Mummy Berry Disease Revisited

What happened in 2010 and how can we prevent it in the future?

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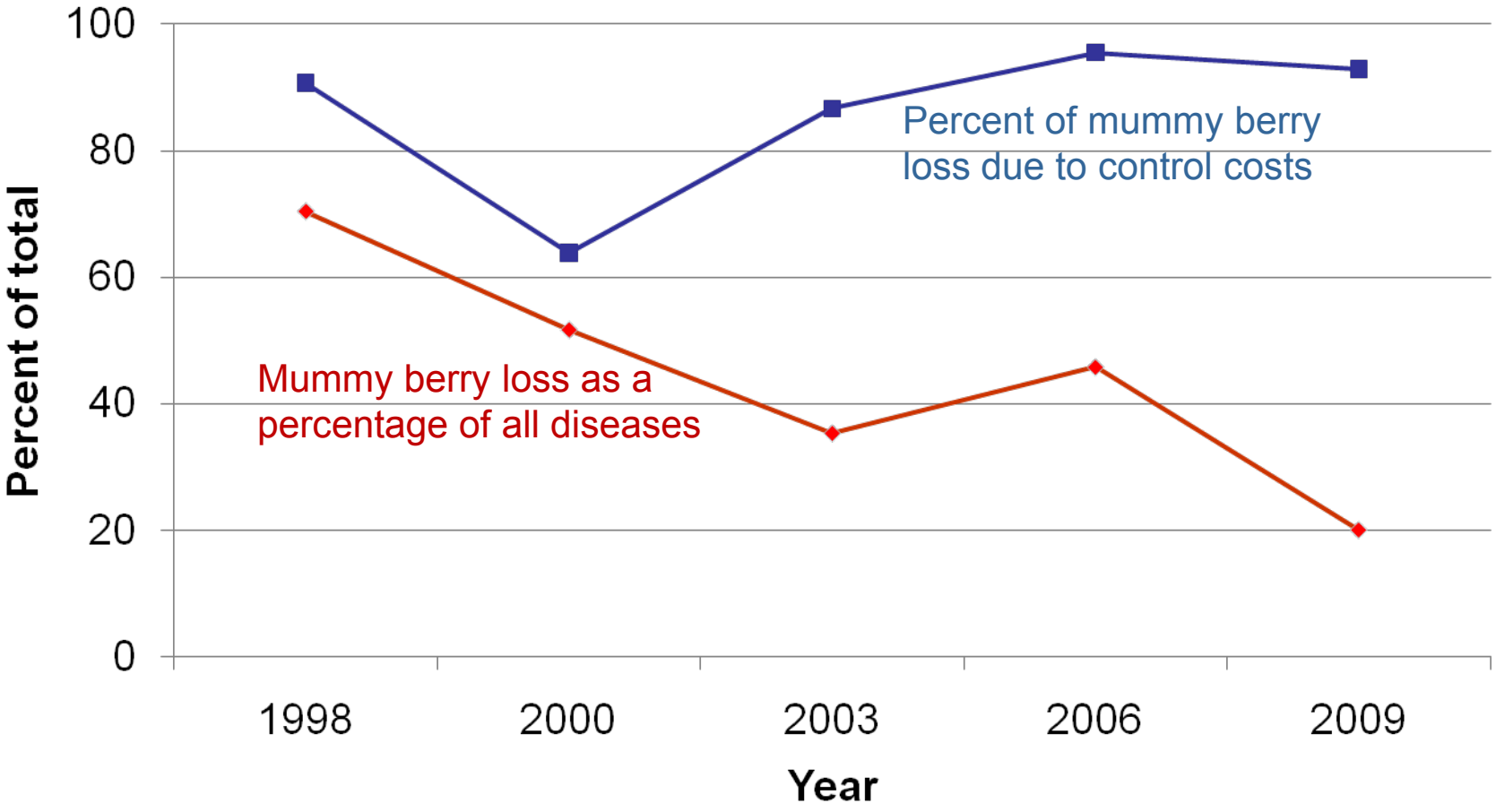
My take on mummy berry, *ca*. 2009

- **First blueberry disease I worked on starting in 1996**
- **Practically successful**
  - Clarified disease cycle on rabbiteyes
  - Transitioned from calendar to phenology-based treatments (green tip or early bloom – *whichever occurs first* – till end of bloom)
- **Professionally rewarding**
  - Lots of good students, postdocs, and publications
  - Interesting basic work on flower infection process
  - Excellent interaction with extension (Stanaland, Smith, Brannen)
- **Problem solved?**
  - Effective fungicides and application timing recommendations
  - Overall lower mummy berry pressure since early 2000s
  - Other diseases have emerged and grabbed our attention

