A Rottin’ Summer in NC: Update on *Glomerella* Research in the Southeast

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Bitter Rot of Apple

Typical bitter rot

- Species: Primarily *Colletotrichum acutatum* species complex (C. *acutatum* (in South); C. *acutatum*; C. *fioriniae* (in Northeast))
- Abundant salmon/orange colored conidia in concentric rings
- Leaf symptoms extremely rare
- Affected cultivars: Most! Even ‘Rome Beauty’ and ‘Red Delicious’ (“MR”)
Glomerella Leaf Spot and Fruit Rot

Not your average bitter rot.................
Species:
- Primarily *Colletotrichum gloeosporioides* species complex (*Glomerella cingulata*, *C. gloeosporioides*, *C. fructicola*) in S.E. U.S.
- Leaf spot (defoliation), fruit spot and rot
- Secondary cycle: Very uncommon to non existent in S.E.
Differentiating the *Colletotrichums*

*C. acutatum*: “acute” ends

*C. gloeosporioides*: rounded at one or both ends
Tackling the GLS Problem

1st year goals:

1. “Immediate” impact: Develop a fungicide program with Glomerella leaf spot/fruit rot as primary focus
2. Start to develop an understanding of Glomerella disease development in North Carolina
3. Understand which spots are which…
Tackling GLS: Fungicide Efficacy

1. Untreated
2. Standard Protectant Program
   - Captan 80WDG (2.5 lb) + Koverall (3 lb): PF-1C
   - Captan 80WDG (2.5 lb) + Ziram 76DF (3 lb): 2C-6C
   - Captan 80WDG (5 lb): 7C-8C
3. Protectant + ProPhyt Program
   - Koverall (3 lb) + ProPhyt (4 pt): PF-1C
   - Captan 80WDG (3.75 lb) + ProPhyt (4 pt): 2C-8C
4. ProPhyt (6 pt): PF-8C
5. Captan 80WDG (5 lb): PF-8C
6. Cabrio EG (9.2 oz): PF-8C
7. Merivon (5.5 fl oz): PF-8C
8. Inspire Super (12 fl oz): PF-8C

Question 1: What is the most efficacious fungicide class for management of Glomerella leaf spot/fruit rot?
Tackling GLS: Fungicide Efficacy

• Question 1: What is the most efficacious fungicide class for management of Glomerella leaf spot/fruit rot?

• How data was evaluated....
  1. Glomerella leaf spot incidence:
     Evaluated GLS incidence on same 8 mid-shoot leaves, ~2 week intervals 8 Aug-8 Sep. 10 collections/rep; 4 rep/trt
  2. Terminal shoot defoliation resulting from GLS: Evaluated defoliation on same 8 mid-shoot leaves, 1-2 week intervals 16 Aug-16 Sept. 10 collections/rep; 4 rep/trt
Tackling GLS: Fungicide Efficacy

What is the most efficacious fungicide class for management of Glomerella leaf spot/fruit rot?

rAUDPC: Leaf spots
Tackling GLS: Fungicide Efficacy

rAUDPC: Terminal shoot defoliation
Tackling GLS: Fungicide Efficacy

1. Question 1: What is the most efficacious fungicide class for management of Glomerella leaf spot/fruit rot?

2. How data was evaluated….

   - Scaffold Defoliation: % defoliation on scaffold branch; 10 collections/trt rep
• Scaffold defoliation much greater than terminal shoot defoliation for poorly performing fungicides
Tackling GLS: Fungicide Efficacy

- Affect of rainfall on Glomerella leaf spot and fruit rot of apple

![Graph showing cumulative rainfall from April to September for 2014, 2015, and 2016.](graph.png)

- Little to no fruit rot, 2015
Tackling GLS: Fungicide Efficacy

• Question 1: What is the most efficacious fungicide class for management of Glomerella leaf spot/fruit rot?
  
  • How data was evaluated….
    
