*Biochem. Cell. Arch.* Vol. 23, No. 2, pp. 671-683, 2023 | DOI: https://doi.org/10.51470/bca.2023.23.2.671 | *ISSN* 0972-5075
**DocID**: https://connectjournals.com/03896.2023.23.671 | Crossref | *eISSN* 0976-1772

# BENEFITS OF BOTANICAL BASED INSECTICIDES AGAINST MOSQUITOES : A REVIEW

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**(Received 12 August 2023, Revised 1 September 2023, Accepted 10 September 2023)**

**ABSTRACT : The mosquito is an arthropod vector spread life-threatening disease. It is responsible for millions of deaths and cases every year. Major genera of mosquitoes that act as vectors for various diseases are *Culex* (Japanese encephalitis, West Nile), *Anopheles* (filariasis, malaria) and *Aedes* (chikungunya, dengue, yellow fever). Diseases caused by mosquitoes remain an important source of morbidity and mortality all over the world. Control of mosquitoes is of extreme importance in the present day with the rising number of mosquito-borne illnesses. Many methods are adopted against mosquito vectors. A common method of preventing mosquito bite(s) is the use of repellents, larvicidal, ovicidal and pupicidal of natural origin with little or no adverse effect on health. There are some major drawbacks of synthetic insecticides, which are lethal for human and cause neurological, respiratory and skin diseases. The main aim of this review is to evaluate how to control mosquitos at different stages of their life cycle and the merits of natural insecticides over synthetic insecticides.**

***Key words :*** Mortality, repellent, ovicidal, neurological, respiratory, life cycle.

**How to cite :** Pradeep Kumar, Priyanka and Archana (2023) Benefits of botanical based insecticides against mosquitoes : A review. *Biochem. Cell. Arch.* **23**, 671-683. DOI: https://doi.org/10.51470/bca.2023.23.2.671



## INTRODUCTION

Mosquitoes can transmit pathogens to human beings and are responsible for numerous infectious diseases, including malaria, filariasis, Japanese encephalitis, yellow fever, dengue and chikungunya (Nauen, 2007). Mosquito-borne diseases are endemic in over 100 countries, causing nearly 2 million deaths each year, including at least 1 million children, with as many as 2100 million people at risk around the world (Korgaonkar *et al*, 2012; Klempner *et al*, 2007). Mosquitoes belong to the Culicidae family of insects, which prey on warm-blooded vertebrates like humans and spreads the worst viruses (Samanidou-Voyadjoglou *et al*, 2007). Every year, almost one billion people battle mosquito-borne illnesses, which include lymphatic filariasis, yellow fever, dengue, and malaria. Moreover, it causes human allergies (Veni *et al*, 2017). The incessant use of synthetic insecticides, which have detrimental effects on human health, the environment, and the biological balance, makes repelling mosquitoes one of the most challenging tasks (Alayo *et al*, 2015). Synthetic insecticides are heavily relied upon to control and slow the rate of transmission, but in the past, chemical insecticides, repellents and larvicides were routinely used, which had disastrous effects on the environment, adverse effects on people and adverse effects on non-target organisms (Degu *et al*, 2020). In most synthetic pesticide formulations currently in the market across the world, DEET (N, N-diethyl-3-methylbenzamide) is the most widely used synthetic insecticide. However, excessive use of DEET has harmful consequences on people, including severe allergic reactions, dermatitis, and other life-threatening disorders. Due to its negative effects on both people and the environment, DEET is advised to be used with caution (Sanghong *et al*, 2015). Due to the effectiveness and environmental friendliness of plant-based products, the demand for plant-based formulations, including plant extracts, essential oils, *etc*., has greatly increased in recent years (Benelli, 2015). Many plants have been tested for their ability to repel mosquitoes over the past 50 years, but few have proven to be more effective than synthetic repellents (Navayan *et al*, 2017). There are almost 3,000 different types of mosquitoes, but only four of them the *Aedes*, *Culex*, *Anopheles* and *Mansonia* are responsible for spreading deadly diseases to people artificial membranes. Adult human test subjects are chosen from a pool of applicants who either display modest or no sensitivity to mosquito bites. It is desirable that test participants be split evenly between men and women. In order to prepare the volunteer's skin for the laboratory tests, the test region should be cleaned with unscented soap, rinsed with water and then rinsed with a solution of 70% ethanol or isopropyl alcohol.

The use of fragrance and repellent items should be avoided by test volunteers for 12 hours prior to and during the testing process due to the likelihood that numerous circumstances may change a person's attractiveness to mosquitoes, which could therefore affect the results of repellency assays. The best candidates for volunteers are those who do not use tobacco products, or who have stopped using them at least 12 hours before the test and throughout it. It is recommended to grow, maintain and test mosquitoes (in a separate area or room) at 27 ± 2°C temperature, ≥ 80 ± 10% relative humidity and a 12:12 (light: dark) photoperiod. It's possible that the environment for raising mosquitoes in temperate climates needs to change. Adult mosquito stock populations ought to have access to sugary solutions but shouldn't have been given blood. You should keep an eye out for repulsiveness. It is important to disclose the test species, strain and age. Using a cage with a solid bottom and top, screen or netting on the back, a clear acrylic sheet (for viewing) on the right, left sides and a fabric sleeve for access on the front, mosquitoes should be kept in check during testing. A metal frame is suggested for ease of decontamination. A stock population cage with both sexes kept in order to facilitate mating should be used to gather female mosquitoes. Use varied ages of mosquitoes when it is better for a particular species. They should be uniform in age, host-seeking and ideally 5-7 days post-emergence. With ethanol or another acceptable diluent, the repellent is diluted repeatedly and evaluated to identify an effective dose range.

Percentage repellency (% p) in field trials can be determined for each hour of the test as:

$$\% = (C - T) / C \times 100$$

Where, T is the average number of mosquitoes taken from the volunteer(s) receiving treatment during a certain test hour and C is the average number of mosquitoes obtained from the volunteer receiving no treatment or a positive control during the same test hour. A profile of the hourly change in percent repellency throughout the course of the 12-hour test period is produced by repeating the computation every hour (WHO, 2009).

### 3. Pupicidal bioassay

For the pupicidal action, laboratory colonies of mosquito pupae were employed. About 25 pupae were added to a 500 ml glass beaker with 249 ml of dechlorinated water and 1 ml of plant extract or essential oil in the desired proportions. Two to five trials were conducted at each concentration under test, with each trial including five replicates. Acetone (1 ml) was combined with 249 mL of dechlorinated water to create the control. The pupae weren't given acetone as a control, just dechlorinated water. Abbott's formula was used to rectify the control mortalities (Panneerselvam *et al*, 2013).

Mortality percentage of Pupae = No. of dead pupae / Total no. of pupae × 100.

## CONCLUSION

In order to control mosquitoes at various stages of their life cycles, improved, effective, and safe insecticides should be developed. As this review has noted, there are numerous factors regarding the detrimental effects of synthetic insecticides on human health and the environment. Here, we've provided a summary of synthetic insecticides, their negative impacts on human health and the environment, the mosquito life cycle, and synthetic insecticide alternatives that can help prevent mosquito-borne illness.

Synthetic pesticides have the ability to decrease mosquito populations and lower the rate of transmission, but their safety and negative side effects make this promise dubious. Because mosquitoes are resistant to many insecticides, they can be difficult for humans to manage. According to numerous studies, natural insecticides have demonstrated efficacy against various mosquito species at all stages of their life cycles, including larvicidal, ovicidal, pupicidal and repellent.

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