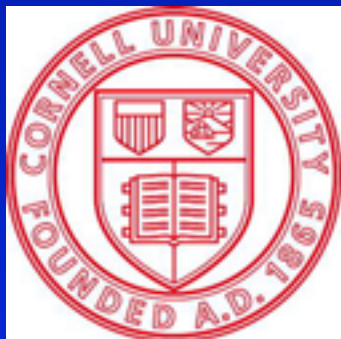


# **Regional apple scab sensitivity and performance stability of difenoconazole on SI resistant apples**

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# Outline

- Apple scab *in vitro* sensitivity to difenoconazole
  - Baseline EC<sub>50</sub> of difenoconazole for North America
  - Difenoconazole in the 2009 & 2010 survey
- Difenoconazole performance on apples
  - Apple Scab
  - Powdery Mildew
  - Sooty Blotch and Fly Speck

# Difenoconazole Baseline

- Examined 56 baseline isolates collected from orchards in NY, MI, & ME
- Dose response curves →  $EC_{50}$
- Difenoconazole  $EC_{50}$  for baseline composite
  - Mean: 0.002  $\mu\text{g/mL}$
  - Median: 0.0015  $\mu\text{g/mL}$
  - Std Dev: 0.0017  $\mu\text{g/mL}$
  - Range: 0.00006 – 0.008  $\mu\text{g/mL}$

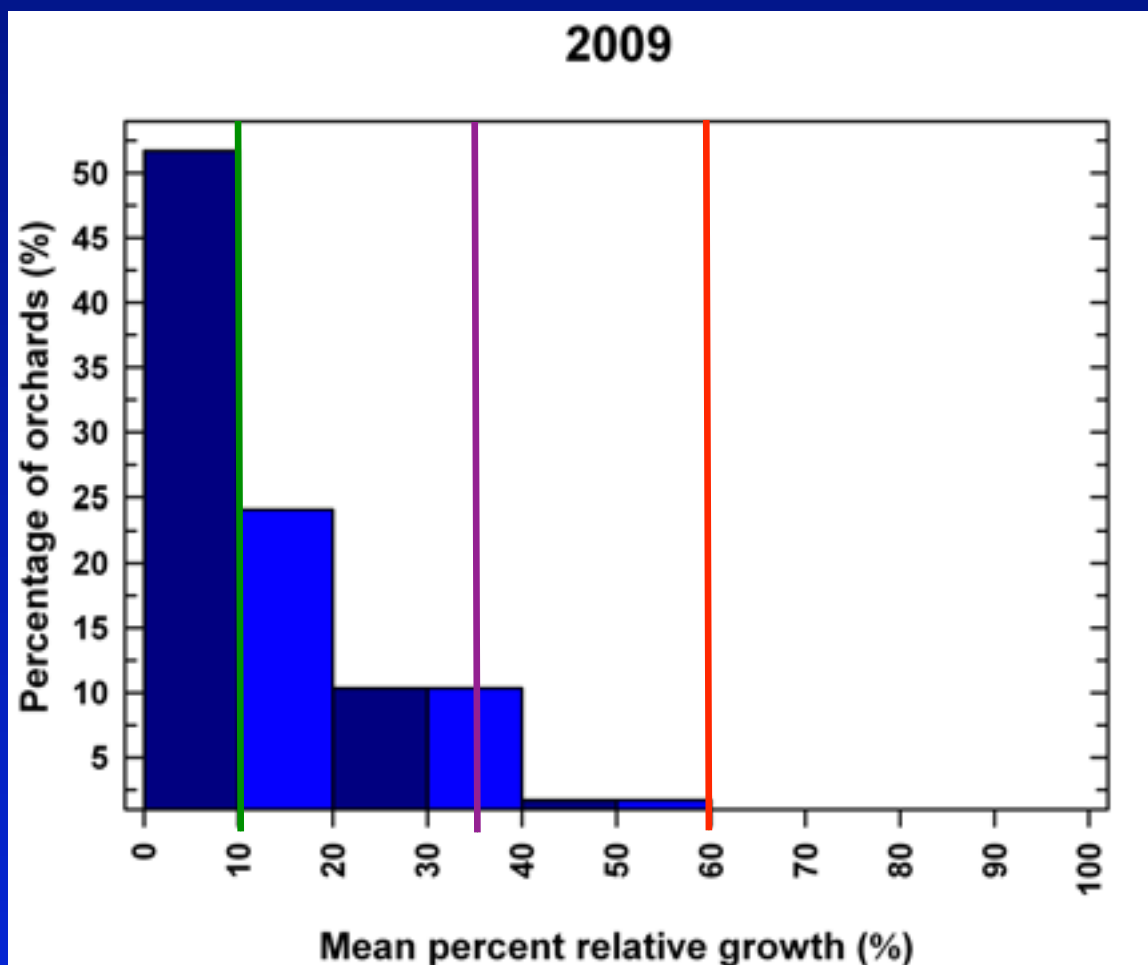
# Fungicide Resistance Survey

- 2009: 39 commercial, 3 baseline, & 16 research orchards
  - NY, VT, WV, NH, MA, ME, RI, MI, OH, IN, PA, & CT
- 2010: 11 commercial, 5 baseline, & 24 research orchards
  - NY, WV, MA, ME, MI, & PA
- Populations assayed for sensitivity to:
  - SI – Inspire (difenoconazole) at 50x baseline for North America (0.1 µg/mL)

