

Minimum inhibitory concentration of nano-silver bactericides for beneficial microbes and its effect on *Ralstonia solanacearum* and seed germination of Japanese Cucumber (*Cucumis sativus*)

ABSTRACT

Background: Plant growth-promoting rhizobacteria (PGPR) are highly promising biofertilizers that contribute to eco-friendly sustainable agriculture. There have been many reports on the anti-microbial properties of nanoparticles (NPs). Toxic effects of NPs under laboratory conditions have also reported; however, there is a lack of information about their uptake and mobility in organisms under environmental conditions. There is an urgent need to determine the highest concentration of NPs which is not detrimental for growth and proliferation of PGPR.

Methods: Transmission electron microscopy (TEM) and scanning electron microscopy (SEM) were used to measure the size and shape of NPs. Minimum inhibitory concentrations (MIC) of nano-silver on selected beneficial microbes and *Ralstonia solanacearum* were measured using the microdilution broth method. The percentage of seed germination was measured under in vitro conditions.

Results: NPs were spherical with a size of 16 ± 6 nm. Nano-silver at 12–40 mg l⁻¹ inhibited the growth of bacteria. Seed application at 40 mg l⁻¹ protected seeds from *R. solanacearum* and improved the rate of seed germination.

Keyword: Nanoparticles; PGPR; Seed germination