(178)

Olax zeylanica Leaf Extract-assisted Eco-Benevolent Synthesis of Sulfur Nanoparticles and the Determination of their Insecticidal Potential against *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae)

Sandeepani G.D.V.A.[1], Perera A.G.W.U.[2]*, Chinthaka S.D.M.[1]

[1] *Department of Chemistry, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*
[2]*Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*
**wathsala@sjp.ac.lk*

Abstract

Stored-product insects are serious pests of dried, stored, durable agricultural goods and value-added foods worldwide. In spite of the commonest way of controlling pestiferous insects associated with cereal grains and their milled products via conventional insecticides, their usage on stored grains are not recommended due to expensiveness, inefficacy due to insect resistance, and potential health hazards to humans. These deleterious consequences thus have been encouraging to merit investigation on the plant extract-assisted eco-benevolent synthesis of nanoparticles, owing to their sustainable, non-noxious, convenient, and environmental friendly nature. In view of this background, the present study was aimed at evaluating the insecticidal effectiveness of green synthesized sulfur nanoparticles (SNPs) against *Sitophilus oryzae* adults. SNPs have been successfully prepared from sodium thiosulfate ($Na_2S_2O_3.5H_2O$) in the presence of *Olax zeylanica* leaf extract at room temperature. The resulting SNPs were then characterized by UV-Vis spectroscopy, X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). The toxicity of *Sitophilus oryzae* was bio-assayed by exposing the test insects to SNPs-treated rice grains at six different dosages at 1.5, 1.0, 0.5, 0.25, 0.125 and 0.0625 g/kg, whereby mortality counts were taken after every 24 hours for seven days. The UV- Vis spectroscopy showed a peak in the range of 260-280 nm, which showed the successful formation of SNPs, while being in accordance with the previous studies reported in the literature. According to the Debye-Scherrer formula of XRD data, the average crystalline size of the SNPs counted to be 72.7 nm. The particle size of SNPs is also confirmed by SEM images. FTIR results showed peak positions corresponding to S_8 with slight differences due to the presence of biomolecules from the *O. zeylanica* leaf extract being bound onto the surface of SNPs. Bioassay results show that the mortality of insects increased with the increase of dosage and exposure time period, reporting 100% *S. oryzae* mortalities at 1.5 and 1.0 g/kg dosages within 7 days. Accordingly, the results of the present study thus suggest that the bio-transformed sulfur nanoparticles could be utilized not only as biocontrol agents, but also as ecofriendly candidates for the sustained-protection storage grain ecosystems from insect pest infestations.

Keywords: Green-synthesized Sulfur nanoparticles, *Olax zeylanica*, Insecticidal, *Sitophilus oryzae*