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Evaluating the Effect of African Basil, Garlic Vine, Lemongrass, and Moringa Extracts on *Aedes aegypti* Larval Stage: A Sustainable and Natural Method

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Abstract

Millions of people suffer from mosquito-borne infections yearly, including dengue fever, chikungunya, and the Zika virus. All these infections pose great threats to global health. The main vector population requires careful management to prevent its spread. This study delves into the larvicidal activity of hexanolic extracts prepared from different plants as a measure of controlling and reducing the larval population of *Aedes aegypti* (Linnaeus) in New Delhi, India. Some of the plants explored in this study include African basil, garlic vine, lemongrass, and moringa leaves. The WHO standard protocol was used for the evaluation of the larvicidal activity of various plant extracts. All the plants were potent and excellent against *Aedes aegypti* larvae, with the cidal activity ranging from 10.503 ppm to 6.376 ppm. The LC_{50} of *Cymbopogon citratus* was 10.503 ppm after exposure for 24h and decreased to 1.924 ppm after 48h. Among the four plants tested in this experiment, *Cymbopogon citratus* was 3.92 fold more effective than *Moringa oliefera*, 5.73 fold more effective than *Ocimum gratissimum*, and 5.94 fold effective than *Mansoa alliacea* within the 24h exposure period. With emphasis on the development of natural measures to control mosquitoes, the present study intends to design novel and efficient methods to manage mosquitoes and also reduce disease transmission. The findings of this research might provide the reader with insight into the development of new insightsand applications of plant-based larvicides, creating eco-friendly means of controlling mosquito populations and conserving these populations from spreading hazardous diseases.

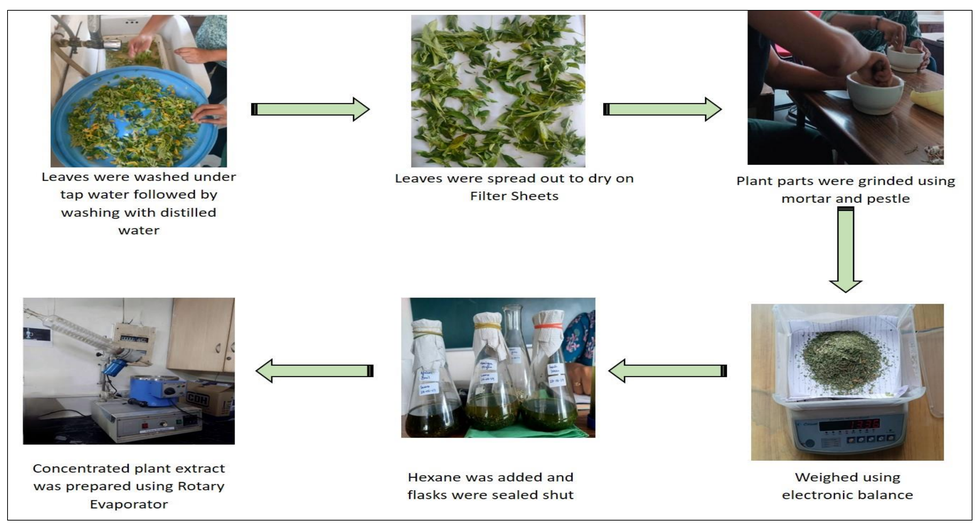
Highlights:

- Vector-borne diseases such as malaria, dengue, and yellow fever cause over 700,000 deaths annually and account for 17% of all infectious diseases.
- These diseases disproportionately affect poor populations in tropical and subtropical regions, where healthcare systems are often inadequate.
- Urbanization, globalization, climate change, and poor sanitation have expanded vector habitats and prolonged transmission seasons. Slum growth, inadequate sewage systems, and improper waste management further increase disease risk.
- Plant-based larvicides offer an eco-friendly, biodegradable, and low-resistance alternative to synthetic insecticides.
- This study utilized extracts from lemongrass (*Cymbopogon*), African basil (*Ocimum gratissimum*), moringa (*Moringa oleifera*), and garlic vine (*Mansoa alliacea)*.
- Using common solvents like hexane and ethanol, this study demonstrates a simple, low-cost approach to larval control of *Aedes aegypti*. By targeting the larval stage, this method can help reduce adult mosquito populations and disease transmission.

