Effect of Monometallic Nanoparticles Produced from *Lawsonia inermis* on Sustainable Control of A*nopheles stephensi* and *Callosobruchus maculates*

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Abstract

Mosquito-borne illnesses are caused by bacteria, viruses or parasites transmitted by mosquitoes which include malaria, dengue, west nile virus, chikungunya, yellow fever, filariasis, japanese encephalitis and zika virus. Newer and safer tools are urgently needed for mosquito control. Stored-product insect pests are responsible for considerable quantitative and qualitative losses of agricultural stored products like peas, cowpea etc. The cowpea weevil *Callosobruchus maculatus* is considered as the most destructive pests in stored grains and grain-derived products. Therefore in this study the effect of monometallic nanoparticles synthesized from *Lawsonia inermis* for the sustainable control of *Anopheles stephensi* and *Callosobruchus maculates* was examined in laboratory condition. Copper nanoparticles were produced by using the leaf extract of *Lawsonia inermis which was characterized by using* UV–vis, FTIR spectroscopy, scanning electron microscopy (SEM), energy-dispersive X-ray (EDAX), and X-ray diffraction analyses (XRD). After biophysical characterization, the Li-Cu NP at various concentrations was tested for its toxicity against young instar of *A. stephensi* and *C. maculates*. From these results it is evident that the toxicity was higher as the concentration increases. Even though *Lawsonia inmeris* has its own toxicity against this vector at the concentration of 20, 40, 60, 80 and 100ppm, Li-NP dominated in the larval mortality when treated with 2, 4, 6, 8 and 10ppm. In the case of stored pest the toxicity was at 0-97% when exposed with the concentrations of 1, 1.5, 2, 2.5, and 3ppm after 72 h exposure time. Overall, the laboratory studies have shown that the formulated Li-copper nanoparticle could be a good alternative for the control of the *A. stephensi* and stored pest *C. maculates*. However, the present research demonstrated simultaneous of the bionano formulations against vector and stored pests.

Keywords: *Anopheles stephensi, Callosobruchus maculates,* Copper nanoparticles, *Lawsonia inermis*

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