# *LARVICIDAL POTENTIAL OF ALTERNANTHERA BETTZICKIANA*

## *(REGEL) G. NICHOLSON*

Project submitted

TO

## MAHATMA GANDHI UNIVERSITY

In partial fulfillment of the requirements in degree

Of **BACHELOR OF SCIENCE IN BOTANY**

Submitted by

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May 2023

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# CERTIFICATE

This is to certify that this project work entitled **Larvicidal potential of Alternanthera bettzickiana.** is a bonafide piece of project work done by **KURIAN ELIAS (reg no ; 200021023427 )** in the Department of Botany, Bharata Mata College, Thrikkakara under my guidance and supervision for the award of Degree of Bachelor of Science in Botany during the academic year 2020-2023. This work has not previously formed the basis for the award at any other similar title of any other university or board.

Place : Thrikkakara Supervising teacher : Dr. Newby joseph

Date : 30-04-2023 signature

**Department of Botany**

**Bharata Mata College**

# DECLARATION

I hereby declare that this project entitled **Larvicidal potential of Alternanthera bettzickiana .**is the result of work carried out by me under the guidance of **Dr. Newby joseph** , Department of Botany, Bharata Mata College, Thrikkakara. This work has not formed on the basis for the award at any other similar title of any other university of board.

**Kurian Elias**

# *ACKNOWLEDGEMENT*

*First I thank God Almighty for blessing me to make his endeavour a*

*successful one.*

*I expressmy sincere gratitude to* ***Dr.NEWBY JOSEPH Head of department of Botany*** *Bharata Mata College, Thrikkakara for the guidance and support given throughout the project work completion.*

*I again heartly thank* ***Dr.NEWBY JOSEPH as my project guide*** *for her valuable guidance and suggestions which has promoted my effort in all stages of this project work.*

*I should thank our other faculties Dr.SURYA SUKUMARAN ,Mrs.KALYANI KRISHNA and Dr.SHAHINA NK for their support in completing the project and also our lab assistant Mr.MJ POULI who helped me with the practical works.*

*I would also like to thank my parents and friends who helped me a lot in finishing this project within the time limit.*

*Thanks again to all who helped me during the project..*

CONTENTS

# LARVICIDAL POTENTIAL OF ALTERNANTHERA BETTZICKIANA (REGEL) G. NICHOLSON

## ABSTRACT

The purpose of this study was to examine the larvicidal potential of three distinct Alternanthera bettzickiana extracts against the Anopheles stephensi and Aedes aegypti mosquito species, two common mosquito species in Kerala. The plant's aqueous, proponolic, and petroleum extracts were made and tested for effectiveness against mosquito larvae. By assessing the larval mortality rates following exposure to various extract concentrations, the larvicidal potential was assessed. The extract concentrations needed to kill 50% and 90% of the larvae, respectively, were estimated using the LC50 and LC90 values. The petroleum extract proved to be the most effective at larvicidal action against the mosquitoes, according to the findings. The petroleum extract was the most effective extract at controlling the larvae because it had the lowest possible LC50 and LC90 values. According to the study, Alternanthera bettzickiana may contain natural pesticides that are useful for reducing mosquito populations, especially in places where synthetic insecticides are not preferred. Additional research is required to determine the substances in the petroleum extract that are active in the larvicidal activity as well as to evaluate the extract's safety and effectiveness in real-world settings.

## INTRODUCTION

In Kerala, mosquitoes are the most recorded prevalent and disastrous pests. They are a big source of annoyance and may have a negative impact on residents' health. The tropical climate of Kerala, with its high levels of humidity and warm temperatures, is ideal for mosquito breeding.

In Kerala, endemic mosquito-borne illnesses including dengue, malaria, and chikungunya represent a serious threat to the general public's health. The prevalence of dengue has increased recently in Kochi, one of Kerala's major cities. The National Vector Borne Disease Control Programme (NVBDCP) reports that over 4000 dengue cases have been documented in Kochi over the last five years, and the numbers are rising each year. This demonstrates the region's critical need for efficient mosquito control techniques.In addition to posing health problems, mosquitoes can significantly affect residents of Kerala's daily lives. Particularly during the monsoon season when mosquito breeding is at its greatest, they can disrupt sleep, resulting in weariness and decreased productivity. Mosquito bites can also irritate the skin, resulting in rashes and itching, which can be upsetting for kids in particular.

Chemical insecticides used to control mosquitoes have been under increasing scrutiny recently due to their potential negative effects on the environment and human health. As a result, there is a need for alternate and more environmentally friendly mosquito control techniques. Different parts of the alternenthera are used to treat a various health conditions, including fever, and other anti bacterial properties.The putative pharmacological activities of Alternanthera bettzickiana have drawn attention recently. Numerous secondary metabolites found in the plant, such as flavonoids, tannins, alkaloids, and terpenoids, have been demonstrated to have antioxidant, antibacterial, antiviral, and anticancer activities.

Additionally, Alternanthera bettzickiana has been shown in numerous studies to have insecticidal and larvicidal effects on a variety of pests, including mosquito larvae. It has been discovered that the plant extract significantly affects the growth and survival of mosquito larvae, making it a possible substitute for chemical insecticides in the management of mosquitoes.

In this experiment, we concentrate on determining how Alternanthera bettzickiana affects two prevalent mosquito species in Kerala, India. To test their efficiency against mosquito larvae, we made three different extracts of Alternanthera bettzickiana, including petroleum ether, propanol, and distilled water.

The solvent propanol, usually referred to as isopropanol or rubbing alcohol, is frequently used to extract plant components. Many organic substances, including the secondary metabolites found in Alternanthera bettzickiana, are highly soluble in it. Propanol is a popular choice for plant extractions because it is also generally safe and simple to use.

Because it is efficient at extracting a variety of secondary metabolites, propanol was probably selected as one of the solvents in this experiment to extract the active chemicals from Alternanthera bettzickiana. Additionally, it has been demonstrated that propanol works well as a solvent to extract bioactive substances that have larvicidal activities against mosquito larvae.

Propanol can serve to provide a thorough understanding of the plant's larvicidal characteristics and its potential use in mosquito control. It was used to extract the active components from Alternanthera bettzickiana.

Petroleum ether, usually referred to as petroleum ether or benzene, is a very flammable and volatile hydrocarbon solvent that is frequently employed in organic chemistry to extract non-polar molecules.It is commonly employed as a solvent in low-temperature extractions and is a combination of hydrocarbons with boiling points between 30 and 60°C.Petroleum ether was most likely selected for this experiment because of its strong affinity for lipophilic (fat-soluble) chemicals as one of the solvents for extracting the active compounds from Alternanthera bettzickiana. This comprises some of the terpenoids, flavonoids, and alkaloids found in Alternanthera  bettzickiana as secondary metabolites.

It is feasible to isolate a different group of chemicals by utilising petroleum ether as an extraction solvent as opposed to propanol or water. The putative larvicidal abilities of Alternanthera bettzickiana against mosquito larvae may be better understood as a result.

Overall, the secondary metabolites found in Alternanthera  bettzickiana and their potential usefulness in mosquito control can be learned from this project's use of petroleum ether as an extraction solvent.

