

# LARVICIDE EFFICACY TEST OF MAJA (*Aegle Marmelos*) LEAVES POWDER ON *Aedes aegypti*

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## Abstract

*Aedes aegypti* is a vector control that mostly done today is still not satisfactory, one of which is because of the use of chemical pesticides. Continuous use of chemical pesticides can interfere with health and cause resistance to mosquito species. Therefore, in this research to develop natural larvicide that is environmentally friendly and biodegradable (easy to decompose in environment). Indonesia is one tropical country rich in various herbs, one of which is the maja plant (*Aegle Marmelos*). The objective of this study was to observe the leaves of maja as a killing power of maja leaf powder with the dose of *Ae. aegypti* larvae mortality compared with temephos 1% powder treatment as chemical larvicide. This study was an experimental study using a completely randomized design with treatment consisting of positive control of temephos 1%, negative control (without exposure) and maja leaf powder as much as 6 concentrations (0.5%, 1%, 1.5%, 2%, 2.5% and 3%) with 4 repetitions. This research was conducted in research laboratory of FK Ukrida with population of instar larvae III/IV of *Ae. aegypti* counted 25 larvae per replication. The results obtained LC<sub>50</sub> value of 0.63% and LC<sub>90</sub> of 2.43%. Based on One Way Anova test result, *Ae. aegypti* larvae mortality percentage on exposure temephos 1% reach 100% as in exposure of maja leaf powder concentration 2.5% and 3%. It can be concluded that effective maja leaf powder concentration killed *Ae. aegypti* larvae was 2.43%.

## Introduction

Mosquitoes are very important insects, can cause some deadly diseases in humans such as malaria, encephalitis, yellow fever, dengue, dengue hemorrhagic fever (DHD), filariasis and arbovirus, especially *Aedes aegypti*.<sup>1</sup> Mosquito control programs using growing chemical insecticides widely used by society today such as organophosphates, organochlorides and carbamates have provoked resistance to mosquitoes and caused environmental damage and biological systems.<sup>2-3</sup> Therefore larvicides need to be developed naturally friendly, safe and inexpensive, one of which is the maja plant (*Aegle marmelos*).

*Aegle marmelos* (L) Correa known as Bael or Bilva, belonging to the family Rutaceae, has medicinal properties and is widely used in India. In addition, *Aegle marmelos* is also found in India, Burma, Bangladesh, Thailand and Indo-China.<sup>4</sup> Several studies have been conducted on *Aegle marmelos*, including some compounds such as alkaloids, terpenoids, phenylpropanoids, tannins, and carotenoids. While the leaves of *Aegle marmelos* contain  $\gamma$ -sitosterol, aegelin, lupeol, routine, marmesinin,  $\beta$ -sitosterol, flavones, glycosides, oisopenteryl halfordiol, marmeline and phenylethyl cinnamamides. Limonene (82.4%) is the main constituent of *Aegle marmelos* leaves and characteristic markers for the identification of *Aegle marmelos* oil samples.<sup>5</sup> Research conducted by Dass (2014) using the three plants extract against *Cu. quinquefasciatus* larvae, reported that *Aegle marmelos* leaves are quite effective as vegetable larvicids.<sup>6</sup> Based on the above background, a study was conducted to see if maja leaf powder could kill *Ae. aegypti* larvae when compared temephos 1% with multilevel doses.

## Result

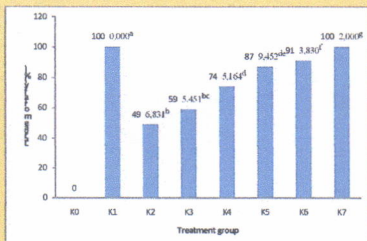


Figure 1. Average mortality graph of *Ae. aegypti* larvae treatment group of maja leaf powder with concentration of stratified observation 24 hours. Different letters indicate a significant difference ( $p < 0.05$ )

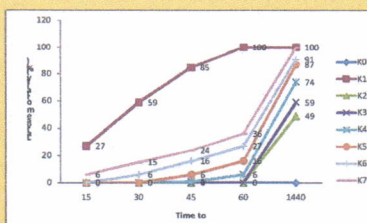


Figure 2. Average mortality graph of *Ae. aegypti* larvae group of powdered leaf treatment then with concentration of stratified based on time of observation

## Method



Figure of *Aedes aegypti* larvae colonization, ranging from instar larvae I, II and III / IV on clean water media and fed with fish food



Figure treatment of maja leaf powder with graded dosage (0.5%; 1%; 1.5%; 2%; 2.5%; 3% and observed mortality after 24 hours to determine the effective dose. And used 1% temephos powder as a positive control.

