

Restoring Arbuscular Mycorrhizal Fungi in Agroecosystems: Oats (*Avena sativa*) Shows Promise as a Cover Crop

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What's a Cover Crop?

➤ Legume

- Clovers

- Peas

- Vetches

➤ Grass

- Ryegrass

- Sudangrass

- Oats

- Winter rye

➤ Brassica

- Turnip

- Radish

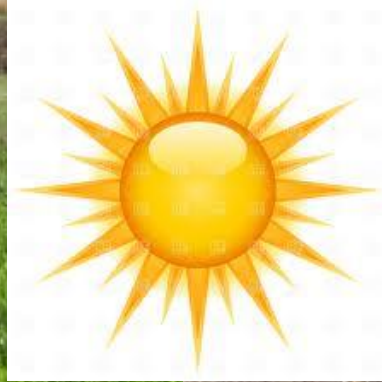
- Rapeseed

- Mustard



Why Cover Crops?

**Free Energy,
Carbon, Nitrogen**



**Better infiltration
More storage
Less water erosion**



Less wind erosion

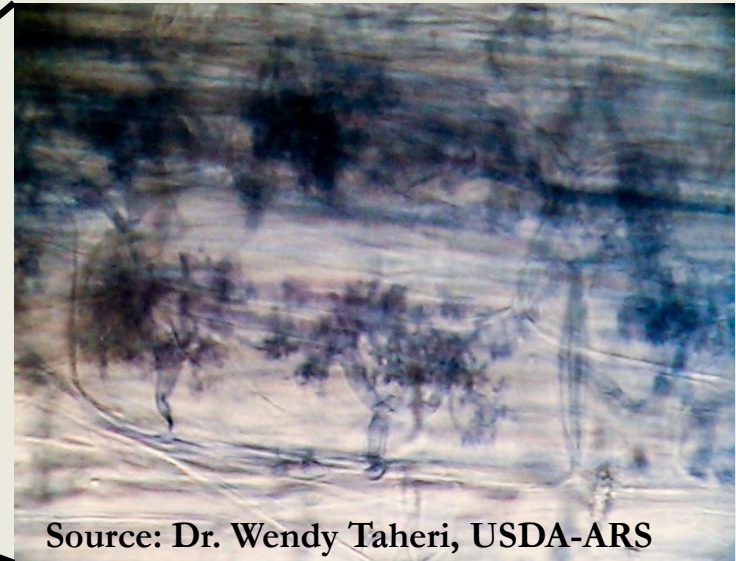
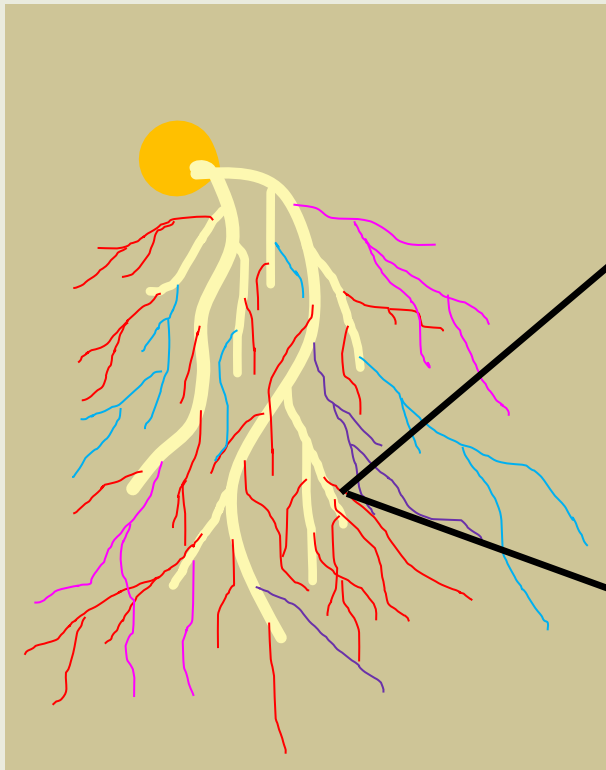


Promoting Arbuscular Mycorrhizal Fungi with Cover Crops



Arbuscular Mycorrhizal Fungi (AMF)

