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TITLE

**TOXICITY OF GREEN SILVER NANOPARTICLES FROM CROTON URUCURANA ON BIOMPHALARIA GLABRATA HEMOCYTES: GENOTOXIC, MUTAGENIC, AND IMMUNOGENIC EFFECTS**

AUTHORS

Araújo, P.S.*[1]; Ribeiro, G.S.[1]; Caixeta, M.B.[2]; Gabriel Qualhato, G.[1]; Bruno Bastos Gonçalves, B.B.[1]; Gomes, R.S.[3]; Viali, E.S.N.[4]; Rocha, T.L.[1]

AFFILIATIONS

[1]Laboratory of Environmental Biotechnology and Ecotoxicology, Institute of Tropical Pathology and Public Health, Federal University of Goiás, Goiânia, Goiás, Brazil.
[2] Technology and Health Science Laboratory, Medicine Departament, Catalão Federal University, Catalão, Goiás,Brazil.
[3] Natural Immunity Laboratory, Institute of Tropical Pathology and Public Health, Federal University of Goiás, Goiânia, Goiás. Brazil.

ABSTRACT

Green silver nanoparticles (G-Ag NPs) have emerged as a promising and safe approach in the development of molluscicides, particularly for controlling snails that act as intermediate hosts of medically important parasites, such as Biomphalaria glabrata, the main intermediate host of Schistosoma mansoni. In this context, the current study investigated the effects of G-Ag NPs synthesized using the aqueous extract of Croton urucurana leaves on the hemocytes of B. glabrata after in vivo exposure. Adults of B. glabrata were exposed to G-Ag NPs (0.05 and 0.14 mg $L^{-1}$), and to an aqueous extract of C. urucurana leaves (5.4 mg $L^{-1}$), for 7 days. Genotoxicity (comet assay), mutagenicity (micronucleus test and nuclear anomalies), and immunotoxicity (phagocytic activity by flow cytometry) were analyzed in the B. glabrata hemocytes'. The results indicated that G-Ag NPs induced DNA damage, with an increase in the percentage of DNA tail and in the Olive Tail Moment compared to the negative control group and those exposed to the aqueous extract of C. urucurana. Additionally, G-Ag NPs induced mutagenic effects in hemocytes, with notable nuclear alterations such as notched and blebbed nuclei. However, the phagocytic activity and cell viability of hemocytes were not affected by exposure to G-Ag NPs or aqueous extract of C. urucurana leaves. The results showed that G-Ag NPs induced significant genotoxic and mutagenic effects in the hemocytes of Biomphalaria glabrata, demonstrating their potential as effective molluscicides. These effects highlight the relevance of green nanoparticles as a promising and more sustainable alternative in the control of snail hosts of parasites, especially in combating schistosomiasis. The study provides an important basis for the development of new technologies that can contribute to reducing the transmission of parasitic diseases.

KEYWORDS

Green nanoparticles; Molluscicides; Nanotechnology; Schistosomiasis control.

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