Impact of antifungals producing rhizobacteria on the performance of Vigna radiata in the presence of arbuscular mycorrhizal fungi

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Plant growth-promoting rhizobacteria (PGPR) that produce antifungal metabolites are potential threats for the arbuscular mycorrhizal (AM) fungi known for their beneficial symbiosis with plants that is crucially important for low-input sustainable agriculture. To address this issue, we used a compartmented container system where test plants, Vigna radiata, could only reach a separate nutrient-rich compartment indirectly via the hyphae of AM fungi associated with their roots. In this system, where plants depended on nutrient uptake via AM symbiosis, we explored the impact of various PGPR. Plants were inoculated with or without a consortium of four species of AM fungi (Glomus coronatum, Glomus etunicatum, Glomus constrictum, and Glomus intraradices), and one or more of the following PGPR strains: phenazine producing (P+) and phenazine-less mutant (P-), diacetylphloroglucinol (DAPG) producing (G(+)) and DAPG-less mutant (G(-)) strains of Pseudomonas fluorescens, and an unknown antifungal metabolite-producing Alcaligenes faecalis strain, SLHRE425 (D). PGPR exerted only a small if any effect on the performance of AM symbiosis. G(+) enhanced AM root colonization and had positive effects on shoot growth and nitrogen content when added alone, but not in combination with P+. D negatively influenced AM root colonization, but did not affect nutrient acquisition. Principal component analysis of all treatments indicated correlation between root weight, shoot weight, and nutrient uptake by AM fungus. The results indicate that antifungal metabolites producing PGPR do not necessarily interfere with AM symbiosis and may even promote it thus carefully chosen combinations of such bioinoculants could lead to better plant growth.

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