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Plant based silver and zinc oxide nanoparticles act as fungicides and control sheath blight disease of rice

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Plant based nanoparticles (NPs) prepared using green chemistry approach are documented for antimicrobial potentials having promising effects against some crop diseases. The present changes of climatic conditions are causing higher rate of mutations in the pathogenic strains that are becoming difficult to control. To control diverse phytopathogens, it is essential to look for more effective integrated strategies having broad spectrum plant protection measures. Silver (Ag) in ionic/nanoparticle form and Zinc as ZnO nanoparticles have antimicrobial properties and are being used for controlling plant pathogens. Novel *Diospyros malabarica* plant based Ag and ZnO nanoparticles were prepared, evaluated and validated for their potential to control *Rhizoctonia solani* causing sheath blight disease of rice crop. The physicochemical characteristics of Ag and ZnO NPs were checked using the UV-Vis spectroscopy, scanning electron microscopy (SEM) and energy dispersive X-ray (EDX) analyses. The in vitro antifungal assays against purified culture of *Rhizoctonia solani* causing sheath blight disease in rice was carried out using poison food technique employing different concentrations (50-1000mg/L) of Ag and ZnO NPs and inhibition in mycelia and schlerotia growth of *R. solani* was quantified. The in vivo evaluation of induced resistance to sheath blight disease by root immersion and foliar application of Ag and ZnO NP in pots experiment showed significant disease reduction by 800 mg/L Ag and ZnO NP, respectively. It is suggested that plant assisted Ag and ZnO NPs are attractive green candidates to control rice sheath blight disease which may be possible alternative for the inhibition of fungal plant disease contrary to the synthetic fungicides. Based on these results and further evaluation of the tested NPs against different diseases and crops may lead to the development of safe and environment friendly nanofungicides. Key words: plant based nanoparticles, silver, zinc oxide, rice, sheath blight disease