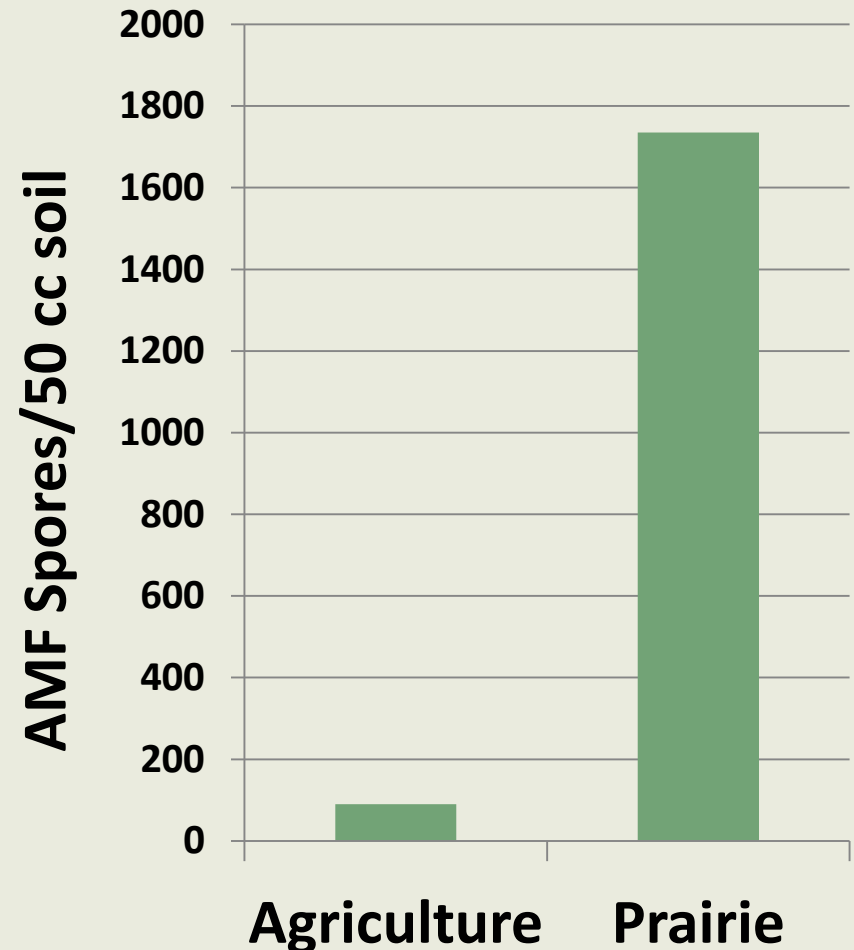
- Form obligate relationships with >80% plants
 - Most crops, excepting the *Brassicaceae*



Source: Dr. Wendy Taheri, USDA-ARS

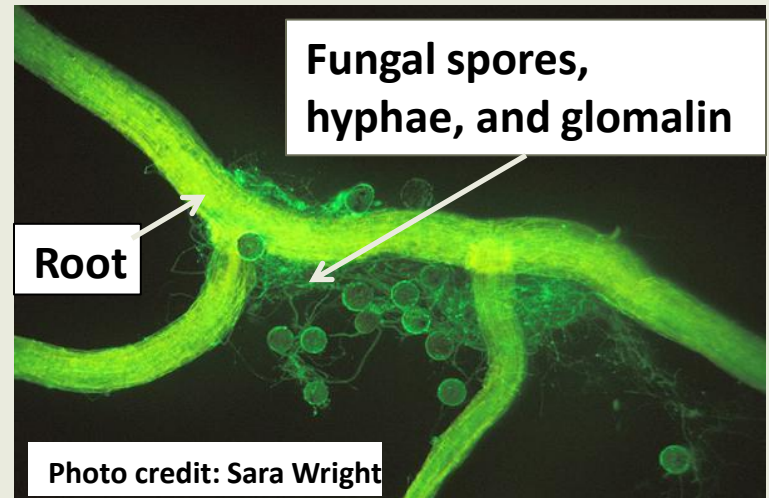
AMF nearly eliminated in Ag Soils

- ❖ Tillage
- ❖ Seasonal Fallow
- ❖ Annual Fallow
- ❖ Monocropping, simple rotations
- ❖ Inorganic fertilizer application
- ❖ Fungicide application
- ❖ Soil Compaction



