

## Extract Basil (*Ocimum basilicum*) as of Mosquito *Aedes Aegypti* Repellent

Rahmasari Farindira V

School of Medicine, Muhammadiyah University of Yogyakarta, PO BOX 55183, Lingkar Selatan street, Kasihan, Bantul, Yogyakarta

### Abstract

The prevalence of deaths from dengue disease from year to year is always high in Indonesia. Dengue prevention is still considered lack of optimal. The discovery of specific drugs and vaccines still under development. Repellent as one mosquito bite prevention efforts began much developed. In Indonesia, many herbs that can be developed as a repellent that is basil (*Ocimum basilicum*). This study aimed to determine the effectiveness of the repellent power basil leaf extract (*Ocimum basilicum*) oil phase of the mosquito *Aedes aegypti*.

This type of research is experimental. The research groups are split into eight groups, six groups treated with basil leaf extract concentration of 100%, 75%, 50%, 25%, 10% and 5%; 1 positive control group (12.5% DEET); and 1 negative control group.

Anova and LSD test results showed that positive control group compare with negative control group were differ significantly ( $P, 0.05$ ). 100% treatment groups were not significantly different ( $P > 0.05$ ) than positive control group. The treatment group 75%, 50% and 25% were significantly different ( $P < 0.05$ ) than positive control group and did not differ significantly ( $P > 0.05$ ) than negative control group. Probit regression lines inclined ramps mean the addition of a relatively large concentration of the extract to induce a low percentage of power repellent.

The extract of basil leaves (*Ocimum basilicum*) with a very high concentration of 100% effectively used as a repellent that has a low toxicity.

**Keywords:** *Aedes aegypti*, repellent, *Ocimum basilicum*

### 1. Introduction

*Aedes aegypti* mosquito is the primary vector of viruses that cause dengue fever and yellow fever. Common form of adult mosquitoes still can found around human environment and bite both in the home and in the hidden neighborhood near the house. Mosquito biting time is usually in the morning or afternoon (Russell, 1993). Dengue is one of the viral disease transmitted by the *Aedes aegypti* mosquito, which is still as a problem in Indonesia. From year to year the number of dengue patients is increasing. Imansyah (2003) mentions that the dengue vector eradication is to break the chain of transmission, by using chemicals (insecticides). In addition can be done immediately, covering large areas, so as to suppress the insect population in a short time.

But on the other hand there are many shortcomings because in this way is only temporary, toxic to humans and animals, can cause environmental pollution, the likelihood of insect resistance and resulted in the death of some predators (Hoedojo and Zulhasril, 2000). Mass insecticide spraying (fogging) is less precise because it can even endanger the health of the human respiratory tract. This is due to the insecticide that can not kill mosquito eggs (200-400 grains per day) that will soon hatch, thereby causing repeated spraying will increase the buildup of chemical insecticides in nature. Given the weakness of chemical insecticides, many researchers try to developed vector control by means dispels insects, environmentally friendly and does not cause resistance, such as by utilizing the content contained on herbaceous plants that have a function as a mosquito repellent. In order to reduce the impact caused by the use of synthetic insecticides, repellent is an alternative option.

Herbaceous plants are relatively resistant to various types of diseases and pests of plants because of volatile oils (volatile) in some types of herbaceous plants act as a natural insecticide (Dharmayanti, 2004). Essential oils has dual role at the plant, which has an appeal against the insects that pollinate flowers and repel destructive insects. Essential oils are abundant in young leaves (Pitojo, 1996). According to a team of researchers from the Center for New Crops and Plant Products, Purdue University, USA aroma of basil (*Ocimum basilicum*) can reject a mosquito bite, while the leaves are proven effective to cure headaches, colds, diarrhea, constipation, intestinal worms, kidney disorders, kejang- seizures, and lethargy agency (Simon, 1995).

It is interesting to study the power of repellent against mosquitoes. Repellent are materials that contain little toxic (low consistency or contain less toxic poison), which can not kill the insects, but rather cause a disruption in insects, so do not bite, do not lay eggs, or approaching a subject that apply with repellent material. Repellent material works as a repellent (barrier) insects. The repellent can be made from natural ingredients and chemicals.

## 2. Research Methodology

This study was an experimental study. The sampling technique used to select the subjects are simple random sampling and the sample is homogeneous from the colonization. The research was divided into 8 groups: 6 groups treated with extracts of basil (*Ocimum basilicum*) at a concentration of 100%, 75%, 50%, 25%, 10% and 5%; a positive control group / comparison (with repellent diethyltoluamide DEET 12.5%); and a negative control group (without application of any test materials).