## Conclusion

Mortality of *Ae. aegypti* larvae on temephos 1% and 3% maja leaf powder is 100%. The effective dose of maja leaf powder (*Aegle marmelos*) was 2.43%.

## References

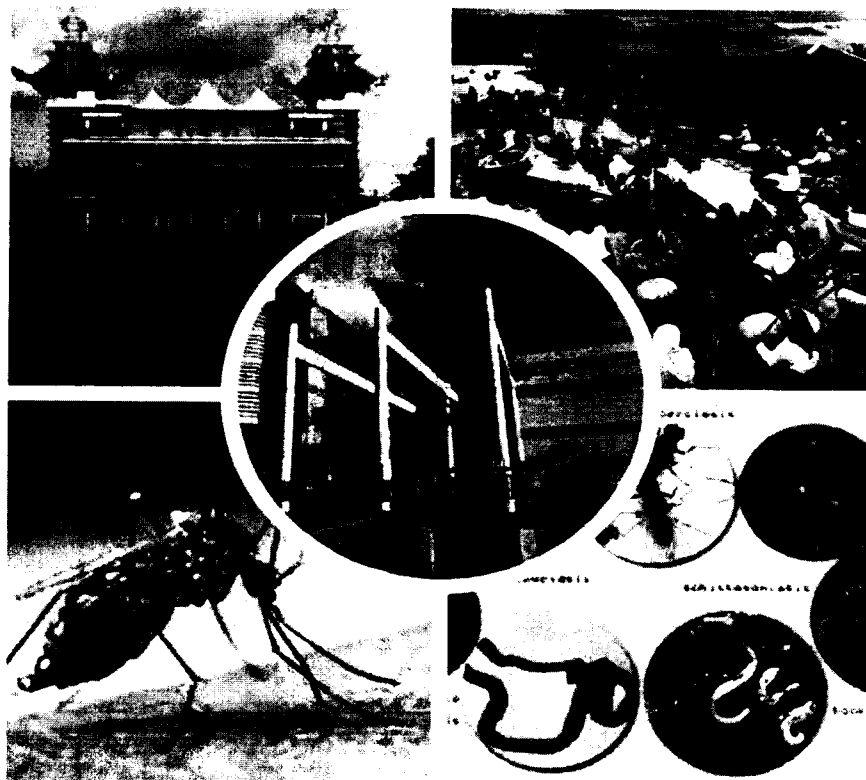
- Ndione RD, Faye O, Ndiaye M, Dieye A, Afoutou JM. Toxic effect of neem products (*Azadirachta indica* A. Juss) on *Aedes aegypti* Linnaeus 1762 larvae. African Journal of Biotechnology 2007; 6(24): 2846-54.
- World Health Organization. Lymphatic filariasis. The disease and its control. WHO Technical Report Series. Geneva: WHO; 1992.p821.
- Wattanachai P, Tintanon B. Resistance of *Aedes aegypti* to chemical compounds in aerosol insecticide products in different areas of Bangkok,Thailand. Commun Dis Journal 1999; 2(2):188e91.
- Brijesh S, Daswani P, Tetali P, Antia N, Birdi T. Studies on the anti diarrhoeal activity of *Aegle marmelos* unripe fruit: validating its traditional usage. BMC Complement Altern Med 2009; 9 (1): 47.
- Chakraborty M et al. *Aegle marmelos* (Linn): a therapeutic boon for human health. IJRAP 2012; 3(2).
- Dass K, Mariappan P. Larvicidal activity of *Aegle marmelos*, *Coleus aromaticus*, and *Vitex negundo* leaf extract against filarial vector *Culex quinquefasciatus*. Turkish Journal of Agricultural and Natural Sciences 2014; 1.