AMF Benefits for Agriculture

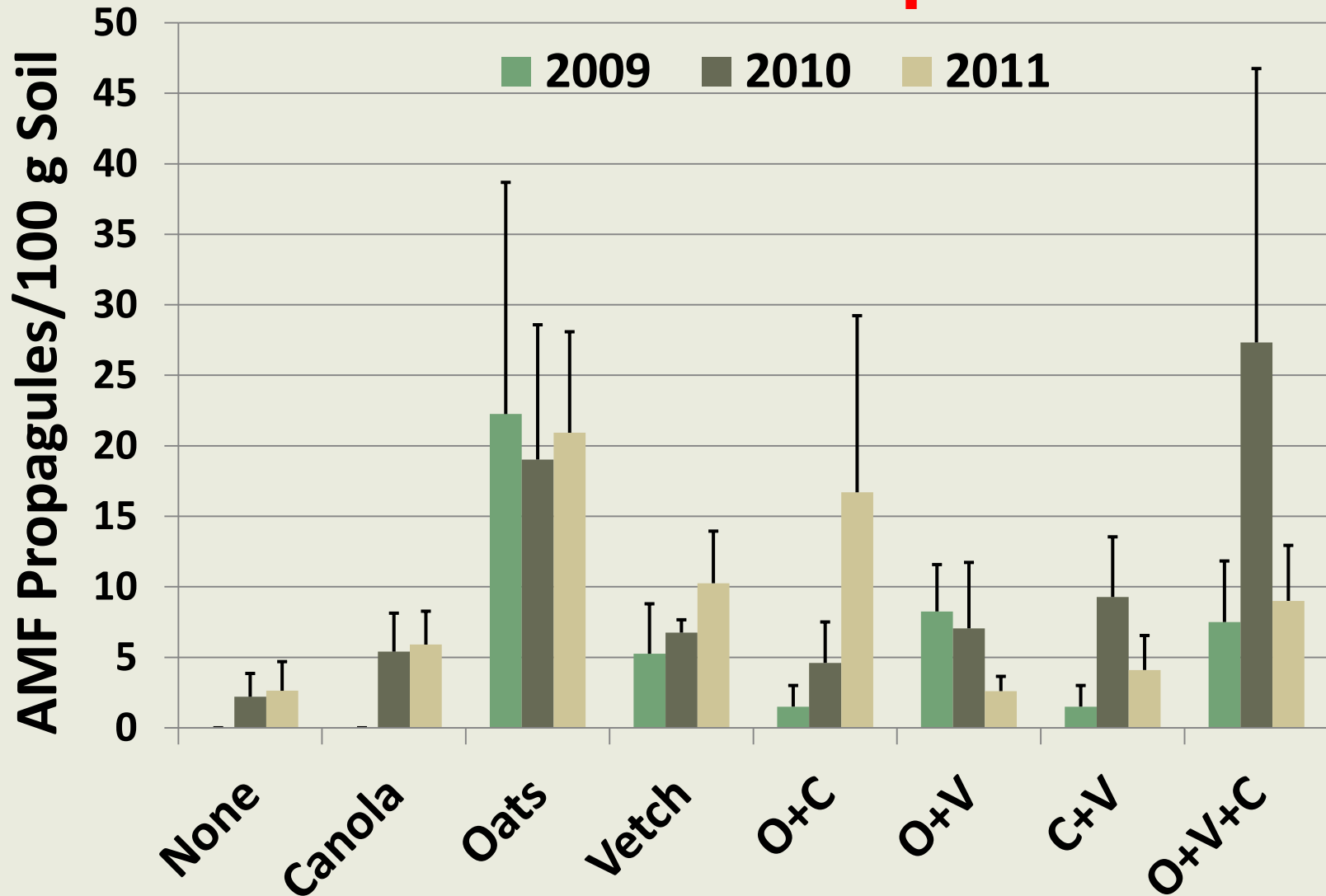
- Low #s can stress plant
 - Improve production
- Acquire P, Cu, Zn, other nutrients
 - Reduce fertilizer
- Increase Tolerance
 - Disease
 - Reduce pesticides
 - Drought, salinity
- Improve soil structure
 - Reduce erosion





