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# Aromatherapy Candle Made of Lime Leaves (Citrus Hystrix) for Mosquito Repellent (Aedes Aegypti)

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**Abstract:** ***Essential oils in lime leaves (Citurs hystrix) can reach levels between 2-3.5% and can be used as a vegetable insecticide to break the chain of Dengue virus culture by aromatherapy candles. The purpose of this study to determine effectiveness of lime leaves extract (Citurs hystrix.) The method of this research is experimental with number of samples were 25 per treatment and replicated four times. The test material was placed in a nest that was exposed to aromatherapy wax smoke with lime leaves extract (Citurs hystrix) with concentrations of 70%, 80%, 90% and 100% for 1 hour then observed by observation presented in tabular form. According to the Pesticide Commission, the death of mosquitoes is considered effective if it has a killing power of 90% -100%. The results showed that the average kills power of lime leaf extract (Citurs hystrix) to Aedes aegypti mosquito equal to 92,25% at various concentration. The conclusion lime leaf extract is effective as killing power of mosquito.***

**Keywords:** Aedes aegypti mosquito, extra lime leaves (Citurs hystrix), repellant mosquito

## 1. Introduction

Mosquito is a big problem concerning public health in countries with tropical climate including Indonesia. The increasing number of mosquitoes in the transition season has become one of the fears among the people, one of which is the increasing number of Aedes aegypti mosquitoes, which is a vector of several serious diseases affecting humans such as malaria, yellow fever or jaundice, dengue fever, dengue hemorrhagic fever, filariasis, and arbovirus. One of the major problems caused by Aedes aegypti mosquitoes in Indonesia is dengue fever and dengue hemorrhagic fever. Dengue hemorrhagic fever is an infectious disease characterized by sudden fever, bleeding both in the skin and other body parts and can cause shock (shock) and death. The cause of dengue fever is dengue virus and is transmitted through the bite of Aedes aegypti and Aedes albopictus mosquitoes. This disease mainly affects children including infants although now the proportion of adult patients increases. This happens because the baby and the child do not have a perfect immune system so that the death rate is high. Dengue fever is also referred to as "breakbone fever" (fever joints), because the fever can cause sufferers to experience severe pain as if their bones are broken. Transmission of this disease is basically due to the presence of patients and carriers of dengue virus (Aedes aegypti mosquito) as a vector and the community as a target.

Asia ranks first in the number of Dengue sufferers every year. Meanwhile, from 1968 to 2009. World Health Organization noted Indonesia as the country with the highest dengue fever case in Southeast Asia. Of the total cases, approximately 95% occur in children under 15 years. And incidents continue to increase from year to year and the wider the affected area. Various eradication efforts have been done that is with vector control both chemically and biologically.

Aedes aegypti mosquitoes live in and around the house, sucking blood, especially in the morning at 08.00 to 12.00 noon and afternoon at 15:00 until 17:00. These mosquitoes have a habit of resting primarily in the house in a dark, damp place, on hanging objects and likes a dark-shaded spot, protected from sunlight, wide open surface, with clear and calm fresh water [1]. From the increasing population of mosquitoes, vector control is important to reduce the number of mosquito populations that begin to spread. Vector control can be done by chemical, radiation, environmental, genetic, or biological [1]. Chemical eradication is expected to eradicate effectively and be used directly. Chemical eradication efforts are expected throughout the public to control mosquito populations. The use of chemical eradication is made from artificial insecticides that are easy to find and can be directly used. On the control of chemical ways have a negative impact on the surrounding environment, because these insecticides cause a stinging smell and can cause shortness of breath or allergies in the skin so it will affect health.

The situation demands the need for a safe biological way to eradicate Aedes aegypti by using natural ingredients, where the base material uses plant extracts. One of the plants that can potentially be used is citrus or known as oranges. In addition to having high economic value because it has vitamin C levels and is often used as the basic ingredients of cooking some of these plants have substances that can be used as bioinsektisida, one of which is the leaves. One species of citrus commonly known by the community is lime (Citrus hystrix). So far in Indonesia most of the function of the leaves of lime is as an additional ingredient in cooking.

