

# The Effectiveness of Momordica Leaves

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# The effectiveness of momordica leaves (*Momordica charantia* Linn) extract as biolarvacide to vector of dengue haemorrhagic fever

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*Health and Environmental Perspectives*

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*Semarang, Indonesia*

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Praba Ginandjar  
Dina Rahayuning Pangestuti  
Lintang Dian Saraswati



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**THE EFFECTIVENESS OF MOMORDICA LEAVES (*Momordica charantia L*)  
EXTRACT AS BIOLARVICIDE TO VECTOR OF  
DENGUE HAEMORRHAGIC FEVER**

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**ABSTRACT**

**Background:** Momordica is a creeping plant which is popular known as traditional medicine to cure cough, intestinal worms, malaria and diabetes mellitus. Momordica plant also has a function as bioinsecticide to control *Aedes aegypti* larvae. This research aimed to determine the effectiveness of Momordica leaves extract in killing *Aedes aegypti* larvae.

**Method:** This was an experimental study with post test only with control group design. The concentration of leaf extract was 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100% along with positive control (temephos) and negative control (ethanol) with 3 times replicate. Momordica leaves were extracted maceratively.

**Results:** The result showed that momordica leaves extract has a significant influence to the mortality rate of larvae ( $p=0.000$ ). Duncan experiment (Duncan Multiple Range Test) showed that all treatment were apparently different. The result of Probit Analysis showed that concentration of 23.9% of momordica leaves extract could cause death of 50% *Aedes aegypti* larvae ( $LC_{50}$ ).

**Conclusion:** Extract of momordica leaves extract is effective as biolarvicides to *Aedes aegypti* larvae.

**Keywords:** momordica leaves extract, biolarvicide, *Aedes aegypti*

**BACKGROUND**

Dengue Hemorrhagic Fever is one of the public health problems [1]. Based on data from the Ministry of Health, dengue cases in Indonesia throughout 2012 as many as 90.245 [2]. in South Kalimantan, throughout 2012 of years, dengue case reaching 1216 cases. Various efforts to reduce morbidity and mortality has been done. One effort is to break the chain of transmission by inhibiting the proliferation of the *Aedes aegypti* mosquito which is the vector potential [3].

People use different ways to kill adult mosquitoes and larvae. One of them is larvicide, which has temephos as active ingredient, to kill larvae in water reservoirs. But there is an ongoing concern that temephos may lead to resistance. Therefore, it is necessary to find environmentally friendly alternatives bioinsecticide which is expected to have effects such as chemical larvicides [4].

Momordica are the plant is often used as one bioinsecticide. This bioinsecticide properties thought to be caused by the content momordicin compounds, alkaloids, flavonoids, triterpenoids and saponins which acts as a stomach poison for mosquitoes [5]. This study aimed to determine the effect of leaf extract of Momordica in a deadly

mosquito *Aedes aegypti* larvae and determine the optimal concentrations that kill 50% of larvae. This study is expected to yield scientific information about alternative larvicides from natural ingredients that can help suppress populations of *Aedes aegypti* larvae

## METHOD

This was an experimental study with Posttest-Only Control Group Design. There were 11 treatments with 3 repetitions. The subjects were larvae of *Aedes aegypti* instar IV, because they have better defense system comparing to I, II and III [6]. The independent variable was concentration of leaf extract of momordica, which was divided into 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100% respectively. We used as many as 25 larvae for each treatment. The dependent variable was the *Aedes aegypti* larval mortality after administration of momordica leaf extract for 24 hours. Room temperature was adjusted to 27°C, which is a normal temperature for larval development [7]. The procedure consisted of extracting momordica leaf by maceration technique, and then testing these extracts larvicidal effect. The workings in this study in accordance with the method set by the WHO for experiments in the laboratory. Data were analyzed by ANOVA test, followed by Duncan and final Test using probit analysis through SPSS program.

## RESULT

Figure 1 showed percentage of larval mortality after administration of the extract of momordica leaves 3 times repetition.