Mummy berry losses, 1998-2009

Source: Georgia Plant Disease Loss Estimates



… but this is what occurred in a number of rabbiteye fields in spring 2010

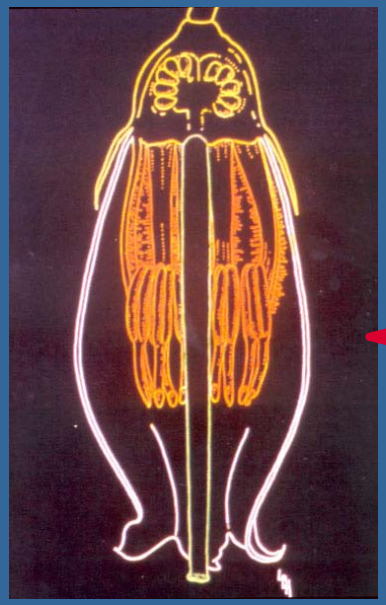
Macon County, GA
(Jeremy Kichler)

Summer

M. vaccinii-corymbosi

Late winter

Spring



Summer

Some findings from early disease cycle work in Georgia

- Protracted leaf bud burst means that shoot infection does not usually occur before onset of bloom on most cultivars
- Ascospores disseminated during rain
- Most of the flower infections leading to fruit mummification occur during second half of bloom
- Flower infection highly efficient, i.e., small number of shoot strikes can lead to high levels of fruit mummification
- In most cases, mummy berry controlled effectively with 2 – 4 bloom applications

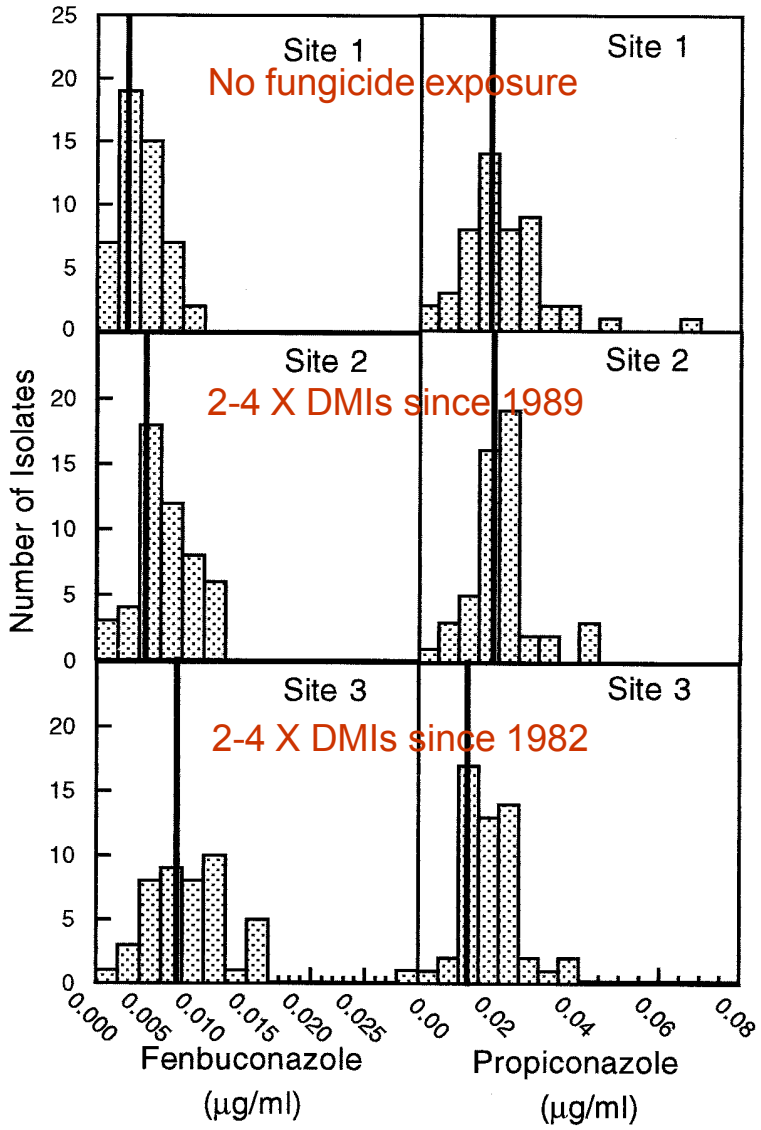
Resulting recommendations (2010 SE Blueberry Management Guide)

"If mummy berry becomes established in your planting, fungicides are very important in pre-bloom sprays (for cultivars that show leaf bud break before flower bud break). Start spraying when green tip occurs on the leaf buds or 1-5% open bloom (stage 6) occurs on the flower buds, **whichever comes first**. Continue sprays till all blooms have fallen."