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**ABSTRACT :** *Aedes aegypti* is a vector control that mostly done today is still not satisfactory, one of which is because of the use of chemical pesticides. Continuous use of chemical pesticides can interfere with health and cause resistance to mosquito species. Therefore, in this research to develop natural larvacide that is environmentally friendly and biodegradable (easy to decompose in environment). Indonesia is one tropical country rich in various herbs, one of which is the maja plant (*Aegle Marmelos*). The objective of this study was to observe the leaves of maja as a killing power of maja leaf powder with the dose of *Ae. aegypti* larvae mortality compared with temephos 1% powder treatment as chemical larvacide. This study was an experimental study using a completely randomized design with treatment consisting of positive control of temephos 1% , negative control (without exposure) and maja leaf powder as much as 6 concentrations (0.5%, 1%, 1.5%, 2 %; 2.5% and 3%) with 4 repetitions. This research was conducted in research laboratory of FK Ukrida with population of instar larvae III/IV of *Ae. aegypti* counted 25 larvae per replication. The results obtained LC<sub>50</sub> value of 0.63% and LC<sub>90</sub> of 2.43%. Based on One Way Anova test result, *Ae. aegypti* larvae mortality percentage on exposure temephos 1% reach 100% as in exposure of maja leaf powder concentration 2.5% and 3%. It can be concluded that effective maja leaf powder concentration killed *Ae. aegypti* larvae was 2.43%.

**Keywords :** maja leaves, larvacide, *Ae. aegypti*, LC<sub>50</sub>

### INTRODUCTION

Mosquitoes are very important insects, can cause some deadly diseases in humans such as malaria, encephalitis, yellow fever, dengue, dengue hemorrhagic fever (DBD), filariasis and arbovirus, especially *Aedes aegypti*.<sup>1</sup> *Ae. aegypti* is a major vector of dengue and dengue, spread over tropical and subtropical areas, endemic to more than 100 countries and threatens the health of 2.5 billion people.<sup>2,3</sup> Therefore it is important to control mosquitoes in order to prevent mosquito-borne diseases and improving

public health.<sup>4,5</sup> Mosquito control programs using growing chemical insecticides widely used by society today such as organophosphates, organochlorides and carbamates have provoked resistance to mosquitoes and caused environmental damage and biological systems.<sup>6-10</sup> Therefore larvasides need to be developed naturally friendly, safe and inexpensive, one of which is the maja plant (*Aegle marmelos*).

*Aegle marmelos* (L) Correa known as Bael or Bilva, belonging to the family Rutaceae, has medicinal properties

and is widely used in India. In addition, *Aegle marmelos* is also found in India, Burma, Bangladesh, Thailand and Indo-China.<sup>11,12</sup> In Indonesia, the maja plant is known as maja, a shrub, consisting of leaves, roots, bark, seeds and fruit - houses. The skin of the green fruit is the size of a volleyball, has a hard shell skin, with leaves slightly wider, alternating and alternating, borne alone or in groups, consisting of 3-5 oval, pointed, shallow, 4-10 cm long, 2-5 cm wide, terminal with long leaf stalk.<sup>13,14</sup> Several studies have been conducted on *Aegle marmelos*, including some compounds such as alkaloids, terpenoids, phenylpropanoids, tannins, and carotenoids. While the leaves of *Aegle marmelos* contain  $\gamma$ -sitosterol, aegelin, lupeol, routine, marmesinin,  $\beta$ -sitosterol, flavones, glycosides, oisopentenyl halfordioliol, marmeline and phenylethyl cinnamamides. Limonene (82.4%) is the main constituent of *Aegle marmelos* leaves and characteristic markers for the identification of *Aegle marmelos* oil samples.<sup>14</sup> In addition, the leaves also contain tannins which are bitter-tasting compounds, reacting with proteins, amino acids and alkaloids containing many hydroxyl groups and carboxyl groups to form strong bonding complexes with proteins and other macromolecules such that it tastes bitter and is not favored by insects that become pests in plants.<sup>13</sup> In addition the workings of saponins and alkaloids as abdominal toxins and inhibit the action of the enzyme cololesterase in larvae, the workings of flavonoids as respiratory toxins and polyphenols as abdominal toxins causing death of larvae. Research conducted by Dass (2014) using the three plants extract against *Cu. quinquefasciatus* larvae, reported that *Aegle marmelos* leaves are quite effective as vegetable larvacids.<sup>15</sup> Based on the above background, a study was conducted to see if maja leaf powder could kill *Ae. aegypti* larvae when

compared temephos 1% with multilevel doses.

