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Ecofriendly Synthesis of Silver Nanoparticles via *Camellia sinensis* Leaves and their Insecticidal Effects towards the Storage Pest, *Sitophilus oryzae*. (L.)

Sandeevani 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

Existing agricultural practices are not enough to satisfy the growing demand for food. Therefore, high-yielding varieties, fertilizers, and pesticides must be used to increase productivity with limited arable land. As the crop yield increases, the incidence of pest attack within field and storage ecosystems rise which leads to increased demand for insecticides. Plant-mediated biosynthesis of nanomaterials has attracted much researcher interest in recent years due to many advantages over chemically synthesized conventional insecticides. This study was carried out to evaluate the effectiveness of silver nanoparticles (AgNPs) synthesized using the leaf extract of Sri Lankan tea from *Camellia sinensis* to control a major stored-grain insect pest, the *Sitophilus oryzae* adults (Coleoptera: Curculionidae). The biosynthesized AgNPs were characterized by UV-Vis spectroscopy, X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). The bio-transformed AgNPs were applied at the rates of 1.5, 1.0, 0.5, 0.25, 0.125 and 0.0625 g/kg on pesticide-free rice grains, wherein the mortality percentage was assessed after every 24 hours for seven days continuously. The appearance of the signature brown color of the solution indicated the formation of silver nanoparticles. UV-Vis spectroscopy results showed a peak of absorbance in the range of 400-460 nm, which is in good agreement with previous records for silver nanoparticles synthesized by green techniques. The average crystallite size determined by subjecting XRD results into Debye-Scherrer equation was found to be 61.9 nm, which was further characterized by the electronmicrography results obtained by SEM, whereby particles were confirmed to be within the nano-range. Results of the toxicity bioassay showed that mortality of *S. oryzae* adults increased with increasing dosages and time exposed to each dosage, producing 100% mortality at 1.5 g/kg dosage. Hence, it can be concluded that the green synthesized silver nanoparticles can be applied effectively and successfully in a stored grain integrated pest management programs.

Keywords: Green-synthesized silver nanoparticles, *Camellia sinensis*, Insecticidal, *Sitophilus oryzae*