

Resistance of the bedbug *Cimex hemipterus* to synthetic insecticides

Status and mechanisms of insecticide resistance were investigated in adult and third instar nymphal populations of the bedbug *Cimex* from Nuwara Eliya district. Insecticide bioassays were carried out with the World Health Organisation (WHO) discriminating dosages of DDT, malathion, propoxur, deltamethrin and permethrin. Insects were exposed to insecticide papers. Knockdown rates for pyrethroids and mortalities for other insecticides were obtained.

All the collected bedbugs belonged to *Cimex hemipterus*. In adult and nymphal bedbugs resistance percentages to DDT were 87.5% and 84.0% respectively. For malathion, they were 17.78% and 8.7% respectively, and for propoxur, 41.31% and 50% respectively. For deltamethrin, KT_{50s} (time taken to knockdown 50% population) (hrs) were 58.51 and 36.69. For permethrin, respective KT_{50s} (hrs) were 8.15 and 13.64 while KT_{90s} were 46.72 and 50.40. Results show high resistance to DDT, intermediate resistance to propoxur and susceptible to malathion, permethrin and deltamethrin.

200 insects were homogenized individually and tested for insecticide detoxifying enzymes. Mean general esterase activity and glutathione S-transferase activity (GST) were 0.26 ± 0.40 and $0.741 \pm 0.465 \mu \text{ mol/min/mg}$ respectively. Monooxygenases were quantified as 0.15 and 0.42 OD/mg protein by titrating the haem group. Malathion carboxylesterases were absent. Native polyacrylamide gel electrophoresis resolved one elevated esterase in both nymphal and adult stages. Insecticide target site, acetylcholinesterases, was not interacting with insecticides in 35% of the population. Results show that high GST activity causes DDT resistance. Esterases and altered acetylcholinesterases are responsible for organophosphate and carbamate resistance. Susceptibility to pyrethroids can be correlated to less quantities of oxidases.