Arbuscular Mycorrhizal Fungi in the Phoenix metropolitan area: Diversity and Functioning

Jean Stutz, Rpb Bills, Jamaica Cousins, Linda Stabler, Sean Whitcomb and Chris Martin
Department of Applied Biological Sciences and Plant Biology Program
Arizona State University

Arbuscular mycorrhizal (AM) fungi are obligate symbionts of most desert plants and many urban landscape plants. Mycorrhizal relationships can be beneficial to plants and may be important factors in plant growth, nutrient status and response to biotic and abiotic stress. Prior to the onset of the Central Arizona Phoenix LTER, little was known about the diversity and functioning of these fungi in urban ecosystems. This poster will present research results from CAP1 on AM fungal diversity and functioning and indicate possible future directions for CAP2.

METHODS

Diversity

Samples were collected at sites in the Phoenix metropolitan area as part of the Central Arizona Phoenix (CAP) LTER Survey 200.. At each site, soil samples were collected from three trees nearest the plot-center. Soil samples were also collected along a chronosequence (ranging in time since development) from *Fraxinus* trees in Tempe AZ. Trap cultures were started from soil samples in the greenhouse to stimulate spore production. Spores were extracted by wet sieving and sucrose density gradient centrifugation, mounted on slides and identified using morphological characteristics.

Functioning

Colonization Roots from trees growing in South Mountain Preserve and adjacent residential areas were collected in August stained and % AM fungal colonization assessed
Pruning *Leucophyllum frutescens* and *Nerium oleander* were planted in an experimental landscaped area located at the Desert Botanical Garden in Phoenix and one-half of the shrubs were sheared (actively growing foliage clipped in a geometrical round shape) every 6 wk. Soils samples were collected in February and May, roots collected, stained and % AM fungal colonization assessed.
Greenhouse Experiment Three common landscape trees (Acacia smallii, Fraxinus uhdei & Parkinsonia microphylla) were inoculated with AM fungal cultures collected in South Mountain Reserve or a residential landscape and grown for 5 month in a greenhouse.

Whitcomb, S. A., and J. C. Stutz. 2001. Effects of pruning on root length density, root biomass, and arbuscular mycorrhizal colonization in two landscape shrubs. Proceeding 3rd International Conference on Mycorrhizas. Abstract 1-157.

REFERENCES

Bills, RJ and JC Stutz 2005 Arbuscular mycorrhizal fungal species richness is lower in the Phoenix metropolitan area in comparison to the surrounding desert. CAP-LTER Symposium

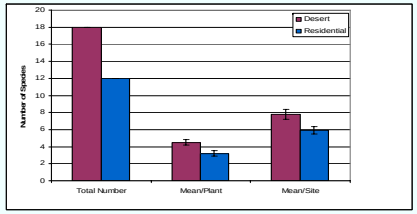
Cousins, J.R., D. Hope, C. Gries and J.C. Stutz. 2003. Preliminary assessment of arbuscular mycorrhizal fungal diversity and community structure in an urban ecosystem. Mycorrhiza 13:319-326.

Stabler, L.B., C.A. Martin, and J.C. Stutz. 2001. Effect of urban expansion on arbuscular mycorrhizal fungal mediation of landscape tree growth. J. Arboriculture 27:193-200

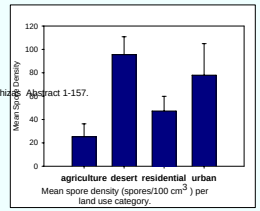
Whitcomb, S. A., and J. C. Stutz. 2001. Effects of pruning on root length density, root biomass, and arbuscular mycorrhizal colonization in two landscape shrubs. Proceeding 3rd International Conference on Mycorrhizas Abstract 1-157.

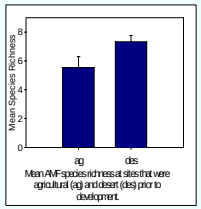
Diversity

AM fungal species richness is lower in the Phoenix urban area in comparison to the surrounding desert

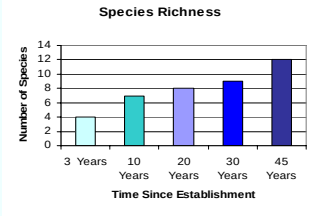


Land use and previous land use have impacts on the number of fungal spores and species richness

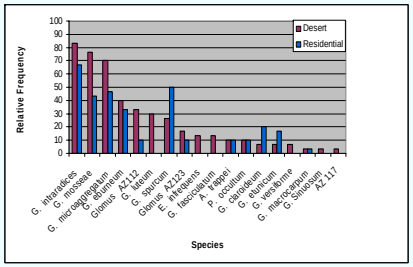




Species richness increases with time since development in urban areas

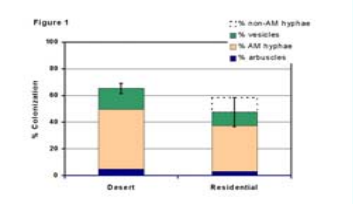


There is a significant overlap in species composition between urban and desert areas with few exotic species

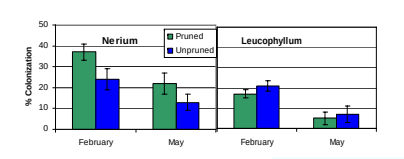


Functioning

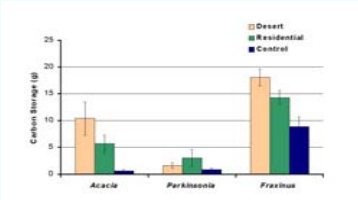
Landscape trees in residential landscapes have lower levels of root colonization compared to trees in the adjacent desert



Pruning decreased AM fungal colonization in oleander but not in Texas sage.



AM fungi increase the growth of common landscape trees, although these effects are dependent on trees species and the source of the fungal community



Possible Future Directions

*** Investigate the effects of exotic vegetation on AM fungal diversity**

***Use controlled experiments to determine linkages between AM fungi and primary productivity in urban areas**