# Fungicide Resistance Survey

Frequency distributions of fungicide sensitivity for *V. inaequalis* orchard populations from 2009

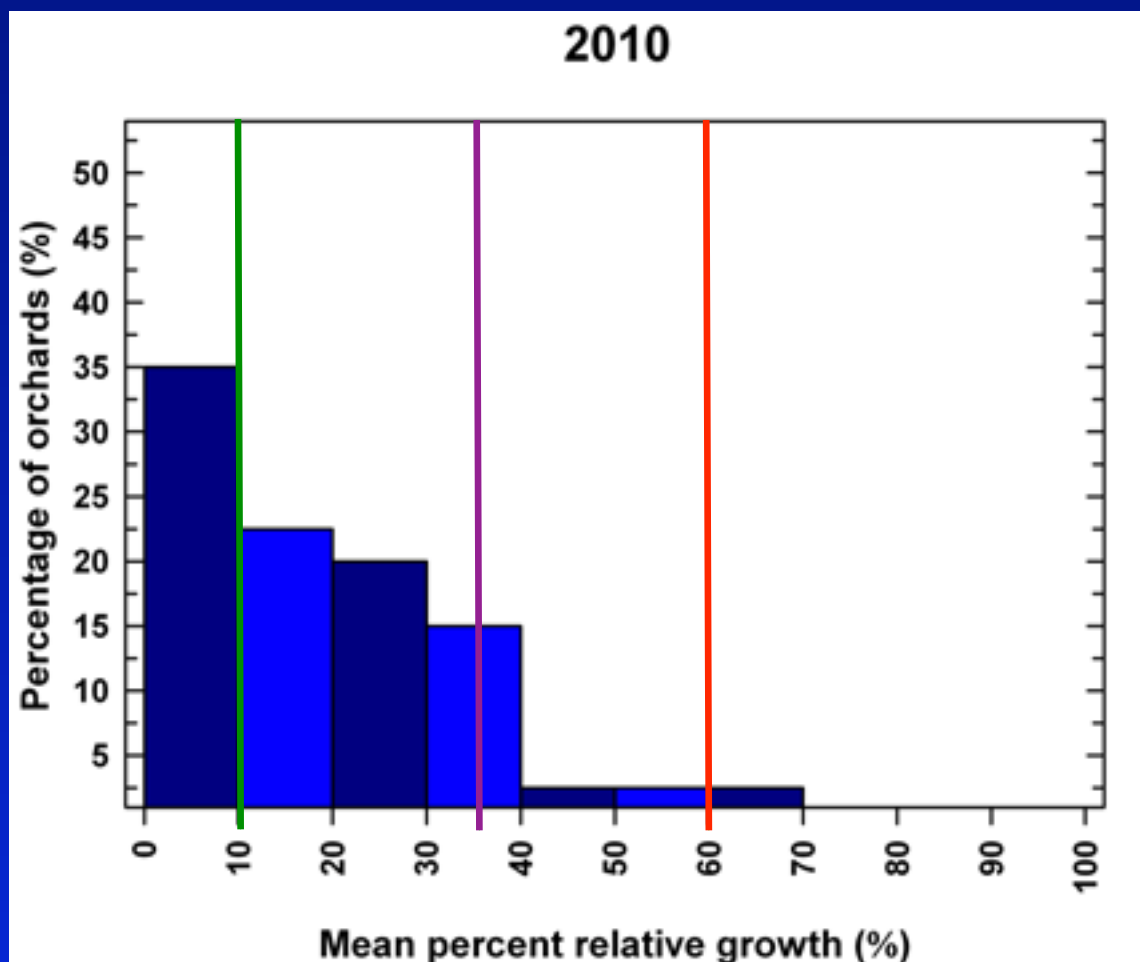
Difenoconazole (Inspire) (0.1 µg/mL, N = 58)



# Fungicide Resistance Survey

Frequency distributions of fungicide sensitivity for *V. inaequalis* orchard populations from 2010

Difenoconazole (Inspire) (0.1  $\mu\text{g/mL}$ , N = 40)



# Fungicide Resistance Survey

- Difenoconazole: Nearly all orchards are below PR threshold
  - After two years: most populations are still sensitive to difenoconazole
- Few (7-10%) orchards above “worst case scenario” threshold
  - Could see resistance failure on ‘McIntosh’ in a heavy scab year

