
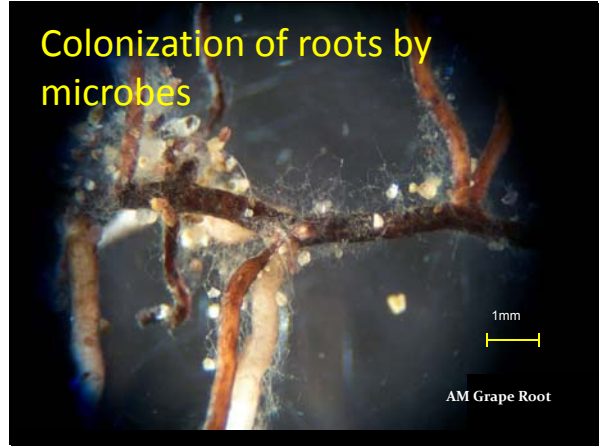


Root-Microbe Interactions
In Grape And Spatial
Variation of the Microbiome

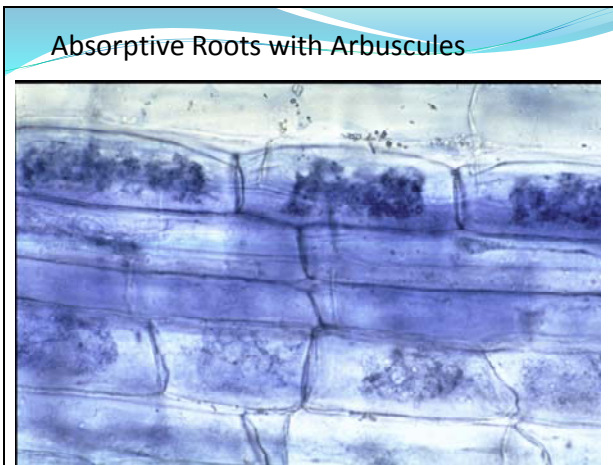
David Eissenstat
Professor Emeritus
Penn State University



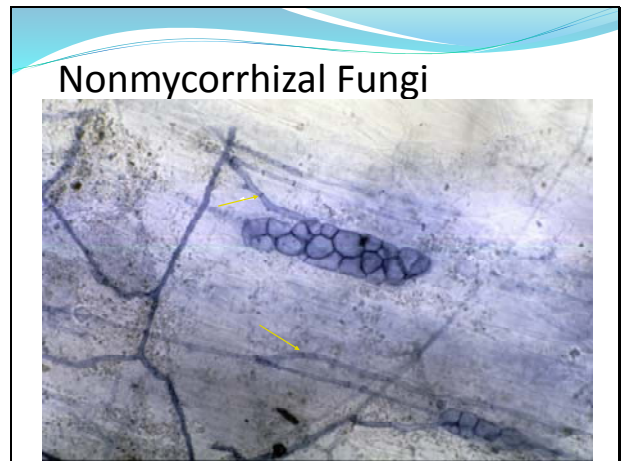
Slide 1



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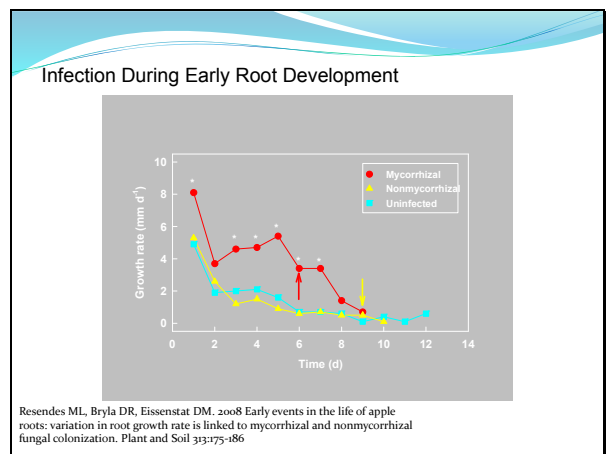


