

Insecticidal Effect of Nanoparticles against *Helicoverpa armigera* Infesting Chickpea

Authors : Shabistana Nisar, Parvez Qamar Rizvi, Sheeraz Malik

Abstract : The potential advantage of nanotechnology is comparably marginal due to its unclear benefits in agriculture and insufficiency in public opinion. The nanotech products might solve the pesticide problems of societal concern fairly at acceptable or low risk for consumers and environmental applications. The deleterious effect of chemicals used on crops can be compacted either by reducing the existing active ingredient to nanosize or by plummeting the metals into nanoform. Considering the above facts, an attempt was made to determine the efficacy of nanoelements viz., Silver, Copper Manganese and Neem seed kernel extract (NSKE) for effective management of gram pod borer, *Helicoverpa armigera* infesting chickpea, being the most damaging pest of large number of crops, gram pod borer was selected as test insect to ascertain the impact of nanoparticles under controlled conditions (25-27 °C, 60-80% RH). The respective nanoformulations (0.01, 0.005, 0.003, 0.0025, 0.002, 0.001) were topically applied on 4th instar larvae of pod borer. In general, nanochemicals (silver, copper, manganese, NSKE) produced relatively high mortality at low dilutions (0.01, 0.005, 0.003). The least mortality was however recorded at 0.001 concentration. Nanosilver proved most efficient producing significantly highest ($f_{4,24}=129.56$, $p < 0.05$) mortality 63.13 ± 1.77 , 83.21 ± 2.02 and 96.10 ± 1.25 % at 0.01 concentration after 2nd, 4th and 6th day, respectively. The least mortality was however recorded with nanoNSKE. The mortality values obtained at respective days were $21.25 \pm 1.50\%$, $25.20 \pm 2.00\%$, and $56.20 \pm 2.25\%$. Nanocopper and nanomanganese showed slow rate of killing on 2nd day of exposure, but increased (79.20 ± 3.25 and 65.33 ± 1.25) at 0.01 dilution on 3rd day, followed by $83.00 \pm 3.50\%$ and $70.20 \pm 2.20\%$ mortality on 6thday. The sluggishness coupled with antifeedancy was noticed at early stage of exposure. The change in body colour to brown due to additional melanisation in copper, manganese, and silver treated larvae and demalinization in nanoNSKE exposed larvae was observed at later stage of treatment. Thus, all the nanochemicals applied, produced the significant lethal impact on *Helicoverpa armigera* and can be used as valuable tool for its effective management.

Keywords : chickpea, *helicoverpa armigera*, management, nanoparticles

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