Abstract

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Transcriptomic changes in green bean pods against grey mould and white rot diseases via field application of chemical elicitor nanoparticles

The authors tested the efficacy of two salt nanoparticles (NPs), namely, copper dioxide (CuO) and tri-calcium phosphate [Ca3(PO4)2] to induce resistance in green bean pods against grey mould and white rot diseases caused by Botrytis cinerea and Sclerotinia sclerotiorum, respectively. High amounts of phytoalexins, kievitone, coumestrol, phaseollidin, 6-?- hydroxyphaseollin, and phaseollin, were detected in naturally infected and artificially inoculated green bean pods in response to the tested NPs. Green bean plants treated in the field with CuO and Ca3(PO4)2 NPs had the highest mRNA quantity of all the studied defence genes, receptor-like kinase (PvRK20), pathogenesis-related protein (PR1), 1,3-?-D-glucanase (pvgluc), polygalacturonase inhibitor protein (PvGIP), and alpha-dioxygenase (a-DOX) than that of the control group. CuO NPs followed by Ca3(PO4)2 NPs at 0.15 mg ml?1 were the most potent in increasing the transcriptomic levels of pk20, DOX, PR1, PvGIP, and pvgluc. Field applications of both chemical elicitor NPs exhibited a non-genotoxic effect on the Paulista green bean DNA using eight ISSR primers. The field application of the studied NPs could effectively extend the shelf life of green bean pods by up to 21 days at 7 ± 1°C during marketing and export due to its potent effect against grey mould and white rot diseases.