

Plant Path

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1. Accession 0214088	Agency Identification No. 2. CSREES 3. LA.B	5. Work Unit/Project No. LAB93913	6. Status Final Report	
7. Title Developing Molecular Tools for the Identification, Classification, and Characterization of Rusts and Other Phytopathogenic Fungi				
12. Investigator Name(s) (Last Name and Initials) Aime, M. C.				
20. Termination Date 09/30/2012		40. Period Covered (mo/da/year): 05/01/2008 TO 09/30/2012		
Outputs: Training was provided for 12 undergraduate students, six graduate students, two post-doctoral fellows, three visiting scientists/interns, and two research associates. Additional student (undergraduate and graduate) training and access to equipment was provided for those engaged in research projects within the LSU AgCenter. This project provided laboratory material and lecture data for academic courses for students in five departments (Renewable Natural Resources, Entomology, Biological Sciences, Horticulture, and Plant Pathology). Five invited presentations, numerous contributed presentations, and departmental seminars were generated from results of this project. Consulting activities include fungal identification for the Plant Disease Diagnostic Clinic at LSU, as well as scientists and citizens. Development of a database for recording rusts reported or collected in the state of Louisiana, including host data, geographic data, voucher details, and literature/herbarium citations was initiated. The addition of data and herbarium vouchers from nearly 100 new rust collections from Louisiana, and more than 100 collections of <i>Phakopsora pachyrhizi</i> (causal agent of soybean rust) were used to help determine the genetic diversity of this pathogen in Louisiana. Hundreds of sequences have been deposited into the public GenBank database. Numerous vouchered specimens have been placed into the LSU herbarium to be maintained in perpetuity and provide a permanent scientific resource.				
Outcomes/Impacts: Historical searches revealed 163 previously recorded species of rust in Louisiana, which is a 300% increase in the number of rust species in the state prior to the initiation of this project. In addition, knowledge of the world distribution and biology of rusts included, for example, development of a fungal barcoding locus, analysis of <i>Melampsora</i> species in the pacific northwest US, description of several mycoparasites of rusts, and description of an entirely new fungal class. New molecular protocols and techniques were developed exclusively for working with rust fungi and their relatives. Rust-specific primers were tested for effectiveness as rust barcodes. Twenty-five new single-copy protein genes were screened for their applicability at different phylogenetic levels; specific primers were created for three of these and three supplementary barcode candidate genes were identified and further tested, although ultimately all failed in one or more barcoding criteria. Specimen collecting, molecular data collection, and multiple-gene analyses contributed to the resolution and the family and ordinal-level placement of several previously misclassified or incertae sedis pathogens and related environmental yeasts isolated from Louisiana. Protocols developed in the laboratory are now used by graduate students and pathogen diagnosticians in this Department and researchers at other universities. The findings are intended to provide early and improved identification of the causal agents of fungal disease agents and aid in developing more effective control measures.				
Publications: Bruckart WL, Eskandari FM, Berner DK, Aime MC. 2012. Comparison of <i>Puccinia acroptili</i> from Eurasia and the USA. <i>Botany</i> 90:465-471. Kaur R, McTaggart AR, Ferrin DM, Aime MC. 2012. First report of <i>Uromyces plumbarius</i>, rust of Gaura, in Louisiana and a new host, <i>Guara lindheimeri</i>. <i>Plant Disease</i> 96:590. Minnis AM, McTaggart A, Rossman A, Aime MC. 2012. Taxonomy of mayapple rust: the genus <i>Allodus</i> resurrected. <i>Mycologia</i> 104:942-950. Schoch CL, et al. 2012. The internal transcribed spacer as a universal DNA barcode marker for Fungi. <i>Proceedings of the</i>				

National Academy of Sciences 109:6241-6246.

Participants:

Mary Catherine Aime (PI), Ramandeep Kaur, Gregory Heller, Maj Padamsee, Merje Toome, Tomas Rush, Youwen Gong, Andrew Rodriguez, Sebastian Albu, Jorge Diaz, Donald Nelsen, and Nicole Ward, LSU AgCenter. One high school student Emily Salzer, was supported by this project and received general laboratory training. Training in general mycology including field collection, culturing, and molecular techniques was provided to numerous LSU undergraduate students including Jeanclaude Jubert, Bethany Kennedy, Bryan Goldberger, Paige Muse, Michelle Warr, Shiquita Brooks, Kelly Landry, Catherine Perino, Katie Stephenson, Aislinn Smith, Andrew Lloyd, Whitney Pilcher, and Alex Cassara. This project also supported training of one exchange student from the University of Tennessee, Jennifer Kozeman, and four summer interns, Clare Whittaker and Rohan Hebbar (University of Maryland) and Nattawut Boonyuen and Amnat Eamvijarn (Thailand).

Target Audiences:

Target audiences for this project are other researchers and students in mycology, plant pathology, and systematics as well as plant breeders, diagnosticians, and the amateur mycological community.

Project Modifications:

Nothing significant to report during this reporting period.

Approved (Signature)	Title	Date
		