UTILIZATION OF ROSMARIN LEAF OIL (*Rosmarinus officinalis* L) ON *Culex quinquefasciatus* MOSQUITO LARVA AS A FILARIASIS VECTOR (ELEPHANT FOOT DISEASE)

Dyah Susilowati

D3 Farmasi, Poltekkes Bhakti Mulia Sukoharjo

Corresponding author : Susilowatidyah75@gmail.com

Abstract

Elephantiasis (filariasis / elephantiasis) is still endemic in hundreds of districts in Indonesia and has become a health problem for the world community in accordance with the resolution of the World Health Assembly (WHA) in 1997. This is caused by *Culex quinquefasciatus* mosquitoes as one of many filariasis vectors found in urban areas (Gandahusada et al., 1998), while the number of filariasis chronic cases reported until 2009 was 11,914 cases. Filariasis / elephantiasis is a chronic infectious disease caused by filarial worm infection transmitted by various types of mosquitoes in the lymph nodes, this disease is chronic (chronic) and if it does not get treatment can cause permanent disability in the form of enlargement of the legs, arms and genitals both women and men.

Rosmarin (*Rosmarinus officinalis* L.) is a multifunctional plant in Indonesia especially abroad, one of its benefits is as larvicides. Because rosmarin has a chemical compound, one of them is essential oil which has larvicidal effectiveness on *Culex quinquefasciatus* mosquito larvae as vector filariasis (elephantiasis). Essential oil was obtained by distillation of fresh rosmarin leaves, then each extract was made with 1000 ppm stock solution and then made 6 series of concentration of 12.5 ppm to 300 ppm then tested on 20 larvae of instar III *Culex quinquefasciatus*. Observations were made after 24 hours and calculated LC90 uses an analysis of the orbit.

The results obtained were only essential oils of Rosmarin leaves (*Rosmarinus officinalis* L.) which had larvicidal activity against *Culex quinquefasciatus* mosquito larvae, with LC90 182,9756 ppm.

Keyword: essential oil, rosmarin, *Culex quinquefasciatus*, filariasis, elephantiasis

Introduction

Elephantiasis (filariasis / elephantiasis) is still endemic in hundreds of regencies in Indonesia due to *Culex quinquefasciatus* mosquitoes as filariasis vectors found in urban areas (Gandahusada et al., 1998). One of the efforts taken to prevent mosquito-borne diseases is using insecticides. But synthetic insecticides have negative impacts, among others, environmental pollution, predator death, resistance of target insects, can kill pets, even humans (Susanna et al., 1999). In connection with this, it is necessary to make an effort to obtain natural insecticides

derived from chemical compounds contained in plants, so that we try to test the effectiveness of larvicides using rosmarin. The purpose of using rosmarin as an insecticide (larvacide) is to find natural insecticides with the content of active compounds in it so that it is expected to have a contribution in killing *Culex quinquefasciatus* mosquitoes as filariasis vectors (elephantiasis).

Methods

A. Research Stages

1. Determination of plants in this research phase is to determine the correctness of a sample of rosmarin plant (*Rosmarinus*

officinalis L.) which is related to its characteristics and morphology with plant determination instructions conducted at the Laboratory of the Center for Research and Development of Traditional Medicinal and Medicinal Plants (B2P2TO2T) in Tawangmangu area, Karanganyar.

2. Material collection

Rosmarin leaves that are young and fresh, which have been separated from the trunk, are taken from the Tawangmangu, Karanganyar area.

3. Water distillation

Rosmarin leaves 100 grams for one time refining. The material is put into a 1000 ml distillation flask, then added with 500 ml aquadestilata until the sample is submerged and connected with a kjedahl tube and filled with water then connected with a condenser (cooler) mounted upright. After the appliance is installed, then heated to boiling and moisture rises. Distillation lasts for 5 hours and then 30 minutes is added to see that the essential oil really does not drip again, then observed the volume of essential oil that is distilled. The oil obtained is added with sodium sulfate to remove water. The oil obtained is then stored in a brown bottle and filled full, tightly closed and protected by light.

