Rapid biosynthesis of silver nanoparticles using Crotalaria verrucosa leaves against the dengue vector Aedes aegypti: what happens around? an analysis of dragonfly predatory behaviour after exposure at ultra-low doses

ABSTRACT

Aedes aegypti is a primary vector of dengue, a mosquito-borne viral disease infecting 50–100 million people every year. Here, we biosynthesised mosquitocidal silver nanoparticles (AgNP) using the aqueous leaf extract of Crotalaria verrucosa. The green synthesis of AgNP was studied by UV–vis spectroscopy, SEM, EDX and FTIR. C. verrucosa-synthesised AgNPs were toxic against A. aegypti larvae and pupae. LC_{50} of AgNP ranged from 3.496 ppm (I instar larvae) to 17.700 ppm (pupae). Furthermore, we evaluated the predatory efficiency of dragonfly nymphs, Brachydiplax sobrina, against II and III instar larvae of A. aegypti in an aquatic environment contaminated with ultra-low doses of AgNP. Under standard laboratory conditions, predation after 24 h was 87.5% (II) and 54.7% (III). In an AgNP-contaminated environment, predation was 91 and 75.5%, respectively. Overall, C. verrucosa-synthesised AgNP could be employed at ultra-low doses to reduce larval population of dengue vectors enhancing predation rates of dragonfly nymphs.

Keyword: Arbovirus; Brachydiplax sobrina; EDX; FTIR; SEM; Green synthesis; Nanobiotechnologies