

Plant Pathology Seminar Series

Ph.D. Exit Seminar

“Insights into the genetic diversity, population structure, and fungicide sensitivity of the apple powdery mildew pathogen *Podosphaera leucotricha* in the United States”



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Apple powdery mildew, caused by *Podosphaera leucotricha*, is a constant threat to apple production worldwide. In this study, a first whole genome (43.8 Mb) of *P. leucotricha* was obtained and used to study the genetic diversity and spatial genetic structure in 253 isolates hierarchically sampled in 2018 and 2019 from 10 U.S. orchards in Washington, Virginia, and New York. Microsatellite genotyping using 15 novel simple sequence repeat loci, revealed a total of 83 multilocus genotypes (MLGs), most of which were unique to a specific orchard population. Differentiations among *P. leucotricha* isolates grouped either by State of origin or orchards in Washington were significant ($P < 0.001$) and accounted for 83% and 12% of the total variation observed, respectively. A Bayesian cluster analysis grouped Washington *P. leucotricha* isolates into four different genetic groups, each represented by different MLG groups, and showed heterogeneity between orchards. Random mating analyses indicated that U.S. *P. leucotricha* populations are clonal during the growing season, although evidence of rare sexual reproduction is presented. None of the most frequent *P. leucotricha* MLGs found in surveyed orchards were virulent on a resistant apple genotype carrying the major mildew resistance gene *PI-1*. Furthermore, 232, 217, and 240 *P. leucotricha* isolates, collected from organic and conventional orchards, were tested for their sensitivity to the fungicides trifloxystrobin, triflumizole, and boscalid, respectively. Effective concentrations inhibiting 50% growth (EC_{50}) were not significantly different ($P > 0.05$) between baseline (organic) and exposed (conventional) populations, although some isolates showed higher EC_{50} values. The latter were not associated with specific mutations, reported to confer resistance in other plant-pathogens, in fungicide target genes of *P. leucotricha* and providing another evidence that actual fungicide resistance has not fully emerged in U.S. commercial orchards. Findings from this study will facilitate future research in this biotrophic pathogen, as well as the monitoring of fungicide resistance and the distribution and spread of potential emerging virulent biotypes to achieve a sustainable control of apple powdery mildew in the Pacific Northwest and other growing regions.

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Zoom Link: <https://wsu.zoom.us/j/99773022102?pwd=Q3Fl>

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