Could fungicide resistance be to blame?

- Increased *in vitro* ED_{50} values for cranberry cotton ball pathogen observed in fields where DMIs had been used in Wisconsin (but no control failures observed)

- McManus *et al*. (1999) Plant Dis. 83:445-450



Could fungicide resistance be to blame?

Con:

- No resistance-related control failures reported for mummy berry or cotton ball elsewhere
- Short infection period (pre-bloom to end of bloom) and low number of sprays (2-4)
- Virtually all growers rotate (e.g. Pristine + DMI)
- Low disease pressure during much of past decade (spring droughts, 2007 freeze)
- Attempts to test 2010 isolates for resistance using peach Profile™ kit unsuccessful

Missed application timing more likely

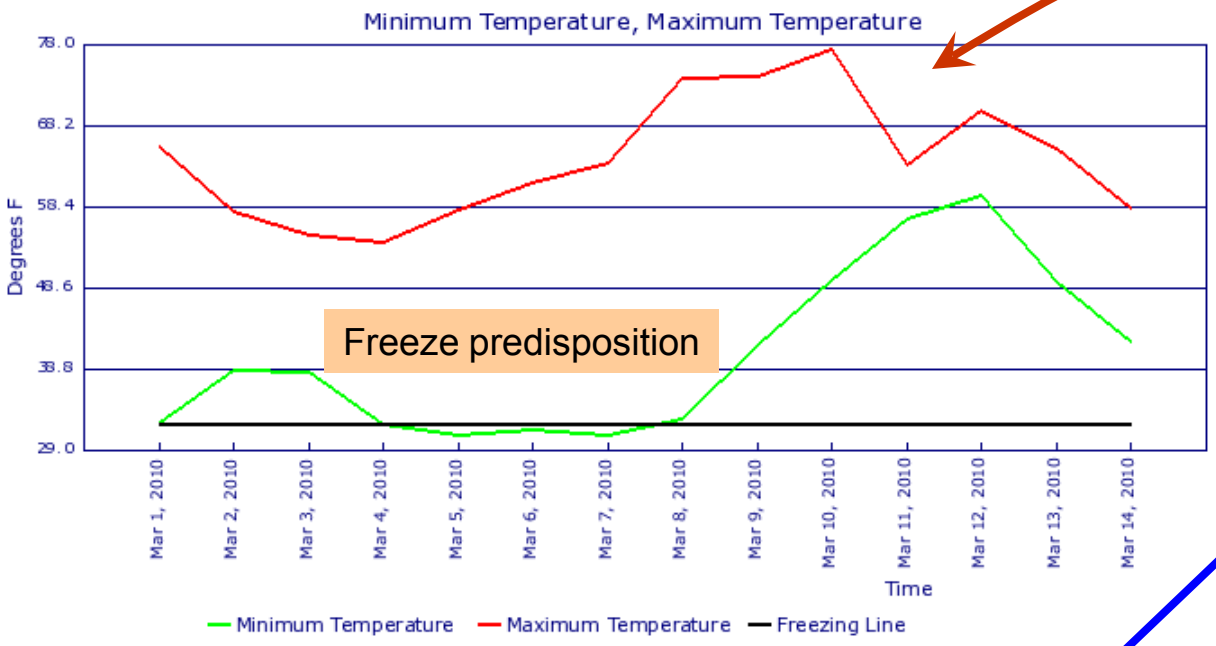
- Mummy berry dropped off growers' radar screens
  - Supposedly easy to control
  - Other diseases have become more worrisome
  - Drought in early 2000s, big freeze of 2007 had natural sanitation effect

- Starting application at onset of bloom works in most years, but did not in 2010 when leaf buds broke earlier than flower buds on most cultivars

