



Mosquito repellent and larvicidal perspectives of weeds *Lantana camara* L. and *Ocimum gratissimum* L. found in central India

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ABSTRACT

Development of natural mosquito repellents is essential considering their safety profile unlike synthetic insecticides. Herein, novel liquid vaporizable preparations of the essential oils obtained from the leaves of weeds *Lantana camara* Linn (*L. Camara*) family Verbenaceae, and *Ocimum gratissimum* Linn (*O. gratissimum*) family Lamiaceae were developed for the evaluation of mosquitocidal and larvicidal activities against malaria vectors, *Anopheles subpictus*, *Aedes aegypti* and *Culex quinquefasciatus*. While mosquitocidal effect was evaluated as knock-down of mosquitoes in modified glass chamber for an exposure period of 1 h, larvicidal activity was assessed as inhibition of larval motility in petri dish at intervals of 6-, 12- and 24-hr. Combination of essential oils of *L. Camara* and *O. gratissimum* leaves prepared in ethyl alcohol at 1:5 ratio exhibited maximum synergistic mosquitocidal effect against all three test species (94–97%). This effect was comparable with that of standard 1:1 combination ratio of essential oils of *Cymbopogon nardus* (L.) Rendle and *Eucalyptus globulus* Labill. Furthermore, statistical analysis using probit regression model for determination of LC50 and LC90 revealed excellent larvicidal effect of essential oil of *O. gratissimum* leaves at 24-hr time-point (LC50 = 40.08 ± 1.60 ppm and LC90 = 78.035 ± 1.90 ppm). Our data suggest the lethal effects of essential oils of *L. camara* and *O. gratissimum* leaves on *Anopheles subpictus*, *Aedes aegypti* and *Culex quinquefasciatus*. Therefore, essential oil preparations of these weeds can be used as natural, harmless and inexpensive mosquito repellents.

1. Introduction

Malaria is a serious mosquito borne disease, which cause millions of deaths globally every year particularly of children under the age of five (Ali et al., 2014). Moreover, filariasis, West Nile, Japanese encephalitis, and arbovirus infections like dengue, yellow fever, chikungunya and Zika are a few of the common, serious and emerging diseases spread by mosquitoes (Tolle, 2009; Lwande et al., 2020). Since vaccines are unavailable for the majority of these diseases, mosquito control is considered as an important approach to address this issue. Therefore, some strategies including repellents to avoid mosquito bites are being developed (Islam et al., 2017). Moreover, application of larvicides at breeding sites is the commonly suggested alternative (Govindarajan and Benelli, 2016). In fact, the synthetic insecticides have been developed successfully for controlling mosquito-borne diseases (Gokulakrishnan

et al., 2013). However, synthetic agents produced deteriorating effects on environment as well as on the human health. For example, organic compounds pyrethroids (similar to pyrethrins produced by the pyrethrums flowers) are 2250 times lethal to the insects than humans. Unfortunately, their repeated contact over prolonged periods in the form of mosquito repellents can lead to potential health consequences including kidney and spleen toxicity (Burfield and Reekie, 2005; Arnason et al., 2010). To address these issues, the development of safe herbal-based mosquito repellents and larvicidals cannot be overemphasized. The use of essential oils (EOs) obtained from plants are seems to be an attractive approach. EOs are effective against broad spectrum of insect pests, and described as easy to remove, eco-friendly and biodegradable, with negligible toxicity to mammals (Younoussa et al., 2016).


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