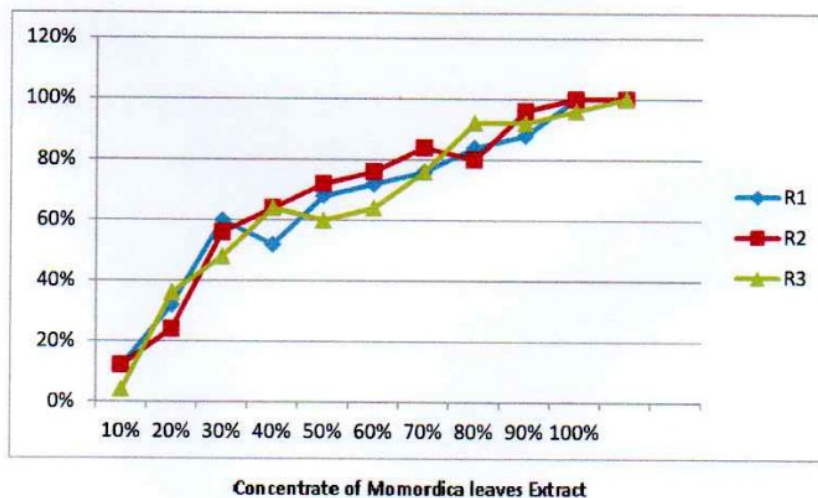


Figure 1. The percentage of larvae mortality after administration Momordica Leaf Extract with 3 times repetition in 24 hours.



The average percentage of larval mortality after administration of the leaf extract of momordica for 24 hours shown in Figure 2. As seen in Figure 2, mortality in control group (marked as group 1) was 9.3%.

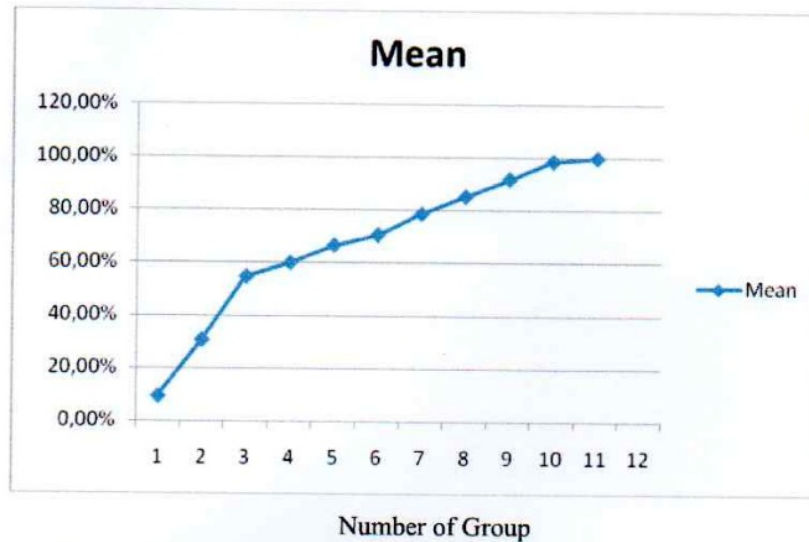


Figure 2. The average percentage of larvae mortality after administration Momordica Leaf Extract after 24 hours.

Since the mortality in control group was in range 5-20 %, the mortality of larvae must be corrected by Abbot's formula. Correction results shown in Figure 3.

