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Microbiology

DEVELOPMENT OF PLANT-BASED LARVICIDE POWDER AGAINST MOSQUITO LARVAE

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ABSTRACT Mosquitoes are major vectors responsible for the transmission of several life-threatening diseases, including malaria, dengue, yellow fever, and filariasis. Conventional chemical larvicides, though effective, pose significant risks to the environment and human health. In this study, plant-based larvicide powders were developed using extracts from *Ocimum basilicum*, *Murraya koenigii*, *Annona squamosa*, *Musa paradisiaca*, *Cynodon dactylon*, and *Lantana camara*, collected from various regions in Coimbatore, Tamil Nadu. The plant materials were shade-dried, powdered, and extracted using methanol and chloroform via Soxhlet extraction. The larvicidal activity was evaluated against mosquito larvae, including *Aedes aegypti*, *Anopheles stephensi*, and *Culex quinquefasciatus*. Results demonstrated a dose-dependent increase in larval mortality, confirming the efficacy of the plant-based formulation. Phytochemical analysis revealed the presence of bioactive compounds like flavonoids, saponins, alkaloids, and terpenoids. The formulation was found to be eco-friendly, cost-effective, and safe for non-target organisms, offering a sustainable alternative to synthetic pesticides.

KEYWORDS : *Mosquito larvae, Larvicide powder, Plant extracts, Vector control, Eco-friendly larvicides.*

INTRODUCTION

Mosquitoes belong to the family of arthropods and are mainly responsible for the spread of many diseases. Vector-borne diseases remain a major health problem in both humans and animals. Diseases caused by mosquitoes include malaria, dengue, hemorrhagic fever, yellow fever and filariasis. One to two million deaths are reported annually due to malaria and dengue worldwide. Disease transmission can be interrupted by controlling the vectors using various methods. The use of artificial pesticides in the water has many risks to people and the environment. Natural extracts of plants with insecticidal properties have been tried recently for the control of a variety of insect pests and vectors. Mosquitoes in the larval stage are attractive targets for pesticides because mosquitoes breed in water, and thus, it is easy to deal with them in this habitat. Many researchers have reported on the effectiveness of plant extracts against mosquito larvae. Many studies on plant extracts against mosquito larvae have been conducted around the world. The plant extracts of Ocimum basilicum(Basil plant), Murraya koenigii(Curry leaf tree), Annona squamosa(Custard apple), Musa paradisiaca(banana), Cynodon dactylon(Bermuda grass), and Lantana camara(Common Lantana) are used to make powder and tested against the mosquito larvae.

METHODOLOGY

1. Collection Of Plant Materials:

The leaves of Ocimum basilicum (Basil plant), Murraya koenigii (Curry leaf tree), Annona squamosa (Custard apple), Cynodon dactylon (Bermuda grass), flowers of Musa paradisiaca (Banana), and the plant of Lantana camara (Common Lantana) were collected from different areas of Coimbatore, Tamil Nadu.

2. Preparation Of Plant Extract:

The collected leaves were washed with tap water and dried. The washed leaves were shade-dried at room temperature (27- 35oC) for 7-15 days. The shade drying process is done only in the daytime. Using an electrical stainless-steel blender, the shade-dried plant materials were finely ground (Powder). The extract was made with methanol (100 mL) and chloroform (100 mL) in a soxhlet apparatus (boiling point range 60-80oC) for 8 hours. The obtained residue taken from the solvent extract was stored at 4oC. One gram of crude extract was first dissolved in 100mL of acetone (stock solution). From the stock solution,100-0.31µg/mL were prepared with dechlorinated tap water. Polysorbate 80 was used as an emulsifier at the concentration of 0.05% in the final test solution. The control was set up with acetone, dechlorinated tap water, and polysorbate 80.

3. Mosquito Culture:

The different types of mosquito larvae were collected from various sewage areas of Coimbatore. Pupae were transferred to the cup containing tap water.

4. Larvicidal Bioassay:

For the bioassay test, larvae were taken in five batches of twenty in 249mL of water and 1mL of the desired plant extract concentration. The control was set up with acetone and polysorbate 80. The numbers of dead larvae were counted after 24 hours of exposure, and the percentage mortality was reported from the average of five replicates.

RESULT

Effective Larvicidal Activity: The plant-based larvicide powder showed significant larvicidal activity against mosquito larvae, particularly targeting species like *Aedes aegypti*, *Anopheles stephensi*, or *Culex quinquefasciatus*. A dose-dependent mortality rate is anticipated, with higher concentrations leading to increased larval mortality within 24–72 hours.

Identification of Active Phytochemicals: Phytochemical screening of the plant extracts used in the powder revealed the presence of bioactive compounds such as alkaloids, saponins, flavonoids, and terpenoids, which are responsible for the larvicidal effect.

Eco-friendly and Non-toxic Formulation: The formulation is to be biodegradable, environmentally friendly, and non-toxic to non-target organisms such as fish, aquatic insects, and humans.

Prolonged Shelf Life and Stability: The larvicide powder is to retain its potency and effectiveness over an extended period under proper storage conditions.

Comparison with Chemical Larvicides: The plant-based larvicide shows comparable or superior effectiveness compared to synthetic larvicides, with fewer side effects or resistance issues.

Cost-effectiveness and Local Availability: The use of locally available plant materials may result in a cost-effective alternative to chemical larvicides, especially for use in rural or resource-limited settings.

CONCLUSION

If field trials are conducted, a significant reduction in mosquito larval population in treated water bodies is expected over a short period.

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