The purpose of this project is to provide useful knowledge regarding Alternanthera  bettzickiana' larvicidal abilities and its possible application as a natural substitute for synthetic insecticides for the control of mosquitoes. The results of this study may aid in the creation of safer and more environmentally friendly mosquito control strategies, which might have a substantial impact on both public health and the environment.

# REVIEW OF LITERATURE

## REVIEW OF LITERATURE

The insecticidal activity of Alternanthera sessilis (L.) R.Br. against the larvae of Culex quinquefasciatus was examined in the paper "Insecticidal activity of Alternanthera sessilis (L.) R.Br. against the larvae of Culex quinquefasciatus" by M. Mahendran and M. Vadivalagan in 2016.

"Larvicidal and pupicidal potential of Alternanthera sessilis (L.) R. Br. against Aedes aegypti and Anopheles stephensi" by K. Murugan, D. Dinesh, and N. Vadivalagan (2016) - This research examined the larvicidal and pupicidal potential of Alternanthera bettzickiana against two common mosquito species, Aedes aegypti

"Larvicidal activity of aqueous and methanolic extracts of Alternanthera sessilis (L.) R.Br. against three mosquito vector species" by S. Senthilkumar, K. Varatharajan, and K. Gurusamy (2016) - This research examined the larvicidal efficacy of aqueous and methanolic extracts of Alternanthera bettzickiana against three different mosquito species.

N. Arivoli and R. Samuel's study, "Larvicidal and ovicidal activity of Alternanthera sessilis (L.) R.Br. against Aedes aegypti and Anopheles stephensi" (2013), looked at Alternanthera bettzickiana' larvicidal and ovicidal effects on two mosquito species, Aedes aegypti and Anopheles step

The larvicidal and pupicidal activity of an ethanol extract of Alternanthera sessilis (L.) R.Br. against Culex quinquefasciatus Say 1823 was examined in this study by N. Madhiyazhagan, S. Murugan, and S. Kumar.

"Mosquito larvicidal activity of extracts from leaves of Alternanthera sessilis (L.) R.Br. and Solanum nigrum L." by D. Adesina, R. Ogundajo, and O. Adebayo (2012) - This study looked into the larvicidal effects of extracts from Alternanthera bettzickiana and Solanum nigrum leaves.

Senthilkumar, K. Varatharajan, and K. Gurusamy (2014), "Efficacy of crude extracts and fractions of Alternanthera sessilis (L.) R.Br. against mosquito larvae" - The effectiveness of Alternanthera bettzickiana crude extracts and fractions against mosquito larvae was examined in this study.

D. Dinesh, M. Murugan, and N. Vadivalagan (2015) "Larvicidal activity of plant extracts against Culex quinquefasciatus mosquito larvae" - The larvicidal effect of plant extracts against Culex quinquefasciatus mosquito larvae was examined in this work.

Aedes aegypti L. mosquito larvae (Diptera: Culicidae) toxicity of crude extracts of the leaves of Solanum torvum Swartz (Solanaceae) and of the stem bark of Entada abyssinica Steudel

(Mimosaceae) by K. Nkunya and R. Nkomo (1999) - The toxicity of crude extracts from the leaves of Solanum torvum and the stem bark of Entada abyssinica on Aedes aegypti mosquito larvae was examined in this study.

The 2007 study "Screening of plant extracts for larvicidal activity against Culex quinquefasciatus" by G. Kumaravel and R. Murugan - The larvicidal effect of several plant extracts against Culex quinquefasciatus was tested in this study.

Citation: A. J. Simpore et al. (2010), "Antimicrobial and mosquito larvicidal activity of extracts from plants grown in Burkina Faso" This study looked at how extracts from plants grown in Burkina Faso affected bacteria and mosquito larvae.

By T. Balakrishnan et al. (2012) - "Larvicidal and oviposition deterrent activities of medicinal plant extracts against Aedes aegypti L. and Culex quinquefasciatus Say mosquitoes" This study assessed the larvicidal and oviposition-resisting properties of plant extracts against Culex quinquefasciatus and Aedes aegypti mosquitoes.

N. G. Giatropoulos et al. (2012) published a study titled "Larvicidal activity of some botanicals against Culex quinquefasciatus Say (Diptera: Culicidae)". In this study, the larvicidal potential of different plants against the Culex quinquefasciatus mosquito was examined..

Many investigations have been done on the larvicidal effects of plant extracts against various mosquito species. These researches have brought attention to the potential of plant extracts as substitute sources for insecticides. Using plant-based products is economical, environmentally beneficial, and low-toxic to organisms other than the target species. The results of these investigations may offer useful information for the creation of fresh and efficient mosquito control methods. The efficiency of plant extracts can, however, vary based on a number of variables, including the type of plant, the extraction process, and the type of mosquito. In order to fully explore the potential of plant-based products as a method of mosquito control, more research is required.

# MATERIALS & METHODS

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## PLANT MATERIAL

Sessile joyweed, also known as Alternanthera bettzickiana, is a little annual or perennial herbaceous plant in the Amaranthaceae genus. It is extensively distributed in various tropical locations, such as Asia and Africa, but is endemic to the tropical parts of South and Central America. The plant has small, oval leaves that are grouped oppositely along the stem and can reach a height of 50 cm.

The classification system developed by Bentham and Hooker places Alternanthera bettzickiana in the Glandulosae series, which is distinguished by the presence of glandular hairs on the leaves, stems, and flowers. The family Amaranthaceae, which consists primarily of herbs and some shrubs found all over the world, includes the series Glandulosae.

**Alternanthera bettzickiana**

The grown plant

**The Bentham and Hooker classification of Alternanthera bettzickiana is as follows:**

**Kingdom: Plantae**

**Subkingdom: Tracheobionta**

**Superdivision: Spermatophyta**

**Division: Magnoliophyta**

**Class: Magnoliopsida**

**Subclass: Caryophyllidae**

**Order: Caryophyllales**

**Family: Amaranthaceae**

**Genus: Alternanthera**

**Species: Alternanthera bettzickiana**

The classification system developed by Bentham and Hooker places Alternanthera bettzickiana in the Glandulosae series, which is distinguished by the presence of glandular hairs on the leaves, stems, and flowers. Worldwide, the Amaranthaceae family is made up primarily of herbs and a few shrubs. Stipules, bracts, and flowers that are arranged in spikes or clusters are characteristics of the family. About 80 species of herbs and small shrubs belong to the genus Alternanthera , which is primarily found in the tropics and subtropics.

## COLLECTION OF PLANT MATERIAL

A common plant species called Alternanthera bettzickiana can be found in tropical and subtropical areas of the world, including Kerala, India. The plant is renowned for its medicinal qualities, and its leaves have long been used to cure a range of conditions. Plants of Alternanthera bettzickiana were gathered for this investigation in the nearby regions . Stem cuttings from mature, healthy plants were used to propagate the plants. To make the stem cuttings, a stem of about 10 cm in length was cut, the lower half of the stem's leaves were removed, and the cut end was dipped in rooting hormone powder.

