CULICIDAE)

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ABSTRACT

Citrus reticulata is a plant that is believed to be used as a repellent against mosquito bites. The plant contains several substances that repel mosquitoes. Although quite effective, this type of mosquito repellent is risky because it is presence of active substances in the form of chemical content. Almost all anti-mosquito lotions circulating in Indonesia contain active ingredient DEET (Diethyl toluamide) which is a toxic synthetic chemical when in a concentration of 10-15%. This research is quasi-experimental which aims to find out the ability of citrus reticulata peel extract vapor to repel *Aedes aegypti* mosquitoes. The research was conducted in the laboratory of Integrated Poltekkes Kemenkes Medan. Starting from May 2018 to October 2018. Research material in the form of orange peel (simplisia) obtained from the market of Fruit Brastagi Karo Regency. Simplisia soaked in organic solvents (alcohol 76%) for 3-5 days to get maserate, and filtered using a fine gauze sieve to get citrus reticulata filtrate. The application process to find out its repulsion, using *Aedes* mosquito test material. adult aegypti, which is carried out rearing for 5 weeks. From the results 2 times 100% (55.52%) and 75% (35.83%). Using electric mosquito repellent, a combination of both comparisons 1 and 2 adult mosquito displacement by 62%. That difference between comparison and test difference is quite small, which is 6.48% at concentration of filtrate 100%, while at a concentration of 75% difference is 26.17%. Test results based on percentage displacement can be said that a dilution of 100%, 75%, 50%.

Keywords : *Citrus reticulata*, Repellent, Extract.

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1. INTRODUCTION

Mosquitoes are one of the vectors of the occurrence of various diseases such as filariasis, malaria, chikungunya, and dengue hemorrhagic fever (DHF). The number of victims and diseases caused by mosquitoes, so we try to be able to prevent from mosquito bites. Usually people choose a practical way, namely using liquid and burn mosquito repellent. Although quite effective, this type of mosquito repellent is risky because it is the presence of active substances in the form of chemical content. Almost all anti-mosquito lotions circulating in Indonesia are active ingredients DEET (Diethyl toluamide) which is a toxic synthetic chemical when in a concentration of 10-15% (Gunandini, 2006).

Mosquitoes develop in water that does not flow (sedable water) called puddle water. There are several ways to prevent the spread of the disease by mosquitoes. One of them is to avoid the risk of being bitten by mosquitoes, namely by using window wire, safe insect repellent, burning mosquito repellent, and others. Currently on the market there are many mosquito repellents, easy to obtain and practical to use, but most of these products are chemical, therefore research is carried out on mosquito repellents (repell power) using natural ingredients (Susanna & Terang Uli, 2011).

The concept of back to nature (naturally returning) in mosquito control that is vector disease, began to be widely looked at by the community. A lot of information has been widespread regarding the use of some vegetable insecticidal substances capable of repelling or repelling mosquitoes from contact with humans. The use of vegetable substances has an important point in human health that is relatively safe to use because it does not cause toxins or toxins in the human body.

One of the plants used is *Citrus reticulata*, which is used from this plant is citrus reticulata skin because it contains essential oils and alkaloids that can serve as mosquito repellents. Therefore, in this study to be used is the skin of *Citrus reticulata* which is food waste.

In this study used compounds contained in the orange peel such as essential oils. The main role of essential oils against plants themselves is as an insect repellent (preventing damaged leaves and flowers) as well as as repellents of other leaf-eating animals.

Previous research has also stated that compounds in *Citrus reticulata* skin can effectively control or repel mosquitoes. Based on this, it can be known that *Citrus reticulata* skin is useful as a controller/repellent mosquitoes

In this study *Citrus reticulata* skin is used as a vegetable repellent power to control and dispel home mosquitoes *Culex quinquefasciatus* and *Aedes aegypti* mosquitoes. The content of essential oils that *Citrus reticulata* skin has can prevent mosquitoes from contact directly with the skin of the human body.

