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INSECTICIDE CROSS-RESISTANCE SPECTRA AND UNDERLYING RESISTANCE MECHANISMS OF INSECT PESTS OF VEGETABLES

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Insecticide resistance spectra were investigated in seven species of insect pests *ie.* five aphid species (*Aphis gossypii*, *A. craccivora*, *Myzus persicae*, *Lipaphis erysimi* and *Toxoptera citricidus*), a diamond-back moth species *Plutella xylostella* and a leaf minor species *Liriomyza huidobrensis*. Insects, except *L. huidobrensis*, were collected from the vegetable fields of Gannoruwa Agricultural Research Station and colonised in the laboratory. *L. huidobrensis* was from Nuwara Eliya vegetable farms.

Adult insects were exposed to three different insecticides; malathion (an organophosphate), propoxur (a carbamate) and permethrin (a pyrethroid) using insecticide impregnated papers of different dosages. LD_{50} and LD_{90} values were obtained by establishing log-probit mortality curves. Activity levels of insecticide metabolising enzymes *ie.* carboxylesterases, glutathione-S-transferases and oxidases, were investigated using biochemical. Quantitative changes of carboxylesterases were studied by native polyacrylamide gel electrophoresis. Qualitative changes were studied by detecting the rates of malathion metabolism. Resistance of the insect target site, acetylcholinesterases, to insecticide inhibition was tested biochemically.

The highest resistance to all three insecticides was shown by *L. huidobrensis* and *M. persicae*. LD_{50} values ($\mu g/cm^2$) of *L. huidobrensis* population for malathion, propoxur and permethrin were 1680.0, 13640.0 and 400 respectively. For *M. persicae*, these values were 408.0, 128.0 and 24.0. *A. craccivora* was the most susceptible to malathion (LD_{50}= 4.8) while *T. citricidus* (LD_{50}= 0.2) and *A. gossypii* (LD_{50}= 0.4) had the lowest resistance for propoxur and permethrin respectively. Results of biochemical assays showed that acetylcholinesterases of *L. huidobrensis* are completely altered giving high resistance to organophosphates and carbamates. High activity levels of insecticide metabolising enzymes were found in *M. persicae*, *L. erysimi*, *A. gossypii* and *P. xylostella*. Quantitative changes of carboxylesterases were found in all the pest species except *T. citricidus*. Qualitatively different (fast metabolising) carboxylesterases were found only in *P.xylostella*.