Each group consisted of 30 female *Aedes aegypti* mosquitoes that bite to guinea pigs that had been shaved. Each treatment is done in three marmots. Then counted how many mosquitoes doesn't landed in the negative control group, the number of mosquitoes doesn't landed in the treatment group and the number of mosquitoes that doesn't landed in the positive control group to obtain the RC 90 (Repellent Concentration-90) and RT 90 (Repellent Time-90).

Data analysis used with probit analysis method to determine at what concentration of basil extract (*Ocimum basilicum*) can provide repellent power effect RC 90 and RT 90 against *Aedes aegypti* and methods of analysis of variance (ANOVA) one way to find out the differences of effectiveness between research groups.

## 3. Discussion

The same hour (hour-1) a concentration of 50% compare with the treatment group concentration of 100% is seen that the graph is at one point. This means that the concentration of 100% and concentration of 50% at (hour-1) has the same ability to repel mosquitoes by 97.6%. Whereas in the treatment group 5% concentration at the (hour-4) the graph lies within one point with the negative control group. This means that between the concentration of 5% with a negative control group on the (hour-4) has the same ability to repel mosquitoes by 98.8%. Ideally, the higher the concentration of basil leaf extract, the greater the power repel, but in this study at concentrations of 10% and 5% indicates the percentage of repel power mosquitoes are increasing. According to Sugito (1989) there are some things that can affect the frequency of biting mosquito, there are: 1) The lower humidity and the higher of ambient temperature can reduce the frequency of biting mosquito; 2) The faster blood digestion in the mosquito body metabolism the faster mosquito for perch or suck the blood again; 3) Whereas the faster development of mosquito eggs in the body the sooner biting frequency of mosquitoes.

Based on probit test data from various groups the repel power percentage against mosquitoes *Aedes aegypti* can be seen that RC 90 at a concentration of 39.1%. This means that basil leaf extract at concentration has repel power 90% at a concentration of 39.1% by RT 90 lasted for 4.6 hours. While basil leaves extracts that still have 50% repel power is at a concentration of 3.37% for 141 hours. While basil leaf extracts still have 50% repel power at a concentration of 3.37% for 141 hours. If the results of this study compared with the effectiveness neem seed extract of (*Azadirachta indica*) against *Aedes albopictus* the RC 90 is 56.9% and RT 90 last for 1.5 hours, it seems that basil leaf extract is more effective than neem seed extract (Yulianto 2002).

Graphic 2 shows the relationship between log dose transformation with the percentage of repel power. The regression coefficient (slope of the line) describes the increase unit mortality. Straight line in the middle shows the probit regression line. The layout of the regression line in the x-axis at left sided describes the smaller LTX. The slope of the line shows the narrowness of the range or size of the increase concentration of materials to achieve LT is too high. The more straight regression line, the more toxic materials used and the more narrow scope of the toxicity of materials (Nugraheni 1999).

In probit regression pictures of basil leaf extract (graphic 2) shows the regression lines inclined ramps, it is meant that the increased extract concentrations have relatively large ranges to pose a low percentage of repel power. This means that basil leaf extracts has lower toxicity to rise the repel power.

The effectiveness differences between reserach groups were tested by analysis of variance (ANOVA) one way. Results of the analysis between the groups showed that there was no significant difference  $p > 0.05$ .

In the treatment group basil leaf extract concentration of 100% when compared to the positive control group showed  $p > 0.05$  statistically. This means that the concentration of 100% of basil leaf extract has the same effectiveness repel power with the positive control group (12.5% DEET).

In the treatment group basil leaf extract concentration of 75%, 50% and 25% when compared to the positive control group (12.5% DEET) indicates  $p < 0.05$  as statistically. This indicates that the positive control group has amore effective repellent than group concentration 75%, 50% and 25%. If the treatment group basil leaf extract concentration of 75%, 50% and 25% compare with negative control group, shows that  $p > 0.05$ . This proves that the group as ineffective as the negative control group. So from both these results indicate that the treatment group at a concentration of 75%, 50% and 25% are not effective as a repellent.

The results above shows that an effective repel power of basil leaf extract treatment group is at a concentration of 100%, because at concentrations below the repel power effectiveness is not different from the negative control group. This may be due to the high content of volatile oil namely linalool, eugenol and geraniol mosquito bites so that the data rejects better. The chemical content of the whole herb including leaves, according Wijayakusuma *et al* (1994) containing vaporized oil consists of ocimene, alpha-pinene, 1,8-cineole, eugenole

methyl ether, anethole, methyl cinnamate, 3-Hexen-1-ol, 3- octanone, furfural.