## RESEARCH METHODS

This study was an experimental study using a complete randomized design (RAL) with treatment consisting of positive control of temephos 1%, negative control (no exposure) and maja leaf powder as much as 6 concentrations (0.5%, 1%, 1.5 %; 2%; 2.5% and 3%) with 4 repetitions.

This research was conducted in research laboratory of FK Ukrida with population of instar larvae III/IV *Ae. aegypti* of 25 larvae per replication. The study was conducted from June to September 2017.

The population used was instar larvae III *Ae. aegypti* obtained from the rearing of *Ae. aegypti* egg from Unit Kajian Pengendalian Hama Pemukiman (UKPHP) IPB. Based on WHO reference, the sample used was 25 larvae per replication, with repetition counted 4 times with 6 concentrations, positive control of temephos 1% and negative control (without exposure), resulting in total larvae of 800 larvae.

The powder used is maja leaf (*Aegle marmelos*). Dry maja leaves blended and then weighed with concentrations of 0.005 grams, 0.01 grams, 0.015 grams, 0.02 grams and then put into 100 ml aquadest each to obtain concentration of 0.5%, 1%, 1.5%, 2 %, 2.5% and 3%.

*Ae. aegypti* egg is placed into a plastic tub containing water for the maintenance of larvae. Eggs will hatch into larvae in 1-2 days. The larvae will develop 3-5 days from stage I larvae to stage III. During its development larvae are fed fish pellets. When the larvae have reached stage III, the larvae are transferred into plastic cups containing maja leaf powder (*Aegle marmelos*) with a titrated dose and temephos 1%, then observed the death of the number of *Ae. aegypti* larvae

in minutes 15, 30, 45, 60, 120, 180, 240, 300, 360, and 1440. After that a probit test is done by calculating  $LC_{50}$  and  $LC_{90}$ .

Data obtained from this study were calculated using one-way anova analysis and continued with the smallest real difference test (LSD) when there was a significant difference.

## RESULTS AND DISCUSSION

In the study, there are some confounding variables that can affect the results of research such as media temperature and pH media. Therefore, the temperature of the media should be measured and controlled by placing the test media in the room so that the temperature is stable. While the pH of the media should be measured to determine the pH changes in the media due to the addition of maja leaf powder. The results of temperature and pH measurements during the study can be seen in Figure 1.

The result of temperature measurement from beginning to end of research during 24 hour observation, got temperature on stable test medium that is  $26^{\circ}\text{C}$ . It can be concluded that the temperature of each test medium does not affect the growth of the larvae because it is included in the optimum temperature criterion for the growth of *Ae. aegypti* larvae is  $25-35^{\circ}\text{C}$ .<sup>16</sup> If there is a difference in the number of deaths of *Ae. aegypti* larvae between the test media, then the difference is not caused by the temperature of the test media.