4. Test for larvicidal activity

Approximately 42 containers were used for the test media for 6 series of sample concentrations tested, 12.5 ppm, 25 ppm, 50 ppm, 100 ppm, 200 ppm and 300 ppm, along with abate as a positive control, aquadest as a negative control for each sample for two types of mosquito larvae. The volume of each test media was 80 ml with 20 instar larvae of *Culex quinquefasciatus* mosquitoes. Each concentration of essential oil is tested with repetition 3 times.

Larval mortality can be observed after 24 hours after treatment by calculating the percentage of larval mortality.

5. Analysis Method

Determination of LC90. The number of larvae of *Culex quinquefasciatus* that died after the treatment was determined by the death rate. *Culex quinquefasciatus* mosquito larvae are then searched for probit by using probit conversion table, after the probit value is known for each concentration then a relationship curve is made between log concentration (X) and probit (Y) value which is

a linear relationship with a straight line $Y = a + bx$. After that, the LC90 price is calculated from the equation $Y = a + bx$ by entering the probit value of 90% of the death of the test animal as (Y), then the antilog will be obtained (X) as the price of the LC90.

6. Category of larval condition after treatment Larvae that are considered dead when the larvae are given stimulation of the movement of water do not give a movement response, the larvae are touched with a stirring rod does not also provide a movement response. The larvae are considered alive when the active larvae move, the larvae live above the surface of the water by hanging to form an angle to the surface of the water, the larvae are given stimulation of the movement of water, giving a response to the movement and the larvae are touched with a stirring rod also provides a movement response.

7. Larvacide test scheme for essential oils, rosmarin leaves (*Rosmarinus officinalis* L.) on each *Culex quinquefasciatus* mosquito larvae

Results And Discussion

A. Research Results of Rosmarin Leaf Essential Oil

The average volatile oil content of rosmarin leaf obtained was 1.23% v / b. Based on the data obtained, it can be seen that the content of rosmarin leaf essential oil according to the study was the same as the content of essential oils according to literature.

The examination results of the refractive index of rosmarin leaves. Refractive index checking is done with a refractometer and the results obtained by practice are 1.4700 at 28 ° C, The result of determining the weight of the type of essential oil of rosmarin leaves. The weight of rosmarin leaf essential oil from this study was 0.938 at 28 ° C.

B. Determination of Rosmarin Leaf (*Rosmarinus officinalis* L.)

Determination was carried out on plants studied according to the book Flora of Java written by C. A. Backer, so that the key to the determination of rosmarin leaves was obtained. The results of determination according to Backer are as follows: 1b_2b_3b_4b_12b_13b_14b_17b_18b_19b_20b_21b_22b_23b_24b_25b_26b_27a_28b_29b_30b_31b_40bb277_28b_29b_30b_31b_403b_404b_405a_406b_409a_410b_411b_190. Lamiaceae

1b_2b_3a_4b 3. Rosmarinus

1 Rosmarinus officinalis L

The results of the determination can show that the plants used for the study are rosmarin plants which belong to the Lamiaceae family.

C. Larvicide Activity Test Results

The data obtained vary, in essential oils with a concentration of 25 ppm the average mortality of larvae is 1 head. At a concentration of 50 ppm, the average mortality of larvae was 5, and at a concentration of 100 ppm, the average mortality of larvae was 11. While at a concentration of 200 ppm, the average mortality of larvae was 17, and starting from a concentration of 300 and above, the average mortality of larvae was 20. Positive control kills all larvae in the container, while the negative control does not kill the larvae.

Table 1. Test results of essential oils on mosquito larvae of *Culex quinquefasciatus* instar III (Attachment Table 1)

LC90 is a concentration that can kill or kill 90% of test animals. In this study 3 values of LC90 were obtained, all of which were derived from replication of essential oils. In replication I obtained 149.5202 ppm, in replication II 214.4371 ppm, and replication III 184.9695 ppm. From the three data above, the average is calculated, and the result is 182.9756 ppm. This means that at a concentration of 182.9756 ppm it can kill 90% of test animals. (Attachment : Figure 1,2,3,4)

The results obtained above have a positive correlation between the number of larvae that die with concentration, meaning that if the concentration is increased, the number of dead larvae also increases. Variations in the concentration of essential oils that can reach 90% of larvae mortality so that the study can determine the LC90, it is evident that the essential oil of rosmarin leaves (*Rosmarinus officinalis* L.) has larvicidal power against third instar *Culex quinquefasciatus* mosquitoes.