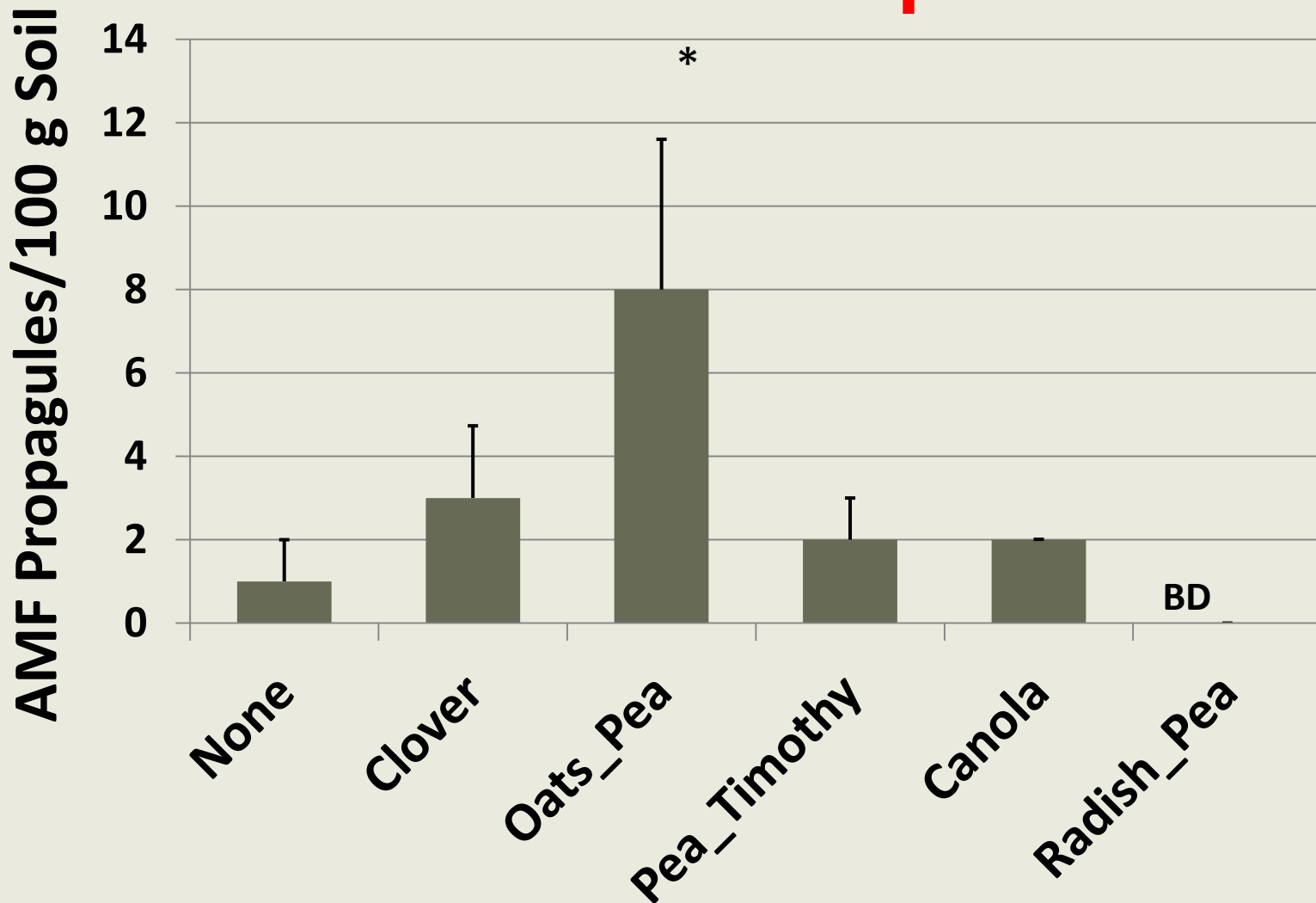
Soil Propagules: Brookings, SD (Fall)