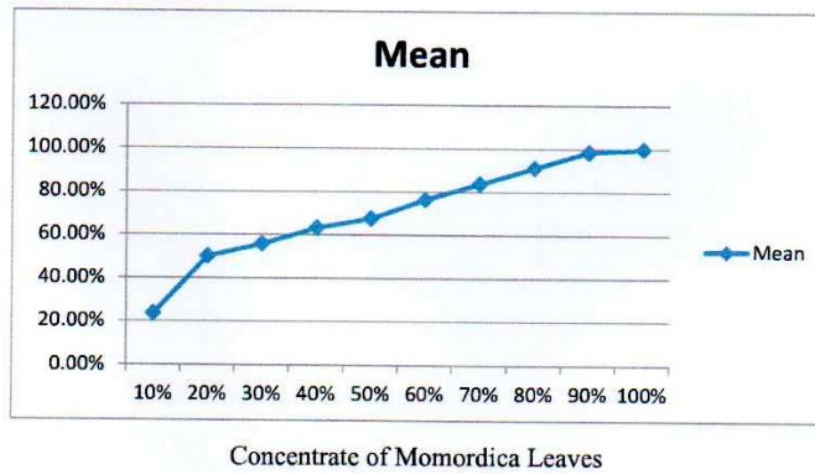


Figure 3. The average percentage of dead larvae after corrected with Abbot formula

Figure 3 shows the average percentage of mortality after correction with Abbott. Once corrected, the figure showed average percentage of dead larvae become smaller. To determine its effectiveness, the analysis of data to assess the homogeneity and the generated  $p=0.066$ , which means that the data are normally distributed. Data were further analyzed with ANOVA to analyze different average mortality of larvae at various concentrations and the result  $p<0.0001$ , which means there is a significant amount of larval mortality between the treatment groups. To see the difference in the average mortality of larvae at various treatments can be determined by Duncan test (Duncan's Multiple Range Test). The results showed that all treatments were significantly different.

### DISCUSSION

Figure 1 shows that the percentage of larval mortality after administration of the leaf extract of momordica for each concentration and repetition is quite varied, although the higher the concentration, the percentage of mortality is also higher. Similar condition also revealed from Figure 2. The results are consistent with Silfiyanti and Kristianto [8] which also showed that the higher the concentration of the extract given, the more dead larvae of *Aedes aegypti*. It is proved that momordica containing active compounds like momordicin, alkaloids, flavonoids, triterpenoids and saponins [5] can be used as larvicides. The working mechanism of momordica as larvicides is a stomach poison. If these compounds into the body of larvae, the appliance will be impaired digestion and inhibits taste receptors in the mouth larvae. This causes the larvae failed to get a stimulus and is unable to recognize the larval food and consequently died of starvation [8]. Active compound contained in the leaves of momordica also serves to inhibit the growth of larvae, which is the hormone inhibits the brain, edikson hormone and growth hormone (juvenile hormone). Due to disruption of the hormone, the larvae will not develop into adult mosquitoes and reduced coordination of movement, resulting in the death of the larvae [8].

The results of this study showed that the concentration of 10% leaf momordica extract has been able to kill larvae by 30.7%, and the average is significantly different from the average mortality at a concentration of 20% and so on up to the highest concentration of 100%. These results suggest that momordica leaf extract on the lowest dose capable of killing larvae already. The higher concentration of leaf extract, larval mortality was also greater. Based on the criteria of efficacy is said that an extract effective if it is able to kill > 80% of the larvae within 24 hours after exposure [8], it can be said pare leaf extract effectively kills larvae at a concentration of 70% for this extract resulted in > 80% mortality of larvae.

To determine lethal concentration (LC) 50% using probit analysis. Probit analysis of the test results showed that the leaf extract of momordica at the lowest concentration of 18.2% can result in death instar IV larvae by 50%. While the upper limit of LC50 is 28.6%. So in this study can be determined LC 50 which effectively kill 50% of larvae was 23.9%. From the results of this research known that concentrations can kill instar IV larvae of *Aedes aegypti* was quite low at only 23.9%. This is in contrast with Silfiyanti and Kristianto [8] that showed that the concentration of 400 ppm, leaf extracts of momordica is able to kill 55% of larvae. Although different, these



results suggest that the leaf extract of momordica is proven laboratory has larvicidal effects.

### CONCLUSION

Momordica leaf extract has the ability to turn off the fourth instar larvae of *Aedes aegypti*. The higher the concentration, the greater the percentage of his death. Concentration of Momordica leaf extract which killing 50% instar IV larvae of *Aedes aegypti* was 23.9% after 24 hours of exposure. However, further study needs to be done to determine the toxicity momordica larvicidal effect so hopefully this can be used as biolarvasida in society without any side effects and environmentally friendly

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