Characterization of Colletotrichum Isolates From Apple in New Hampshire

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Bitter rot

• Increased frequency in 2011 & 2012
• Climate plays an important role in disease development
• Where is the inoculum coming from?
  – Infected leaves?
  – Latent infections?
  – Other orchards
  – Other crops (strawberry, cherry, blueberry, etc)
Colletotrichum

- *C. gloeosporioides*. *C. acutatum*, and *Glomerella cingulata* associated with bitter rot.
- *C. gloeosporioides* and *C. acutatum* known to be quite diverse and likely species complexes.
Objectives

• The objective of this study was to evaluate the virulence and genetic diversity of isolates of *Colletotrichum* from apple leaves and fruit.
Materials and Methods

• Isolation of monosporic isolates
• Sequenced 5 genes for multi-gene phylogeny
• Virulence test
  – 20 isolates
  – 8 cultivars
Inoculations
Isolate Virulence
Cultivar Susceptibility

![Graph showing lesion volume for different cultivars]
Virulence of Isolate by Origin

![Bar graph showing lesion volume (cm³) for different origins. The graph includes bars for Apple leaf, Apple fruit, and Cherry fruit, with the Apple fruit showing the highest lesion volume.](image-url)
• 332 strains previously identified as *C. acutatum* including type material located at CBS
• Used a 6-gene phylogeny
• *C. acutatum* sensu latu is comprised of 29 subclades that represent distinct species
• So how many species infect apple and cause bitter rot?
  • Likely 6+
More importantly, how many and which species infect apple in the NE?

• In our study all 20 isolates were *C. fioriniae*
  – Intraspecies variability correlates with virulence
• Most isolates from Southern states belong to *C. gloeosporioides* complex (*C. siamense*)
  – Associated with many tropic fruit species
• Most isolates from NZ are *C. acerbum* and *C. fioriniae*
Phylogenetic analysis of *Colletotrichum* from apple in New Hampshire

- All 20 isolates were *C. fioriniae*
- BH-02 and Wood-10 composed a distinct genotype within *C. fioriniae*
- BH-02 and Wood-10 were also the most virulent across all apple varieties
Colletotrichum fioriniae

- Type culture from *Fiorinia externa* (hemlock scale) in New York
- Associated with fruit rot of cranberry, peach, blueberry, strawberry, and apple in northern USA and British Columbia
- Likely has an endophytic phase.
- Also found on *Malus* in New Zealand, Netherland, Italy and blueberries in NA and USA
Implications

• What we knew about *C. acutatum* and *C. gloeosporioides* may not hold true for *C. fioriniae*.
• What is the distribution of *C. fioriniae* in NE & NA?
• Is *C. fioriniae* the dominant species in NE?
• Is there variability in virulence?
• Do endophytic strains also cause bitter rot symptoms?
• What climatic conditions induce infection/symptom development?
Post-infection Fungicide Trial

• Objectives:
  – Quantify infection and colonization by *V. inaequalis* and the production of primary inoculum (ascospores) from symptomless leaves treated with post-infection fungicides.

• Compounds evaluated in 2012
  – 3 strobilurins
  – 3 triazoles
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