Soybean - Small Grains/CC - Corn

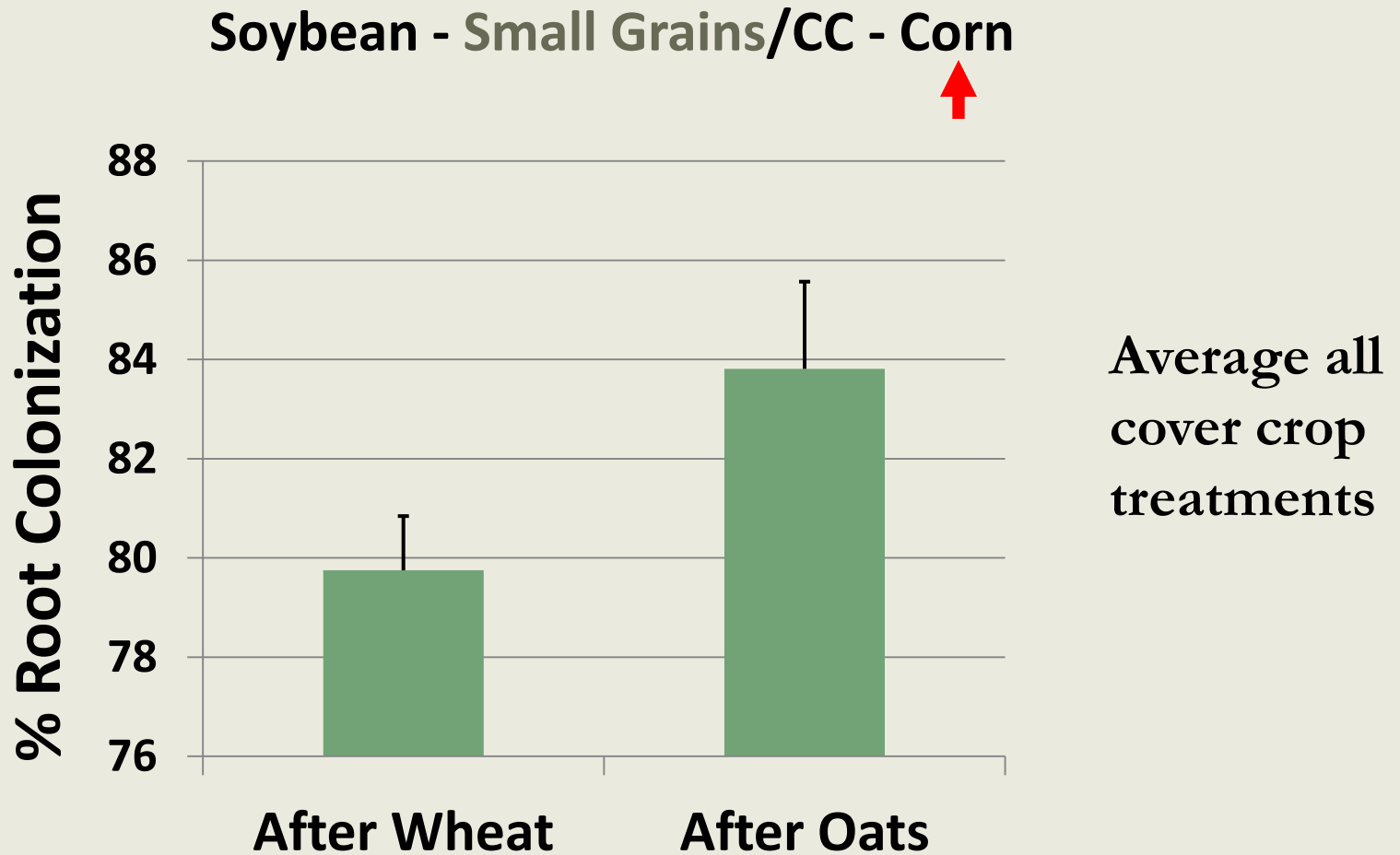


Soil Propagules: White Lake, SD (Fall, 2009)

