Susceptibility Status of *Anopheles gambiae* s.l. (Diptera: Culicidae) from Cabbage Growing Areas Associated with Pyrethroid and Organophosphate Use in Accra, Ghana

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Abstract

Resistance in malaria vectors is likely to be caused by the massive use of insecticides in agriculture. *Anopheles gambiae* s.l. collected from breeding grounds in two cabbage growing areas within Accra were assessed for levels of resistance to 0.75% permethrin, 0.05% deltamethrin, 5% malathion and 4% DDT using standard WHO susceptibility test kits. Pyrethroid and organophosphate residue levels in soil and run-off water from these cabbage farms were determined and possible association between resistance and residue levels were established. Compared to the susceptible ‘Kisumu’ strain, both Korle-Bu and Airport populations were highly resistant to DDT and gave resistance levels which were over nine-fold for permethrin and over 2.5-fold for deltamethrin. Both wild and susceptible populations showed full susceptibility to malathion. The S and M forms of *A. gambiae* s.s. were found to occur in sympatry in the two study sites with a higher frequency of S form in the Airport area. Toxicity testing of extracts of soil and run-off water from these cabbage farms, using brine shrimp lethality tests, showed high level of toxicity, indicative of the presence of residues of insecticides. Differential fractionation of these extracts using solid phase extractor (SPE) suggests that the bulk of residues in these extracts may be pyrethroids and organophosphates. No correlation was observed between either residue levels or residual bioactivity in soil and run-off water, and resistance levels in *A. gambiae* s.l. populations, collected from breeding grounds within the farms under investigation. It is proposed that resistance in *A. gambiae* larvae in these breeding sites contaminated with agricultural insecticides may have occurred over time due to continuous exposure to sub-lethal doses.