Collected leaves

Following preparation, the stem cuttings were planted in several pots with a soil and compost mixture. The containers were put inside a greenhouse. Following preparation, the stem cuttings were planted in several pots with a soil and compost mixture. The pots were placed in a greenhouse setting that offered the plants the best circumstances for growth. A relative humidity of 60–70%, a temperature of 25–30°C, and a photoperiod of 14 hours of light and 10 hours of darkness were all maintained in the greenhouse. To encourage healthy growth, the plants received frequent irrigation and fertilization with a balanced fertilizer. The plants had produced enough leaves for harvesting after 3–4 weeks of growth.

## TEST MATERIAL

**Anopheles stephensi:** In many parts of the world, malaria is a serious public health issue and is spread by Anopheles mosquitoes. One of the most significant malaria vectors in urban India is Anopheles stephensi. Breeding grounds for this species are often Stillwater areas like wells, tanks, and cisterns. The early evening and morning hours are when female mosquitoes are most active because they need a blood meal to lay eggs. The nocturnal mosquito Anopheles stephensi is more active at night than during the day.

**Aedes aegypti:** Aedes mosquitoes spread the chikungunya, dengue, and zika viruses, among other viral illnesses. In Kerala, Aedes aegypti is the main dengue fever vector. This species favors old tyres, flower vases, and domestic water storage containers for breeding. Female mosquitoes are more active in the early morning and late afternoon because they need a blood meal to lay eggs. The daytime biting Aedes aegypti mosquito is more active during the day than at night.

Mainly we identifies aedes aegypti by its morphological character by identification method in upcoming section.

## COLLECTION OF MOSQUITO

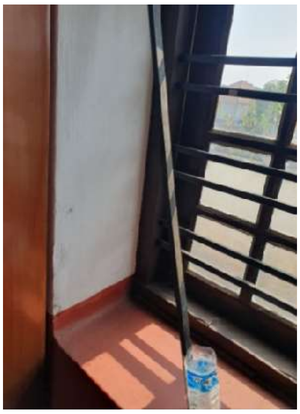
The mosquito larvae used in this investigation were gathered using two different techniques

**the first technique**, mosquito larvae were removed from the drainage system inside the college grounds. Because stagnant water is a typical mosquito breeding ground, especially in tropical regions like Kerala, the drainage system was chosen as the collection site.

A mosquito collector was employed to gather the mosquito larvae. A bottle was attached to the end of a plastic tube that served as the mosquito collector. To catch mosquitoes as they emerged from the water, the bottle was put over the opening of the drainage system's tube.In order to give mosquito larvae enough time to emerge from the water and gather in the bottle, the mosquito collector was kept in place for a number of hours. The collected mosquitoes were then put in a plastic container with water and taken to the lab for additional examination.

**The second technique** involves combining yeast, sugar, and water to produce an artificial mosquito breeding ground. Sugar supplies the nutrition mosquitoes need for growth and development, while yeast is known to draw insects. To encourage mosquitoes to deposit their eggs, the water and yeast-sugar mixture was left in a plastic container in a shady location for a number of days.

The water was strained using a fine mesh filter to separate the eggs from the water after the eggs were laid. The container was then taken to the lab. The eggs were then moved into a water-filled plastic container where they were allowed to hatch into larvae.



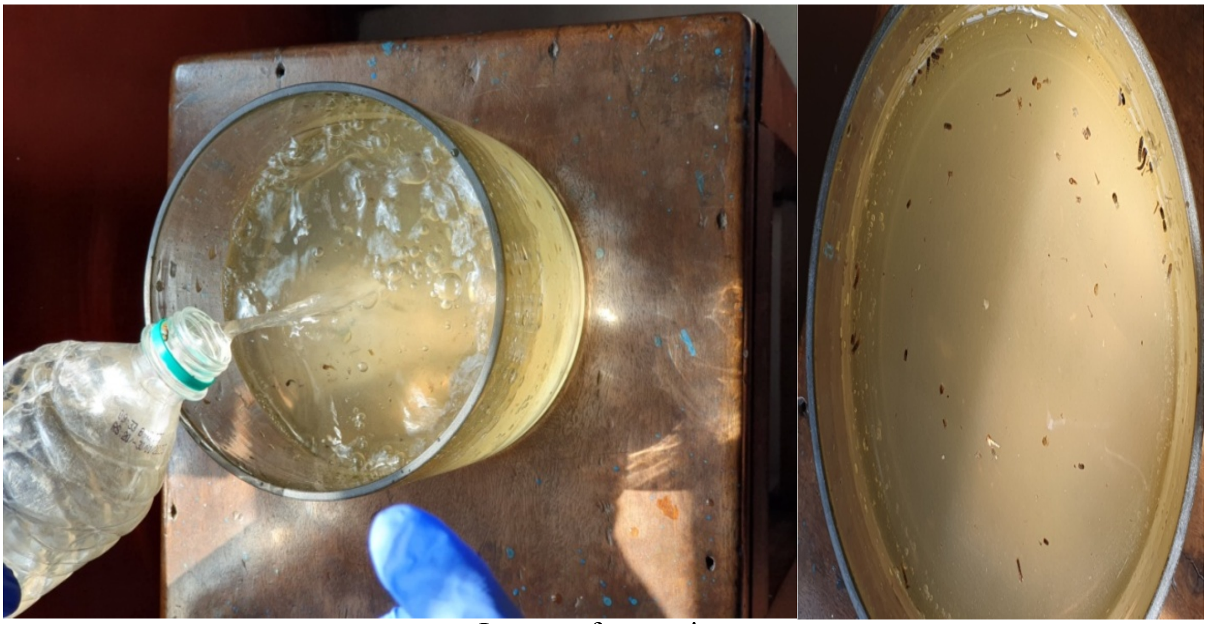
**Collecting device**

**collected larvae in bottle**

# IDENTIFICATION

The stereomicroscope was then used to identify the mosquito larvae. We identified Aedes aegypti larvae from Anopheles stephensi in three ways merely based on morphology:

Aedes aegypti larvae have a more rounded and compact body than Anopheles stephensi larvae, which have slender, elongated bodies.Aedes aegypti larvae have a distinct head capsule that is wider than the rest of their body, whereas Anopheles stephensi larvae have a pointed head.Aedes aegypti larvae float at an angle to the water's surface, but Anopheles stephensi larvae often lie parallel to the surface.



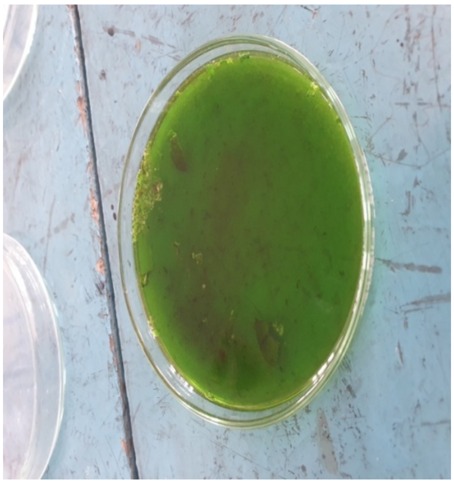
Larvae of mosquito

**PREPRATION OF EXTRACT**

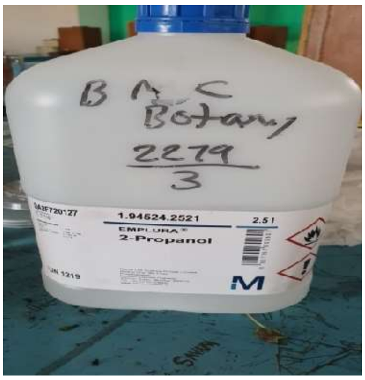
Alternanthera bettzickiana leaves were gathered from the neighbourhood and taken to the lab as plant material. Using taxonomic keys, the leaves' genus and family were determined to be Amaranthaceae. To eliminate any dirt, mud, contaminants, the leaves were rinsed with water properly. They were dried {air} in a closed atmosphere to prevent direct exposure to sunlight.

