

Developing a *Wolbachia*-Infected *Aedes Aegypti* Mosquito Line for Dengue Control Activities

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Mosquito-borne diseases like dengue, Zika, and chikungunya transmitted by *Aedes aegypti* mosquitoes pose a persistent global health threat. This study was to explore the *Wolbachia*-mediated approaches for *Ae. aegypti* control through microinjection-induced artificial infection, leveraging the absence of natural *Wolbachia* in this species. *Aedes albopictus*, naturally *Wolbachia*-infected, serves as an artificial trans-infection source. To achieve this goal, wild *Ae. albopictus* mosquitoes were screened for *Wolbachia* infection using the *Wolbachia*-surface specific PCR primers(wsp) followed by ovary dissection, *Wolbachia* genomic DNA extraction, and quantification via agarose gel electrophoresis with known DNA lambda marker. Live *Wolbachia* isolations from *Ae. albopictus* ovaries were microinjected into *Ae. aegypti* adults and L4 larvae. F0 generation showed *Wolbachia* presence, confirmed by the wspPCR. Survival rates of microinjected adults and larvae, pupation, and emergence were analyzed against a control group of wild *Ae. aegypti* mosquitoes. The data was analyzed by Levene's test and t-tests using SPSS ver. 6.0. Larvae survival rates significantly differed *Wolbachia* microinjected and control groups ($p=0.000$). The control group exhibited a higher mean survival rate (0.97, $n=35$) compared to the treatment group (0.84, $n=25$). *Wolbachia* infection in microinjected *Ae. aegypti* larvae were confirmed by *Wolbachia* wspPCR and gel electrophoresis with an expected band size of 180 bp. Comparative analyses with known *Wolbachia*-infected *Ae. albopictus* mosquito DNA validated the infection. This study successfully developed a new *Ae. aegypti* line for *Wolbachia*-mediated population suppression, enhancing *Ae. aegypti* mosquitoes control. The innovative methodologies and compelling results contribute to dengue disease control, enhancing the public health in Sri Lanka.

Keywords: *Wolbachia*; *Aedes aegypti*; *Aedes albopictus*; Mosquito-borne diseases; Microinjection