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A SIGNIFICANT EFFECT OF TEA-TREE OIL AGAINST THE LARVAE OF *AEDES ALBOPICTUS* (SKUSE)

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Abstract

This research looked at how well tea-tree oil was able to kill the larvae of *Aedes albopictus* Skuse, the mosquito that spreads Chickenguniya and Dengue. Twenty *Aedes albopictus* Skuse instar larvae were subjected to tea-tree oil solutions containing 30 ppm, 50 ppm, and 100 ppm in both alcohol and ether. In an entomological testing facility, these were analyzed. Mortality in the larval stage was recorded at 8, 16, and 24 hours. Abbott's method was used to correct the number, and control groups were used to determine the mortality rate of larvae. Concentration-dependent values were measured.

Keywords: Alcohol, Auto-disposable syringe, Tea-tree oil, Ether, Abbotts Formula.

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Introduction

The mosquito population is the largest vector of human disease, responsible for millions of annual fatalities, millions of cases of disability, and a significant economic and social cost. Recently three species of *Aedes* viz., *Aedes aegypti*, *Aedes albopictus* and *Aedes vittatus* rapidly spread to Utter Pradesh, India (Kumar et al., 2023). When pesticides are used excessively, resistance develops, and vectorial capacity and other parasitic diseases recover. Mosquito control is crucial for protecting people and animals from mosquito-borne illnesses and enhancing environmental and public health. Many synthetic insecticides are not biodegradable, thus their usage in mosquito control programs has been curtailed in recent years. Mosquito repellents made from plants could be a viable option. The usage of traditional pesticides (larvicide) has been going on for decades all throughout the world. Culex larvae have become resistant to Phenthion due to its widespread use. Phytoecdysteroids can be found in abundance in plant-based foods. The alternative to these insecticides was discovered by earlier researchers who were focusing on the prevention of vector-borne diseases. Researchers in the past have documented the success of phytoproducts in repelling mosquitoes and other insects at both the adult and larval stages. Prominent researchers (McMillin 1969) looked into the effects of Chinaberry leaf extract as a growth inhibitor and a change in feeding behavior in maize earworm and fall armyworm larvae. Dwivedi (2004) and Yadav (1987) found that plant extracts significantly disrupted the oviposition behavior of malaria, filaria, and dengue vectors. The repellant and feeding were first discovered by another pioneering worker (Jilani, 1990).

Against the smaller grain borer (Coleoptera: Tanabrionidae), the effects of turmeric oil, sweet flag oil, neem oil, and neem-based pesticides were studied. The toxicity of neem oil was tested on cucumber plants infected with the leaf-minor *Liriomyza trifolli* Burgress (Azam 1991). Earlier researchers (Hung, 1995) hypothesized that Azadirachtin, derived from the phytochemistry of *Melia azadirachta*, is a limnoid antifeedant. The effectiveness of commercial insect repellents on human skin against *Aedes aegypti* (Diptera: Culicidae) has been hypothesized (Chou.1997), and experiments on the repellency of *Lantana camara* (Verbenaceae) flower against *Aedes* mosquitoes have been conducted (Dua, 1996). Researchers have looked into the larvicidal and repellent action of the oil of *Dalbergia sissoo* (Roxb) (*F. laguminasae*) and have found that it is effective against mosquitoes (Diptera: Culicidae; Banard, 1990). Evaluation of neem products as pesticides in rice grain production is an important work that has been completed6. In the most recent research, Azadirachtin, a phytoproduct, was found to significantly reduce the density of *Aedes*, the vectors that spread dengue and chikungunya (Baghel, 2006).

Plate-1 Siting position of *Aedes albopictus*

Natural product crop protection regulations were investigated (Neale, 2000). Kumar and Arya, (2023) investigated the larvicidal activity of Tinospora cordifolia against the third instar larvae of Aedes aegypti. At 1000, 500, and 800 ppm subsequently in aqueous, ethanol, and petroleum ether extract, 100% larval mortality was observed.