# Outline

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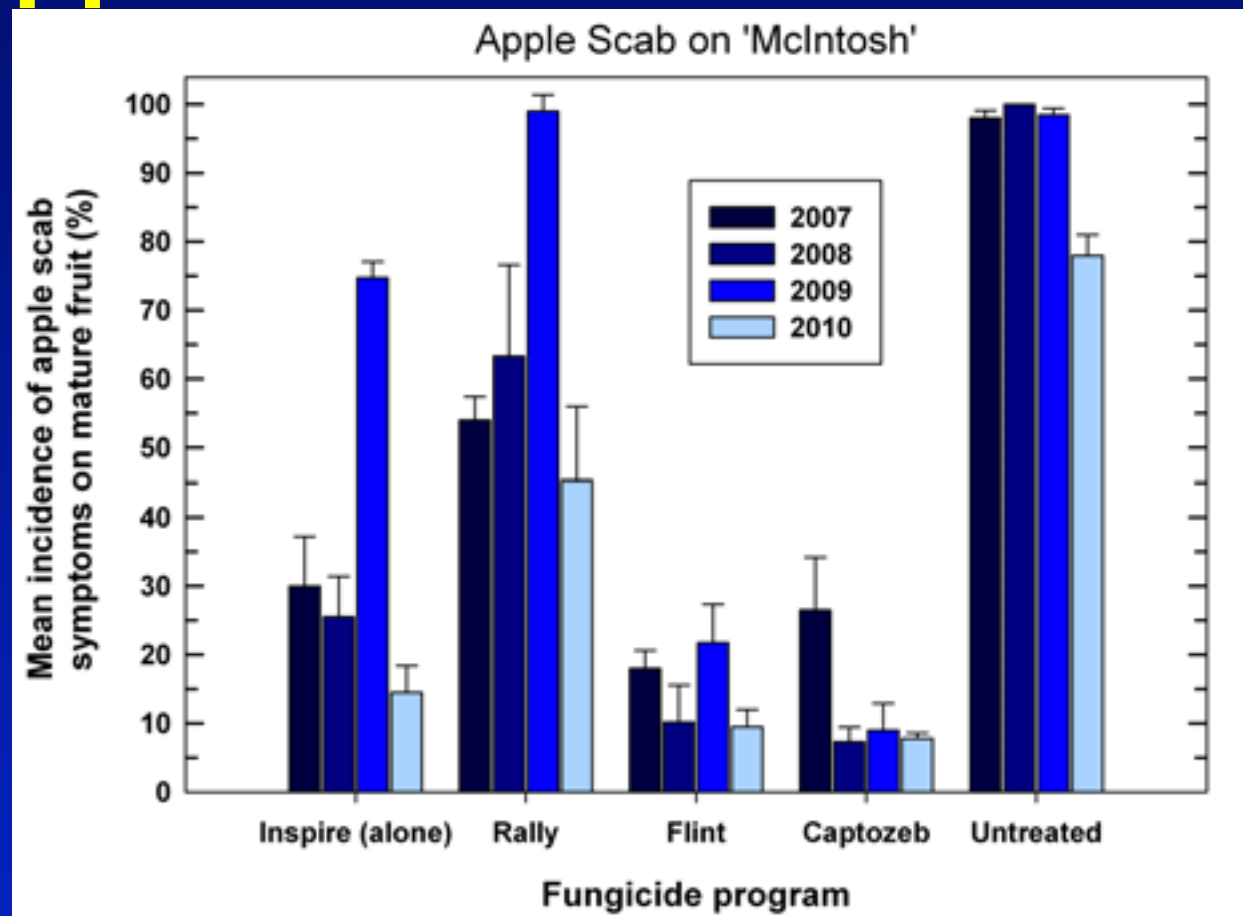


# Performance in SI resistant orchards

- Two mature orchard sites (2007-2010)
  - ‘McIntosh’ and ‘Cortland’- MM.106
  - ‘Empire’ and ‘Jonagold’- M.9/M.111 interstem
- *V. inaequalis* population resistant to SIs
- Apple scab and powdery mildew fungicide treatments:
  - Applied without mix partners or protectants
  - Timed at 7-10 day intervals from bloom - 1<sup>st</sup> cover
  - Protectants (manzate/captan): green tip - tight cluster