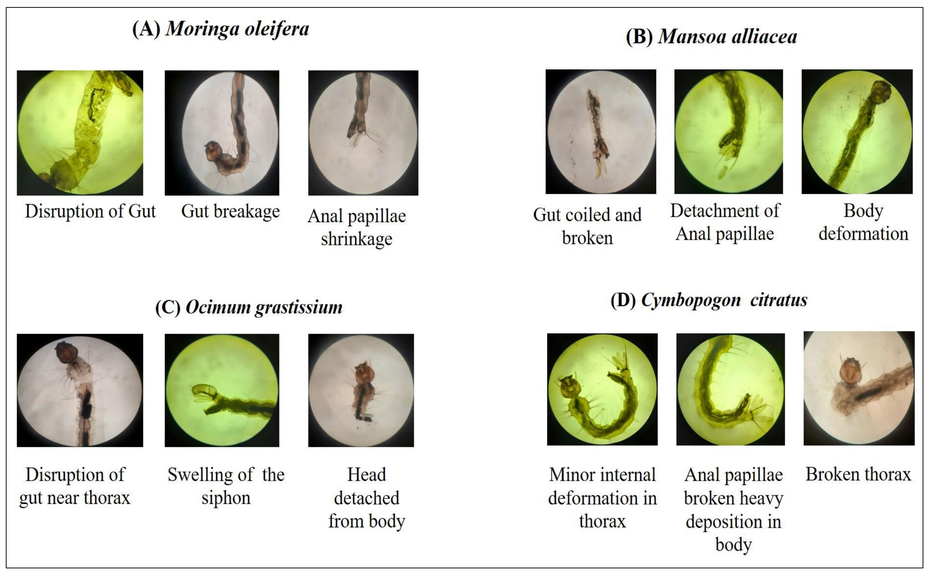
Materials and Methodology

Schematic diagram showing the process of formation of plant extracts

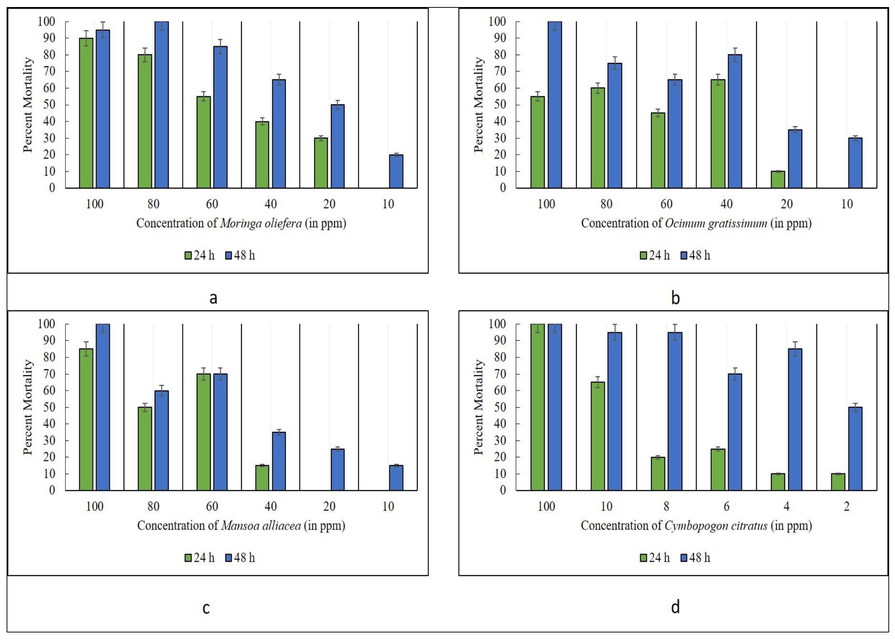
Plant used in the current study		Family
Cymbopogon citratus		Poaceae
Moringa oliefera		Moringaceae
Mansoa alliacea		Amaryllidaceae
Ocimum gratissimum		Lamiaceae



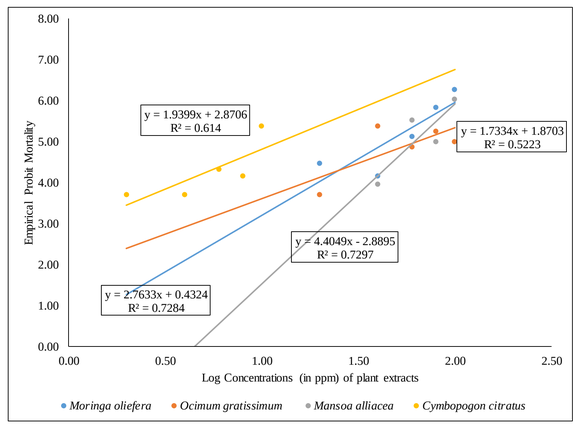
Results and Discussion

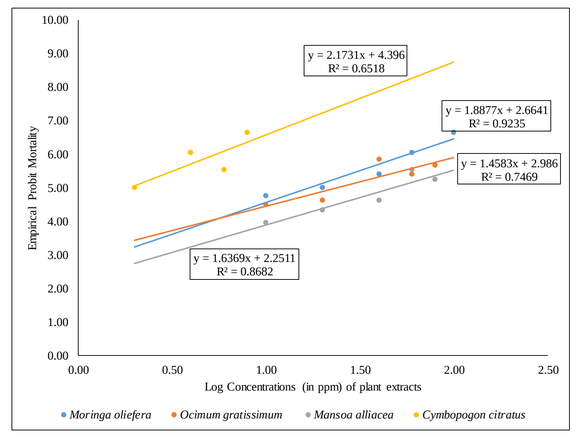


Morphological Changes observed in *Aedes aegypti* early fourth instars after 24 h of exposure with 1000ppm (A) *Ocimum gratissimum*, (B) *Mansoa alliacea*, (C) *Cymbopogon citratus* (D) *Moringa oleifera*.



Percent mortality after exposure to different concentration (in ppm) of hexanolic extract of leaves of (a) *Moringa oliefera*, (b) *Ocimum gratissimum* (c) *Mansoa alliacea* (d) *Cymbopogon citratus* at 24h and 48h





Dosage-mortality regression lines obtained when larvae of *Aedes aegypti* exposed to different dose of different plant extracts for 24h & 48h

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