

## **Optimization of Irradiation Dose for Sterilization of *Aedes aegypti* (Linnaeus) Mosquitoes for Application of Sterile Insect Technique (SIT) Program in Sri Lanka**

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There is an increasing demand for exploration of the potential of applying sterile insect techniques (SIT) in area-wide integrated vector management (AW-IVM) in many countries. Sterility of male insects can be accomplished with ionizing irradiation and SIT focus on release of sufficient sterile male mosquitoes to induce sterility in the wild females which over time causes decline of the target mosquito population. Therefore, current study was focused on determining the effects of different doses of radiation on survival, flight ability and reproductive capacity of local strains of *Aedes aegypti* (Linnaeus) for SIT application in Sri Lanka. Adults *Ae. aegypti* were maintained under standard laboratory conditions at the Molecular Medicine Unit, Faculty of Medicine, University of Kelaniya, Sri Lanka. Male pupae and female pupae were separated using a Fay and Morlan glass plate technique. A total of 100 male *Ae. aegypti* pupae were exposed to each different irradiation doses (40, 50, 60, 70 and 80 Gy) using Co60 source of gamma rays. Effects of irradiation on pupal mortality, flight ability, fertility and adult male survival were monitored under laboratory conditions. One-way analysis of variance (ANOVA) was used to investigate the significance in the variations among observed factors. Kaplan-Meier survival analysis was conducted to estimate the survival functions of irradiated males. The survival in relation to different radiation doses were compared using ANOVA followed by Tukey's pairwise comparison. The survival of irradiated pupae was invariably greater than 90% in control- and in test groups and they did not differ significantly ( $P > 0.05$ ). Irradiation had no significant adverse effects on the flight ability (capacity to fly out of a test device) of male mosquitoes, which consistently exceeded 90%. The fertility of female mated with irradiated male was significantly reduced in *Ae. aegypti* at all doses and zero fertility was observed at 70 and 80 Gy. *Ae. aegypti*, fertility in irradiated males mated with female was less than 1% at 50 and 60 Gy. The male mean survival time was reduced by irradiation in a dose-dependent manner. However, the mean survival time in control and sterilizing doses of 40, 50, 60 and 70 did not differ significantly ( $P > 0.05$ ). Therefore, 50 Gy dose will be used as the optimal radiation dose *Ae. aegypti* population for future evaluations of SIT-based control. The results of the present study will be applied to studies of male sexual competitiveness and for stepwise evaluations of the SIT for suppression of *Ae. aegypti* population in Sri Lanka.

Keywords: "Sterile insect technique, *Ae. aegypti*, irradiation, fertility, flight ability, survival"

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