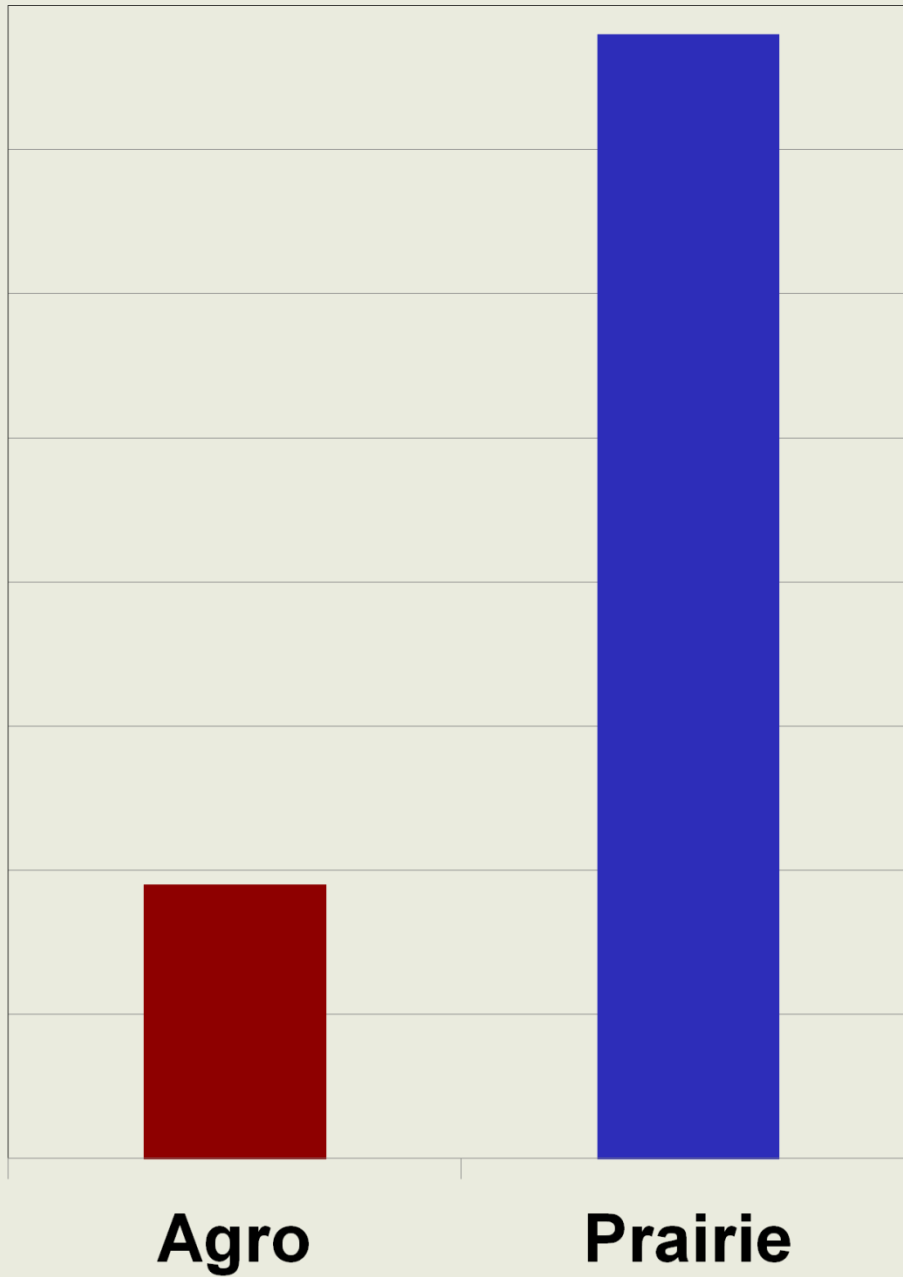
Soybean - Small Grains/CC - Corn



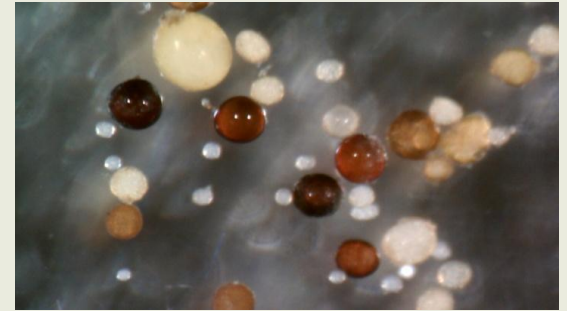
% Colonization of Corn Following Cover Crops (2010, 2011)



AMF Diversity ↑



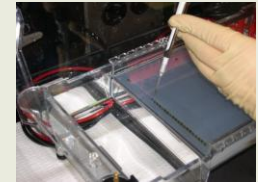
Cropped Field



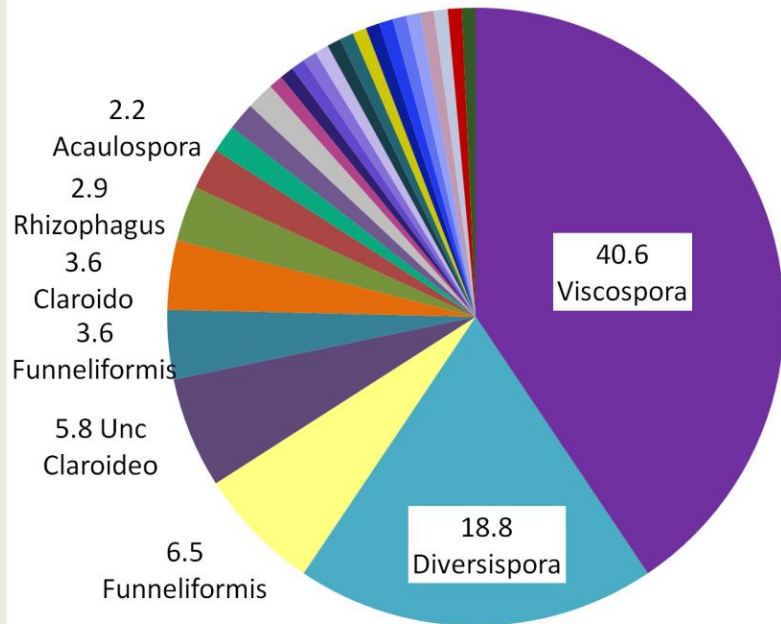
Prairie



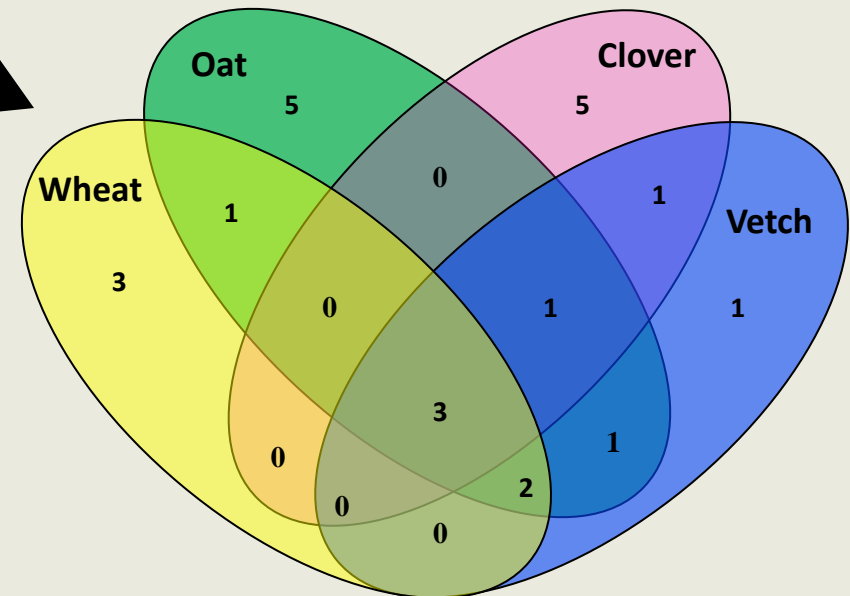
Capturing AMF Diversity with Cover Crops



