Synthesis of Silver Nanoparticles using *Pavetta indica* Leaf Extract and its Toxicity on *Spodoptera litura* and Dengue Vector, *Aedes aegypti*

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Abstract

Spodoptera litura is a significant polyphagous pest in many countries**,** causing substantial failure to numerous vegetable and field crops. The yellow fever mosquito, *Aedes aegypti*, is accountable for dengue fever. It is there in more than 100 countries and threatens the health of just about 2.5 billion people. The application of synthetic insecticides in agricultural pest and mosquito control plan has resulted huge damage to the ecosystem, insect pest resistance and adverse effects on non-target organisms. Therefore, eco-friendly management tools against lepidopteran pest and mosquito vectors are a primary concern. In this study, silver nanoparticles (AgNPs) were synthesized by the leaf extracts of *Pavetta indica.* The AgNPs were illustrated by UV–vis spectrophotometry, X-ray diffraction (XRD), Fourier transform infrared spectrum (FTIR), and transmission electron microscopy (TEM) analysis. *P. indica* - aqueous extract and AgNPs were tested for their potential larvicidal activity against *S. litura* and *A. aegypti.* In addition, we estimated the biological toxicity of aqueous extract of *P. indica* and green synthesized AgNPs on non-target aquatic organisms, *Gambusia affinis*. The AgNPs was confirmed by the color of the leaf extract which was altered from light yellow to light-brown within 3 h after the *P. indica* extract was added to the $AgNO_3$ solution. The pattern of AgNPs was confirmed through the presence of an absorption peak at 466.5 nm. XRD patterns of AgNPs showed a high crystalline nature. TEM analysis exhibited most of the AgNPs were roughly circular and spherical in shapes. The leaf extract of *P.indica* exhibited a moderate toxic effect on *S. litura* after 24hr of exposure (99.5 and 100% mortality was observed at 750 and 100 µg/mL of leaf extract and AgNPs, respectively); Nevertheless, the utmost larval mortality was established in the AgNPs (LC_{50} =38.22 µg/mL). Under laboratory conditions, the AgNPs were greatly toxic against *A. aegypti* with the LC_{50} value was 11.11 µg/mL and the negligible toxicity against *G. affinis*. On the whole, the green synthesized AgNPs have potential to be employed as a promising candidate for the control of agricultural pests and mosquitoes through eco-friendly and cost-effective approaches.

Keywords: Green-synthesis, Innovative nanotechnology, Insect pest, Mosquitoes, Smart agriculture and environment

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