



Exploring the Insecticidal Effect of Lemon Grass Juice on Mosquitoes

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<p>Abstract: This experimental study was conducted to explore the insecticidal effect of lemon grass juice on the number of mosquitoes killed. The experiment was conducted at Baras, Dumangas Iloilo. A total of sixty mosquito larvae are bred to make adult mosquitoes and used in the experiment. Complete Randomized Design was employed with four treatments each, corresponding to 100% concentration of lemon grass juice, 50% concentration of lemon grass juice, commercial mosquito insecticide, and no treatment administered. Each treatment was replicated four times. Descriptive statistics such as mean, and standard deviation, and inferential statistics such as Analysis of Variance were utilized. Results showed that a 100% concentration of lemon grass juice has an insecticidal effect on mosquitoes. Considering that 100% lemon grass juice was the most effective, preservation of lemon grass at this level was recommended for commercial purposes. Further studies are recommended to be conducted to determine the active chemical component for the death of mosquitoes.</p>	<p style="text-align: center;">Research Paper</p> <p>*Corresponding Author: <i>Lavinia B. Dulla</i> Iloilo Science and Technology University, La Paz, Iloilo City, Philippines</p> <p>How to cite this paper: Lavinia B. Dulla (2023). Exploring the Insecticidal Effect of Lemon Grass Juice on Mosquitoes. <i>Middle East Res J. Eng. Technol.</i>, 3(3): 39-43.</p> <p>Article History: Submit: 17.04.2023 Accepted: 25.05.2023 Published: 30.05.2023 </p>
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INTRODUCTION

Lemon grass (*Cymbopogon citratus*) is a grass that has a vigorous tradition with a large compound inflorescence and is cultivated in tropical regions. Likewise, it was used in herbal teas and other non-alcoholic beverages. Lemon grass is used as a common ingredient for dining or as a perfume scent in the recreational bath and lifestyle activities. Lemon grass was used for the treatment of different diseases and is frequently perceived as a pest control substitute for mosquitoes.

The oil of lemon grass extract has a very long history of being powerful as an insecticide, bactericide, and antiseptic. The oil of lemongrass is called citronella and is an essential oil extracted from the stems and leaves of different types of *Cymbopogon* (lemon grass). Citronella is the easiest and most common traditional ingredient used in formulating mosquito repellents. The characteristic citronella aroma has a strong smell that protects any skin from being attacked by the mosquitoes (Seaman, 2011).

According to Zulfikar (2019), lemon grass extract can be used as a substitute for malathion with the mortality rate of the *Aedes aegypti* mosquito. Moreover, different research studies from biomedical, bioscience, and biological research revealed that lemon grass oil has an insecticidal effect that could get rid of mosquito larvae which cause dengue fever. Ojewumi *et al.* (2017)

investigated the efficacy of lemon grass extract on mosquitoes using different concentrations of the oil extract. Naturally active compounds extracted from this plant have been commonly used in the past to control insects including mosquitoes in many tropical countries (Ojewumi and Owolabi, (2012).

Further studies from Goselle *et al.* (2017) recommended that lemon grass is non-toxic, safe, and natural insect repellent. It is just as effective and can be substituted for commercial insecticide. It should be planted around the surroundings that can reduce mosquito and their borne diseases recommend that lemongrass is a safe and natural insect repellent that is just as effective as the commercial chemical product and should be planted around homes, as they could have potentials of repelling mosquitoes and reducing mosquito borne diseases.

The mosquitoes are health-threatening, killing millions of people over thousands of years and continuing to kill million per year. Thus, this insect is used as the subject of several experiments. Based on the latest report by Regional Epidemiology and Surveillance Unit (RESU-6), there were 5,527 dengue cases in Western Visayas from January to April 6, 2019. This is 159 percent higher compared to the same period last year. According to health experts, provincial mosquitoes should never be given the chance to multiply. Studies from Aditama *et al.* (2019), state that there is a need for

environmentally friendly insecticides that were mild and safe for health and can kill mosquitoes.

As the standard of living develops, the need and concerns for safety are important, natural alternatives are also in demand, thus this study was realized. The rationale for conducting this study was to expand the ever-increasing and growing scientific database information on traditional herbal medicine thru the exploration of the insecticidal effect of lemon grass (*Cymbopogon citrates*), a traditional medicinal plant abundantly available in the Philippines.