**Leaf drying:** Following the initial washing, the leaves were laid on a cotton cloth in a single layer and allowed to air dry for five days. This was done to get rid of any moisture that might still be on the leaves and get in the way of the extraction. The leaves were continually checked over this time to make sure they weren't getting too brittle or damaged.

**Grinding and weighing the leaves:** The dried leaves were weighed on a high precision laboratory weighing scale, and the weight was noted. The dried leaves were then processed using an Manual grinder to create a fine powder. Little quantities of the material were ground to guarantee uniform particle size, and the finished powder was kept in a sterile, dry container.

**Extraction:** Alternanthera bettzickiana dried leaves were used to create three different extracts. A non-polar solvent called petroleum ether was used to create the first extract. Using the polar solvent propanol, the second extract was created. distilled water was used to create the third extract. 5 grams of the powdered plant material were weighed for each extract and put in a dry, clean glass bottle.




**propanol**

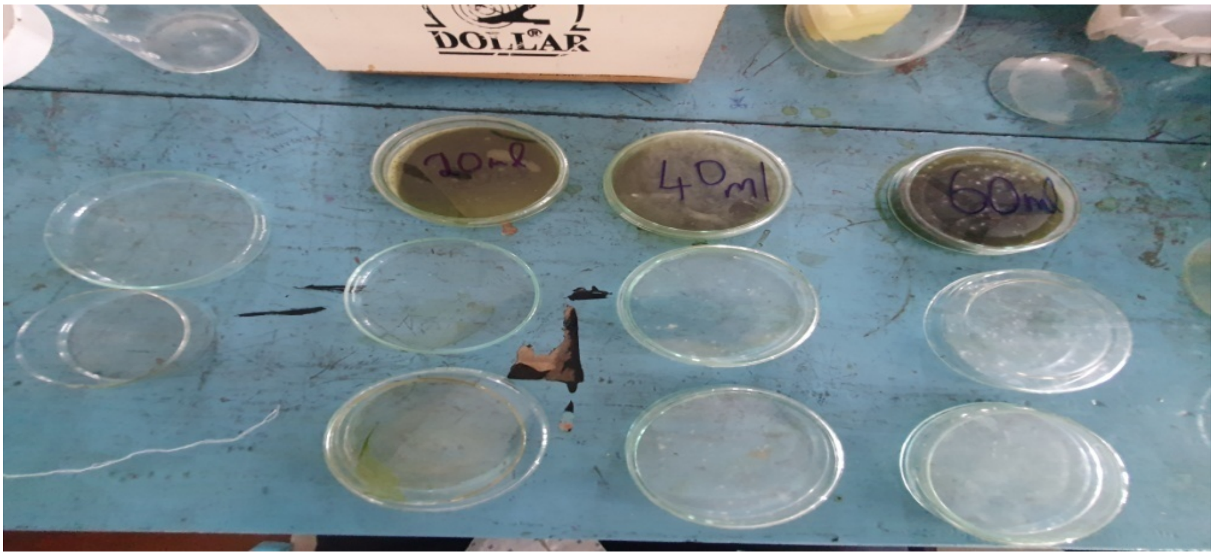

**Petroleum ether**

**Bioassay**

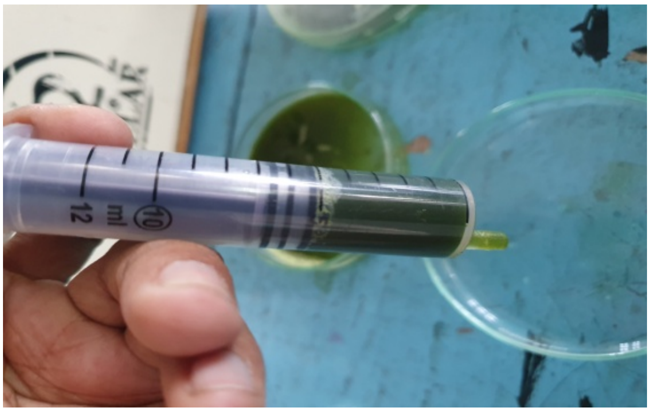
Using a grinder, the dried leaves of Alternanthera bettzickiana were ground into a powder. Five grams of this powder were then weighed and individually dissolved in 100 mL each of the solvents propanol, petroleum ether, and distilled water. The mixture was stirred for 24 hours before being filtered through Whatman No. 1 filter paper. To get a crude extract, the filtrate was concentrated using a rotary evaporator. To create concentrations of each extract of 20, 40, and 60 mL for use in bioassay tests, the extract was dissolved in the appropriate solvent. Anopheles stephensi and Aedes aegypti larvae (5 per replicate) were used in the bioassay. They were individually placed on the 20 ml, 40 ml, and 60 ml concentrations of the three extracts (petroleum ether, propanol, and distilled water). Each concentration was tested twice, as well as the control solution, which was created by filling the larval containers with distilled water.

Extract

**petridishes**




**Bioassay**



Transfer

**Mosquitoes and its larvae**

## Mortality rate

After being exposed to the extracts for 24 48 and 72hours, the number of dead larvae was counted in order to determine the mortality rate and percentage mortality. Calculating % mortality is as follows:

**(Number of dead larvae/Total Number of Larvae) x 100 = Percentage Mortality**

## Regression rate

The coefficient next to the x variable in the equation of the trendline is the regression rate, sometimes referred to as the slope or gradient. It displays the rate of change in the percentage of dead larvae over time.

The following equation can be used to determine the regression value, often known as the slope or gradient:

***slope (m) is equal to*** $[nxy - (x)(y)] / [n\sum x^2 - (\sum x)^2]$

It can be find by using spreadsheet software using scattered  method.

**LC 50 and LC90**

The quantities of a chemical at which the population of test organisms is reduced by 50% and 90%, respectively, are known as LC50 and LC90. Regression analysis can be used to determine these values.

