

Soils in Restoration

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Plant Health LLC

- **Founded in 1987 while I was still with ARS to be better able to help nurserymen**
- **Retirement from ARS in 2007**
- **Production of mycorrhizal fungal inoculum (Endo, Ecto, and Ericoid) and other beneficial microbes**
- **Services: assays for pathogens, antagonistic potential, mycorrhizal fungi in soil or roots, consulting, contract research**

Types of mycorrhizae

- Ectomycorrhizae (pines, oaks, birches)
- Endomycorrhizae (most other plants)
 - Ericoid mycorrhizae
 - Orchid mycorrhizae
 - VAM or AM mycorrhizae
- Ectendomycorrhizae (some ericaceous plants)
- Non-mycorrhizal families: Crucifers, Chenopods, sedges, carnation family, etc.

Milestone concepts

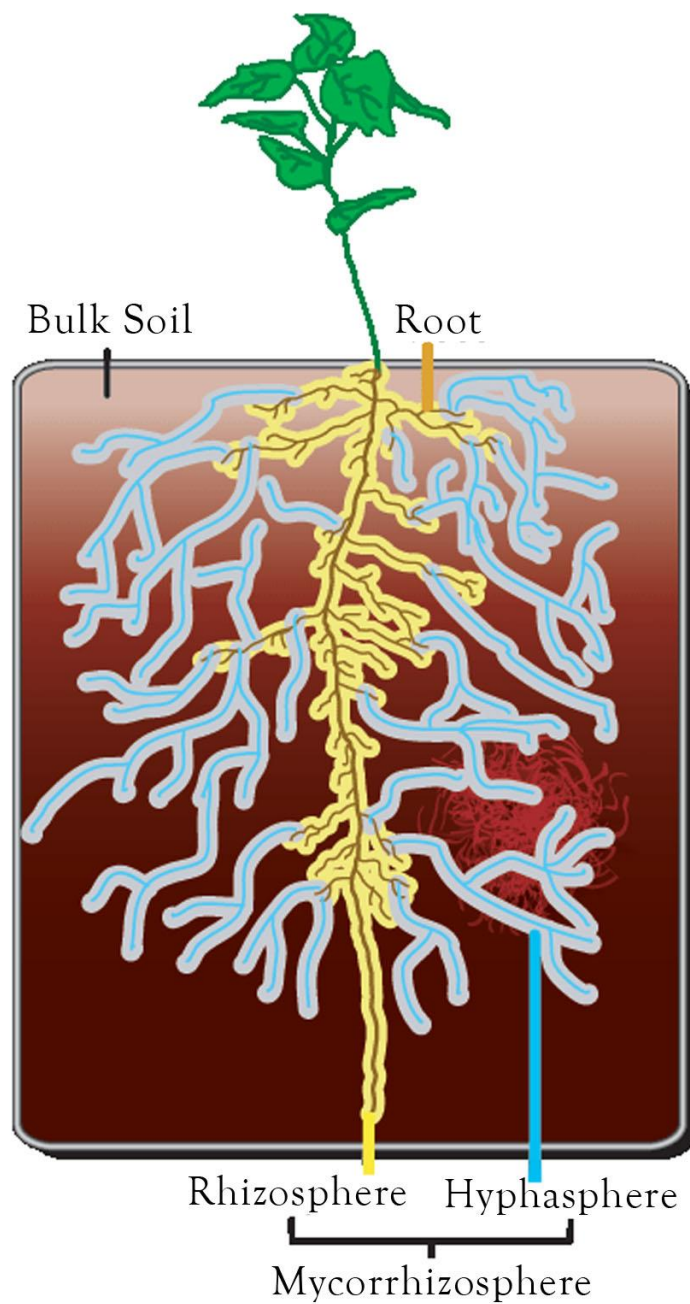
- Managing soilborne pathogens and disease led to study of rhizosphere biology
- Emphasis on pathogen biology, cultural and biological control
- Mycorrhizal fungi major player in the rhizosphere; fungi symbiotic with plant roots. Normal for almost all plants
- Microbial interactions led to **mycorrhizosphere phenomenon**