    • Fruit spot + rot: % of fruit out of 5 with Glomerella spot+rot; 10 collections; 4 rep/trt

  • Post-harvest Glomerella spot and rot incidence (fruit): 20 fruit per treatment/rep
Tackling GLS: Harvest fruit spot and rot

- Cabrio and Merivon: highest levels of control against Glomerella fruit rot at harvest
  - ProPhyt and Inspire Super: Significantly lower efficacy against GLS
Tackling GLS: Post Harvest Spots

- Development of Glomerella fruit spot development evaluated 14 days post-harvest (fungicide applied 1-day before harvest)
- Similar trend as harvest data
Tackling GLS: Post Harvest Rot

- Development of Glomerella spots to rot (rAUDPC): 35 days
- Merivon applied 1-day before harvest: Highest level of control
- Similar trends throughout efficacy trial
Tackling GLS: Merivon Active Ingredients

- Question 2: Do both a.i.’s in Merivon have similar efficacy against Glomerella leaf spot/fruit rot?

- Cabrio (Pyraclostrobin, Group 11) provided greater efficacy of Glomerella foliar incidence and scaffold defoliation prevention than Sercadis (fluxapyroxad, Group 7)
Question 2: Do both a.i.’s in Merivon have similar efficacy against Glomerella leaf spot/fruit rot?

Cabrio (Pyraclostrobin, Group 11) and Merivon provided greater control against Glomerella fruit rot development at and post-harvest compared to Sercadis (fluxapyroxad, Group 7).
Quick Recap so Far…

• Question 1: Non-rotational fungicide efficacy?
  • Incidence of Glomerella on leaves: Cabrio, Merivon, Protectant+ProPhyt programs all better than untreated program
  • Standard protectant program demonstrated same level of efficacy as Merivon and Cabrio EG at harvest, but control broke down post harvest

• Question 2: Merivon a.i. efficacy?
  • Pyraclostrobin (QoI, Group 11) responsible for high level of efficacy demonstrated by Merivon
Tackling GLS: Merivon Timings

14 day PH Glomerella fruit spots

- Post-harvest Glomerella spots: Captozeb/Captan+Ziram full season program performed as well as most Merivon programs
- No difference in Glomerella incidence on fruit among Merivon programs at harvest
2017 Game Plan

- Pre-Season: Orchard floor management: urea (20-40 lb/A), flail mowing, leaf removal, etc

- Copper
- ½ Manzate + Syllit
- ½ Manzate + Luna Tran.
- Scala
- Vanguard

- ½ Manzate + Syllit
- Luna Tran.
- Scala
- Vanguard

- ½ Manzate + Aprovia*
- Fontelis
- Inspire Super*
- Indar 2F*
  *add sulfur if heavy mildew

- ½ Manzate + Rally 40WSP
- Topguard
2017 Game Plan

- **2nd- Cover:**
  - General covers: Ziram 3 lb + Captan 80WDG 2.5 lb + ProPhyt 3-4 pt
  - Bot Rots: DMI fungicides (Inspire Super), QoI, SDHI (ie. Aprovyja)
  - Save 1 Merivon application for harvest (0 PHI)
• For cultivars susceptible to Glomerella tighten schedule at PF (3-5 day intervals)
  • PF to 2C: Merivon +1/2 manzate, ½ captan + ½ manzate + Prophyt, Merivon + ½ manzate (1C), ½ manzate/Ziram + Prophyt
  • 3C to 7 to 10 days before harvest: ½ captan + ½ Ziram + 3-4 pt ProPhyt
    • Incorporate Topsin (FSSB) and DMIs (Bot Rot) when needed
  • 7-10 days Pre-Harvest: Merivon + ½ Captan
  • Harvest: Merivon + ½ Captan
What’s Next......

- NC Ag Foundation
- Overwintering study: Location, control, detection

September 2016

November 2016

December 2016
What’s Next……

• NC Specialty Crops Block Grant:
  • Refine management program with integrating pathogen biology
  • In vitro fungicide sensitivity screening/grower service by species

• Identifying sources responsible for late season infections

http://www.oardc.ohio-state.edu
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