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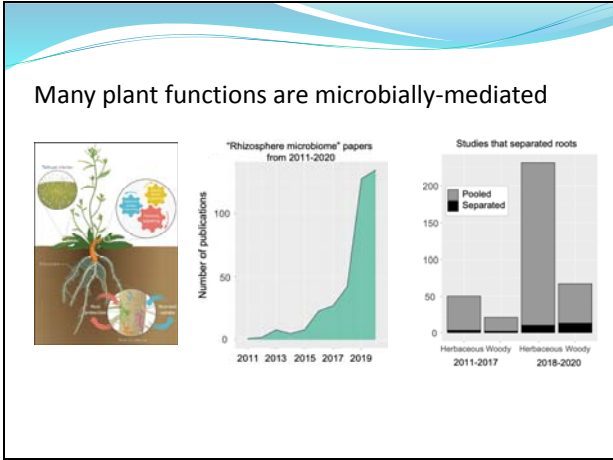
Proportion of Young Roots Either Infected or Uninfected by
Mycorrhizal or Nonmycorrhizal Fungi

	Type of root fungi (%)	
	Fall 1997 (n=69)	Spring 1998 (n=44)
M fungi	28.1	42.3
NM fungi	50.0	11.5
Uninfected	21.9	46.2
M + NM fungi	0	0

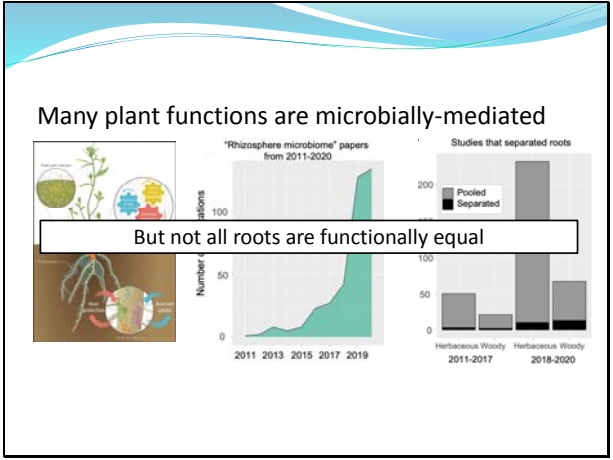
Slide 5



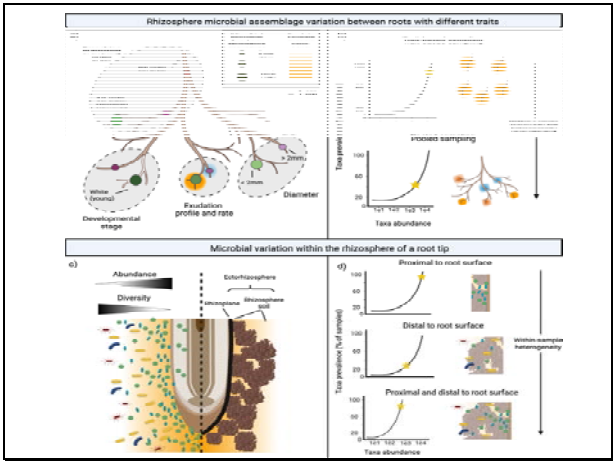
Slide 6



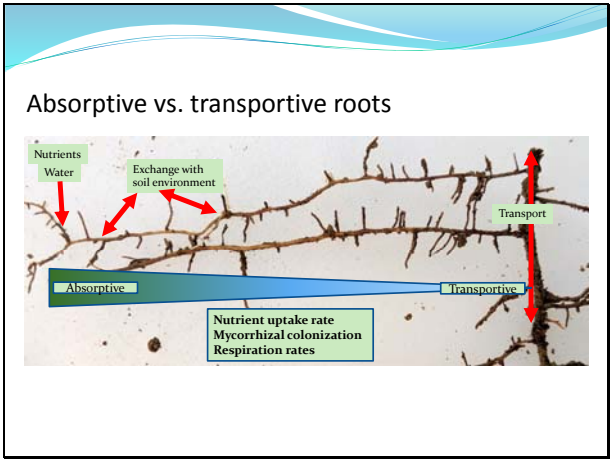
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Slide 9