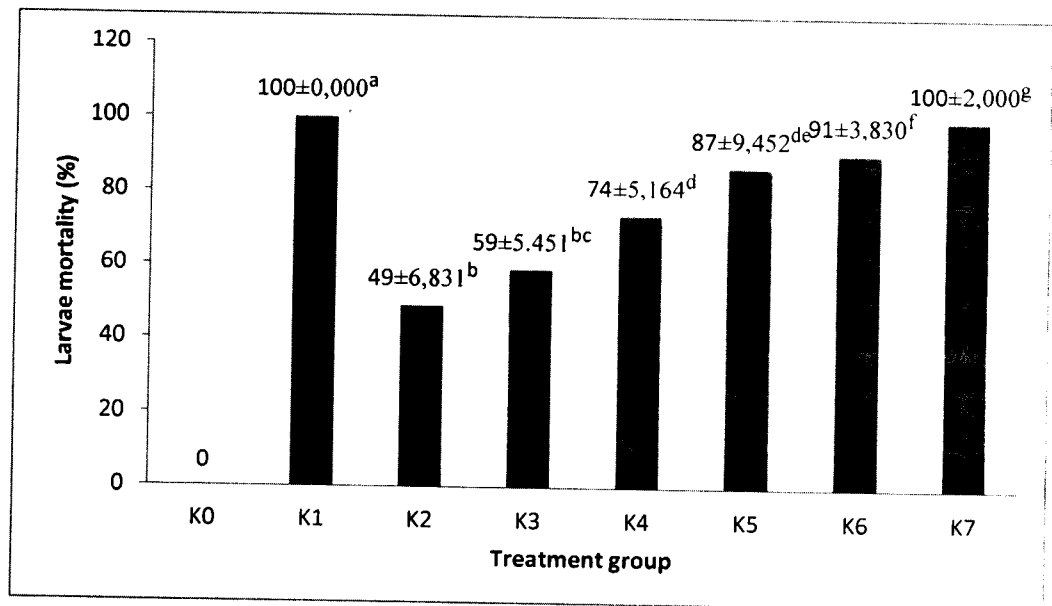
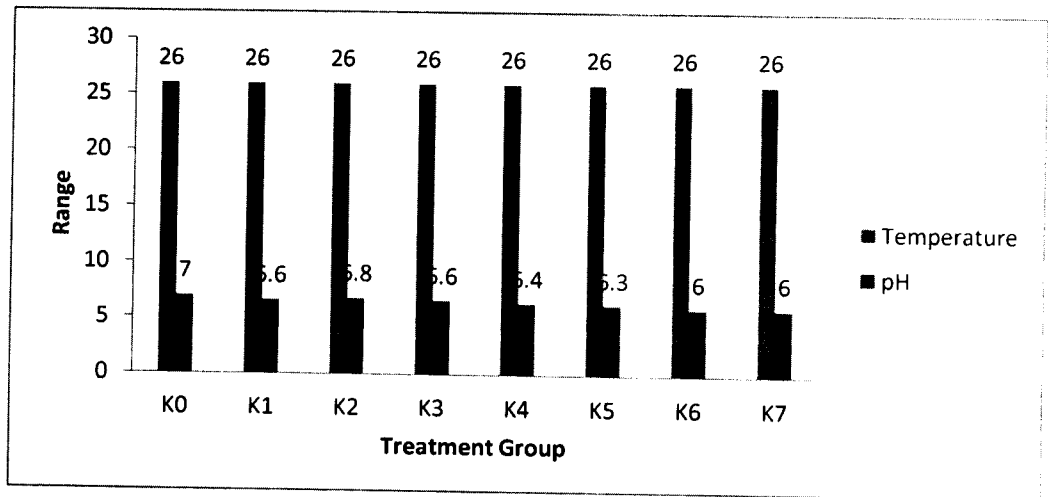
The pH measurement during observation 24 showed that the pH of the control group was 7.0, which is a normal water pH, whereas the addition of maja leaf powder on the test medium with various concentrations resulted in the addition of acidity of the pH of the test medium ie 6.0-6.8. However, this does not affect the death of *Ae. aegypti* larvae because of *Ae. aegypti* larvae can grow in the pH range from 6.0 to 7.0. If there is a

difference in the number of deaths of *Ae. aegypti* larvae with various test media, then the difference is not caused by pH on test media.

To break the transmission chain by vector, one of the methods used is to kill the larvae using temephos 1%. Temephos 1% is a chemical larvicide group of organic phosphate compounds which, if used continuously, can cause resistance to mosquito species. In addition, this larvicide has a working mechanism by inhibiting cholinesterase enzyme, causing disruption to nerve activity due to accretion of acetylcholine on nerve endings. Temephos binds to the cholinesterase enzyme and is destroyed resulting in continuous contractions, seizures, and eventually the larvae die.<sup>17,18</sup> It is therefore necessary to develop natural larvicides which are larvicides made from plants that have a toxic content to insects at the larval stage. It is hoped that the use of this natural larvicide, one of which maja (*Aegle marmelos*) has no adverse environmental, human, and insect resistance. The maja plant (*Aegle marmelos*) is one of the most important medicinal plants in India.<sup>19,20</sup> Maja leaves are considered to be one part of the plant with the highest bioactive compound content synthesized as secondary metabolites.<sup>20,21</sup> This research uses maja leaf powder because of some the compounds therein are thought to have a killing force against the *Ae. aegypti* larvae and expected this maja leaf powder can be used and made by housewife as an alternative temephos 1%. The study started with negative control, positive control using temephos 1% and maja leaf powder with concentration of stratified and then observed in minutes to 15, 30, 45, 60, and 1440. Death of *Ae. aegypti* larvae can be seen in Figures 2 and 3.

