


Article

Transfluthrin and Metofluthrin as Effective Repellents against Pyrethroid-Susceptible and Pyrethroid-Resistant *Aedes aegypti* (L.) (Diptera: Culicidae)

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Simple Summary: *Aedes aegypti* (L.) is a major vector of dengue fever in tropical regions. To prevent their contact with human hosts, spatial repellents (SRs) like transfluthrin (TFT) and metofluthrin (MFT) have shown promise in delaying pesticide resistance and addressing gaps in outdoor transmission not covered by other interventions such as indoor residual spray or long-lasting insecticide-treated nets. In this study, we successfully identified optimal discriminating concentrations of TFT and MFT, using a high-throughput screening system toxicity bioassay (HITSS-TOX). These concentrations were effective against both susceptible and resistant *Ae. aegypti* mosquitoes. However, it was observed that TFT required a 4.7-fold higher concentration compared to MFT. Additionally, after 60 min of exposure, TFT caused a stronger knockdown (KD₆₀) of mosquitoes but did not significantly increase the 24 h mortality rate compared to MFT. This means that more mosquitoes exposed to TFT were able to recover from KD₆₀, unlike those exposed to MFT. To better understand the behavioral response of mosquitoes to these repellents, further research is required using the HITSS contact irritancy and spatial repellency assays. Such investigations could provide valuable insights into improving vector control strategies and combating the transmission of dengue fever and other mosquito-borne diseases.



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Abstract: *Aedes aegypti* is a major vector of dengue fever in tropical regions. Spatial repellents (SRs) have shown promise in delaying pesticide resistance. Methods for discriminating concentrations (DCs) are well established using various bioassay tools, while data for high-throughput screening system (HITSS) toxicity bioassay (TOX) are absent. In this study, we compared and optimized lethal (LCs) and sub-lethal concentrations (SLCs) of transfluthrin (TFT) and metofluthrin (MFT) on pyrethroid-susceptible (USDA) and pyrethroid-resistant (Pu-Teuy) *Ae. aegypti* (L.) strains, using the HITSS-TOX. Mean mortality (MT) was 100% at LC₉₉ and DC, compared to LC₅₀ (45.0 ± 3.7%) and LC₇₅ (65.8 ± 7.0%) for the USDA strain. However, the resistant strain (Pu-Teuy) showed reduced susceptibility against TFT and a significantly lower MT at LC₅₀ (12.5 ± 4.4%; $t = 5.665$, $df = 10$, $p < 0.001$), LC₇₅ (9.2 ± 3.5%; $t = 4.844$, $df = 10$, $p = 0.001$), LC₉₉ (55.0 ± 9.9%; $t = 4.538$, $df = 5$, $p = 0.006$), and DC (75.0 ± 5.2%; $U = 3.0$, $p = 0.007$). The DC of TFT (0.15222%) was 4.7-fold higher than for MFT (0.03242%) in USDA strain. The baseline DCs established are useful to better understand susceptibility and the efficacy of various repellents against field populations of *Ae. aegypti*.

Keywords: *Aedes aegypti*; spatial repellent; high-throughput screening system; toxicity bioassay; transfluthrin; metofluthrin

1. Introduction

Dengue is the most rapidly spreading mosquito-borne viral disease, which is estimated to cause 390 million infections annually and approximately 20,000 deaths, of which 70%