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CUTICLE THICKNESS OF LARVAE OF PYRETHROID RESISTANT *CULEX QUINQUEFASCIATUS* MOSQUITOES IN SRI LANKA

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Metabolic resistance and target site insensitivity are primary insecticide resistance mechanisms in *Culex quinquefasciatus* vectors. Cuticle thickness of the larval stages of these mosquitoes is another crucial factor that affects resistance development and, thereby, the control of mosquito vectors. In this study, we investigated the association between the thickness of the cuticle and the resistance developed to deltamethrin in larvae of *Cx. quinquefasciatus* mosquitoes. Early fourth-instar larvae of *Cx. quinquefasciatus* obtained from field-collected eggs were exposed to four different concentrations of deltamethrin, giving mortality between 0-100% (0.0025mgL^{-1}, 0.00375mgL^{-1}, 0.005mgL^{-1}, 0.00625mgL^{-1}, 0.0075mgL^{-1}). A total of one-hundred larvae were exposed to each concentration in four replicates. Control was conducted for each replicate with dechlorinated water and ethanol. Mortalities were reported after 24-hour exposure period. Using standard protocols, six dead and six live larvae from each concentration were processed for microtomy. Sixty sections were prepared, and microscopic images were taken using the image processing microscopic system (*ZEN-2012*). The average cuticle thickness of each individual was taken by measuring eight points from each image, and the ratio between the thickness and the diameter was calculated to obtain the cuticle thickness index—values of LD_{50} and LD_{90}, calculated using log-probit mortality curves for fourth instar larvae of *Cx. quinquefasciatus* were $0.003 mgL^{-1}$ and $0.012\ mgL^{-1}$ respectively. A significant difference in the thickness indices was observed between the susceptible and resistant larvae of each concentration (DF=9, F=16.419, P<0.001). The minimum indices of the survivors were 0.0149, 0.0172, 0.022, 0.0323, and 0.0447, respectively, for each concentration, while the maximum obtained for susceptible were 0.0144, 0.0167, 0.0206, 0.0299, and 0.0402, respectively. The Pearson correlation analysis revealed a significantly positive relationship between the concentration and thickness difference of the cuticle of susceptible and resistant individuals (r=0.937, P=0.019). The results of the study evident the presence of a cuticular resistance mechanism in pyrethroid-resistant *Cx. quinquefasciatus* larvae.

Keywords: *Culex quinquefasciatus,* Deltamethrin, LD50, LD90, Microtome section