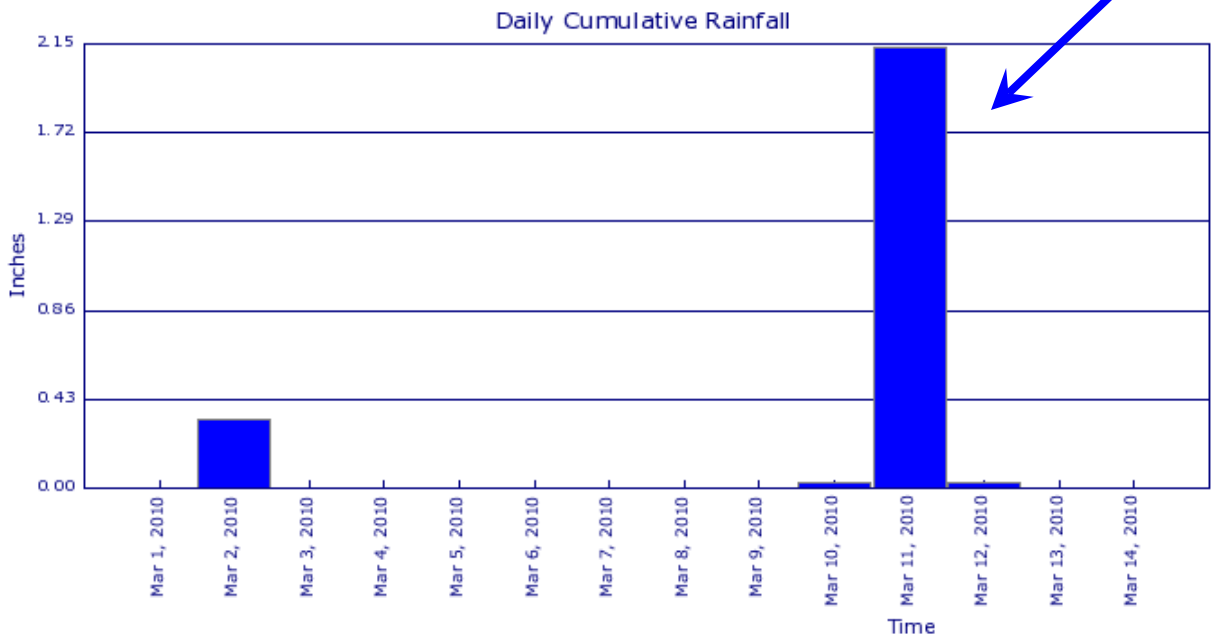
Unusual weather of 2010 major contributing factor

- Cold winter of 2010 (high chilling)
  - Favored leaf bud break before flower bud break
  - Synchronized most cultivars across the state
  - Synchronized mummy germination at the same time
- Green tips emerged very rapidly once temperatures warmed up
  - Missed fungicide application window
- Freezing weather 4 - 7 March predisposed leaf and flower buds to infection
- Warmer temperatures 8 - 12 March, with rain 10-12 March, favored infection by ascospores