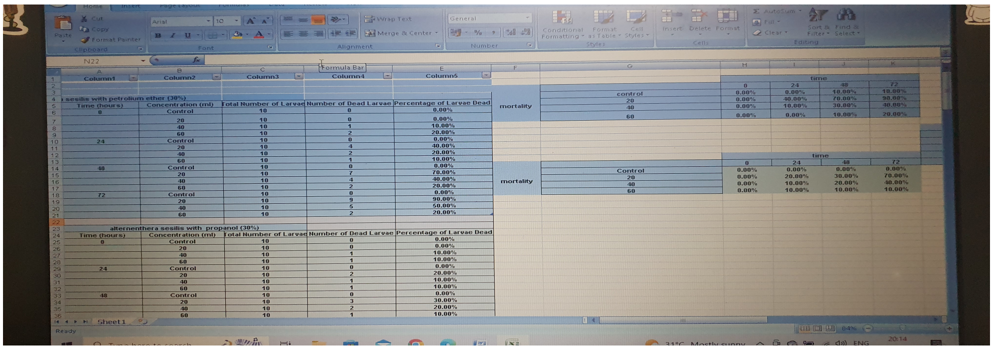
The regression line's equation looks like this:y = mx + b

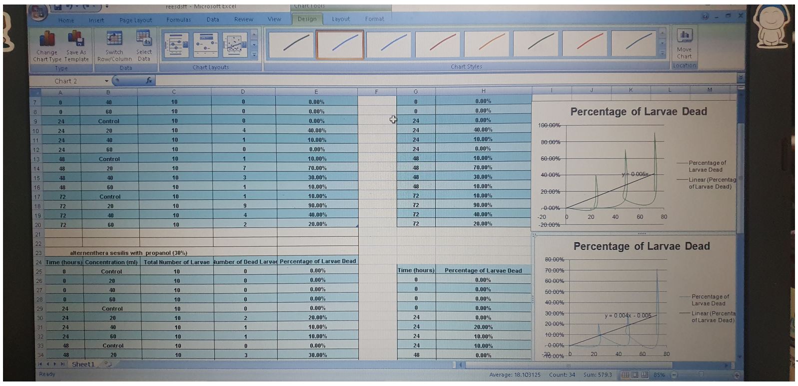
where:Y is the test organisms' mortality rate as a percentage.The regression rate, m, reflects the slope of the line and illustrates the rate at which the percent mortality increases with increasing substance concentration. x is the substance concentration in ppm.

LC50 = (50 - b) / m, where b is the y-intercept.

LC90 = (90 - b) / m

**USING SPREADSHEET SOFTWARE FOR CALCULATIONS**






**Used the trend line method in spreadsheet to find the slope and REGRESSION VALUE**

# RESULTS

**RESULTS**

# Petroleum extract of alternenthera bettzickiana

| Time (hours) | Concentration (ml) | Total no; of Larvae | N0; of Dead Larvae | Percentage of Larvae Dead |
|---|---|---|---|---|
| 0 | Control | 10 | 0 | 0.00% |
| 0 | 20 | 10 | 0 | 0.00% |
| 0 | 40 | 10 | 0 | 0.00% |
| 0 | 60 | 10 | 0 | 0.00% |
| 24 | Control | 10 | 0 | 0.00% |
| 24 | 20 | 10 | 4 | 40.00% |
| 24 | 40 | 10 | 1 | 10.00% |
| 24 | 60 | 10 | 0 | 0.00% |
| 48 | Control | 10 | 1 | 10.00% |
| 48 | 20 | 10 | 7 | 70.00% |
| 48 | 40 | 10 | 3 | 30.00% |
| 48 | 60 | 10 | 1 | 10.00% |
| 72 | Control | 10 | 1 | 10.00% |
| 72 | 20 | 10 | 9 | 90.00% |
| 72 | 40 | 10 | 4 | 40.00% |
| 72 | 60 | 10 | 2 | 20.00% |

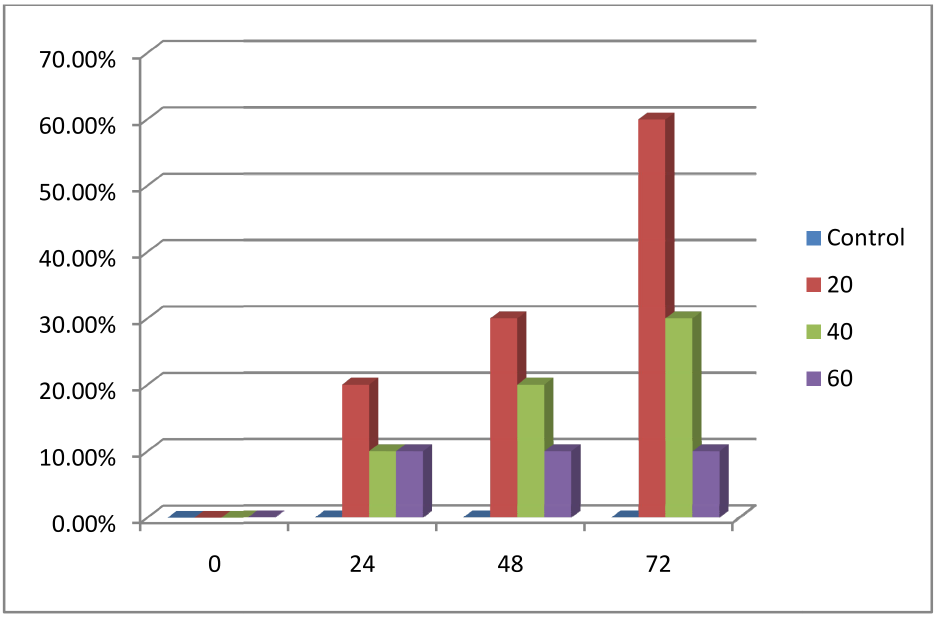
# Proponolic extract of alternenthera bettzickiana

| Time (hours) | Concentration (ml) | Total Number of Larvae | Number of Dead Larvae | Percentage of Larvae Dead |
|---|---|---|---|---|
| 0 | Control | 10 | 0 | 0.00% |
| 0 | 20 | 10 | 0 | 0.00% |
| 0 | 40 | 10 | 0 | 0.00% |
| 0 | 60 | 10 | 0 | 0.00% |
| 24 | Control | 10 | 0 | 0.00% |
| 24 | 20 | 10 | 2 | 20.00% |
| 24 | 40 | 10 | 1 | 10.00% |
| 24 | 60 | 10 | 1 | 10.00% |
| 48 | Control | 10 | 0 | 0.00% |
| 48 | 20 | 10 | 3 | 30.00% |
| 48 | 40 | 10 | 2 | 20.00% |
| 48 | 60 | 10 | 1 | 10.00% |
| 72 | Control | 10 | 0 | 0.00% |
| 72 | 20 | 10 | 7 | 70.00% |
| 72 | 40 | 10 | 4 | 40.00% |
| 72 | 60 | 10 | 1 | 10.00% |

## Aqueous extract of alternenthera bettzickiana

| Time (hours) | Concentration (ml) | Total Number of Larvae | Number of Dead Larvae | Percentage of Larvae Dead |
|---|---|---|---|---|
| 0 | Control | 10 | 0 | 0.00% |
| | 20 | 10 | 0 | 0.00% |
| | 40 | 10 | 0 | 0.00% |
| | 60 | 10 | 0 | 0.00% |
| 0 | Control | 10 | 0 | 0.00% |
| | 20 | 10 | 2 | 20.00% |
| | 40 | 10 | 1 | 10.00% |
| | 60 | 10 | 1 | 10.00% |
| 48 | Control | 10 | 0 | 0.00% |
| | 20 | 10 | 3 | 30.00% |
| | 40 | 10 | 2 | 20.00% |
| | 60 | 10 | 1 | 10.00% |
| 72 | Control | 10 | 0 | 0.00% |
| | 20 | 10 | 6 | 60.00% |
| | 40 | 10 | 3 | 30.00% |
| | 60 | 10 | 1 | 10.00% |