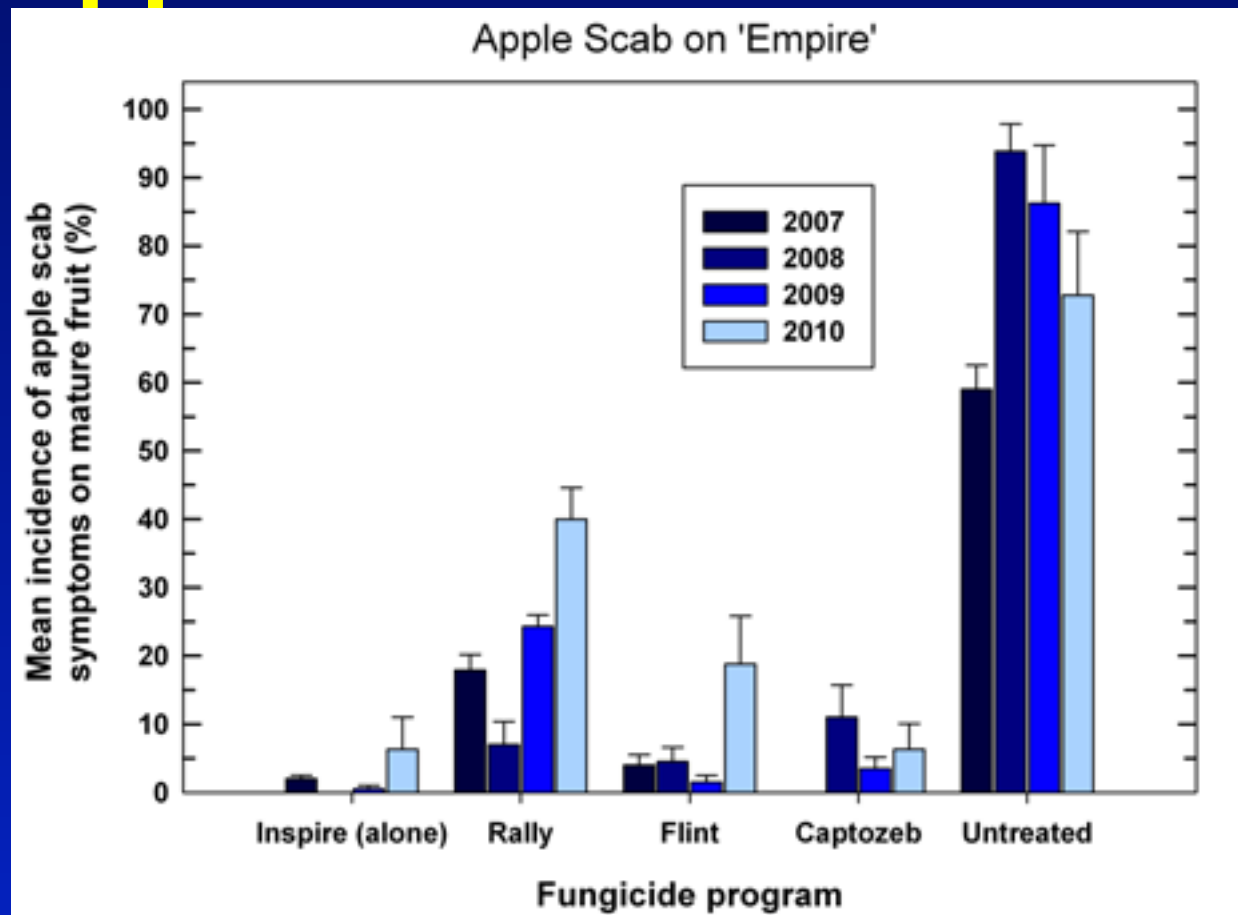
# Apple Scab Performance

Heavy scab  
pressure in  
2009!!



- Except for 2009, consistent difenoconazole performance from 2007-2010
- Seasonal weather factor in manifestation of practical resistance on 'McIntosh'
  - Same trend for Rally, but not others
  - Stable SI resistance levels from 2007-2010