Alma weather station 1 - 14 March 2010



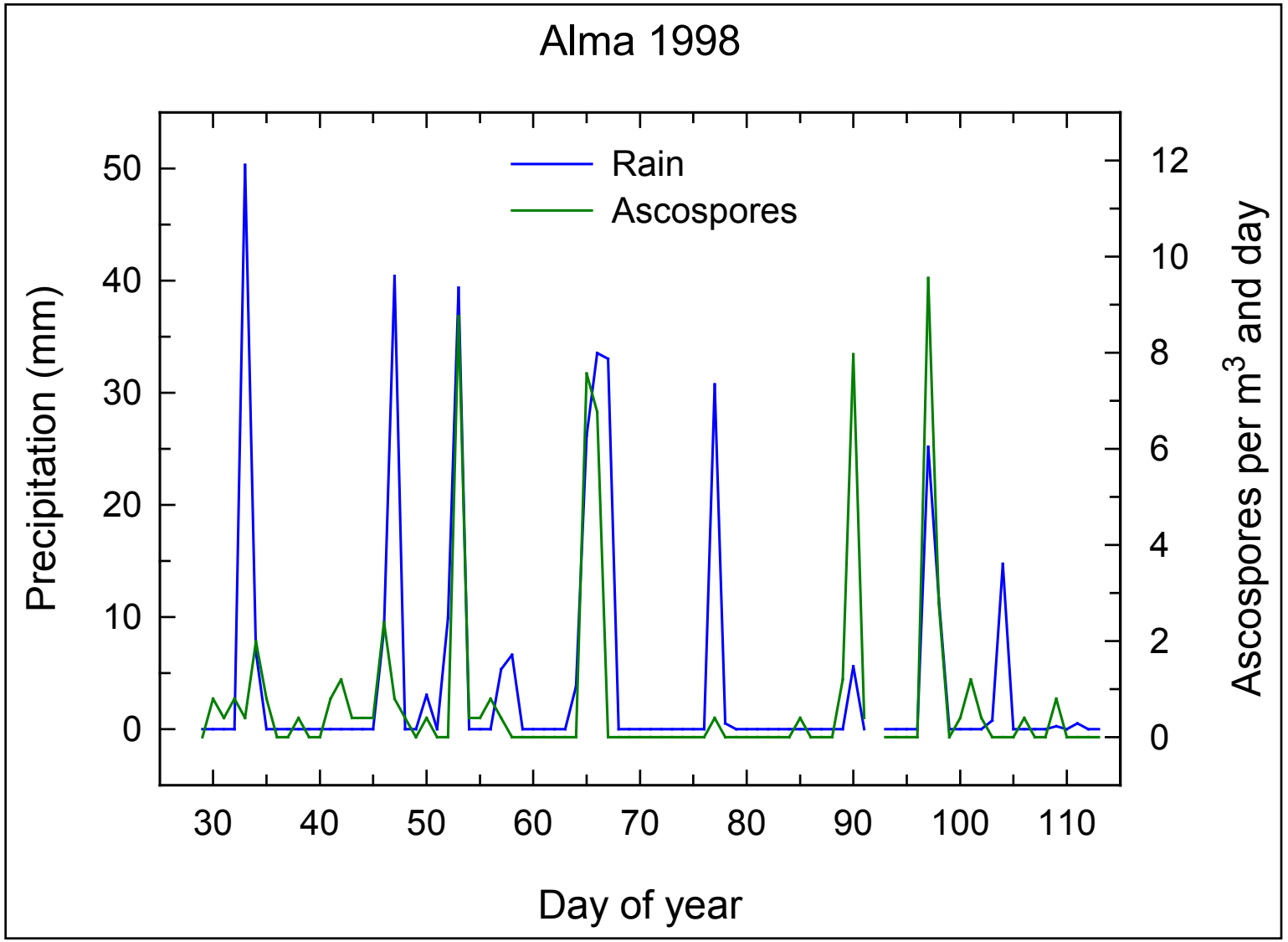
Freeze predisposition



Latent period of 7-14 days consistent with strike appearance in late March

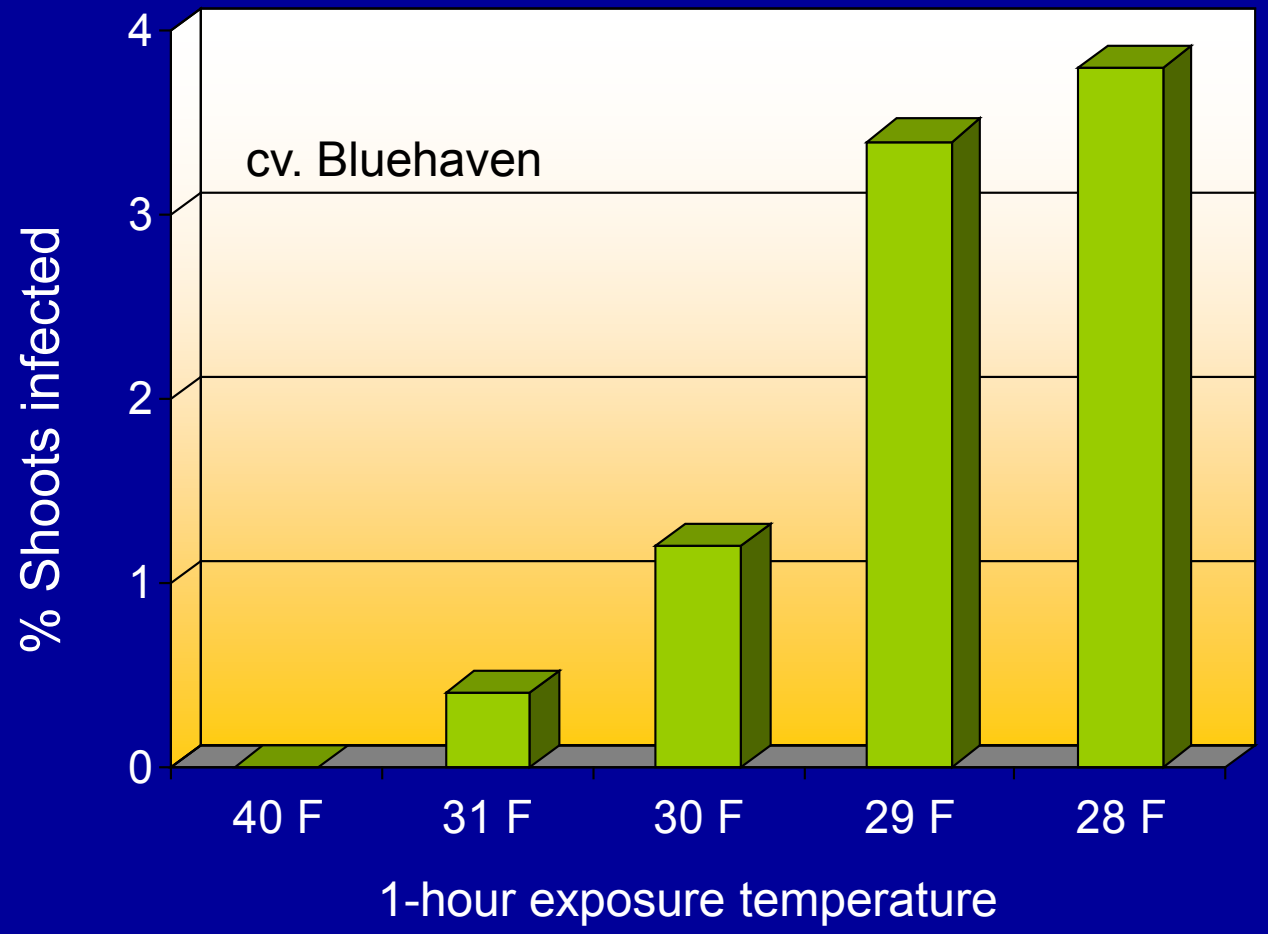
Suitable temperature and rainfall for infection

