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Integration of *Wolbachia* infection and irradiation to obtain sterile male mosquitoes of *Aedes albopictus* to be used in integrated vector control in Sri Lanka

N. D. A. D. Wijegunawardana,[1] Y. I. N. Silva Gunawardene,[1*] W. Abeyewickreme, [2] T. G. A. N. Chandrasena,[3] R. S. Dassanayake,[4] Zhiyong Xi,[5] and K. Bourtzis[6]

[1]*Molecular Medicine Unit, Faculty of Medicine, University of Kelaniya, Ragama*
[2]*Department of Parasitology, Faculty of Medicine, Sir John Kotelawala Defence University*
[3]*Department of Parasitology, Faculty of Medicine, University of Kelaniya, Ragama*
[4]*Department of Chemistry, Faculty of Science, University of Colombo, Colombo 03.*
[5] *Sun Yat-sen University - Michigan State University Joint Center of Vector Control for Tropical Diseases, Zhongshan School of Medicine, Guangzhou, China*
[6]*Insect Pest Control Laboratory, Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, Vienna, Austria*

This study focused on using a novel and environmentally friendly strategy of combined sterile insect technique (SIT) and a *Wolbachia*-based incompatible insect technique (IIT) in *Aedes albopictus* population control efforts.The above strategy uses the intracellular endosymbiont bacteria *Wolbachia* in insects, which is vertically transmitted from mother to offspring and has ability to enhance cytoplasmic incompatibility (CI). The objective of this study was to suppress the *Ae. albopictus* wild mosquito population by releasing sexually incompatible *Wolbachia* triple infected male mosquitoes on a large scale to the natural environment. The work involved introgression and characterization of the *Wolbachia* triple infected *Ae. albopictus* line and determination of the minimum sterility dose for males and females of the introgressed line to be used for the pilot control trial in Sri Lanka. All experimental data were compared with control Sri Lankan wild-type *Ae. albopictus* mosquito strain (ALB-SL). Transformation of *Wolbachia* triple infection to *Ae.albopictus* with a Sri Lankan genetic background was achieved through an introgression experiment with 100% efficacy up to the 8th generation. Characterization of the new *Wolbachia* triple infected *Ae. albopictus* Sri Lankan line revealed competitive fitness cost with respect to fecundity (□ = 28, SD=5), fertility (□=71%) and longevity (□=28 & 37 days for male & female) compared with wild type (□'s of 55, 88% and 30 & 43 days respectively), with no cost for pupation rate (□=78%), adult emergence and sex ratio (M:F, 45:55) while comparing to control group (□'s of 80% and 46:54 respectively). Complete sterility due to CI was not achieved for the new introgressed males with mean fertility of 16%. Therefore, integration of irradiation (dose: 30Gy) was practised to achieve complete male and female sterility prior to mosquito release (minimum sterility dose for males and females was 28 Gy and 30 Gy respectively). This dose is lower than the irradiation dose applied for SIT (>55 Gy) and did not have a significant effect on male competitiveness. Therefore, integration of *Wolbachia* infection and irradiation to obtain sterile male mosquitoes of *Ae.albopictus* to be used in integrated vector control in Sri Lanka is recommended for the future dengue vector control program.

Key words: SIT, IIT, *Wolbachia*, population suppression, *Ae. albopictus*

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E-mail: nilminisg@kln.ac.lk