Lundblad Prairie, MN

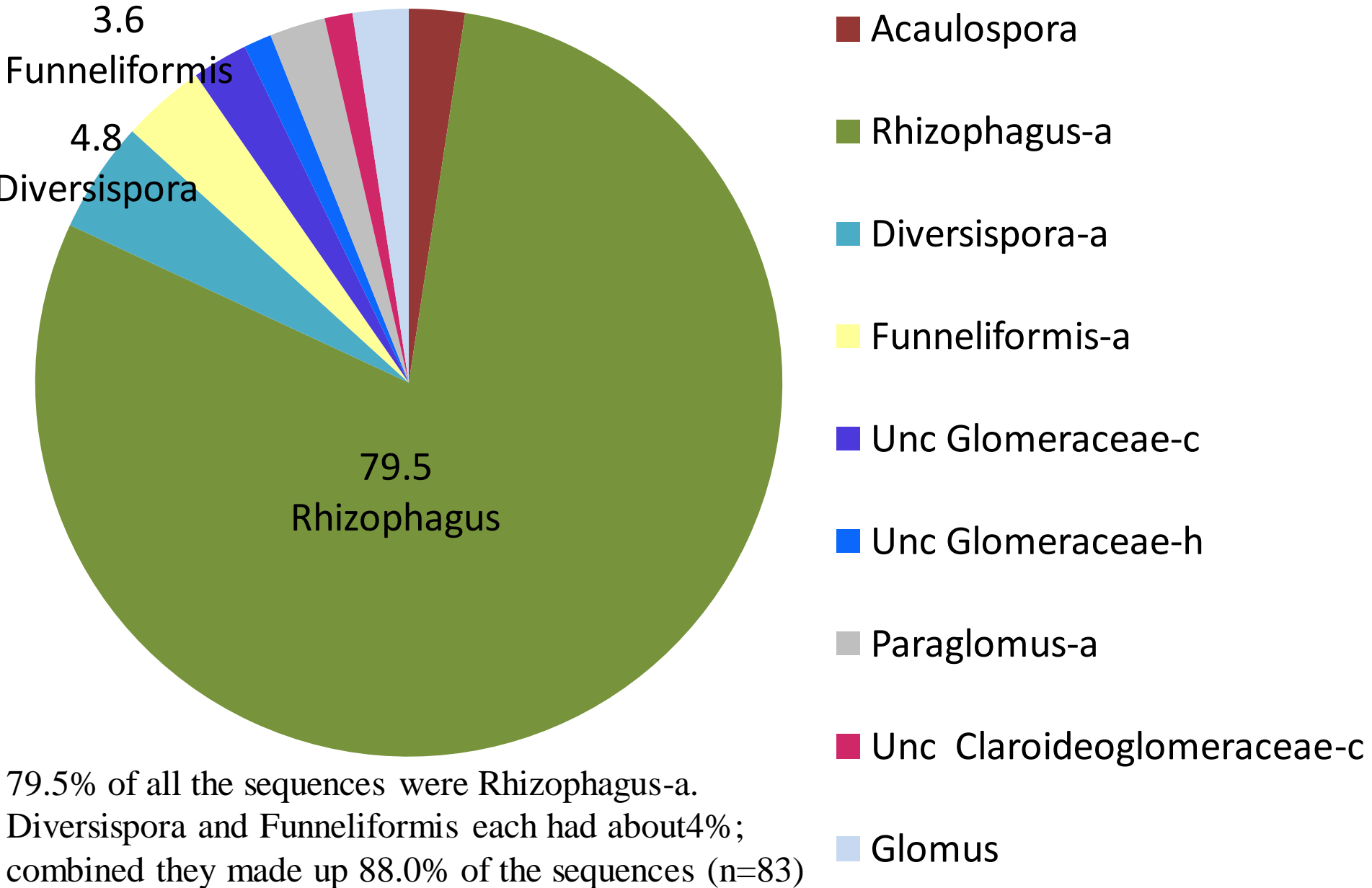


Fungal: NS1, 4
AMF: AML1, 2

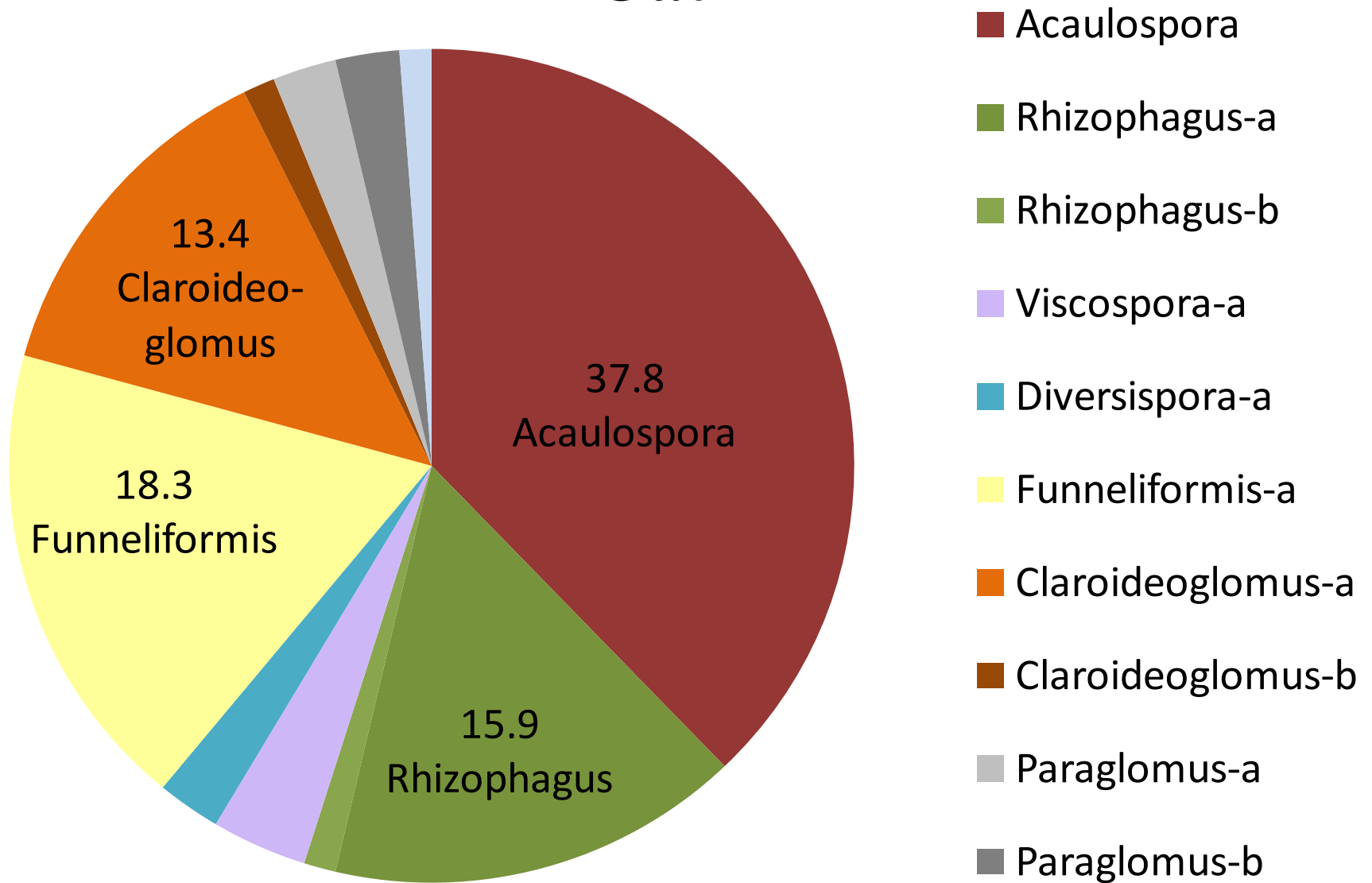


Classified with validated reference database (Krüger et al., 2012)

Wheat



Oat



85.4% of the sequences were in the four largest OTUs, Acaulospora, Funneliformis-a, Rhizophagus-a and Claroideoglomus-a (n=82).

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**NATURAL RE-ESTABLISHMENT OF VESICULAR-
ARBUSCULAR MYCORRHIZAE FOLLOWING
