

**INSECTICIDE RESISTANCE OF *Culex quinquefasciatus*
SAY (DIPTERA : CULICIDAE) IN SRI LANKA.**

BY

VASANTHI DEVIKA DASSANAYAKE

**A THESIS SUBMITTED IN FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF
PHILOSOPHY TO THE FACULTY OF NATURAL SCIENCES
OF THE OPEN UNIVERSITY OF SRI LANKA.**

REFERENCE ONLY

DECEMBER - 1998



63945

ABSTRACT

Resistance status, underlying mechanism of resistance and the frequency of resistance genes in *C. quinquefasciatus* populations, the vector of Bancroftian filariasis, were investigated from eight selected areas within and outside the endemic filariasis belt of Sri Lanka, during the period of 1992 to 1994. Along with this, the resistance observed in these populations was characterized by electrophoretic and molecular biological techniques.

Larval resistance to organophosphorous insecticides (OPs) namely, fenthion, chlorpyrifos and temephos were found to vary among the populations and showed a marked increase with respect to *C. quinquefasciatus* populations investigated previously. *C. quinquefasciatus* from Dehiwela area (Deh) had a significantly high resistance, at LC_{50} and LC_{90} level, 0.074 and 0.243mg/l respectively for fenthion which is used for the larval control of *C. quinquefasciatus* in Sri Lanka. *C. quinquefasciatus* from the Peradeniya (Pera) had a significantly low resistance to fenthion at LC_{50} and LC_{90} level, 0.016 and 0.041mg/l respectively which were in the range of susceptible strains of *C. quinquefasciatus*, PelSS and KadSS. Although chlorpyrifos and temephos were not used as larvicides against *C. quinquefasciatus* of Sri Lanka, resistance to these insecticides was observed in all populations.

Resistance was observed in adults populations of *C. quinquefasciatus* for organochlorine, OPs, carbamate and pyrethroid insecticides. Relatively high resistance

was observed for 4% DDT and all populations were susceptible to permethrin. The degree of resistance to organophosphates and carbamates varied in populations investigated.

The underlying basis of resistance of field populations was found to be an esterase-based mechanism and a significant correlation was observed between resistance levels and mean esterase specific activity of the populations. Altered AChE - based mechanism was absent in all populations. A significantly high mean GST specific activity was found in populations not exposed to fenthion treatment.

The electrophoretic and restriction digest patterns indicated the presence of amplified esterases, $Est\alpha 2'$ and $Est\beta 2'$, in all populations investigated. *EcoR*I digested southern blot analysis revealed the presence of amplified *esta2'* and *estb2'* fragments along with three common susceptible non-amplified *esta* and *estb* alleles in these populations.