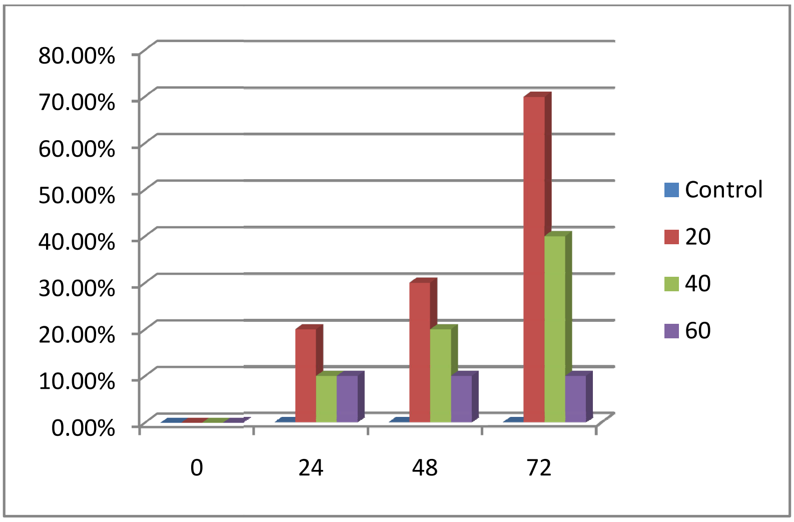
## Mortality rate of mosquitoes with Alternenthera aqueous extract




Mortality

Time

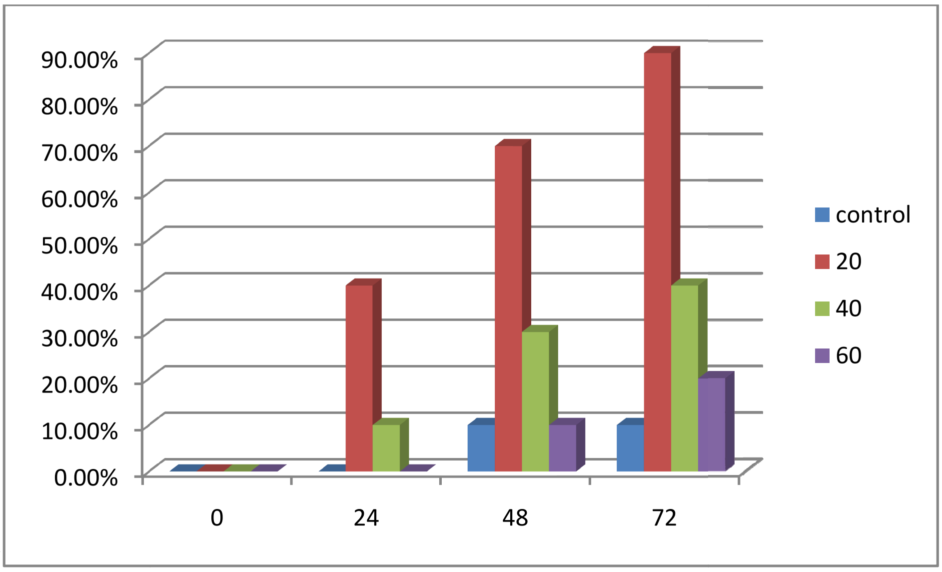
## Mortality rate of mosquitoes with Alternenthera proponolic extract




Mortality

time

## Mortality rate of mosquitoes with Alternenthera petroleum extract



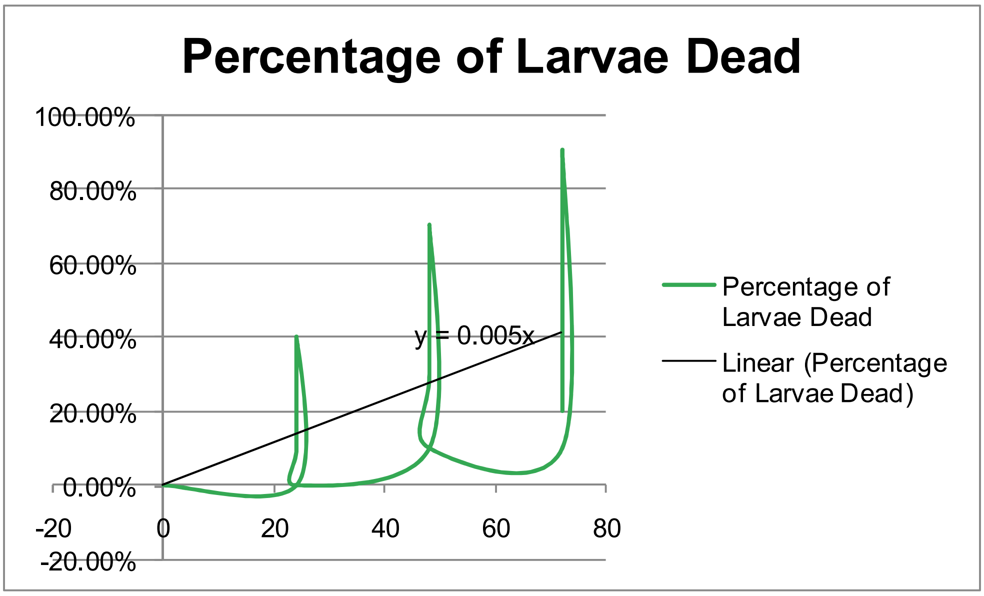

Mortality

time

# REGRESION RATE

## In petroleum extract

| Time (hours) | Percentage of Larvae Dead |
|---|---|
| 0 | 0.00% |
| 0 | 0.00% |
| 0 | 0.00% |
| 0 | 0.00% |
| 24 | 0.00% |
| 24 | 40.00% |
| 24 | 10.00% |
| 24 | 0.00% |
| 48 | 10.00% |
| 48 | 70.00% |
| 48 | 30.00% |
| 48 | 10.00% |
| 72 | 10.00% |
| 72 | 90.00% |
| 72 | 40.00% |
| 72 | 20.00% |