From previous research, that concentration of 1% of ethanol extract of Legundi leaves obtained 95% of deaths in test larvae in the 4320th minute, the number closest to the death of larvae in the abate group 1% with a large mortality of 100% (Cania, 2013).

Based on the description above the author wants to test the steam extract (filtrate) of *Citrus reticulata* leaves to be able to repel adult mosquitoes *Ae. aegypti*. So in this study, author wanted to know and obtain concentrations of steam extract (filtrate) *Citrus reticulata* leaves to be able to repel adult mosquitoes.

2. METHODS

2.1 Type and Research Design

This research is Quasi Experiment Laboratory which is an experimental activity that aims to see the influence caused as a result of treatment. The research design used is One Group Posttest. In this study, the measured influence was the fumes from citrus reticulate maceration results filtrate against adult mosquitoes.

2.2. Location and Time of Research

The research testing was in the Integrated Laboratory of Medan Health Polytechnic of Ministry of Health, Letjen Jamin Ginting Street, Medan, North Sumatera.

Testing in this study was conducted from May to October 2018.

2.3. Population and Sample Research

The population in this study was *Citrus reticulata* in the form of maceration using organic solvents alcohol 75% and test materials purchased from fruit seller

In this study, the test material used is citrus peel *Citrus reticulata* in maceration (maceration method obtain filtrate), and made in various concentrations of 5%, 10%, 15%, 20%, 25%, 50%, 75%, and 100%. *Citrus reticulata* skin filtrate obtained then carried out testing applications against adult mosquitoes, where adult mosquitoes as a test indicator of citrus peel filtrate *Citrus reticulata*. Citrus skin reticulata (called simplisia), made maserate by soaking in alcohol solution 76% (maceration process) that produces maserate. Then the maserat is filtered with a fine filter to get filtrate.

2.4. Reagent, Material and Tool

The test materials used are citrus peel *Citrus reticulata*, as well as adult mosquitoes as an indicator of the test material. The test equipment is a mosquito cage measuring 40 cm long x 40 cm wide and 40 cm cage height of 6 units. Sometimes the mosquito for the test consists of two units connected by a hallway diameter of 4-6 cm along 20-30 cm, where one of the cages is inserted by adult mosquitoes rearing as much as 100 heads. Then under the cage, put filtrate in an open container (Petri dish) so that the steam from the filtrate will fly up to the test cage. This vapor is thought to affect mosquitoes to avoid. These mosquitoes will go to the connecting passageway to the next cage, and the moving mosquitoes are calculated and processed as data on the influence of repelling power from citrus reticulata skin filtrate steam

2.4.1 Reagent and Tool

Reagents used in the form of alcohol 76%, a set of maceration tools (beaker glass, thermometer, pumpkin ellemeyer). In addition to the set of tools, supported by the following tools beaker glass 1000 ml and 500 ml, bottle reagents, pipette measuring 1 ml, 5 ml, 10 ml, glass takar 1000 ml, 500 ml, 50 ml, 10 ml, aspirator. In addition, as an additional tool for comparing tests, used electric mosquito repellent tools.

2.4.2 Test Indicator Material

In this study used as a test indicator material is in the form of adult mosquito from *Ae. aegypti* which has been believed to be sterile from infectious agents, this material is purchased by Balai Penelitian Vektor Baturaja, Palembang, South Sumatera.

2.4.3. Comparative Test Material

Ready-made electric mosquito repellent plate as a comparison against the effects of steam filtrate *L. reticulata*.

2.5. Working Methods

Working method in the form of steam rejection power test from extract against adult mosquitoes using two cages.

2.6. Working Procedure

The work steps that researchers will take in this study are:

1) Adult mosquitoes are taken with an aspirator device and divided into observation boxes of 100 heads each and on the test box 2) Perform the test by placing the filtrate of the lowest concentration on the petri dish and placed under the cage used as a test tool 3) Observations of adult mosquitoes that fly move to the next-door mosquito box through the aisle are made in such a way 4) After 60 minutes observe and count the mosquitoes in the next box, where the number of mosquitoes is a percentage of the influence of the effects of steam 5) The results of the data obtained are presented in the form of tables and performed deriftip analysis, can also be tested in accordance with the statistical method used.

