

THE ROLE OF ARBUSCULAR MYCORRHIZAL FUNGI
IN PASTURE COLONIZATION BY THE TROPICAL FOREST TREE
TERMINALIA AMAZONIA IN SOUTHERN COSTA RICA

A Dissertation

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by

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At three sites in Siete Colinas, Coto Brus, Costa Rica, I examined differences in composition of arbuscular mycorrhizal (AM) fungi between forest fragments and pastures, and consequences of these differences for seedling establishment in pastures by the tropical forest tree *Terminalia amazonia*.

I estimated species composition of AM fungi through spore counts from field soils and greenhouse cultures. The AM fungal community differed between forest and pasture. While some AM fungi were common in both habitats, others were abundant in one and rare or absent in the other.

To assess the importance of the change in community composition for pasture colonization by *T. amazonia*, I planted seedlings inoculated with either forest or pasture soil in forest and pasture, and compared survivorship, growth, and root colonization by AM fungi. Seedlings inoculated with forest soil experienced lower mortality, and greater initial growth rates and colonization by AM fungi, than seedlings inoculated with pasture soil. Differences in growth and survivorship may have resulted from differences in the AM fungal community or other differences between forest and pasture soils.

To determine whether AM fungal communities differ in their benefit, I compared the growth of seedlings inoculated with either spores obtained from forest or pasture, or with spore-free media. Seedlings inoculated with forest

AM fungi had the highest root colonization, shoot phosphorus, and biomass. Seedlings inoculated with pasture AM fungi differed little from controls.

I used molecular analysis to identify which AM fungi colonize forest *T. amazonia*, pasture-grown seedlings, and dominant pasture grasses. AM fungal communities of seedlings planted into pastures did not reflect those of the other plants, suggesting the importance of both environment and host in determining AM fungal community composition.

Conversion of forest to pasture alters the AM fungal community. Seedling survival is higher for seedlings inoculated with forest than with pasture soil. At least some pasture AM fungi reduce mycorrhiza formation and seedling growth of *T. amazonia* relative to forest AM fungi. Seedlings colonizing pastures do not form mycorrhizas with the same symbionts as in forest. The significance of these differences for forest regeneration in tropical pastures merits further exploration.

BIOGRAPHICAL SKETCH

Laura Aldrich-Wolfe was born on July 28, 1969 in Milwaukie, Oregon and grew up in Berkeley, California. She attended Maybeck High School, where she studied botany and ornithology. She also completed the Summer Architecture Academy program at the University of Oregon in 1986. After graduating from high school in 1987, Laura spent four months riding her bicycle from the Netherlands to Greece.

Laura was a Regents' Scholar at the University of California at Santa Barbara, where she earned bachelor's degrees in Ecology & Evolution and Latin American & Iberian Studies in 1994. She completed a senior thesis in plant evolutionary ecology with Dr. Susan Mazer. While an undergraduate, Laura attended the University of California's Education Abroad Program in Monteverde, Costa Rica and at the Pontificia Universidad Católica in Quito, Ecuador. She also completed a summer internship at the Smithsonian Institution's National Museum of Natural History with Drs. Elizabeth Zimmer and Brunella Bowditch.

Laura worked briefly as an environmental consultant, teacher, and laboratory researcher prior to initiating her doctoral studies at Cornell University in 1995. She attended the Organization for Tropical Studies' field course in tropical ecology with Dr. Eric Olson in 1996. From September 2000 to August 2003, Laura was a visiting graduate student in Dr. Roger Koide's laboratory at the Pennsylvania State University. She accepted a position as a postdoctoral researcher with Dr. Ari Jumpponen at Kansas State University in July 2005.

To Steve, Jesemy and Fiona

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