STRIPMINE RECLAMATION IN WYOMING**

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Agriculture, Ecosystems and Environment, 21 (1988) 135–142
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**Vesicular–Arbuscular Mycorrhizae in Taconite
Tailings. I. Incidence and Spread of
Endogonaceous Fungi Following Reclamation**

NANCY COLLINS JOHNSON^{1*} and ANNE-CRESSEY McGRAW²

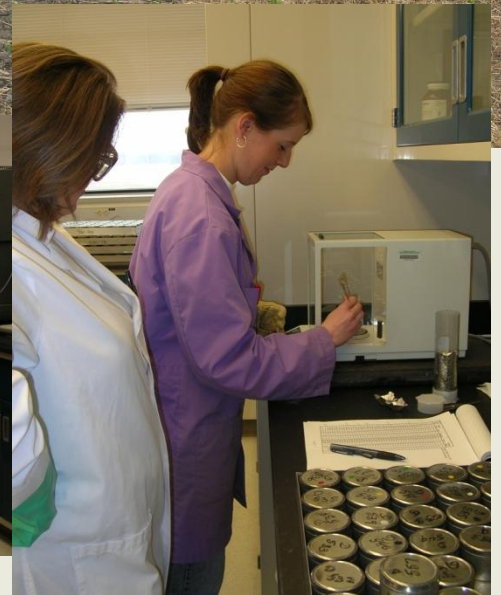
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