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Fungicidal activity study of capped and uncapped metallic nanoparticles based on *Trichoderma harzianum*

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Biogenic synthesis of metallic nanoparticles is emerging as an interesting and environmental friendly alternative of nanotechnology. Nanoparticles produced through this route are covered by a capping of proteins and other compounds, which provides stability and can present biological activity. In this study, nanoparticles of silver, titanium dioxide and iron were synthesized using the filtrate of the biocontrol fungus *Trichoderma harzianum*. After synthesis, the capping of the nanoparticles was removed in order to compare capped and uncapped nanoparticles through evaluation of physic-chemical parameters, toxicity and biological activity against the phytopathogenic fungus *Sclerotinia sclerotiorum* (White mold). Size distribution, polydispersity index, zeta potential and concentration were obtained through dynamic light scattering, microelectrophoresis and nanoparticles tracking analysis. Cytotoxicity and genotoxicity were evaluated through *Allium cepa* assay. Activity against *S. sclerotiorum* was investigated performing the culture of sclerotia (resistant structures of the fungus) in agar supplemented with the nanoparticles and evaluating mycelial growth and development of new sclerotia. Synthesis of the three types of nanoparticles were successful and results of characterization revealed changes in size, polydispersity index and zeta potential after the capping was removed, mainly for iron nanoparticles, which showed an increase in size of about tenfold. *Allium cepa* results showed that capped silver and iron nanoparticles caused an increase in mitotic index and the three uncapped nanoparticles caused significantly higher chromossomal aberrations indices than capped ones. With regard to nanoparticles effects on *S. sclerotiorum*, the capped nanoparticles showed better results inhibiting mycelial growth and the development of new *sclerotia*. These better results for capped nanoparticles can be attributed to the stabilization of the nanoparticles with the capping from *Trichoderma harzianum* compounds, which contributes for size maintenance and can possess biological activity. Although this investigation arises as a promising application for biogenic metallic nanoparticles, these are initial results and more studies are necessary.

Speaker Biography

Mariana Guilger is a doctoral student of University of Sorocaba, Brazil. In this moment, she is working on the synthesis of biogenic metallic nanoparticles aiming agricultural applications and investigating these nanomaterials toxicity. One of her work focus is the use of *Trichoderma harzianum* as a reducing and capping agent in the attempt to synthesize biogenic nanoparticles for targeted control of phytopathogens.

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