Lime (Citrus hystrix) is a herbaceous plant that is used mainly fruit and leaves as a seasoning seasoning. On lime leaves (Citrus hystrix) contains chemical compounds which are secondary metabolite compounds such as essential oils, flavonoids, saponins, and steroids. The source of the fragrant odor on the leaves of lime actually comes from the oil content of atsirinya. In addition to the source of the scent of essential oils also play a role in bioinsektisida. Essential oils can also repel and kill mosquitoes, as they contain linalool, geraniol, and eugenol. Linalool is a contact poison that increases the activity of the sensory nerves in insects, more precisely causing motor neuronal stimulation that can cause seizures and paralysis in some insects. While eugenol is a

liquid that has a refreshing aroma and is a stimulant, local anesthetic, carminative, antiemetic, antiseptic, and antispasmodik. This antiseptic properties that can avoid the mosquitoes. Furthermore, for geraniol is a compound that can cause death in insects. Insects exposed to these compounds will show symptoms of poisoning and can cause death due to toxic substances in the stomach [2]. The compounds are toxic to kill insects, but many people are unaware of the benefits of orange leaves as bioinsecticides. So far people only know the function of the citrus leaves themselves are as additional food ingredients.

From the description above, researchers interested in doing research on citrus leaf extract (Citrus hystrix) as the basic material against mosquito repellent Aedes aegypti.

## 2. Research Methods

This research uses experimental research type and this research is conducted in Parasitology Laboratory of Surabaya Health Analyst Department.

The sample of this study used Aedes aegypti female mosquitoes aged 2-5 days taken at random. Using Aedes agypti mosquitoes aged 2-5 days to keep mosquitoes stable and unaffected by other factors that can cause death of mosquitoes during the test. The samples were 25 per treatment and replicated four times.

Citrus hystrix (Citrus hystrix) is used as citrus leaves extract (Citrus hystrix) with maseration method and then dilute to Citrus hystrix extract 70%, 80%, 90% and 100%.

The first research procedure is to make the extract of Citrus Hystrix Leaf (Citrus hystrix) by washing the Citrus Hystrix Leaf (Citrus hystrix) using water flowing then chopping Citrus Hystrix leaves that are clean to become small, drying Citrus hystrix leaves aerated without sun, smoothing Citrus Hystrix leaves, weighing the dry powder of Citrus Hyprix leaves (Citrus hystrix) as needed into beaker glass and adding with 96% ethanol solvent up to Orange Citrus powder (Citrus hystrix) powder is submerged, stirring for 1 hour to reach homogeneous conditions in a waterbath shaker at a rate of 120 rpm for 1 hour, soaking the solution for 24 hours at room temperature. After 24 hours, filtering the solution or separating by using a Buchner filter, aerating the filtering residue and re-regenerating for 24 hours, the maceration is repeated up to 3 times and then mixing the filter results 1 to 3 and concentrating with the rotary vacuum evaporator at 50 to get concentrated extract or pure. After obtaining the extract of Citrus Hystrix, concentrated 70%, 80%, 90% and 100% concentration of Citrus Hystrix leaves (Citrus hystrix).

**Table 1 :** The effect of lime leaf extract (Citrus hystrix) as an anti-mosquito aromateraphy candle against Aedes aegypti mosquitoes

| Replication | Σ Aedes aegypti mosquito that dies every concentration | | | | | |
|---|---|---|---|---|---|---|
| | 70% | 80% | 90% | 100% | Control Positive | Control Negative |
| 1 | 21 | 23 | 23 | 24 | 25 | 0 |
| 2 | 22 | 22 | 24 | 25 | 25 | 0 |
| 3 | 21 | 23 | 23 | 24 | 25 | 0 |
| 4 | 23 | 22 | 24 | 25 | 25 | 0 |
| Average | 21,5 | 22,5 | 23,5 | 24,5 | 25 | 0 |
| Percentage | 87% | 90% | 94% | 98% | 100 % | 0 % |

After making dilution of Citrus Hystrix leaves extract (Citrus hystrix) then prepare all the tools and materials that will be used then put it into a glass that will be used as a candle printer. Candle that has been frozen and has contain Citrus Hystrix leaves extract, positive control and negative control are included in the nest, inserting 25 Aedes aegypti mosquitoes into mosquito nest medium at each treatment, turning on aromateraphy candle which already contains extract of Jeruk Purut Leaf (Citrus hystrix), positive control and negative control in mosquito breeding for 1 hour, aromatheraphy mosquito repellent is turned off and Aedes aegypti mosquitoes are silenced for 24 hours then count Aedes aegypti mosquito that died after applied.