2.6.1 Rearing Mosquitoes

Getting the adult of *Ae. aegypti* is carried out by hatching eggs of the *Ae. aegypti* i.e : 1) Put the *Ae. aegypti* in a container filled with water, the eggs will hatch 30 minutes to 1 hour after submerging in water, 2) About 1-2 days will be clearly visible larvae of mosquitoes, 3) Then feed once every 2 days, 4) After that wait for the larva to turn into a pupa around the sixth day 5) Maintenance: prepare a mosquito box size 45 cm x 45 cm x 45 cm, 6) Larvae pupae *Ae. aegypti* is put in a small container containing clean water and placed in a maintenance box, 7) Store in a cool place and avoid direct sunlight, 8) After the pupa phase, then the pupae will become adult mosquitoes, 9) Wait up to 1-3 days until the mosquito is hungry and ready to mate and ready to suck blood and lay eggs, 10) Then sort the female mosquitoes and place them in each laying box and the rest are fed once every 2 days using guinea pig blood by putting the guinea pigs into the maintenance cage for 10-15 minutes, and 11) Put a container of clean water into the maintenance cage as a mosquito egg container later, where the egg is back in the rearing for the test.

The *Ae. aegypti* egg as the initial material used in this research was obtained from Laboratorium Badan Litbang, Loka penelitian dan pengembangan PVBP2 Baturaja South Sumatera and these eggs are rearing to get mosquitoes as a test material. After becoming an adult mosquito, it is carried out testing (application) against adult mosquitoes with citrus reticulata filtrate test material. The transfer of adult mosquitoes from the rearing cage to the test cage using an aspirator, and the number of each test mosquito amounted to 100 heads. Then applied with *Citrus reticulata* steam test material.

2.6.2. Preparation of Simplicia

Here are the stages of making *Citrus reticulata* skin simplisia into filtrate: 1) Before drying the orange peel cut into small pieces, 2) after cutting into small pieces, then dried at room temperature.

2.6.2.1 Maceration of *Citrus Reticulata* Peel

The maceration process is done by soaking the dry and mashed *Citrus reticulata* peel test material with a certain weight against organic solvents, namely 76% alcohol solvent until submerged. The vessel is covered with aluminum foil and left to stand for 4-7 days, stirring occasionally to prevent saturation. Then filtering is done to separate the pulp with filtrate. The maserate obtained is then filtered with a fine filter to obtain filtrate, and the filtrate is stored at room temperature by covering it in a sempuran so that the steam does not fly. With the treatment of separation by filtering, it will separate the pulp of the skin with a solution that has dissolved substances of an adult mosquito repellent.

2.6.2.2 Preparation of The Concentration of *Citrus Reticulata* Peel Maserate

The material from maceration is made dilution to treat adult mosquitoes, with a dilution from 5% - 100% with a range of 5% to 25%, medium 25% to 100% with a range of 25% .

Table, 1. The Concentration of *Citrus Reticulata* Peel Maserate

<i>Citrus reticulata</i> peel extraction	Aquabidest	Concentration
100 ml	0%	100%
75 ml	25 ml	75%
50 ml	50 ml	50%
25 mL	75 mL	25%
20 mL	80 mL	20%
15 mL	85 mL	15%
10 mL	90 mL	10%
5 mL	95 mL	5%

