

Kanutcharae Thanispong 2008: Behavioral Responses of *Aedes aegypti* to Insecticides Using Two Assays Systems and The Influence of Insecticide Resistance Mechanisms. Doctor of Philosophy (Entomology), Major Field: Entomology, Department of Entomology. Thesis Advisor: Professor Theeraphap Chareonviriyaphap, Ph.D. 139 pages.

This study was designed to quantify irritancy (contact) and repellency (non-contact) responses of six field strains of female *Aedes aegypti* adults to alphacypermethrin, deltamethrin, permethrin and DDT and to describe strain-specific insecticide susceptibility status and resistance mechanisms. Field strains were collected from various geographical regions in Thailand; Chiang Mai (north), Kanchanaburi (west), Khonkaen (northeast), Nonthaburi (central), Songkhla and Satun (south). Susceptibility bioassays were performed to evaluate the degree of background insecticide resistance in all 6 strains of *Ae. aegypti*. All strains were found highly resistant to DDT and permethrin, with one exception (Chiang Mai susceptible to permethrin). In contrast, the majority of test strains were found susceptible to deltamethrin, alphacypermethrin and malathion, exceptions being Nonthaburi strain showing incipient (low) resistance to alphacypermethrin and Khonkaen strain showing marked resistance to malathion. One mechanism of insecticide resistance, metabolic detoxification, was investigated. The findings found that monooxygenase activity was elevated in two permethrin- resistant *Ae. aegypti* strains and one susceptible strain. Elevated esterase activity in the Khonkaen strain appears to be associated with malathion resistance.

In addition, all strains exhibited strong contact irritancy responses when exposed to synthetic pyrethroids but significantly weaker irritant responses when exposed to DDT. The degree of non-contact repellency varied, depending upon the *Ae. aegypti* strain and assay type. Pronounced repellency to DDT was found in the three *Ae. aegypti* strains from Chiang Mai, Kanchanaburi and Khonkaen when evaluation was performed using an excito-repellency test system. In contrast, five strains of *Ae. aegypti* showed strong repellency response when a high throughput screening system was used. Although differences in response outcomes were seen depending on assay type, both test systems remain appropriate for evaluating the behavioral responses of *Ae. aegypti* to residual insecticides used in vector control. Differences in repellency responses among the *Ae. aegypti* strains between the two test systems are discussed. We conclude that irritant/repellent responses of *Ae. aegypti* females to insecticides are important components of vector control. Results from this study indicate physiological resistance and behavioral responses may not be associated.

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Thesis Advisor's signature

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