The results of the positive control showed the maximum value because it can kill all *Culex quinquefasciatus* larvae, while Tween 80 as a negative control did not affect the larval activity. This is evidenced by all the larvae in the negative control still alive.

Conclusion

Essential oils of rosmarin leaves (*Rosmarinus officinalis* L.) at a concentration of 182.9756 ppm

can kill 90% of *Culex quinquefasciatus* mosquito larvae.

References

- Agusta A. 2000. Indonesian Tropical Plant Essential Oils. Bandung: ITB
- Anief. 2004. The Science of Making Drugs Theory and Practice. eleventh print. Yogyakarta: Gadjah Mada University Press.
- Ansel HC. 1989. Introduction to Pharmaceutical Preparations, Edition IV. Jakarta: University of Indonesia.
- Brotosisworo. 1978. Pharmacognosy. Yogyakarta: Faculty of Pharmacy, Universitas Gadjah Mada.
- Bisset NG, Wichll M. 1994. Herbal Drugs and Phytopharmaceuticals, A Handbook for Practice on a Scientific Base. Stuttgart: CRC press, pp. 428-429.
- Cahyani ENR. 2008. Effectiveness Test of Rosmarin Leaf Essential Oil in Lotion Preparation as *Aedes aegypti* Mosquito Repellent. Surakarta: Setia Budi University.
- Dewick, P.M. 1997. Medical Natural Products A Biosynthetic Approach. New York, USA: Jhon Wiley & Sons.
- Gandahusada S, Pribadi W, Illahue HD. 1998. Medical Parasitology Edition III. Jakarta: Faculty of Medicine, University of Indonesia.
- Grieve M. A Modern herbal, <http://www.botanical.com> [19:58, 31 August 2010].
- Gunawan D, Mulyani S. 2004. Natural Medicine (Pharmacognosy) Volume 1. Jakarta: Spreader self-help.
- Harborne. 1987. Phytochemical Method, Modern Way Guide to Analyzing Plants, Bandung: ITB Publishers.
- Hoan Jay T, Rahardja K. 2003. Important Medicines. Jakarta: PT Elex Media Komputindo, Gramedia, pp. 189-191.
- Praeparandi. 1979. Analysis of Qualitative Pharmaceutical Chemicals. Bandung: Bandung Institute of Technology.

Robinson T. 1995. Organic Plant High Content. Padmawinanto K, translator; Bandung: ITB Press.

Analyst Academy. Surabaya: MOH RI, pp. 152-153.

Soejoto, Soebari. 1996. Instructions on Practicum on Medical Parasitology, Health Attachment

Chart : Larvacide test scheme for essential oils, rosmarin leaves (*Rosmarinus officinalis* L.) on each *Culex quinquefasciatus* mosquito larvae

Table 1. Test results of essential oils on mosquito larvae of *Culex quinquefasciatus* instar III

Concentration (ppm)	Number of mosquito larvae from third instar <i>Culex quinquefasciatus</i> which died each treatment (20 tails)			
	Essential oil			
	I	II	III	$\bar{x}$
12,5	0	0	0	0
25	2	1	1	1
50	5	5	6	5
100	10	11	12	11
200	20	14	17	17
300	20	20	20	20
400	20	20	20	20
500	20	20	20	20
1000	20	20	20	20
K. +	20	20	20	20
K. -	0	0	0	0

Description: Control + = abate

Control - = tween 80

Figure 1. Graph of the relationship of the number of larval deaths per container with concentration

Figure 2. Graph of the relationship between log concentrations with probit essential oil for replication I

Figure 3. Graph of the relationship between log concentrations with probit essential oil for replication II

Figure 4. Graph of the relationship between log concentrations with probit essential oil for replication III