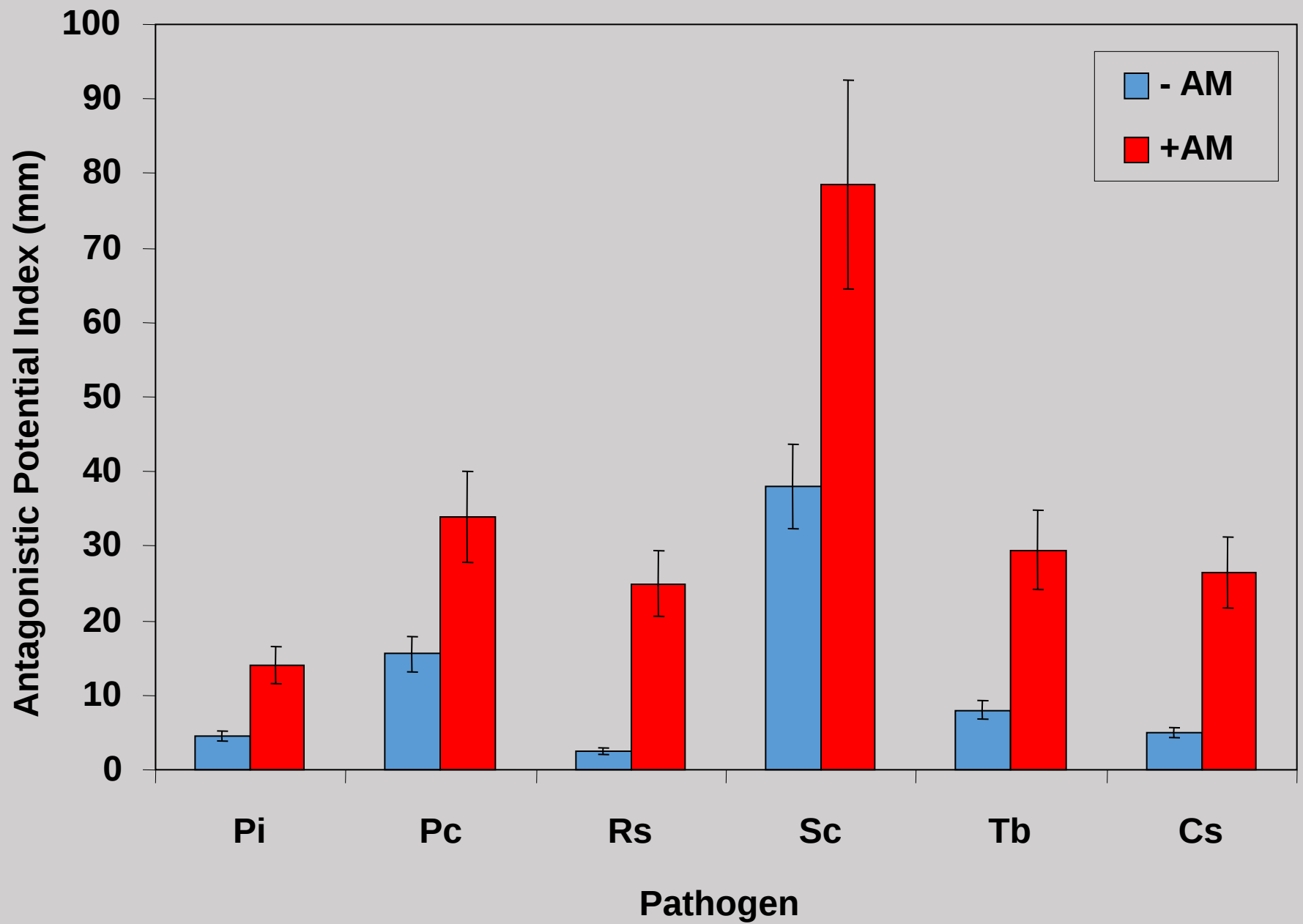
Mycorrhizosphere

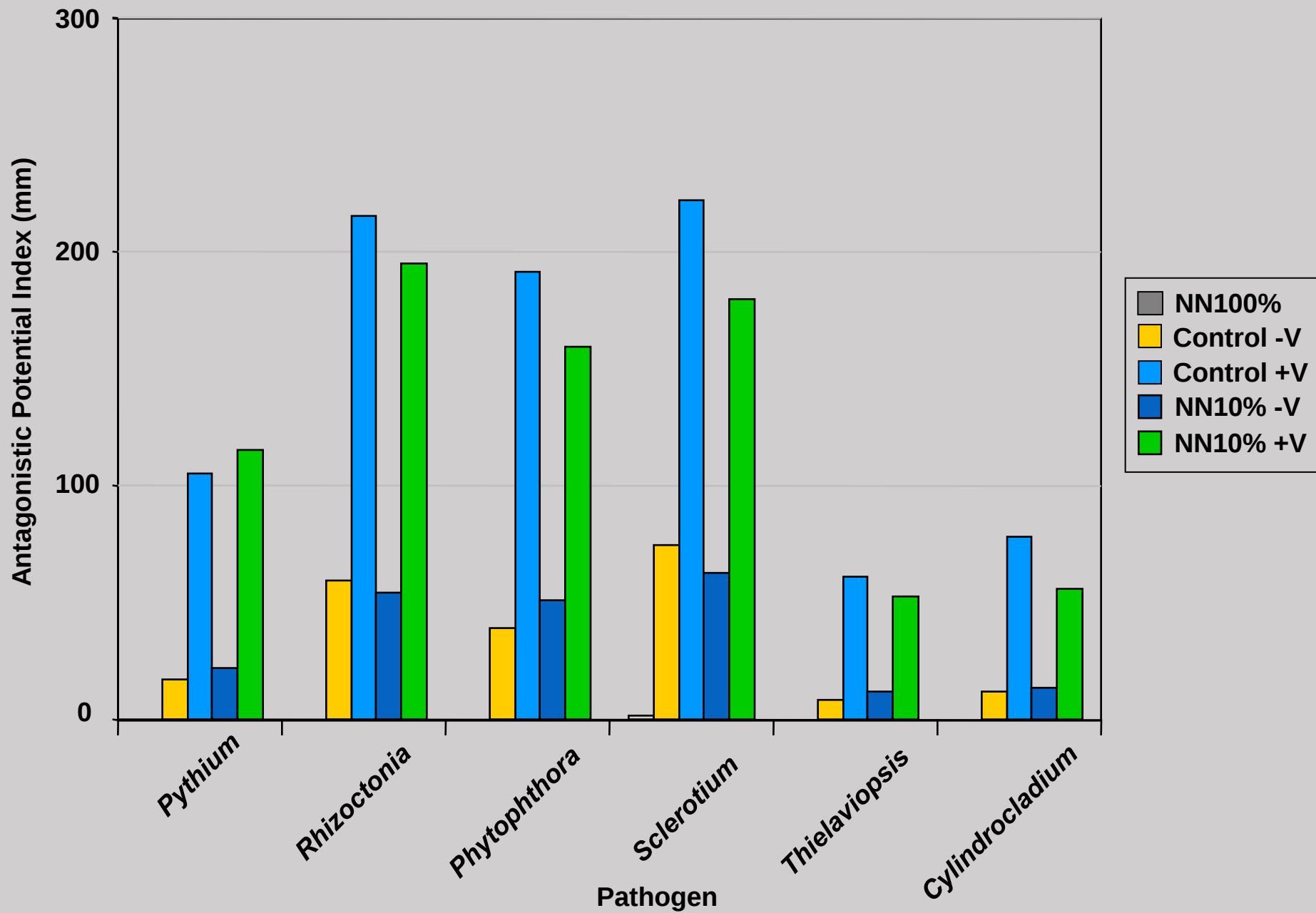
**Rhizosphere of a root colonized by
mycorrhizal fungi
(exudates of fungus + root)**

