

Rusts of Forest Trees - A Threat to Ecology and Economy

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Rust fungi (*Basidiomycota*, *Uredinales*) are the largest group of fungal plant pathogens, containing more than 7000 species that infect trees and other plants in virtually all important families worldwide. Combined, these rusts cause billions of dollars of lost revenues annually to the agricultural and forestry sectors worldwide. In addition to monetary losses caused to the forest industry, rusts are responsible for ecological destabilization, for example by threatening keystone species such as high elevation pines.

More than 40 tree rust specialists convened in beautiful Florence for the Fourth International Rusts of Forest Trees Conference held by IUFRO Working Party 7.02.05 (on May 3-6 2010) to talk about a broad array of topics, including phylogeny, distribution, biology, epidemiology, genomics, genetic resistance, and management. A field trip allowed participants to visit Tuscany and to see pine rusts.

The **keynote address** was presented by Dr. Richard C. Hamelin who gave an overview of the progress in tree rust research in the past 4 years and highlighted some of the great advances, including the genome sequencing of the first tree pathogen, the poplar rust *Melampsora larici-populina*. In the section on Phylogeny, DNA-based approaches were presented to better understand the species concepts in the complex world of *Melampsora* rusts. A phylogeographic framework was also presented to depict potential sources of introduction of White Pine Blister Rust in North America.

In the session on **Distribution**, scientists from India, Italy, South Africa, Indonesia and Brazil presented results on rust diversity, new reports, incidence, and damage.

A broad range of topics was treated in the session on **Biology and Epidemiology**, including historical accounts of epidemics, rust monitoring, host studies, molecular epidemiology and axenic cultures.

Population Genetics and Genomics was quite an exciting session that included a presentation on the progress of *Melampsora larici-populina* genome analysis, an update on a sequencing project of Fusiform rust, a study on population genetics of *C. flaccidum* and *P. pini*, and work to characterize the secretome and to develop tools for functional analysis of poplar rust in its interaction with the host.



Examining tree rusts during the field trip
Photo provided by Richard Hamelin

Presentations on the very efficient and standardized fusiform resistance screening center in the Southern US, genotype selection in Eucalyptus, and impact of terpenes on rusts susceptibility were covered in the session on **Genetic Resistance**. Intriguing and exciting results on adaptation of rust to quantitative resistance and on the impact of mycorrhiza on infection by poplar rusts were also presented.

The meeting closed with a session on **Management and Control** with both resistance and biological control being covered.

During the field trip, participants had a chance to see *Cronartium flaccidum* (with aecial pustules sporulating on the bark of the pine host *Pinus pinaster!*), *Coleosporium senecionis* (with aecia on needles of the same pine) and *Melampsora pinitorqua* (not yet sporulating, but displaying typical "twist shoots" symptoms).

Overall, the meeting was a great success in terms of representation and breadth of topics. There were **significant advances in tree rust research** since the previous meeting in Lake Tahoe and there were great opportunities for scientists from different countries to discuss and exchange their findings.