Silver and zinc oxide nanoparticles induce developmental and physiological changes in the larval and pupal stages of Spodoptera littoralis (Lepidoptera: Noctuidae)

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Abstract:

The rapid growth of nanotechnology application in various fields of science led to need of understanding their possible effects on development and physiology of insects before using them as control agents. Instead of feeding on a toxic dose, the impact of silver nanoparticles (AgNPs, 50–60 nm) and zinc oxide nanoparticles (ZnONPs, 10–30 nm) was studied at a nonlethal concentration on the larval stages of Spodoptera littoralis. Late second instar larvae of S. littoralis were treated with water, 10 mg/mL AgNPs and ZnONPs dipped castor leaves for 6 days. Both nanoparticles treated leaves caused reduction in both larval weight gain and pupal weight than water dipped leaves while ZnONPs only caused extended larval period. ZnONPs increased total hemocyte, granular cell and plasmatocyte counts while AgNPs increased plasmatocytes only. ZnONPs decreased the levels of protein, lipids and carbohydrates than control and AgNPs treated larvae. On the contrary, ZnONPs induced significant increase in the activities of amylase, glucose 6 phosphate dehydrogenase (G6PD), lipase as well as two antioxidative enzymes, the catalase and superoxide dismutase. These results clearly show that ZnONPs ingestion interfere with the digestive and immunological physiology as well as the development of S. littoralis.

Keywords:

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