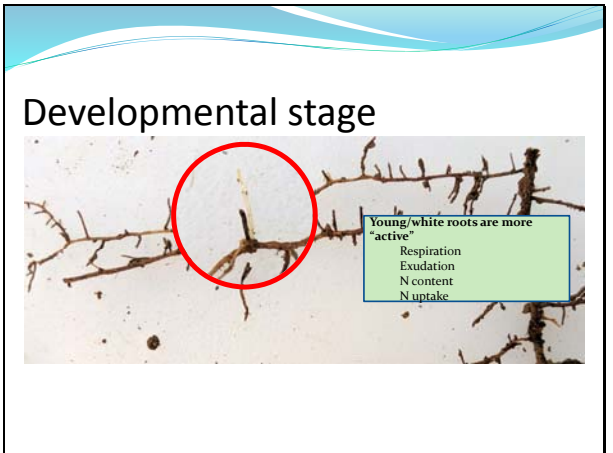
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Does root location explain microbial variation?

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Monitoring root traits and locations in the field

1 meter deep root boxes

Fleishman et al., 2023; *J. Exp. Botany*

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Work is a challenge

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1 cm

Percent Proteobacteria

0 25 38 50 64 77 90

Fleishman et al., 2023; *J. Exp. Botany*

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Root traits explain less variation in rhizosphere microbes than spatially structured factors

Relative variance (%)

Variation Partitioning Analysis

ASV Gen Phy Bacteria

Linear spatial trend
Spatial cluster
Root cluster
Root traits

Spatial variables

Fleishman et al., 2023; *J. Exp. Botany*

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Root traits explain less variation in rhizosphere microbes than spatially structured factors

Relative variance (%)

Variation Partitioning Analysis

ASV Gen Phy Bacteria

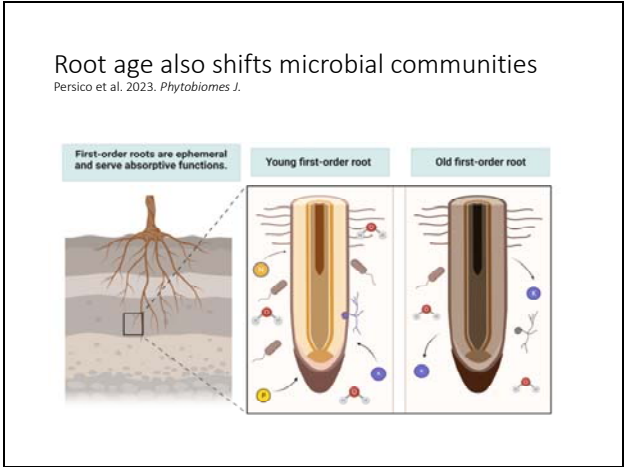
Linear spatial trend
Spatial cluster
Root cluster
Root traits

Spatial variables

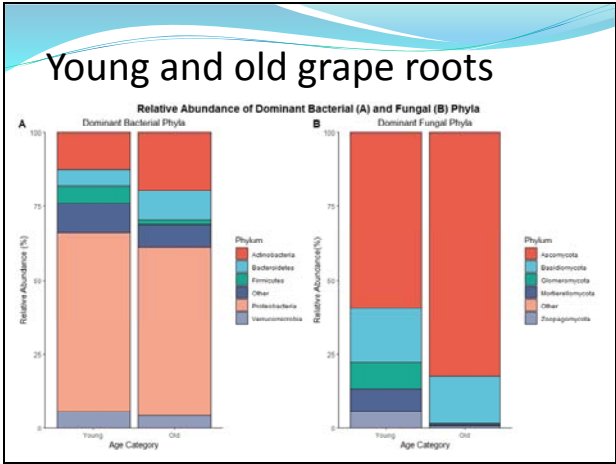
Importance of considering the heterogeneity of soils and roots *in situ*

Fleishman et al., 2023; *J. Exp. Botany*

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Young vs. old roots

- Microbial composition was distinct between young and old absorptive roots at the ASV and Phylum taxonomic levels, with stronger evidence for fungi ($p < 0.005$) than bacteria ($p < 0.100$)
- Bacteria and fungi associated with high resource environments (copiotrophs) tended to be more abundant on young roots and those associated with low nutrient environments (oligotrophs and saprotrophs) more associated with older roots

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Conclusions

- While root traits affect microbial structure, they explained less variation in rhizosphere microbes than spatially structured factors.
- Unraveling the effects of microbes on soil health and crop vigor will require careful attention to sources of spatial and root variation.

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Acknowledgements

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