

Male isolation of dengue vector *Aedes* mosquitoes for sterile insect technique by spiking blood with ivermectin

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There is an increasing demand for exploration of the potential for applying the Sterile Insect Technique (SIT) in area-wide integrated vector management (AW-IVM) in many countries. However, because female mosquitoes, unlike male mosquitoes, can transmit disease, means to eliminate them from the mass production process are a critical pre-requisite. In addition, the efficiency of the SIT programme could be increased by not releasing female mosquitoes due to the fact that sterile males can then only focus on wild females to achieve mating. Therefore, mosquito SIT programmes success will depend on exclusive release of sterile males, which is impossible on a large scale without efficient sex separation methods.

Many different sex separations for different stages of mosquitoes are currently being attempted to successfully establish a sexing mechanism for the above purpose. Among them, the mostly attempted methods broadly include genetic sexing methods, molecular methods, mechanical methods and behavioral methods. For all blood feeding mosquitoes, sex separation could occur at the adult stage by spiking blood with insecticides (malathion, dieldrin) or other mosquito toxins (ivermectin, spinosad), as behavioral tools.

In this study, a veterinary preparation of ivermectin (Ivotec, 1% w/v) which is used to treat dogs infested with the filarial worm *Dirofilaria repens* in Sri Lanka was used as a tool for sex separation of adult *Aedes albopictus* and *Aedes aegypti* mosquitoes by feeding on spiked blood. In an initial attempt by spiking blood with 5 parts per million (5 ppm) ivermectin, 40% of the blood-fed females could survive beyond 24 hours post feeding. However, when the dosage of ivermectin was increased to 7 ppm the survival rate decreased below 40%. Since there had been high mortality of both females and males even in the control cages in which mosquitoes were blood-fed without ivermectin it was suggested that the age of the mosquitoes used may be a factor for high mortality of mosquitoes in the control experiment. When the experiment was repeated with 7 ppm ivermectin in blood using 4-5 day old mosquitoes more than 65% mortality could be observed within 12 hours post feeding in the experimental cage with a significant difference in mortality compared to the control ($p < 0.001$). However, at 18 hours post feeding 100% mortality could be observed in ivermectin in blood fed *Ae. albopictus* females. When 4-5 day old female *Ae. aegypti* were blood spiked with 7 ppm ivermectin 100% mortality could be seen only at 24 hours post-feeding.

These observations suggest that repeated spiking blood with 7 ppm ivermectin for 24 hours could be used as a successful method for male isolation of adult dengue vector *Ae. aegypti* and *Ae. albopictus* mosquitoes. This techniques may be used for implementation of SIT for AW-IVM for dengue control.

Keywords: Dengue, *Aedes*, sterile insect technique, ivermectin, male isolation