2.6.3 Rearing *Ae.aegypti*

Getting an adult of *Ae.aegypti* mosquito is carried out by hatching eggs of *Ae.aegypti* mosquitoes: 1) Place the eggs of the *Ae.aegypti* mosquito in a container containing water, the eggs will hatch 30 minutes to 1 hour after being submerged in water, 2) About 1-2 days will be clearly visible larvae of mosquitoes, 3) Then feed once every 2 days, 4) After that wait for the larva to turn into a pupa around the sixth day 5) Maintenance: prepare a mosquito box size 45cm x 45cm x 45cm, 6) The pupa larva of *Ae.aegypti* is put in a small container containing clean water and put in a maintenance box, 7) Store in a cool place and avoid direct sunlight, 8) After the pupa phase, then the pupae will become adult mosquitoes, 9) Wait 1-3 days until the mosquito is hungry and ready to mate and ready to suck blood and lay eggs, 10) Then sort the female mosquitoes and place them in each test box as many as 15 mosquitoes per test box. While the rest are fed once every 2 days using guinea pig blood by putting the guinea pig into the maintenance cage for 10-15 minutes, and 11) Then put a container containing

clean water, where the container is coated with filter paper on the wall of the inner container, and this container is inserted into the maintenance cage as a container of mosquito eggs later. Mosquito eggs contained on the paper from mosquitoes today can be stored in containers at room temperature for 3 months.

2.7. Data Analysis

Data obtained from the observations are analyzed descriptively, in the form of narration based on the results displayed in the form of table data.

3. RESULT AND DISCUSSIONS

3.1 Result

The results achieved in the study in the form of mosquito breeding that began from eggs to adult mosquitoes, where the breeding treatment for three derivatives (3 times rearing). The one-time rearing period of each treatment takes about 2 weeks. Then the application of filtrate test material from maserat *C. reticulata* so that it is obtained the number of mosquitoes that move from the application box to the dodge mosquito shelter box. The value of filtrate ability repels *Ae. aegypti* with filtrate experiments conducted dilution is a percentage of the reject power of the filtrate.

The result obtained against the application of filtrate *C. reticulata* against *Ae aegypti* adult of 100 heads of each dilution in first test can be seen in table 5.1 and the second test can be seen from table 2.

Table. 2. First Testing Results Of Application Of *C.Reticulata* Filtrate To The Adult Of *Ae. Aegypti* Mosquitoes As Many As 100 Heads Of Each Dilution In Testing

No.	Filtration (%)	Readings in 60 minutes / repetition			Average	Mosquitoes Displacement (%)	Electric Mosquitoes Repellent Comparison Control
		1	2	3			
1	100	63	58	52	57,70	57,70	63
2	75	40	39	36	38,33	38,33	
3	50	21	18	18	19,00	19,00	
4	25	14	11	15	13,33	13,33	
5	20	7	9	7	7,70	7,70	
6	15	3	4	2	3,00	3,00	
7	10	2	1	1	1,33	1,33	
8	5	2	1	1	1,33	1,33	

The results of testing filtrate *C. reticulata* against *Ae. aegypti* adult mosquitoes as many as 100 heads, which are applied from various concentrations by repeating 3 times within 60 minutes of each test. Results obtained without dilution (100%) average of 57.70, dilution of 75% on average of

38.33, 50% on average of 19.00, 25% of rerase of 13.33, 20% average of 7.70, 15% average of 3.00, 10% average of 1.33, and 5% average of 1.33.

When viewed from the results of the first test based on dilution seen the movement of mosquitoes from the application box to the shelter box there is a decrease. Where the decrease in mosquitoes that move corresponds to the large concentration of filtrate. When viewed the decrease based on dilution, namely between 100% to 75% there is a difference in mosquito displacement by an average of 19.37, and between 75% to 50% on average of 19.33, while from 50% to 25% on average of 13.33. Based on the percentage of displacement the difference between 100% to 75% and 75% to 50% is the same, while between 50% to 25% there is a decrease in mosquito displacement. From the comparative testing using the drug electrical mosquitoes traded in the market (brand X) seen the displacement of as many as 63 mosquitoes.