The Objective of the Problem

The main objective of this paper was to explore the insecticidal effect of lemon grass juice on mosquitoes. To support the main objective above, the following specific were considered:

1. To assess the number of mosquitoes killed when treated with different insecticides; and
2. To find the significant difference in the mortality of mosquitoes when treated with different insecticides.

METHODOLOGY

Research Design

This experimental exploration aimed at determining the insecticidal effect of lemon grass juice on mosquitoes and identifying which juice concentration was the most effective. The independent variable in this study was different insecticides and the dependent variable was the mortality rate of mosquitoes. A complete Randomized Design was employed with four treatments and each treatment has four replications.

Subject

A total of sixty mosquito larvae were bred to make adult mosquitoes and used in the experiment. Sixty mosquito larvae were distributed among the four jars. The first jar with fifteen mosquitoes has no treatment administered. The second and third jars, with the corresponding number of mosquitoes (15 each), were treated to 100 percent lemon grass juice and 50 percent lemon grass juice. Likewise, fifteen mosquitoes were treated with commercial mosquito insecticide. The experiment has four replication per treatment administered.



Figure 1: Jars with mosquito larvae

Materials

The experimental material used was the lemon grass juice solutions. The other materials utilized were classified into glassware and non-glassware.

Glassware

The materials in this classification include the bottles and jars.



Figure 2: Bottles and sprayer

Non-Glassware

The materials in this classification include distilled water, a mosquito net, a rubber band, a big mortar and pestle, and a sprayer bottle.



Figure 3: Big mortar and pestle



Figure 4: Pounding the lemon grass

Procedures

In obtaining data for the insecticidal effect of lemon grass juice on the mortality rate of mosquitoes, the researcher used the following procedure.

Preliminary Procedure

Certain preliminary activities were observed in this experiment.

Preparation of Glassware

The bottles and jars were washed carefully with soap and water. They were cleaned with distilled water to make sure that no soap remained. Next, they were allowed to be air-dried.

Breeding of Mosquitoes

The researcher finds sixty mosquito larvae in the pond and the big jar full of rainwater. Mosquito larvae can be as large as about 5 millimeters and clearly visible in water (Laurel, 2014). Sixty mosquito larvae were distributed among the four jars and covered with mosquito nets and secured with a rubber band. The breeding period from larvae to become adult mosquitoes followed the natural cycle of mosquitoes. The life cycle of mosquitoes typically takes up to two weeks, but conditional on the environment, it can range from 4 days to as long as a month (United States Environmental Protection Agency, 2017). The experiment was conducted at Baras, Dumangas, Iloilo.

Preparation of Lemon Grass Juice

The leaves and bark of the lemon grass plants were washed meticulously with tap water and rinsed with distilled water to make sure that the leaves and bark were clean. The leaves and bark were placed in the big mortar and were pounded with a big pestle. The pounded leaves and bark were squeezed to produce the extract and placed in the bottles.

The extract from lemon grass leaves and bark was divided into two partitions. The 100 percent lemon grass extract and the fifty percent concentration, 50ml. distilled water was added to 50ml. lemon grass extract. Each concentration was placed into the bottle with the labeled percentage of concentration.



Figure 5: Pure lemon grass juice

The prepared concentrations of juice were sprayed on the mosquitoes as follows: the first jar was written off as A which is 100ml percent concentration of juice. The second jar written off as B 50ml percent concentration of juice. The third jar labeled C with commercial mosquito insecticide. The fourth jar labeled D has no treatment administered. A thirty seconds observation was made after every treatment. The dead mosquitoes in every treatment were counted and recorded. These treatments are replicated 4 times per treatment administered.

Analysis of the Data

The data gathered from the study were analyzed using means and standard deviation for descriptive statistics and F-test for inferential statistics using the Analysis of variance (ANOVA). Duncan's Multiple Range Test (DMRT) was adopted to determine which lemon grass juice concentration was the most effective at 0.05 alpha level. All computations were done in Rstudio using the pastecs package for descriptive statistics. The code for the Analysis of variance was `res.aov <- aov(Mortality ~ Concentration, data = data)`. Package agricolae was used in analyzing Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Numerous procedures have been conducted either naturally or chemically to reduce the mosquito population with the objective of preventing the transmission of diseases like dengue caused by

mosquitoes. Thus, the main objective of this study was to explore the insecticidal effect of lemon grass juice and if it can be used as a possible alternative to commercial mosquito insecticides.