Connection between rainfall and ascospore dissemination



Effect of frost on susceptibility of blueberry shoots to mummy berry shoot strikes

(Annemiek Schilder MSU)



Why was there very little, if any, fruit mummification in 2010?

- Very rapid bloom progression -> short infection window

- Fungicide applications, although too late against blight, perfectly timed against mummification during bloom

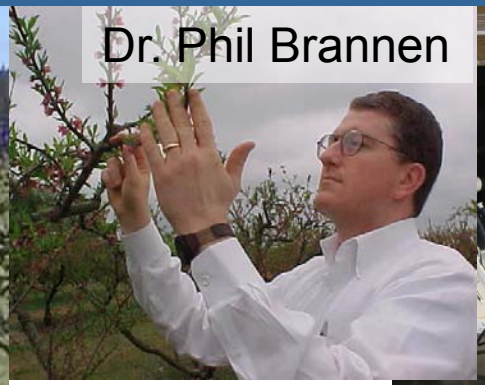
The 2010 mummy berry epidemic - Tentative conclusions

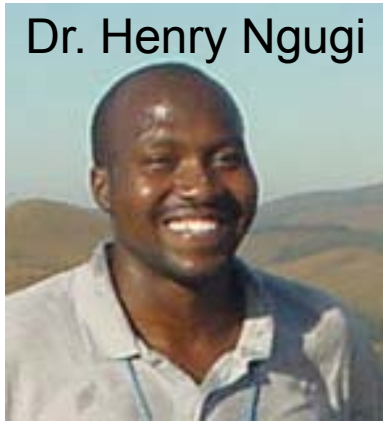
- **"Perfect storm" of environmental conditions**
  - High-chill favored leaf bud break and synchronization across cultivars and regions
  - Freeze injury predisposed buds to infection
  - Warmer temps and rain favored bud infection
- **Optimum application timing missed**
  - Leaf buds before flower buds
  - Rapid bud burst as temps warmed up
  - Mummy berry off growers' radar screens
- **Fruit mummification controlled surprisingly well**
  - Rapid bloom progression
  - Effective, well-timed fungicides

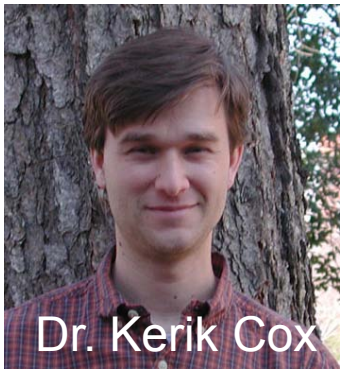
Lessons for the future

- Current mummy berry management recommendations appear to be on target
- Don’t ignore the clause “*whichever occurs first*” in the recommendations
- For 2011, conservative management strategy advisable
- Additional research needed on cultivar susceptibility of closed flower buds in relation to freeze damage
- Despite all the hype around new and emerging diseases, don’t ignore old menaces!

