

Facile synthesis of silver and gold nanoparticles using Mangrove (*Avicennia marina*) leaves extract and its cytotoxicity and larvicidal activity

Hamed A. Gramah^{1,2,3}, Zubair Ahmad^{2,4} and Essam H. Ibrahim³

¹Research Center for Advanced Materials Science (RCAMS), King Khalid University, Abha 61413, Saudi Arabia.

²Center of Bee Research and its Products, King Khalid University, Abha 61413, Saudi Arabia.

³Biology Department, Faculty of Science, King Khalid University, Abha 61413, Saudi Arabia.

⁴Applied College, Mahala Campus, King Khalid University, Abha 61413, Saudi Arabia.

Abstract: The field of bio-fabricated noble metallic nanoparticles (NPs) has gained significant attention in applied research due to their eco-friendly and biocompatible nature. This study focuses on employing a green synthesis method to produce silver and gold nanoparticles (bio-fabricated) using a Mangrove plant extract and assessing their insecticidal and growth-inhibitory effects for environmentally friendly pest control. The resulting NPs underwent comprehensive characterization through various spectroscopy techniques. The morphology of both silver and gold mediated nanoparticles of *Avicennia marina leaf* extract displayed a spherical shape, with average sizes measuring around 70-80 nm and 95-100 nm, respectively. Regarding cytotoxicity, the inhibitory effects of silver nanoparticles were less than that observed by the extract alone while gold nanoparticles showed stronger cell growth inhibitory effects on splenic cells. The hepatic toxicity of silver and gold nanoparticles showed significant toxic effects as compared to *A. marina* extract alone. Notably, as prepared silver nanoparticles exhibited substantial larvicidal toxicity as compared to gold nanoparticles, when tested against fourth instar *Culex pipiens* larvae. These biocompatible silver and gold nanoparticles prepared from *A. marina leaf* extract hold promise for future applications as larvicides to effectively control mosquito species.

Keywords: Gold nanoparticles, silver nanoparticles, cytotoxicity, larvicidal activity, *Avicennia marina*, *culex pipiens*
