Plant Pathology Seminar Series

What's in a name? The need for coherent taxonomic and nomenclatural standards for plant pathogens

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Robust classification of living organisms is necessary for effective communication among plant pathologists, providing a *lingua franca* for characterizing populations of organisms with common traits (genetic or morphological) and/or sexual compatibility (i.e., species). Taxonomy is the discipline concerned with classifying life, while nomenclature is the systematic naming of organisms. The two practices, although interdependent, are distinct (de Queiroz 2006). The effectiveness of morphological and genetic techniques used to characterize species is limited by our ability to concur on the standards associated with naming organisms. This seminar examines case studies that demonstrate how discrepancies in the nomenclature and taxonomy of specific plant pathogens can affect management of plant diseases, and how improvements in our understanding of plant pathogen taxonomy and nomenclature could reduce economic losses.

Some congeneric species of plant pathogenic fungi are indistinguishable morphologically, which complicates species identification based on morphology. One example is the *Fusarium solani* species complex, which includes plant pathogenic isolates that cause root rots, crown rots, and/or fruit rots. Additionally, some isolates are pathogens of immunocompromised human and animal hosts, proving *F. solani* to be of concern in relation to plant, human, and animal health (O'Donnell et al. 2020). A proposal to reclassify members of the *F. solani* species complex into the genus *Neocosmospora* (Sandoval-Dennis and Crous 2018) was met with resistance from the broader *Fusarium* research community, based in part on reappraisal of the last common ancestor of the genus *Fusarium* (O'Donnell et al. 2020). However, the standards with which nomenclature is assigned to taxonomic groups are decided, ultimately, by the communities using these names. These standards vary across time, disciplines, and based on available technologies. For example, within the International Collection of Microorganisms from Plants, a New Zealand-based collection of plant-associated microorganisms, 23% of *Phoma* cultures were determined to have been misidentified as other genera within the Didymellaceae or other families (Johnston et al. 2017). Many of the misidentified cultures were deposited in the collection before DNA sequencing was readily accessible. DNA sequencing methods have aided our understanding of the cryptic diversity of coelomycetes such as *Phoma* spp. (Johnston et al. 2017). Misidentifications of pathogens of quarantine significance or limitations in the ability to detect the presence of quarantine pathogens can have substantial ramifications for global trade. For example, between 2011 and 2012, ~US$20 million worth of spinach seed was rejected at ports of entry to the USA by USDA Customs and Border Protection due to the presence of pycnidia of *Phomopsis* on the seed that were visible to the naked eye, followed by DNA sequencing that indicated some isolates on the seed lots did not match any species known to occur in the USA (American Seed Trade Association 2012). Although some *Phomopsis* spp. are plant pathogens, none has yet been determined to be a pathogen of spinach, but the seed lots were quarantined based on the possibility that the isolates could be pathogenic on any plant species.

Standards for naming plant pathogenic bacteria, fungi, and viruses exist through the International Society of Plant Pathology Committee on the Taxonomy of Plant Pathogenic Bacteria (Bull et al. 2012), the International Code of Nomenclature for Algae, Fungi, and Plants (Turland et al. 2018), and the International Committee on Taxonomy of Viruses (Adams et al. 2017), respectively. However, defining standards alone is not always sufficient since disagreements about naming novel species or re-characterizing known species are common for cryptic taxa. Furthermore, naming a microorganism associated with a plant species neither implicates the entity as a pathogen of that plant species nor precludes the possibility of the organism being a pathogen of other plant species. An important step towards addressing some of these discrepancies is continued development of microbial culture collections that house morphologically- and genetically-typed specimens as reference material.

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Call in number: 1 253 215 8782

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