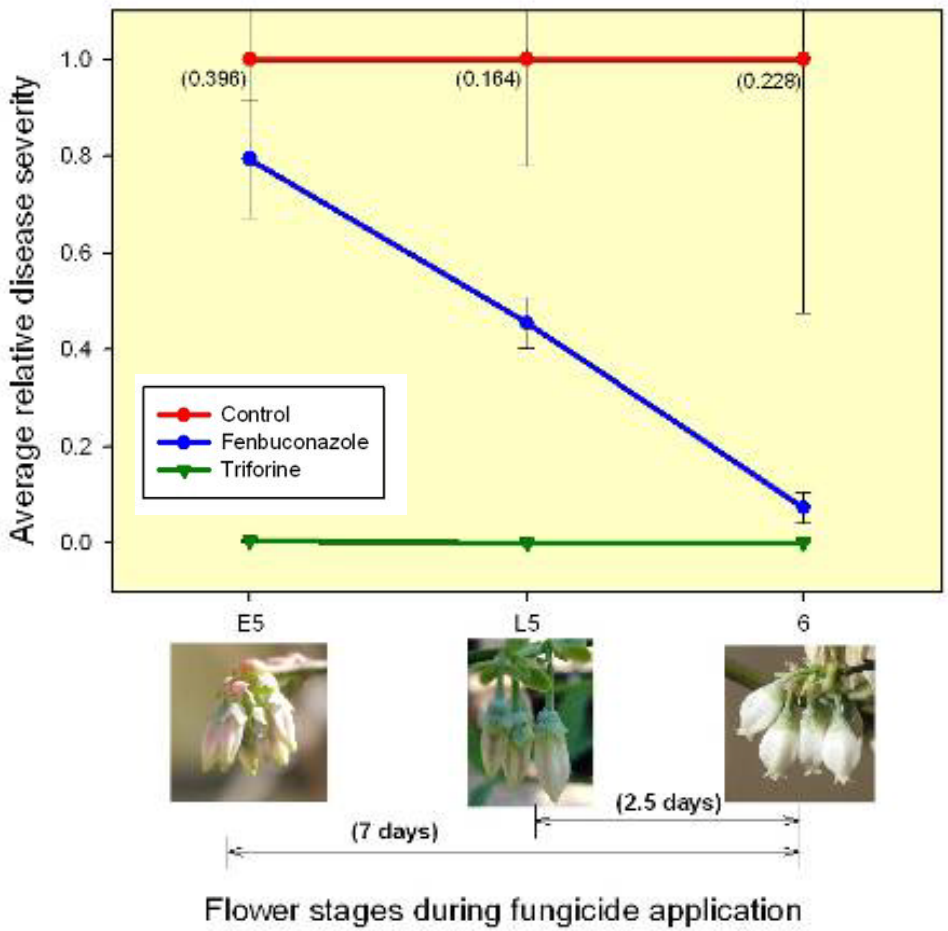
Major Contributors to mummy berry research effort 1996 - present







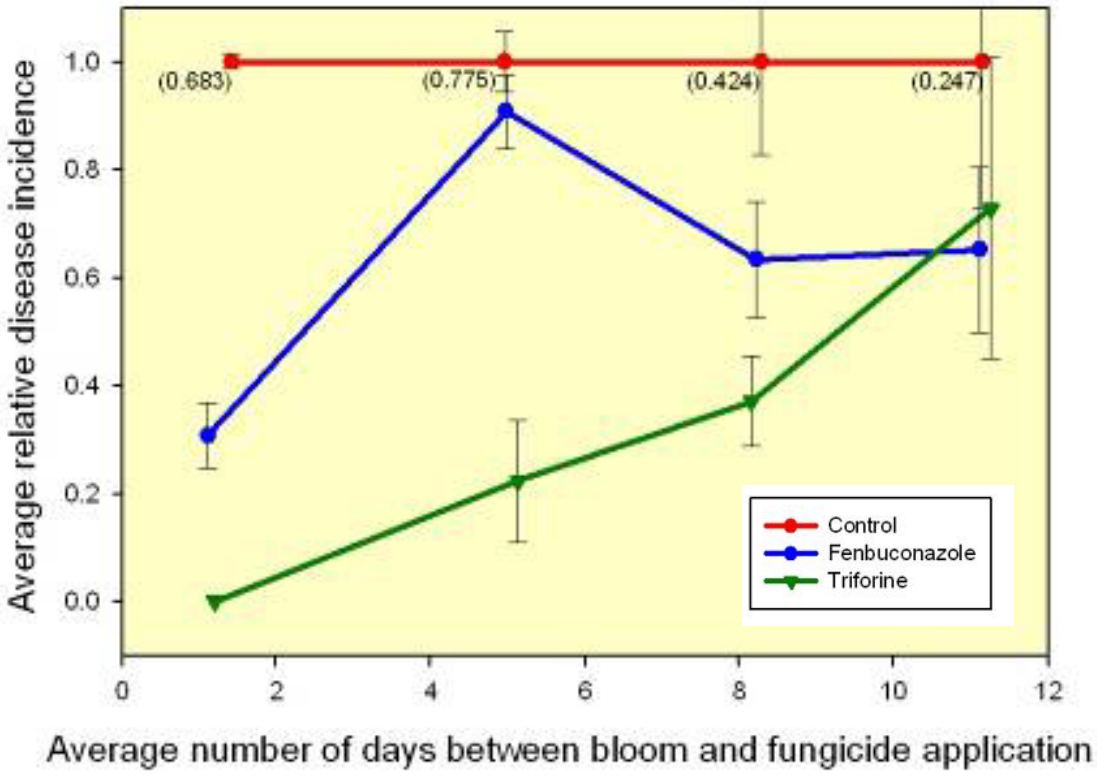
Pre-infection activity against mummification of fungicides applied before bloom



