Investigating the biocontrol and plant growth promotion potential of fungal endophytes

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Previous studies have amply demonstrated the potential of fungal endophytes to protect host plants from pests and diseases, while promoting plant growth via different mechanisms. Nevertheless, these potential roles have not been comprehensively explored and fungal endophyte communities around the world remain as a vastly untapped resource. Thus, this study was focused on screening putative fungal endophytes isolated from weedy and wild rice species of Sri Lanka for plant growth promoting properties and antagonism against known rice pathogens.

From a repository of putative rice fungal endophyte isolates, 60 isolates were screened for antagonism against the phytopathogen, *Rhizoctoniasolani,* using dual culture assay. Among them, two isolates, G.W.I.N.R 004 and B.W.E.R.L 024, showed promising antagonistic activity against *R. solani*, with 83.4% and 58.6% inhibition of radial colony growth compared to the control (*R. solani*alone), on 1% PDA at room temperature. Ethyl acetate crude extracts of both isolates,G.W.I.N.R 004 and B.W.E.R.L 024,tested using the well diffusion method demonstrated significant ($P<0.05$) inhibition of radial colony growth of *R. solani*at50 µL of fungal extract (20 mg/mL) per well compared to the negative control (50 µL of DMSO). In addition to antifungal activity, crude extracts of both G.W.I.N.R 004 and B.W.E.R.L 024, in a disk diffusion assay on NA plates with 20 µL of fungal extract (20 mg/mL) per disk, demonstrated antibacterial activity against four bacterial strains, *Bacillus subtilis, Escherichia coli, Pseudomonas aeruginosa*and *Staphylococcus aureus*at varying degrees. ITS sequences of G.W.I.N.R 004 and B.W.E.R.L 024 showed 99% identity with ITS sequences of *Trichodermaatroviride*(KR868351.1) and *Sarocladiumoryzae*(KP999970.1) respectively. *Trichodermaatroviride*is a well-documented biocontrol agent while *Sarocladiumoryzae*is a known rice pathogen. Further studies are necessary to ascertain their biocontrol potentials and endophytic life styles. To investigate the plant growth promotion potential of rice fungal endophytes, 15 isolates were screened for IAA production in 1% PDB medium supplemented with L-trptophan (0.5% (w/v)) using Shalkowski's reagent. All 15 isolates screened produced IAA, with amounts ranging from 0.16 to61.81 µg/mL, while isolate G.W.I.Rh.L 006 (61.81 µg/mL) showed the highest IAA production followed by isolate G.W.I.G.PS 018 (52.85 µg/mL).The isolates are yet to be identified via ITS sequencing. The current study yielded a number of putative rice fungal endophytes which can be further tested in future for potential biocontrol and plant growth enhancement applications.