

Biochemical basis of organophosphorus and carbamate insecticide resistance of the Leafminer, *Liriomyza huidobrensis* (Diptera : agromyzidae)

Liriomyza huidobrensis (Diptera; Agromyzidae) is a destructive insect pest introduced to Sri Lanka recently. This insect is a leaf mining dipteran which attacks all types of agricultural and ornamental plants in Sita Eliya and Kandapola area in Nuwara Eliya district. Resistance to insecticides and underlying resistance mechanisms of the leafminer, *Liriomyza huidobrensis* were studied during 1998/1999 using insects collected from Regional Agricultural Research Centre, Sita Eliya, Nuwara Eliya. Adults and larvae were collected from the hosts beet-root and potato plants.

Bioassay experiments were carried out at the Sita Eliya Research Centre by exposing adults to insecticide impregnated papers and the log-probit mortality curves were obtained for organophosphates malathion & chlorpyrifos, carbamate propoxur and pyrethroid permethrin. The LD₅₀ values were 1680, 192.8, 37.6, and 400 µg/ cm² respectively. These values reflect a high level of resistance to all synthetic insecticides which are currently in use. However, the insects were susceptible to the organochlorine DDT (92% mortality for 200 µg/ cm²).

Insects were individually tested for activity levels of insecticide detoxifying enzymes. Both adults and larvae showed low esterase activity for the substrate para-nitrophenyl acetate (adults 0.143 ± 0.202; larvae 0.093 ± 0.069 µmol/ min/ mg). Native gel electrophoresis resolved only one esterase band with high affinity to organophosphates. Activity of glutathione-S-transferases for the substrate reduced-glutathione/chloro, dinitrobenzene (adults 0.388 ± 0.273; larvae 0.516 ± 0.174 µmol/ min/ mg) and the amount of oxidases (adults 0.107 ± 0.173; larvae 0.171 ± 0.309 mOD/ mg protein) were also low.

Activity of the organophosphate and carbamate target site acetylcholine esterase, was not inhibited by propoxur (up to 1M) exhibiting that alteration of the target site is responsible for high organophosphate and carbamate resistance. Malathion metabolism studies revealed the presence of highly reactive malathion carboxylesterases, a group of esterases which quickly hydrolyse organophosphates. Pyrethroid resistance, with low oxidase activity, suggests the presence of altered pyrethroid target site, Na⁺ channel proteins.