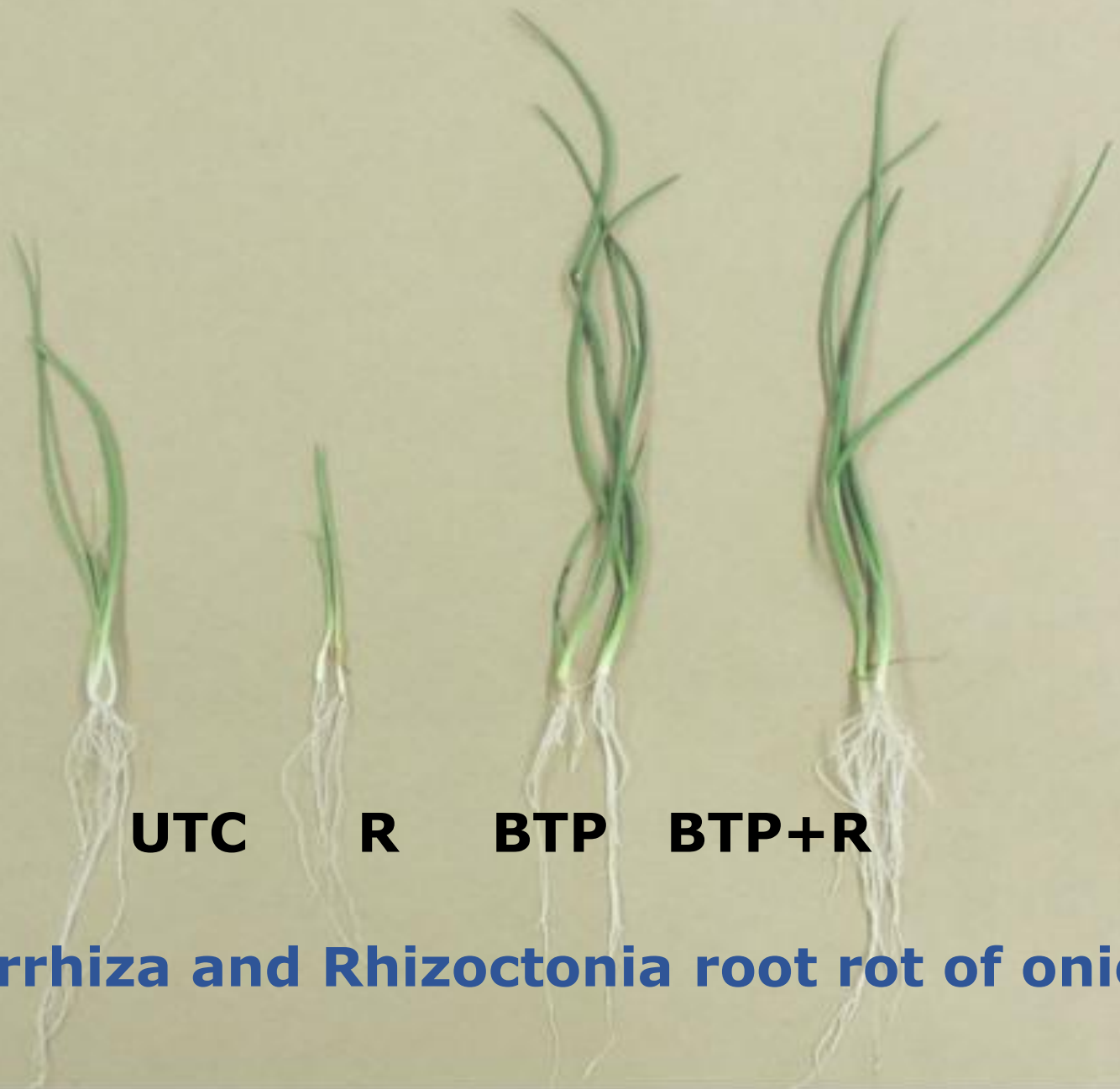
Bacteria colonizing the mycelium of *Glomus* sp. on agar











UTC

R

BTP

BTP+R

Mycorrhiza and Rhizoctonia root rot of onion

Mycorrhizal products

- **BioTerra PLUS Endo Mix**
 - Sold to growers in agriculture and for restoration projects (Montana, Nevada, Washington)
 - Holistic product with mix of mycorrhizal fungi and an organic matrix with high microbial diversity
- **Ectomycorrhizal and Ericoid mycorrhizal inoculum**
- **Custom inoculum**
 - Start from native soil and roots; multiply in pot culture