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Metal and Salinity Tolerance in *Trichoderma asperellum* and the Impact on Biocontrol Efficacy against *Fusarium* Pathogens

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Purpose: *Trichoderma asperellum* (isolate T2), a mycoparasite with biocontrol activities, is studied for its tolerance to metal and salinity stress, and the gradual impact of the stress on biocontrol activities. This helps to establish the role of *Trichoderma asperellum* as a biocontrol agent and its ability to retain biocontrol activities when used in soils with high metal and salinity stress.

Methods: *Trichoderma asperellum* was first screened for tolerance against varying concentrations (100ppm, 200ppm, 300ppm, 400ppm, 500ppm and 1000ppm) of copper (Cu), lead (Pb), zinc (Zn), aluminium (Al), chromium (Cr), cadmium (Cd) and of salt (50mM, 100mM, 150mM, 200mM and 250mM). This was conducted using plate assays (potato dextrose agar supplemented with metals and salt). The isolate was also tested for antagonistic effect against *Fusarium solani*, *F. proliferatum* and *F. verticillioides* by dual culture assay.

Results: Results showed that *Trichoderma asperellum* was able to tolerate high concentrations of toxic metals (up to 500ppm except for cadmium) and also salinity (up to 250mM). At high metal concentrations, morphological changes (pigmentation) of the mycelium was observed. Tolerance assay revealed that *Trichoderma asperellum* grew under presence of cadmium with less than 100ppm, and other metals with less than 500ppm. *Trichoderma asperellum* exhibited antagonistic activity against *Fusarium* pathogens and suppressed the growth of *F. solani* ($60.75 \pm 0.54\%$), *F. proliferatum* ($64.14 \pm 0.51\%$) and *F. verticillioides* ($70.57 \pm 0.35\%$) on dual culture assay.

Conclusions: It is concluded that *Trichoderma asperellum* is able to tolerate metals and grow in high salinity environment. With these characteristics, *Trichoderma asperellum* can potentially have applications as biofertilizer, and biofungicide in soils high with metal and salinity stresses.