



**Selection and Enzyme Assays of Pyrethroid Resistance in
Anopheles minimus Colony**

Master Program of Entomology

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The Graduate School, Prince of Songkla University, has approved the thesis as fulfillment of the requirement for the Master of Science degree in Entomology.

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Abstract

This study was conducted to test susceptibilities of *Anopheles minimus* species A mosquitoes following exposures to deltamethrin, during each of 19 generations. The LD₅₀ and LD₉₀ (or LT₅₀ and LT₉₀) values were determined for populations from each subsequent generation by probit analysis and significant increases occurring from one generation to the next. They were analyzed by chi-square test ($P < 0.01$). Selection for resistance via the World Health Organization test protocol (was by exposing), sequential generations of *An. minimus* females to LD₅₀ and LT₅₀ values of deltamethrin. There was approximately a 26-fold increase in the LD₅₀ and a 23-fold increase in LD₉₀ when the F₁₀ generation was compared to the parent colony (F₀). Similarly, the LT₅₀ and LT₉₀ values were also increased during selection experiments from generations 14-19. There was roughly a 3-fold increase in LT₅₀ and LT₉₀ values of F₁₉ females compared to F₁₄ females.

In addition, enzyme-based mechanisms of insecticide resistance were performed on susceptible and resistant colonies of *An. minimus* to deltamethrin using biochemical assay. Three enzyme assays, esterase, monooxygenases and glutathione S-transferases, were performed on 4 test populations (F₀, F₈, F₁₂ and F₁₈). F₀ was found completely susceptible to deltamethrin, whereas F₈, F₁₂ and F₁₈ demonstrated levels of tolerance/resistance to deltamethrin. Monooxygenases (MFOs) activity was continuously elevated in resistant test populations (F₈, F₁₂ and F₁₈) than those from the parent colony (F₀). There was a 5-fold increase in specific activity of MFOs in F₁₈ compared to the control colony (F₀). Specific activities of alpha and beta-esterases as measured by the

hydrolysis of alpha and beta-naphthyl propionate to naphthol showed it was unclear whether it is responsible for pyrethroid resistance. Glutathione S-transferases (GSTs) were not elevated in the 4 resistant test populations. Based on our results, it is more likely that the development of physiological resistance to deltamethrin may be related to elevated MFOs activity.

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