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Research



# Excito-repellency Activity of *Andrographis paniculata* (Lamiales: Acanthaceae) Against Colonized Mosquitoes

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## Abstract

Excito-repellency activity of plant extracts have been increasingly studied as mosquito repellents. In this study, the crude extract of *Andrographis paniculata* was evaluated for its noncontact repellency, contact excitation (irritancy + repellency), and knockdown/toxicity response against five colonized mosquitoes; *Aedes aegypti* (L.), *Aedes albopictus* (Skuse), *Anopheles dirus* Peyton & Harrison, *Anopheles epiroticus* Linton & Harbach, and *Culex quinquefasciatus* Say (Diptera: Culicidae) using an excito-repellency assay system under laboratory-controlled conditions. The escape responses were observed at four different concentrations (0.5–5.0% w/v) with *A. paniculata* showing strong spatial repellency against *Ae. albopictus* (96.7% escape) and *Ae. aegypti* (71.7% escape) at the 2.5% and 0.5% concentrations, respectively. At 0.5% and 5.0% concentrations, the greatest repellency was seen for *An. dirus* (48.2% escape) and *Cx. quinquefasciatus* (59.7% escape), respectively. Comparatively, low repellency action was observed against *An. epiroticus* (1.6–15.0% escape). Escape in contact assays (before adjustment) was generally less pronounced compared to noncontact spatial repellency, with *Ae. albopictus* showing highest percent escape (71.4% escape) in the contact assay at 1.0% concentration. After adjusting for spatial repellency, escape due to contact irritancy alone was either not present or an insignificant contribution to the overall avoidance response for all species. No knockdown or mortality at 24-h postexposure was observed in any trials. These findings indicate that the *A. paniculata* crude extract is more active against day-biting mosquitoes; however, this may be a reflection of the time of testing. This study demonstrates compelling evidence that *A. paniculata* extract performs primarily as a spatial repellent. Further investigations exploring the use *A. paniculata* as a potential active ingredient in repellent products are needed.

**Key words:** *Aedes aegypti*, *Aedes albopictus*, *Andrographis paniculata*, avoidance behavior, excito-repellency

Despite vector control and other public health efforts, mosquito-borne pathogens that cause disease in humans remain major threats worldwide, including malaria protozoa and dengue, Zika, West Nile, yellow fever, and Japanese encephalitis viruses to name a few. In Thailand, *Aedes aegypti* (L.) and *Aedes albopictus* (Skuse) are the primary vectors of dengue (Tavara et al. 2009). *Anopheles dirus* Peyton & Harrison is one of the most important malaria vectors in the country and inhabits hilly, forested areas (Tainchum et al. 2015, Tananchai et al. 2019), while *Anopheles epiroticus* Linton & Harbach is predominately found near coastal zones, utilizing fresh, brackish, and saltwater habitats (Sinka et al. 2011). *Culex quinquefasciatus* Say is a widespread nuisance mosquito in urban areas and a vector of the nocturnal periodic strain of *Wuchereria bancrofti* causing human lymphatic filariasis (Triteeraprapab et al. 2000). One of the principal methods of disease abatement has been through various vector control methods, including insecticides, to reduce the transmission risk (Chareonviriyaphap et al. 2013).

Synthetic insecticides, particularly pyrethroid and organophosphate compounds have been widely used via various application methods for killing both immature and adult mosquitoes (Chareonviriyaphap et al. 2013). The prudent use of insecticides is a useful means of controlling pests and disease vectors but also carries cost implications and environmental concerns. An alternative method of bite prevention is to reduce human-vector contact using topical (skin) repellents to ward off would be insect attack. DEET (*N*, *N*-diethyl-3-methylbenzamide) is a common and widely