

Field efficacy of palm oil-based nanoemulsion insecticides against *Aedes aegypti* in Malaysia

ABSTRACT

This study evaluates the efficacy of palm oil-based nanoemulsion insecticides in thermal fogging applications against adult *Ae. aegypti*. The nanoemulsion formulations contained a palm oil methyl ester solvent, water, a non-ionic surfactant, and active ingredient deltamethrin, with nanoemulsion droplet diameters ranging from 362 to 382 nm. Knockdown and mortality rates of caged mosquitoes were measured at various distances up to 18 m from the spray nozzle. After 15 min of insecticide exposure, nanoemulsion insecticides achieved a knockdown rate of >97% at a spraying distance of 4 m, and the knockdown effect increased substantially with exposure time. At an 18 m spraying distance, the best nanoemulsion formulation, NanoEW8, achieved a high mosquito mortality rate of more than 80%, whereas the non-nanoemulsion and the commercial product reached only 14 and 8 m distances, respectively, for comparable mortality. The artificial neural network (ANN) was used to predict the mosquito knockdown distribution over the spraying distances and time intervals. The models predicted that NanoEW8 can still cause knockdown at a maximum distance of 61.5 m from the discharge point 60 min after spraying. The results established that *Ae. aegypti* was susceptible to the newly developed palm oil-based nanoemulsion insecticide, indicating a high potential for mosquito control.

Keyword: Nanoemulsion insecticide; Oil-in-water insecticide; Thermal-fogging; Palm oil methyl ester