AGR1305 Development of a Highly Reliable Biofertilizer for Pulse-Based Rotations

Adapted associative bacteria can enhance the growth, yield, and N_2-fixation of legumes. The plant-growth-promoting attributes of H_2-oxydizing rhizobacteria associated with the roots of lentil grown in semiarid Saskatchewan were evaluated. Siderophore production was detected in nine of the 10 isolates, whereas only one of the bacteria was found to solubilize phosphate. Indole-3-acetic acid production was found in four bacterial isolates, and 1-aminocyclopropane-1-carboxylate deaminase activity was found in six bacterial isolates. The soil-borne pathogen *Fusarium avenaceum* was markedly suppressed by all the H_2-oxidizing bacteria in vitro, and seven isolates also suppressed the growth of both *Rhizoctonia solani* and *Pythium ultimum*. The 10 H_2-oxidizing isolates were evaluated for plant growth promotion on lentil under drought and biotic stresses in the greenhouse. Several of the H_2-oxidizing rhizobacterial isolates increased shoot and root biomass. Several isolates increase nodule number both under drought and conditions of moisture sufficiency. The inoculation of lentil with individual H_2-oxidizing rhizobacteria enhanced greenhouse-grown plants infected by the fungal root pathogens *F. avenaceum, R. solani*, and *P. ultimum*. The H_2-oxidizing rhizobacteria identified as *Variovorax paradoxus*, *Mycobacterium* sp., *Acinetobacter* sp., *Acinetobacter calcoaceticus*, and *Curtobacterium* sp. exhibited multiple plant-growth-promoting attributes. We tested also the influence of H_2-oxidizing isolates of the genus *Variovorax* and *Mycobacterium* on the AM fungus *Rhizophagus irregularis*, which showed 'Mycorrhization Helper Bacteria' properties influencing the growth of the AM fungus in the laboratory. Finally three selected bacteria were also formulated in peat-powder and tested as inoculant under field conditions, in pulse-wheat systems. Inoculation with the H_2-oxydizing rhizobacteria increased the level of natural AM root colonization in the field and could improve plant productivity at flowering, with no effect on grain yield.