Result and Discussion

Mortality rates of larvae exposed to various concentrations of alcohol. *Aedes albopictus* Skuse larvae were used in the study. Twenty larvae submerged in a control solution revealed no mortality, while the same number of larvae exposed to tea-tree methanol solutions at concentrations of 30 ppm, 50 ppm, and 100 ppm all died. Larval mortality rates in several ether solutions are displayed. Experiments were also conducted with an ether and tea tree oil solution. When 20 *Aedes albopictus* Skuse larvae were put into a control solution, there was no mortality. However, mortality rates of 38-42% at 30 ppm, 60-68% at 50 ppm, and

Material and Methods

From September 2022 to June 2023, trials were conducted. Tea tree oil that was purchased commercially. Subsequently, the solution has been prepared with alcohol and ether at 30ppm, 50ppm, and 100ppm concentrations. Auto disposable syringes of 0.1 ml, 0.5 ml, and 1 ml were used for purity, and the stock was stored in the fridge to preserve its potency. The larvae were gathered from several areas of Agra city, including the Avas Vikas, Bichpuri campus, lambda, B.V.R.I Professor Colony, and abandoned plastic tubs and buckets filled with water. The larvae were taken to the Entomological lab at R.B.S. College in Bichpuri, Uttar Pradesh, India. Four jars were utilized in each experiment in this investigation. Each jar was filled with one liter of water. As per the standard procedure of WHO (2005) with little modification, 0.1 ml, 0.5 ml, and 1 ml auto-disposable syringes were used to create the tea-tree oil solutions. Up until the same time, 20 mosquito larvae were placed into the control solution. Twenty larvae were poured into each solution of 30ppm, 50ppm and100ppm up to 8, 16, and 24 hrs in each solution of alcohol and ether, and then the observed mortality rate was calculated and corrected by –

rate has been calculated and corrected by Abbott's[1] formula:

$$\frac{\%\ \text{Test motility} - \%\ \text{control mortality}}{100 - \%\ \text{control mortality}} \times 100$$

88-100% at 100 ppm in a solution of tea tree with ether were observed. The 100-ppm ether solution produced the same reliable and accurate results for larval mortality as had been seen in earlier studies. In 100 ppm of either solution, we found the same level of mortality in larvae as in the prior study, which is consistent with our own. Our findings confirm the larvicidal action of *Acheyranthes aspera* saponin against *Aedes* and *Culex*, as hypothesized by Bagavan (2008). The effectiveness of screening plants for novel larvicides has been demonstrated (Ansari 2000, Dwevedi 2000, Dwevedi 2004).

Table 1: Show the treated larvae with a solution of tea tree oil with methanol and ether

	Our Study with methanol		Our study with ether	
Concentration	Lower confidence	Upper confidence	Lower confidence	Upper confidence
30ppm	6	10	20	33
50ppm	40	48	60	70
100ppm	68	80	88	100

And it's similar to the research we did. Similar larvicidal activity was found in another study Hung (1995) using *Ficus bengalensis* leaf extract against *Culex quinquefasciatus*, *Aedes aegypti*, and *Anopheles stephensi*. Similar theories about the chinberry leaf's effect on maize earworm larvae's feeding habits and development were proposed by scientists in the United Arab Emirates in the past. The leaf extract of *Prunus persica* showed significant larvicidal activity against the third instar larvae of *Aedes aegypti* (Kumar and Arya, 2022) and synergistic larvicidal activity of *Argemone mexicana* leaf extract in aqueous, ethanol, and petroleum ether against *Aedes aegypti* investigated by Kumar and Arya (2022). The flower extract of *C. fistula* Linn was found to be larvicidal against *Culex tritaeniorhynchus* Giles, *Aedes albopictus* Skuse, and *Anopheles subpictus* (Diptera: Culicidae), while the leaf extract was effective against the

same three species. Which is the same as our study (Diptera: Culicidae), pronounced. The phytosterols investigated in the study of McMillin (1969) are abundant in plant foods. Phytochemicals have been found to reduce and slow the development of a variety of pest insects. Researchers found that in low concentrations, various stages of larvae survived for a long period, but those in high concentrations killed off quickly Baghel 2006. Our analysis confirmed the high mortality in ether solutions of 100 ppm found by others (Ansari 2000, Baghel 2005). Different stages of *Aedes albopictus* Skuse mosquito larvae live longer than expected, and the larvae are paralyzed and die quickly when exposed to high concentrations of the compound. From our perspective, the oil is practically ready for distribution to low-income communities.

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