Table 1: Descriptive result of killed mosquitoes treated with different concentrations of insecticide

Concentration	Replication				Total	Mean	SD
	1 st	2 nd	3 rd	4 th			
100% lemon grass extract	12	12	11	14	49	12.25	1.26
50% lemon grass extract	9	6	7	8	30	7.50	1.29
Commercial mosquito insecticide	15	15	12	14	56	14	1.41
No treatment	3	2	4	2	11	2.75	0.96

Table 1 presents the descriptive results of killed mosquitoes treated with different concentrations of insecticide. Each concentration had four replicates. The numbers of killed mosquitoes subjected to commercial insecticide have the highest mortality mean of 14 and a standard deviation of 1.41. This was followed by 100% lemon grass juice with a mean of 12.25 (SD=1.26).

Moreover, the mean mortality rate of mosquitoes with 50% lemon grass juice and no treatment administered has the lowest mean mortality rate of 7.50 and 2.75 with a standard deviation of 1.29 and 0.96, respectively. This is consistent with Zulfikar, et. al (2019) that the 100% lemon grass extract (*Cymbopogon citratus*) has the highest percentage of killed mosquitoes.

Table 2: ANOVA (Analysis of Variance) Result of the Difference of killed mosquitoes treated with different insecticides

Source of Variation	Sum of Squares	df	Mean Square	F	Sig
Between Groups	307.25	3	102.42	66.43	.000
Within Groups	18.5	12	1.54		

Table 2 shows that there was a significant difference in the mortality of mosquitoes treated with different concentrations of insecticide with $F=66.43$ and a $p\text{-value}<0.005$ level of significance. This is consistent with Zulfikar, et. al (2019) that there was a significant difference in the process of lemon grass extract with the mortality rate of the *Aedes aegypti* mosquito.

Furthermore, Duncan's Multiple Range Test (DMRT) shows that the 100% lemon grass juice concentration was significantly higher than the other

level of concentration of lemon grass juice as shown in table 3. According to Wells (2019), the chemical components of lemon grass extract were like contact toxic that can kill mosquitoes because of the continuous loss of fluids. This is consistent with, e.g. Cloyd et al, 2009; Girenti and Suss, 2002; Heimerdinger et al, 2006; Magesa and Kamugisha, 2006, Sakulku et al, 2009; and Yaday et al, 2006; that lemon grass (*Cymbopogon citratus*) oil has an insecticidal effect on different species specifically on mosquitoes.

Table 3: Duncan's Multiple Range Test (DMRT)

Treatment	Subset for alpha=.05		
	1	2	3
100% lemon grass juice	12.25		
50% lemon grass juice		7.50	
Commercial mosquito insecticide	14.00		
No treatment			2.75

CONCLUSIONS

The study investigated the insecticidal effect of lemon grass juice on mosquitoes. The finding revealed that there was a significant difference in the mean mortality of mosquitoes treated with different concentrations of insecticide. The most effective juice concentration of lemon grass was 100% juice extract. Thus, the lemon grass extract possesses an insecticidal effect which implies that it can be utilized as a substitute mosquito insecticide. It is the passionate hope of the

author that this result would be beneficial and helpful to the community. This study is already a good start and signs of better scientific exploration of traditional medicinal plants.

RECOMMENDATION

An exploration of the insecticidal effect of lemon grass juice on mosquitoes has been investigated and presented. Considering that 100% lemon grass concentration was the most effective, preservation of

lemon grass at this level was recommended for commercial purposes. For the benefit of the community, they could purchase lemon grass in an easier and more convenient way at a lower cost with the same effect as that of commercial insecticide. Further studies are conducted to ascertain the validity and reliability of the study. Furthermore, the use of larger numbers of samples was recommended to know at what point or how long a specific level of lemon grass extract juice will be effective. This study can be also used by the researchers and they can enjoin to conduct more studies as they will have an adequate review of related literature which could guide them in their research quest.

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