Table 3. Second Testing Results Of Application Of *C.Reticulata* Filtrate To The Adult Of *Ae. Aegypti* Mosquitoes As Many As 100 Heads Of Each Dilution In Testing

No.	Filtration (%)	Readings in 60 minutes / repetition			Average	Mosquitoes Displacement (%)	Electric Mosquitoes Repellent Comparison Control
		1	2	3			
1	100	58	50	52	53,33	53,33	61
2	75	30	39	31	33,33	33,33	
3	50	18	10	10	12,67	12,67	
4	25	10	5	9	8,00	8,00	
5	20	3	4	6	4,33	4,33	
6	15	1	1	3	1,67	1,67	
7	10	1	1	0	0,67	0,67	
8	5	0	0	1	0,33	0,33	

The results of testing filtrate *C. reticulata* against *Ae. Aegypti* adult mosquitoes as many as 100 heads, which are applied from various concentrations by repeating 3 times within 60 minutes of each test. Results obtained without dilution (100%) average of 53.33 dilution of 75% on average of 33.33, 50% averaged 12.67, 25% rerasa by 8.00, 20% average of 4.33, 15% average of 1.67, 10% average of 0.67, and 5% average of 0.33.

When viewed from the results of the first test based on dilution seen the movement of mosquitoes from the application box to the shelter box there is a decrease. Where the decrease in mosquitoes that move corresponds to the large concentration of filtrate. When viewed the decrease based on dilution, namely between 100% to 75% there is a difference in mosquito displacement by an average of 20, and between 75% to 50% on average of 20.66, while from 50% to 25% on average of 4.66, and 25% to 20% on average of 3.67. Based on the percentage of displacement the difference

between 100% to 75% and 75% to 50% is relatively the same, while between 50% to 25% there is a decrease in mosquito displacement

Combined results of 2 tests without dilution (100%) found mosquitoes moved on average by 55.52 (55.52%), dilution of 75% on average of 35.83 (35.83%), 50% average of 15.84 (15.84%), 25% of the average of 10.66 (10.66%), 20% averaged 6.02 (6.02%), 15% averaged 2.34 (2.34%), 10% averaged 1.00, and 5% averaged 0.83 (0.83%).

Based on dilution, the difference between 100% to 75% mosquito displacement is an average of 19.69%, and between 75% to 50% average of 19.99%, from 50% to 25% on average of 5.18%, from 25% to 20% on average of 4.64%, from 20% to 15% on average of 3.64%, and 15% to 10% on average of 0.16%. In this case it is seen that the influence of lemon reticulate filtrate steam between dilution from 100%, 75% relativity is the same, while dilution of 50% occurs a decrease in the percentage of displacement by 74.1% (taken from an average of between 75% to 50% by 19.99% with 50% to 25% by 5.18%). From comparative testing using electrical mosquito repellent in the market (brand X) seen the displacement of as many as 61 mosquitoes.

3.2. Discussions

Based on the results of the second combined study of testing of several dilution conducted against filtrate *C. reticulata*, it can be said to be quite useful with the percentage value of mosquitoes moving (avoiding). This is seen in the average displacement value, especially at the deposition of 100% (55.52%) and 75% (35.83%). While in the comparison with , using electric mosquito repellent, a combination of both comparisons 1 and 2 adult mosquito displacement by 62%. It can be seen that the difference between the comparison and the test difference is quite small, which is 6.48% at the concentration of filtrate 100%, while at a concentration of 75% the difference is 26.17%. It can be said that lemon reticulate vapor can be used as repellent. According to Hariana that essential oils have three functions that help the process of preventing crop damage by insects or animals. Then it is expected to be used as a repulsion against mosquito bites in households. With the ability of steam from filtrate *C. reticulata* to resist mosquitoes to the human body, it is expected that it can be used as a prevention of the transmission of zoonotic infections (Hariana, 2005).

4. CONCLUSION

Based on the percentage from the test results of displacement it can be said that at a dilution of 100%, 75%, and 50% can be used as a repel against adult mosquitoes. It can be concluded from the test results that *C. reticulata* vapor can be used as a repelling power against adult mosquitoes. At small dilution such as 5% to 25%, it is ineffective to use as a repel against adult mosquitoes.

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