Figure 1. Mean temperature and pH of live medium of *Ae. aegypti* larvae during treatment

Figure 2. Average mortality graph of *Ae. aegypti* larvae treatment group of maja leaf powder with concentration of stratified observation 24 hours. Different letters indicate a significant difference ( $p < 0.05$ )



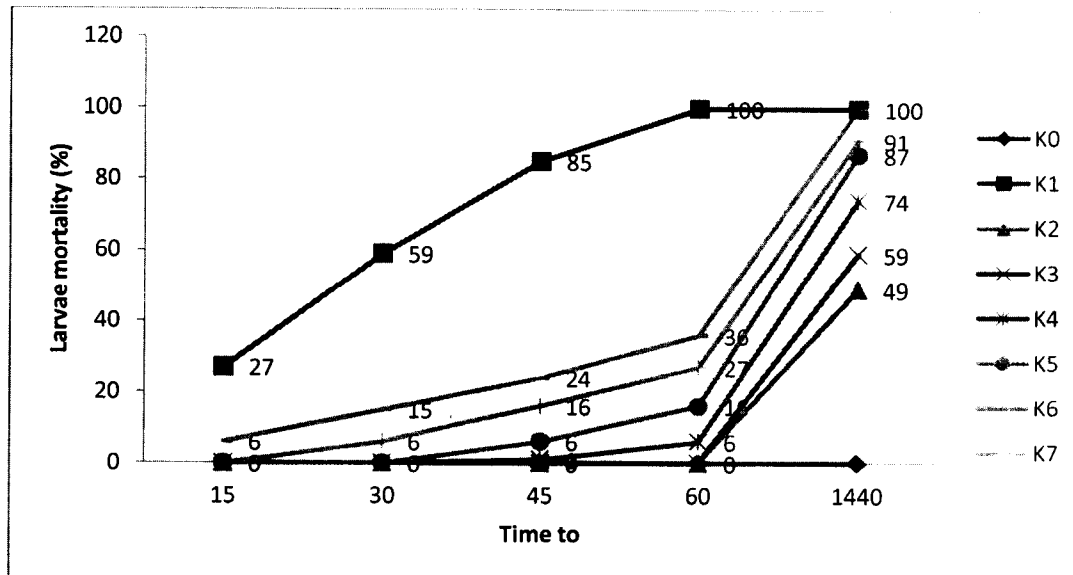


Figure 3. Average mortality graph of *Ae. aegypti* larvae group of powdered leaf treatment then with concentration of stratified based on time of observation

concentration of 2.43%. Thus it can be said that the effective concentration of maja leaf powder to kill *Ae. aegypti* larvae is 2.43%. Unlike the case with temephos 1% in the 60th minute alone is very effective at all in killing *Ae. aegypti* larvae. The dose of temephos used is 1%, which is the effective dose corresponding to WHO.

The data were analyzed using one-way Anova with p value <0.05, meaning there was significant difference between the number of dead larvae between the treatment groups. The test was continued with the smallest significant difference test and the result

**CONCLUSION**

Mortality of *Ae. aegypti* larvae on temephos 1% and 3% maja leaf powder is

was a significant difference between the temephos 1 & with the 0.5% leaf powder group; 1%; 1.5%; 2% and 2.5%, but not significant with 3% leaf powder group.

Based on percentage mortality of *Ae. aegypti* larvae it can be tested probit to obtain the optimal dose of maja leaf powder in the form of lethal concentration value. The value of LC<sub>50</sub> treatment of maja leaf powder was 0.63% and LC<sub>90</sub> was 2.43%.

100%. The effective dose of maja leaf powder (*Aegle marmelos*) was 2.43%.

