SIGNALS AFFECTING THE UREASE STATUS OF PLANT-ASSOCIATED BACTERIA, *METHYLOBACTERIUM* SPP.

Stephen B. Witzig

Dr. Joseph C. Polacco, Thesis Supervisor

ABSTRACT

Pink-Pigmented Facultative Methylotrophic bacteria (PPFMs, *Methylobacterium* spp.) have been found to be the most abundant microorganisms among phylloplane microflora, and have been recovered from all plants examined. I examined the ability of resident PPFMs to mimic the urease-negative phenotype of two mutant classes of urease-negative soybean hosts. The working model is that there is a signal from the plant that either inhibits the production of the urease gene products in the associated bacteria or inhibits the function or transport of Ni^{2+} from the plant to the bacteria. My studies led to the overall conclusion that urease is essential for assimilation of urea and of ureides, that urease has a constitutive basal level of expression and is "induced" by the ureide allantoin and "repressed" by the preferential nitrogen source, ammonium. However, these nitrogenous signals are not responsible for the urease-negative status of the plant-associated PPFMs. Our working model has shifted to a block in Ni^{2+} uptake necessitating examination of Ni^{2+} content in these bacteria. I attempted the recolonization of plants with PPFMs to determine how this affects urease activity in recovered isolates. In the course of these studies it became obvious that the interactions between PPFMs and the host plant is an intimate one because seed-reintroduced strains, though colonizing the host plant, were not seed-transmitted. In addition, PPFM interactions with *Arabidopsis* and with soybean were distinguishable, in that only in the latter were endogenous PPFMs urease-negative on mutant hosts defective in urease accessory genes.