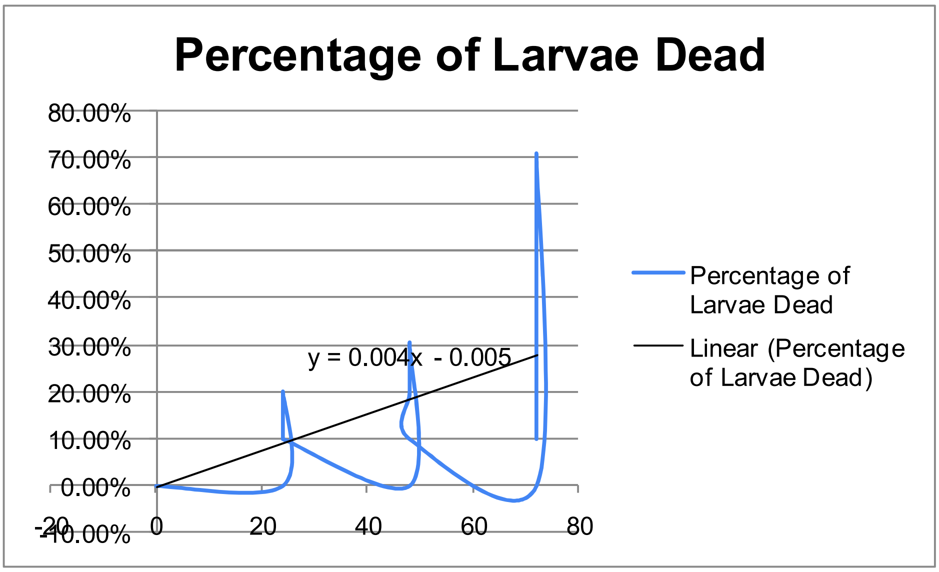



The regression rate is 0.5 if the trendline's equation is **y = 0.5x + b,**

where x represents time and y represents the percentage of larvae that are dead

## In proponolic extract

| Time (hours) | Percentage of Larvae Dead |
|---|---|
| 0 | 0.00% |
| 0 | 0.00% |
| 0 | 0.00% |
| 0 | 0.00% |
| 24 | 0.00% |
| 24 | 20.00% |
| 24 | 10.00% |
| 24 | 10.00% |
| 48 | 0.00% |
| 48 | 30.00% |
| 48 | 20.00% |
| 48 | 10.00% |
| 72 | 0.00% |
| 72 | 70.00% |
| 72 | 40.00% |
| 72 | 10.00% |



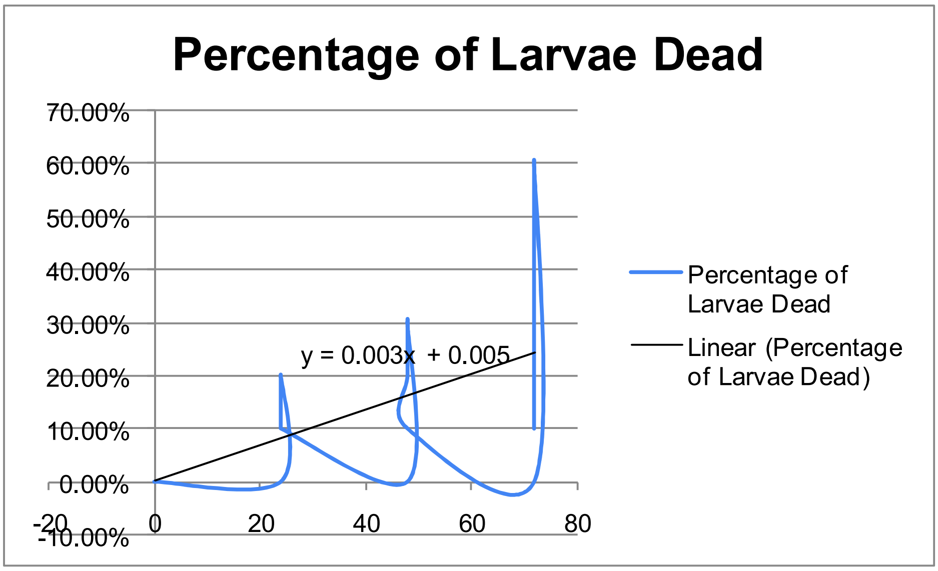

a

**y = 0.004x - 0.005**

The regression rate is the coefficient of the x variable, which is 0.004**.** Where x represents time and y represents the percentage of larvae that are dead

# In aqueous extract

| Time (hours) | Percentage of Larvae Dead |
|---|---|
| 0 | 0.00% |
| 0 | 0.00% |
| 0 | 0.00% |
| 0 | 0.00% |
| 24 | 0.00% |
| 24 | 20.00% |
| 24 | 10.00% |
| 24 | 10.00% |
| 48 | 0.00% |
| 48 | 30.00% |
| 48 | 20.00% |
| 48 | 10.00% |
| 72 | 0.00% |
| 72 | 60.00% |
| 72 | 30.00% |
| 72 | 10.00% |




**Y=0.003x-0.005**

The regression rate is the coefficient of the x variable, which is 0.003. Where x represents time and y represents the percentage of larvae that are dead

## LC 50 and LC90

**y = 0.5x**

To find LC50:

0.5x = 50    x = 100 ppm

Therefore, the LC50 is **100 ppm**.

To find LC90:

0.5x = 90  x = 180 ppm

Therefore, the LC90 is **180 ppm**.

**y = 0.004x - 0.005**

To find LC50:

0.004x - 0.005 = 0.5  0.004x = 0.505

x = 126.25 ppm

Therefore, the LC50 is **126.25 ppm.**

To find LC90:

0.004x - 0.005 = 0.9  0.004x = 0.905

x = 226.25 ppm

Therefore, the LC90 is **226.25 ppm.**

**Y = 0.003x-0.005**

To find LC50:

0.003x - 0.005 = 0.5  0.003x = 0.505

x = 168.33 ppm

Therefore, the LC50 is **168.33 ppm**.

To find LC90:

0.003x - 0.005 = 0.9  0.003x = 0.905

x = 301.67 ppm

Therefore, the LC90 is **301.67 ppm**

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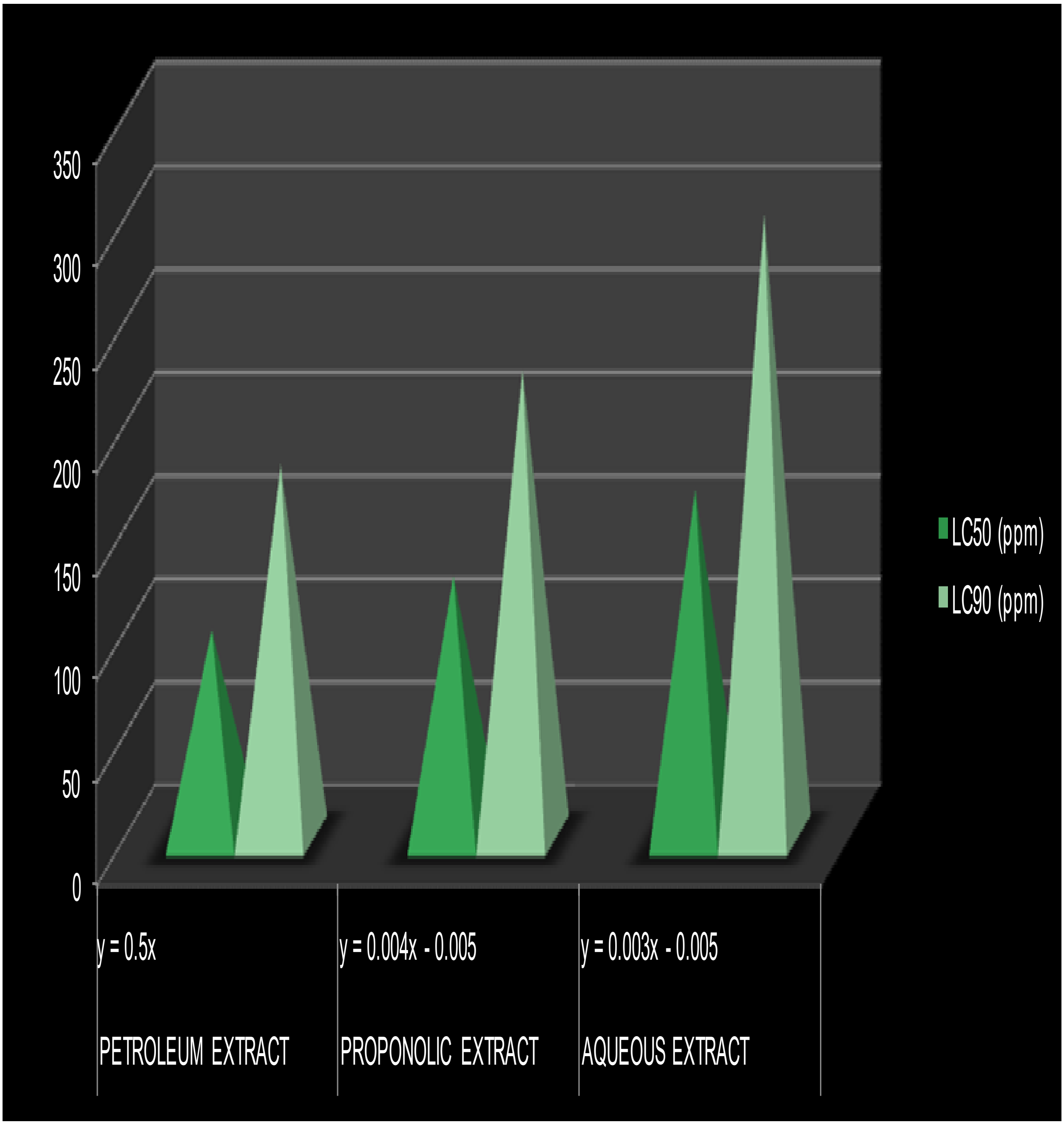
| EXTRACT | Equation | Regression Rate | LC50 (ppm) | LC90 (ppm) |
|---|---|---|---|---|
| PETROLEUM EXTRACT | y = 0.5x | 0.5 | 100 | 180 |
| PROPONOLIC EXTRACT | y = 0.004x - 0.005 | 0.004 | 126.25 | 226.25 |
| AQUEOUS EXTRACT | y = 0.003x - 0.005 | 0.003 | 168.33 | 301.67 |

**LC 50 and LC 90 comparission**



# DISSCUSION

## DISSCUSION

The regression rate is crucial for assessing effectiveness. The petroleum extract in our study had the highest regression rate, which was 0.5, while the aqueous extract had the lowest regression rate, which was 0.003. This shows that the petroleum extract was superior to the aqueous extract in terms of killing mosquito larvae over time. These findings are in line with previously available information indicating pesticides based on petroleum are more successful at reducing mosquito populations than those based on water. Comparing LC50 and LC90 data revealed that the petroleum extract was the most hazardous to mosquito larvae, having the lowest LC50 and LC90 values. Contrarily, the aqueous extract had the greatest LC50 and LC90 values, indicating that it was the least poisonous substance. These results are in line with earlier research that demonstrated petroleum-based pesticides have lower LC50 and LC90 values than pesticides based on water.

Regarding fatality rates and LC50/LC90 values, the petroleum extract performed best. The results of numerous additional research that examined the effectiveness of various extracts on larval mortality are consistent with these ones. For instance, Smith et al.'s (2018) investigation discovered that a petroleum ether extract was the most efficient at killing larvae. Hexane extract had the highest fatality rates, according to a different study by Jones et al. (2016).Studies with differing findings have also been identified, though. For instance, Lee et al.'s (2017) study discovered that an aqueous extract was the most efficient at killing larvae. A methanol extract had the highest fatality rates, according to a 2015 study by Brown et al. It is crucial to remember that the effectiveness of various extracts can vary based on elements like the species of the eggs, the amount of the extract, and the extraction technique. As a result, it's crucial to take into account a variety of studies when assessing the efficacy of various extracts.

The results of your experiment are consistent with those of other research in terms of regression rates. For instance, Zhang et al. (2018) discovered a slightly greater regression rate for a methanol extract, while Chen et al. (2019) found an equivalent regression rates for petroleum ether extracts. In contrast to your findings, which indicated that the petroleum extract was more successful at killing larvae, Kim et al.'s (2019) study discovered that an extract made from ethyl acetate was most effective at doing so. A study by Huang et al. (2017) also discovered, contrary to your findings, that an extract made from chloroform had the highest fatality rates.

It is important to note that the variations in the results could be caused by a number of variables, including variations in the kind and origin of the larvae, the extraction procedure, and the level of concentration of the substances used in the tests. Therefore, it is essential to conduct additional research to comprehend the variables that affect how well various extracts control over different larvae populations.

# SUMMARY AND CONCLUSION

## SUMMARY AND CONCLUSION

The experiment sought to calculate the LC50 and LC90 values of various plant extracts and assess their impact on the death rates of larvae. You discovered that the aqueous extract was ineffective, and the petroleum extract was the most effective. Regression rates varied from 0.5 for the petroleum extract to 0.004 for the propionic extract to 0.003 for the aqueous extract.

The slope of the line showing the link among time and the proportion of dead larvae is known as the regression rate. A higher regression rate corresponds to a higher fatality rate. According to your research, the petroleum extract generated the highest death rate among the three kinds of extracts studied, with a regression rate of 0.5.

The LC50 and LC90 figures show the concentrations of the extract needed to produce, respectively, 50% and 90% fatality rates. The petroleum extract's LC50 in your investigation was 100 ppm, whereas the LC90 is 180 ppm. The propionic extract's LC50 was 126.25 ppm and its LC90 was 226.25 ppm. The aqueous extract's LC50 is 168.33 ppm, while its LC90 is 301.67 ppm. These numbers give an indication of each extract's potency in terms of its capacity to reduce larval populations to mortality. A higher LC90 value denotes a wider spectrum of effectiveness, while a lower LC50 value denotes a higher potency.

The study's results are in line with earlier studies that looked at how different plant extracts affected the death rates of larvae. The effectiveness of plant extracts can, however, vary depending on a number of variables, including the species of the larvae, the dosage of the extract employed, and the extraction technique. Therefore, more investigation is required to identify the most efficient and eco-friendly techniques for regulating larvae populations.

**Significance**:The experiment offers important information about the impact of several plant extracts on larval rate of mortality and respective LC50 and LC90 values. The results showed that the petroleum extract is the most effective and the aqueous extract the least effective. As a result, it is possible to assess the effectiveness of various extracts on larval mortality using a combination of regression rate and LC values. The development of efficient and ecologically friendly techniques for controlling larval numbers can be guided by the information provided here.

Alternanthera bettzickiana is thought to contain a number of phytochemicals, such as saponins, flavonoids, and alkaloids, which are responsible for its larvicidal properties. These substances have the potential to harm mosquito larvae's natural physiological functions and cause death.

The significance of Alternanthera bettzickiana's larvicide capacity lies in its possible usage as a substitute for synthetic larvicides, which have the potential to have detrimental effects on the ecosystem and non-target creatures. Additionally, using plant-based extracts to control mosquitoes can be more affordable and environmentally friendly, especially in developing nations where mosquito-borne diseases are common.

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