

Photodynamic Inactivation of *Aedes Aegypti*: Laboratory and Simulated Field Trials of Curcumin As a Photolarvicide

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Increasing cases of arboviruses transmitted by the *Aedes aegypti* mosquito underscore a need to alternative vector control measures. Photodynamic inactivation (PDI) is a promising technique against in this regard. PDI requires light at an appropriate wavelength, a photosensitizer (PS), and molecular oxygen. The combination of these three factors generates highly reactive oxygen species for the target organism, which, in this scenario, is the vector larvae, so that the PS acts as a photolarvicide. In the last few years, curcumin, a vegetal-based PS, has demonstrated great potential as a photolarvicide. Here, we aimed to evaluate the mortality of larvae in the laboratory via PDI to obtain lethal concentrations (LCs) using curcumin and extrapolate it to simulated field, where mortality was evaluated along with PS persistence. For laboratory tests, curcumin concentrations between 0.01 – 2.5 mg.L⁻¹ were applied against 3rd stage *Ae. aegypti* larvae, irradiated with white, fluorescent lamps (0.83 mW/cm²) for 12h. The simulated field tests were carried out in an open environment, using solar irradiation as a light source. Field tests were performed in container (100 L), sealed against rainwater input during the experiments. The PS concentrations used were between 0.16 and 160 mg.L⁻¹. Persistence assays were oriented by results obtained in the simulated field PDI tests. Larval mortality in both trials was performed every 24 h, a method adapted from the World Health Organization protocol. Laboratory results showed an LC₅₀ of 0.27 mg.L⁻¹ and LC₉₀ 1.6 mg.L⁻¹. For the simulated field tests, concentrations were 50, 22.2 mg.L⁻¹ and for 90, 84 mg.L⁻¹. Finally, it was observed that the PS effectiveness remained at 100 until day 20. From day 21, it remained at 80, completely losing its effectiveness after 45 days. The results reiterate that curcumin has significantly high photolarvicidal action not only in benchtop tests, but also in simulated field. The effect of persistence in a similar habitat for the larvae was significant in terms of residuality when compared with conventional larvicides. Results point to a positive perspective on curcumin-mediated PDI, but further research is recommended aiming to assess the PS persistence in potential breeding sites for *Ae. aegypti*.