- Greenhouse experiments
- Fungicide applied at early 5, late 5, and stage 6
- Inoculated at stage 6
- Mummification assessed

- Fenbuconazole not effective at early 5, moderately effective late 5
- Triforine highly effective at all stages

Post-infection activity against mummification of fungicides applied before bloom



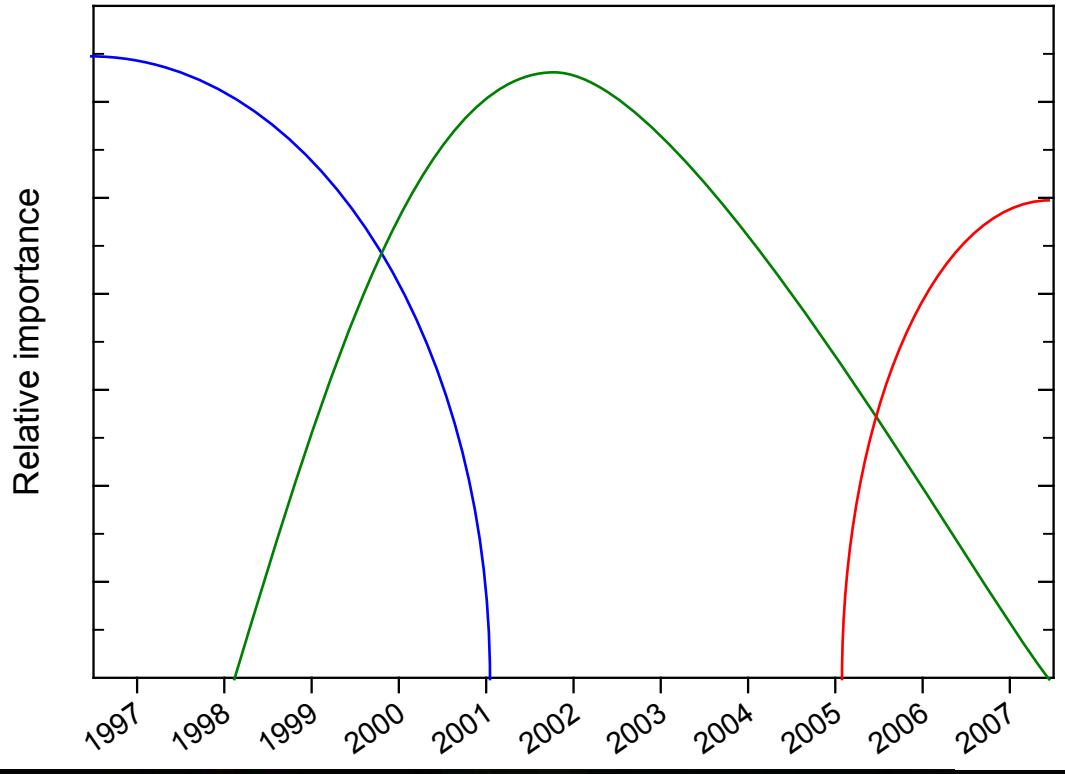
- Greenhouse experiments
- Inoculated at stage 6
- Fungicide applied up to 12 days after inoc. (small green fruit stage)
- Mummification assessed

- Fenbuconazole effective up to 5 days after bloom
- Triforine active up to 8 days

Window of protection:

- Fenbuconazole: 1.5 + 5 = 7.5 days
- Triforine: 7 + 8 = 15 days

Evolution of blueberry disease research priorities



Systemic diseases

Bacterial leaf scorch
(*Xylella fastidiosa*)

Blueberry red ringspot virus

Stem blight
(*Botryosphaeria* spp.)