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Abstract Book

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I-CReST 2025:143-120 – Green Synthesis of ZnO-NPs and Ag/ZnO-NPs using *Mariposa Christia vespertilionis* leaves extract and its Photodegradation against Pesticides: Endosulfan and Aldrin

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ABSTRACT

Green synthesis of zinc oxide nanoparticles (ZnO-NPs) has gained interest and its application as a photocatalyst for the degradation of various organic pollutants. In this study, ZnO-NPs and silver doped Ag/ZnO-NPs with various ratios (3%,5%,7%) were synthesized using *Mariposa christia vespertilionis* (MCV) leaves extract by a simple and economical green synthesis approach. Ultraviolet-visible spectroscopy (UV-Vis) was used to confirm the nanoparticle synthesis by observing the SPR around 277 nm wavelength. The Fourier Transform-Infrared Spectroscopy (FT-IR) also confirmed the formation of ZnO-NPs by observing the metal-oxygen absorption peak at a wavenumber of 601.81 cm-1, referred to as the Zn-O bond. The sharp peaks of the X-ray diffractogram (XRD) indicated the hexagonal wurtzite structure of the samples. Scanning electron microscope (SEM) declared that the synthesized nanoparticle samples were spherical shaped with a size range of 270–530 nm while transmission electron microscopy (TEM) reveal spherical and polyhedral crystallites with highly agglomerated structures with interplanar distances of 0.2497 nm, 0.2005 nm, 0.2194 nm, and 0.2625 nm. The Thermogravimetric analysis (TGA) was employed to study the thermal properties. The fully characterized samples were used as a photocatalyst against the degradation of model pesticides of endosulfan and aldrin. ZnO-NPs showed high degradation compared to previous studies of 94.79% and 96.07%, which is greater than Ag/ZnO-NPs that indicated 94.51% and 90.70% when tested against endosulfan and aldrin, correspondingly at optimum conditions under direct sunlight at pH7 for 180 min. Comparative studies on different kinetic models like zero-order, first-order, and second-order reaction kinetics were carried out which revealed First-order reaction as the best fit kinetic model for the photocatalytic degradation of both Endosulfan and Adrin. This finding also shows the potential of ZnO-NPs and Ag/ZnO-NPs synthesized by green, economical and sustainable route with various potential applications that can be further explored.

Keywords: Green synthesis; ZnO-NPs, Pesticides; Photodegradation; *Mariposa Christia Vespertilionis*