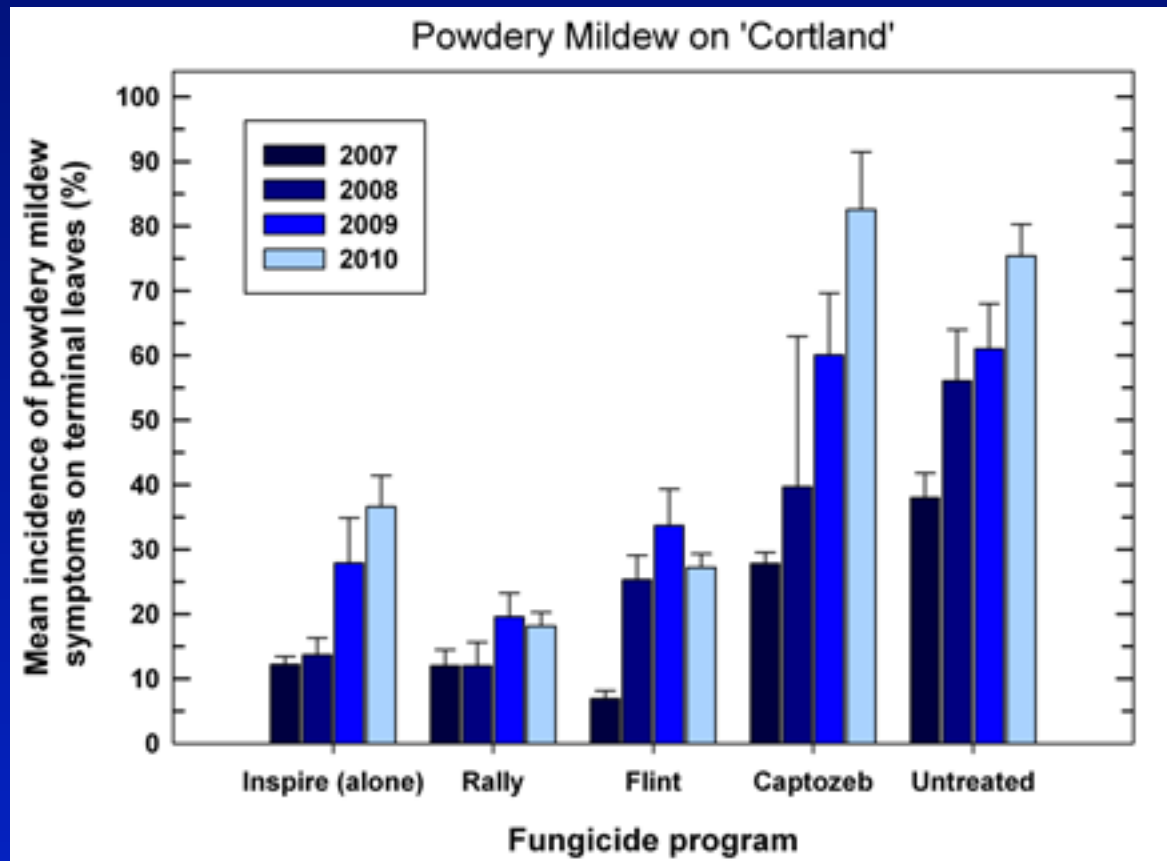
# Apple Scab Performance



- Similar trends on 'Empire' apples
  - 2009 season weather effect not as strong
  - Practical resistance with Rally in 2010
  - Quantitative resistance with Flint in 2010?

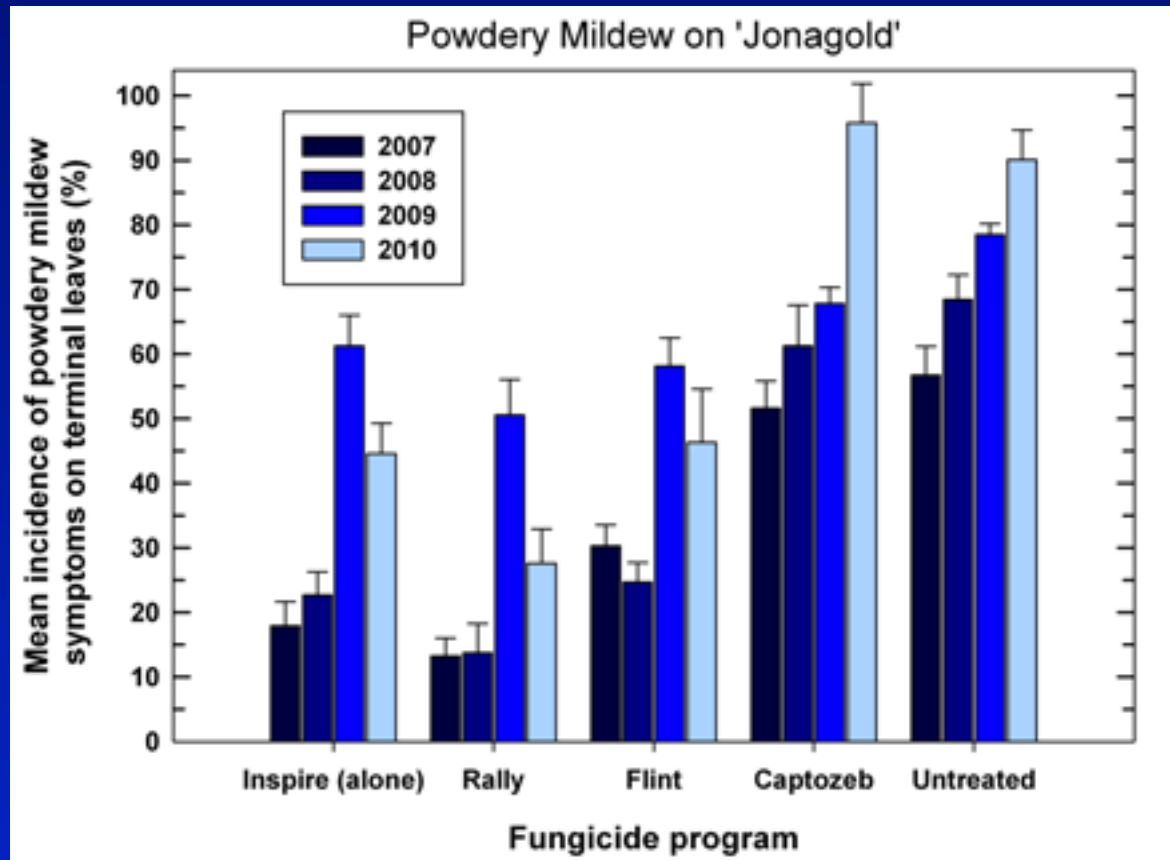
**Heavy scab  
pressure in  
2009!!**

# Powdery Mildew Performance



- Mildew performance of Inspire seems to be seasonally influenced
  - Some seasons good as Rally; Good as Flint in others

# Powdery Mildew Performance



- Performance trends are similar on 'Jonagold', but differences between Inspire and other fungicides are less pronounced