Data analysis technique used in this research is descriptive with data presented in table form. Analysis of data used is to see the number of deaths of Aedes aegypti mosquitoes and then inserted into the table of research results.

## 3. Result and Discussion

Based on existing data analysis, showed effective result on mosquito death on aromatheraphy candle exposure based on lime leaves because the percentage value of mosquito mortality approximately 90%. Standart effectiveness of insecticide kill power according to Pesticide Commission if it can turn off by 90% -100%. Percentage results that showed the greatest result was at 100% concentration with mosquito mortality result 98% from 25 mosquitoes test.

In this study the average mosquito mortality of 92.25% of various concentrations. The death of mosquitoes in this study was observed physically by looking at the signs among others: The mosquitoes did not move at all despite the stimulation of touch and wind and lying at the bottom of the test chamber; incoordination or igor, ie the state of his body shows stiffness. To confirm whether the observed mosquitoes have died or not after being silenced for 24 hours. If the mosquito is still in motion, it can be said that the mosquito is still alive or just fainted and not declared or counted in the number of dead mosquitoes.

Information
Incubation time: 24 hours
Temperature: 30.4$^{o}$C
Humidity: 44%
Positive control: Liquid liquid anti-mosquito solution on the market
Negative control: Silence in mosquito nest without treatment
Lime leaves (Citrus hystrix) has the potential as a vegetable insecticide because inside lime leaves contain secondary metabolite compounds that are carcinogenic for insects. Secondary metabolite compounds contained in lime leaves are essential oils, flavonoids, saponins, and steroids. The secondary metabolite compounds that play the most role in the killing power of mosquitoes are the essential oils in lime

leaves (Citrus hystrix) due to the amount of essential oil content in the leaves of lime compared to other secondary metabolite compounds. Essential oil itself on the leaves of lime (Citrus hystrix) there are three kinds of one is linalool which increases the activity of sensory nerves in insects, more precisely causing motor neuron stimulation that can cause seizures and paralysis to death in some insects [2]. However, the results obtained after the analysis of the above data, showed the effectiveness of the provision of anti-mosquito-based aromatheraphy extract of citrus leaf citrus (Citrus hystrix) that is, on the extract of lime leaves secondary metabolite substances that play a role in killing mosquitoes are essential oil which is volatile [3].

In the process of making this aromatheraphy candle extract is mixed into hot liquid wax, thus causing reduced levels of essential oils so that it can reduce the efficacy of the work of aromatheraphy-based wax mosquito-based extract of lime. The other factors that may affect the decrease in the number of Aedes aegypti mosquito deaths, ie mechanical factors at the time of anti-mosquito test. The mechanical factors are as follows:

1) The distance of Aedes aegypti mosquito with anti mosquito at the time of exposure because of long distance with anti mosquito tool will not easy to die due to accumulation of exposure to mosquito body become less perfect.
2) The presence of Aedes aegypti mosquitoes and the corners of the mosquito nests that cause Aedes aegypti mosquitoes protected against direct exposure from anti mosquitoes when exposure.

In addition, the work of vegetable insecticides is also relatively slow to insects that inhibit success in killing insects, compared with chemical insecticides.

## 4. Conclusion

From the result of research of effectiveness of citrus leaf extract (Citrus hystrix) as anti mosquito Aedes aegypti can be taken some conclusion that lime leaf extract (Citrus hystrix) effective as antinyamuk Aedes aegypti.

For further research is expected to continue this research by applying different methods to be more effective to be made anti mosquito and is expected to conduct research on other mosquito species to know the development of research. In addition, for researchers if you want to continue the research to clean up every turn of concentration.

Further research is still needed on the effectiveness of aromatherapy wax using secondary metabolite substances from other plants because to develop a variety of antinyamuk market.

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