In this research, there are two factors that may affect the results due to the limitations of researchers,: 1. Basting PEG as a solvent in the placebo group are not done, resulting in the possibility PEG affect repellent against mosquitoes is unknown.2. No measurement of temperature and humidity, so the possibility of the effects on biting mosquitoes frequency is not known.

#### 4. Conclusion

Basil leaf extracts (*Ocimum basilicum*) has a repellent effect against *Aedes aegypti* in the oil phase with a value RC 90 39.1% and RT 90 for 4.6 hours. The treatment group basil leaf extract in oil phase 75%, 50% and 25% concentration proven to be not effective as a repellent against *Aedes aegypti* mosquito. So, *Ocimum basilicum* leaf extracts still can't be used as repellent and need more further reserach. The longer span of time of exposure to mosquitoes test also decreases the effectiveness of the repel power basil leaf extract (*Ocimum basilicum*)

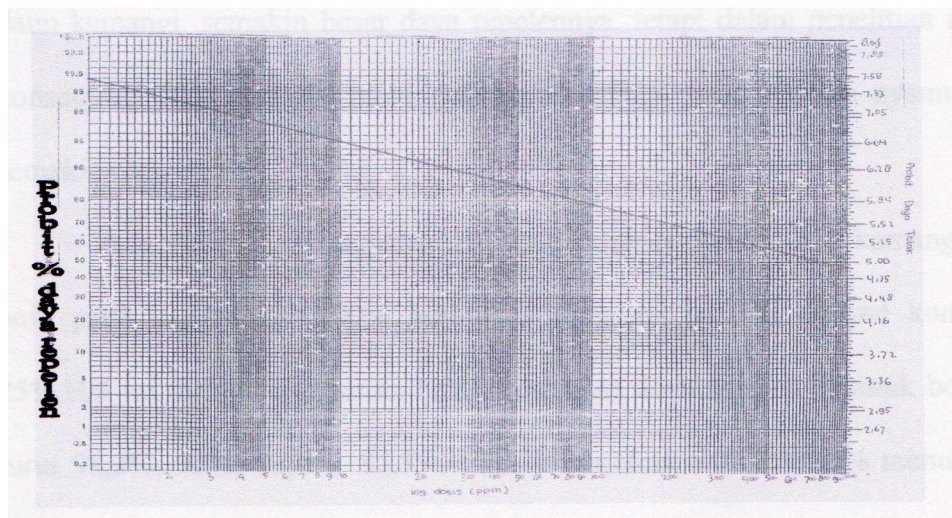
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**First A.** This author was born in Yogyakarta , 5<sup>th</sup> August 1984. She is graduated from medical doctor at year 2009. In 2014 she get the Master of Science in Immunology and Biology Moleculer Tropical Medicine at Gadjah Mada University. She is know as a lecturer in Muhammadiyah University as staff in Parasitology Department.

**Table 1. Repellent Power in each Concentration Reseach Groups to *Aedes aegypti* Mosquito**

KE	100%		75%		50%		25%		10%		5%		(-) *		(+) **	
	x	%	x	%	x	%	x	%	x	%	x	%	x	%	x	%
0	29.3	97.6	29.6	98.8	28	93.3	28.3	94.4	29.3	97.7	28.6	95.5	21.3	71.1	30	100
1	29.3	97.6	29.6	98.8	29.3	97.6	25.3	84.4	27.6	92.2	29	96.6	24.3	81.1	30	100
2	29.3	97.6	28.3	94.4	27.6	92.2	25.3	84.4	25.6	85.5	28.6	95.5	27.3	91.1	30	100
3	30	100	29.6	98.8	26.3	87.7	25.6	85.5	28.3	94.4	29	96.6	27.6	92.2	30	100
4	29.3	97.6	28	93.3	27.6	92.2	25	83.3	29	96.6	29.6	98.8	29.6	98.8	30	100
5	29.6	98.6	24.6	82.2	26.6	88.8	26	86.6	27	90	29	96.6	29.6	98.8	30	100
6	29.6	98.6	23.3	77.7	26.3	87.7	24.3	81.1	27.3	91.1	29.6	98.8	30	100	30	100
Σ x	29.5	98.2	27.6	92	27.4	91.4	25.7	85.7	27.7	92.5	29.1	96.9	27.1	90.4	30	100
±SD	0.27	0.91	2.59	8.63	1.09	3.59	1.27	4.22	1.27	4.18	0.41	1.38	3.23	10.8	0	0



**Graphic 2. Probit Regression Line between test time log basil leave extract with repellent power % probit**