# Powdery Mildew Performance



**Rally**



**Untreated**



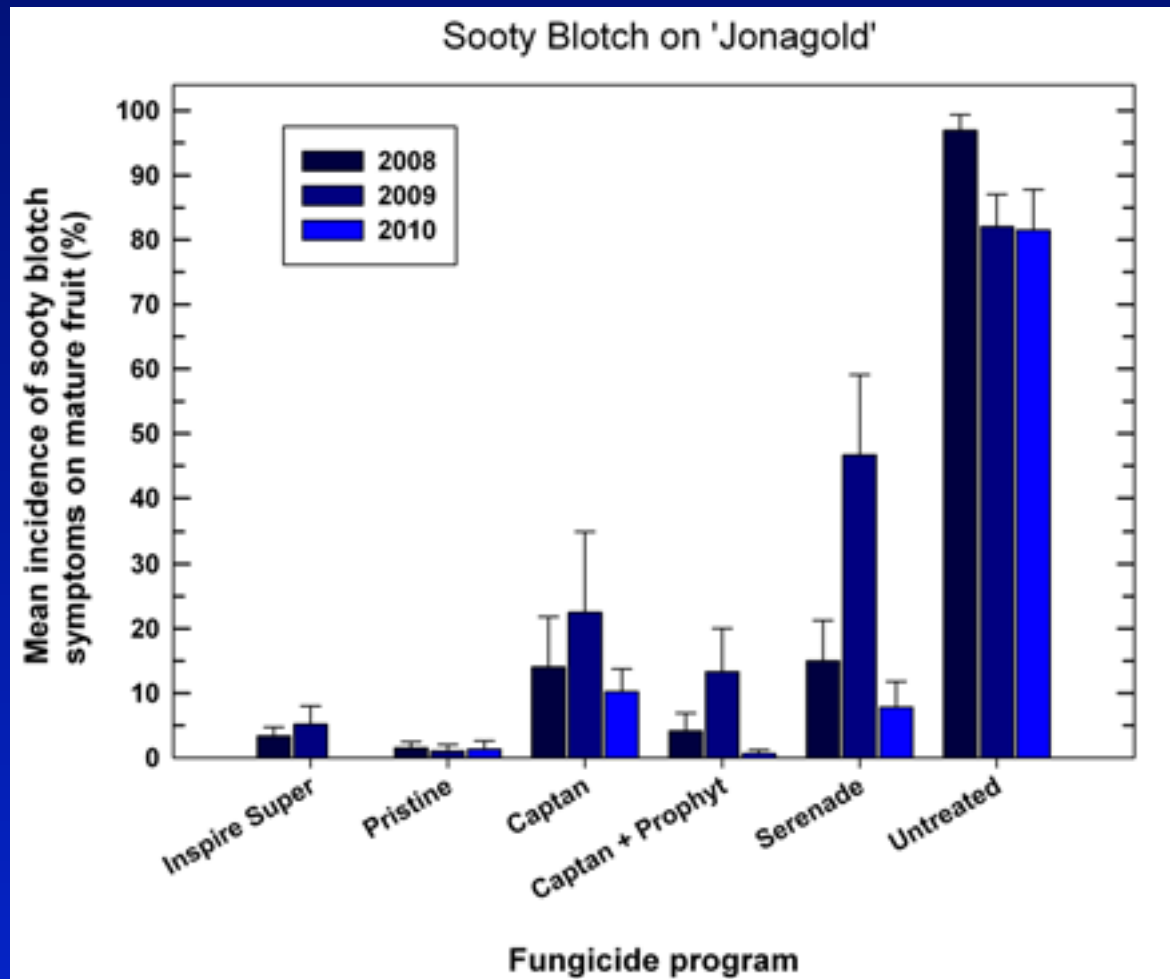
**Inspire**

- Visually, all SI treatments look fairly similar to one another at the end of season
- Are the differences in incidence relevant to the level of bud infection and overwintering?

# Performance against SB FS

- Orchard site (2008 - 2010)
  - ‘Empire’ and ‘Jonagold’- M.9/M.111 interstem
- Natural and artificial inoculum
- Application timing
  - 3<sup>rd</sup> cover to harvest (5-6 applications)
  - 1<sup>st</sup> and 2<sup>nd</sup> cover applications → from less effective programs
- Harvest incidence on Jonagold (4-8 reps)