## REFERENCES

1. Ndione RD, Faye O, Ndiaye M, Dieye A, Afoutou JM. Toxic effect of neem products (*Azadirachta indica*)
2. Monath TP. Yellow fever and dengue the interactions of virus, vector and host in the re-emergence of epidemic disease. *Semin. Virol* 1994; 5:133-5.
3. Borah R, Kalita MC, Kar A, Talukdar AK. Larvicidal efficacy of *Todalia asiatica* (Linn.) lam against two mosquito vectors *Aedes aegypti* and *Culex quinquefasciatus*. *African Journal of Biotechnology* 2010; 9(16): 2527-30.
4. Akram DS, Ahmed S. Dengue fever. *Infect Dis Journal* 2005; 14: 124-5.
5. Reegan AD, Gandhi MR, Paulraj MG, Ignacimuthu S. Ovicidal and oviposition deterrent activities of medicinal plant extracts against *Aedes aegypti* L. and *Culex quinquefasciatus* say mosquitoes
10. effects of various essential oils against *Aedes*, *Anopheles* and *Culex* larvae (Diptera, Culicidae). *Parasitol Res* 2006; 99(4): 466e72.
11. Amer A, Mehlhorn H. Repellency effect of forty-one essential oils against *Aedes*, *Anopheles*, and *Culex* mosquitoes. *Parasitol Res* 2006; 99(4): 478e90.
12. Brijesh S, Daswani P, Tetali P, Antia N, Birdi T. Studies on the antidiarrhoeal activity of *Aegle marmelos* unripe fruit: validating its traditional usage. *BMC Complement Altern Med* 2009; 9(1): 47. 2012; 3(2).
17. Dass K, Mariappan P. Larvicidal activity of *Aegle marmelos*, *Coleus aromaticus*, and *Vitex negundo* leaf extract against filarial vector *Culex quinquefasciatus*. *Turkish Journal of Agricultural and Natural Sciences* 2014; 1. A. Juss) on *Aedes aegypti* Linnaeus 1762 larvae. *African Journal of Biotechnology* 2007; 6(24): 2846-54. (Diptera:Culicidae). *Osong Public Health Res Perspect* 2015; 6(1): 64-9.
6. World Health Organization. Lymphatic filariasis. The disease and its control. WHO Technical Report Series. Geneva: WHO; 1992.p821.
7. Wattanachai P, Tintanon B. Resistance of *Aedes aegypti* to chemical compounds in aerosol insecticide products in different areas of Bangkok,Thailand. *Commun Dis Journal* 1999; 25(2):188e91.
8. Liu H, Xu Q, Zhang L, et al. Chlorpyrifos resistance mosquito *Culex quinquefasciatus*. *Journal Medical Entomology* 2005; 42(5):815e20.
9. Amer A, Mehlhorn H. Larvicidal
13. Rahman S, Parvin R. Therapeutic potential of *Aegle marmelos* (L.)-an overview. *Asian Pac Trop Dis* 2014; 4(1): 71-7.
14. Rismayani. Manfaat buah maja sebagai pestisida nabati untuk hama penggerek buah kakao (*Conopomorpha cramerella*). *Warta penelitian dan pengembangan tanaman industri* 2013; 19 (3): 24-5.
15. Chakraboty M et al. *Aegle marmelos* (Linn): a therapeutic boon for human health. *IJRAP*
18. Ni Luh PMW, Sanusi M. Uji toksisitas jamur *Metarhizum anisopliae* terhadap larva *Aedes aegypti*. *Media Litbang Kesehatan* 2004; 14(3):25-30.
19. Atmosoehardjo S. 1991. Suatu Upaya Pengendalian Penggunaan Pestisida Melalui pendekatan Ilmu

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- pengetahuan dan Teknologi.  
Surabaya : FK Unair.
20. Ridha MR, Nisa K. Larva *Aedes aegypti* sudah toleran terhadap
21. Chemexcil. Selected Medicinal Plants of India. Basic Chemicals, Pharmaceutical and Cosmetic Export Promotion Council, Bombay India; 1992.
22. Mujeeb F, Bajpai P, Pathak N. Phytochemical evaluation, antimicrobial activity, and temephos di kota Banjarbaru, Kalimantan Selatan. Jurnal Vektora.
- determination of bioactive components from leaves of *Aegle marmelos*. Biomed Research International 2014; 11.
23. Cowan MM. Plant products as antimicrobial agents. Clinical Microbiology Reviews 1999; 12(4) : 564–82.





# CERTIFICATE

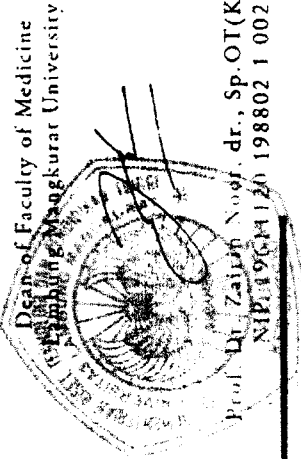
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"DEVELOPMENT OF TROPICAL DISEASES RESEARCH BASED ON WETLANDS AND  
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