

Suaeda maritima-based herbal coils and green nanoparticles as potential biopesticides against the dengue vector *Aedes aegypti* and the tobacco cutworm *Spodoptera litura*

ABSTRACT

The overuse of synthetic pesticides to control insect pests leads to physiological resistance and adverse environmental effects, in addition to high operational cost. Insecticides of botanical origin have been reported as useful for control of agricultural and public health insect pests. This research proposed a novel method of mangrove-mediated synthesis of insecticidal silver nanoparticles (AgNP) using *Suaeda maritima*, acting as a reducing and stabilizing agent. AgNP were characterized by UV–vis spectroscopy, Fourier transform infrared (FTIR) spectroscopy, scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), and X-ray diffraction (XRD) analysis. *S. maritima* aqueous extract and mangrove-synthesized AgNP showed larvicidal and pupicidal toxicity against the dengue vector *Aedes aegypti* and the tobacco cutworm *Spodoptera litura*. In particular, LC₅₀ of AgNP ranged from 8.668 (larva I) to 17.975 ppm (pupa) for *A. aegypti*, and from 20.937 (larva I) to 46.896 ppm (pupa) for *S. litura*. In the field, the application of *S. maritima* extract and AgNP (10 × LC₅₀) led to 100% mosquito larval reduction after 72 h. Smoke toxicity experiments conducted on *A. aegypti* adults showed that *S. maritima* leaf-, stem- and root-based coils evoked mortality rates comparable or higher if compared to permethrin-based positive control (62%, 52%, 42%, and 50.2 respectively). In ovicidal experiments, egg hatchability was reduced by 100% after treatment with 20 ppm of AgNP and 250 ppm of *S. maritima* extract. Furthermore, low doses of the AgNP inhibited the growth of *Bacillus subtilis*, *Klebsiella pneumoniae* and *Salmonella typhi*. Overall, our results highlighted the potential of *S. maritima*-based herbal coils and green nanoparticles as biopesticides in the fight against the dengue vector *A. aegypti* and the tobacco cutworm *S. litura*.

Keyword: Arbovirus; Crop protection; Mangrove; Antibacterial activity; Nanotechnology