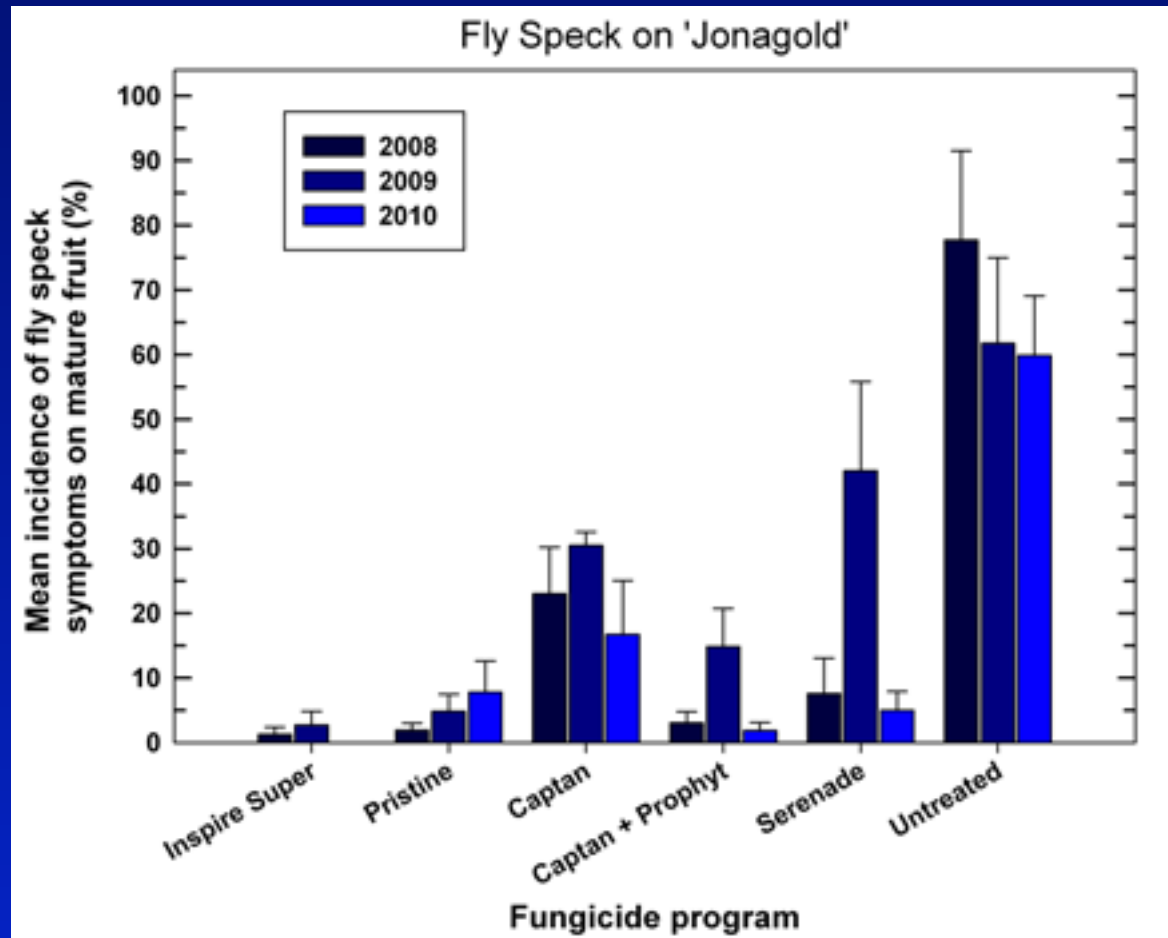
# Performance against SB FS



- Season long: Inspire Super provides sooty blotch control comparable to Pristine or captan + Prophyt

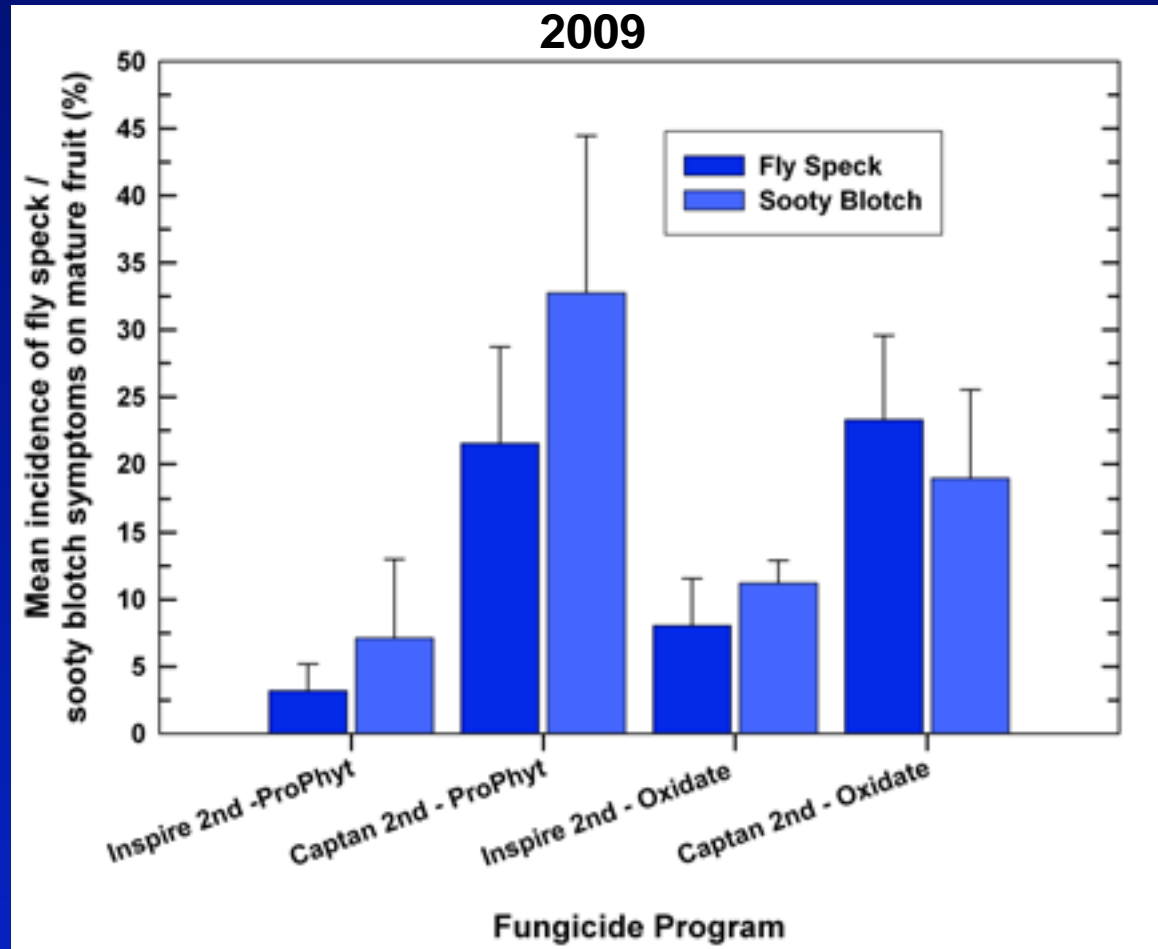


# Performance against SB FS



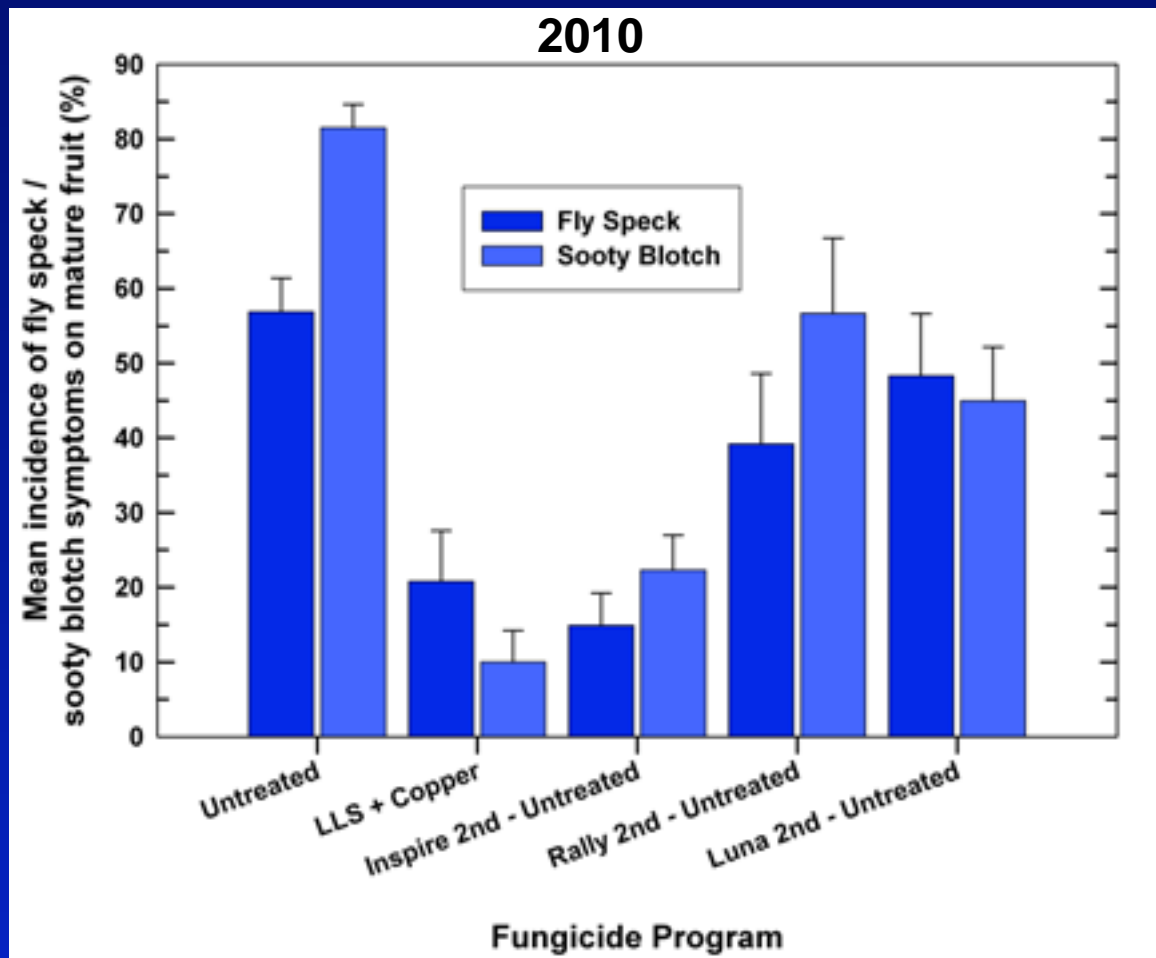
- Season long: Similar trends against fly speck

# Performance against SB FS



- Inspire Super at 1<sup>st</sup> & 2<sup>nd</sup> cover may improve SB FS control at harvest

# Performance against SB FS



- Even if trees are left untreated from 3<sup>rd</sup> cover to harvest?
- Other fungicide products may not provide the same benefit

# Performance in SI resistant orchards

- Apple Scab:
  - Performance level consistent over four years
  - Season weather can effect manifestation of practical resistance on susceptible cultivars
- Powdery mildew
  - Provides a good level of mildew control, but not the best fungicide
  - Differences in control relevant at season's end?
- Sooty blotch and Fly Speck
  - Season long: excellent control, but is it really necessary? Just 1<sup>st</sup> – 2<sup>nd</sup> cover?

# Acknowledgements

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# Questions

