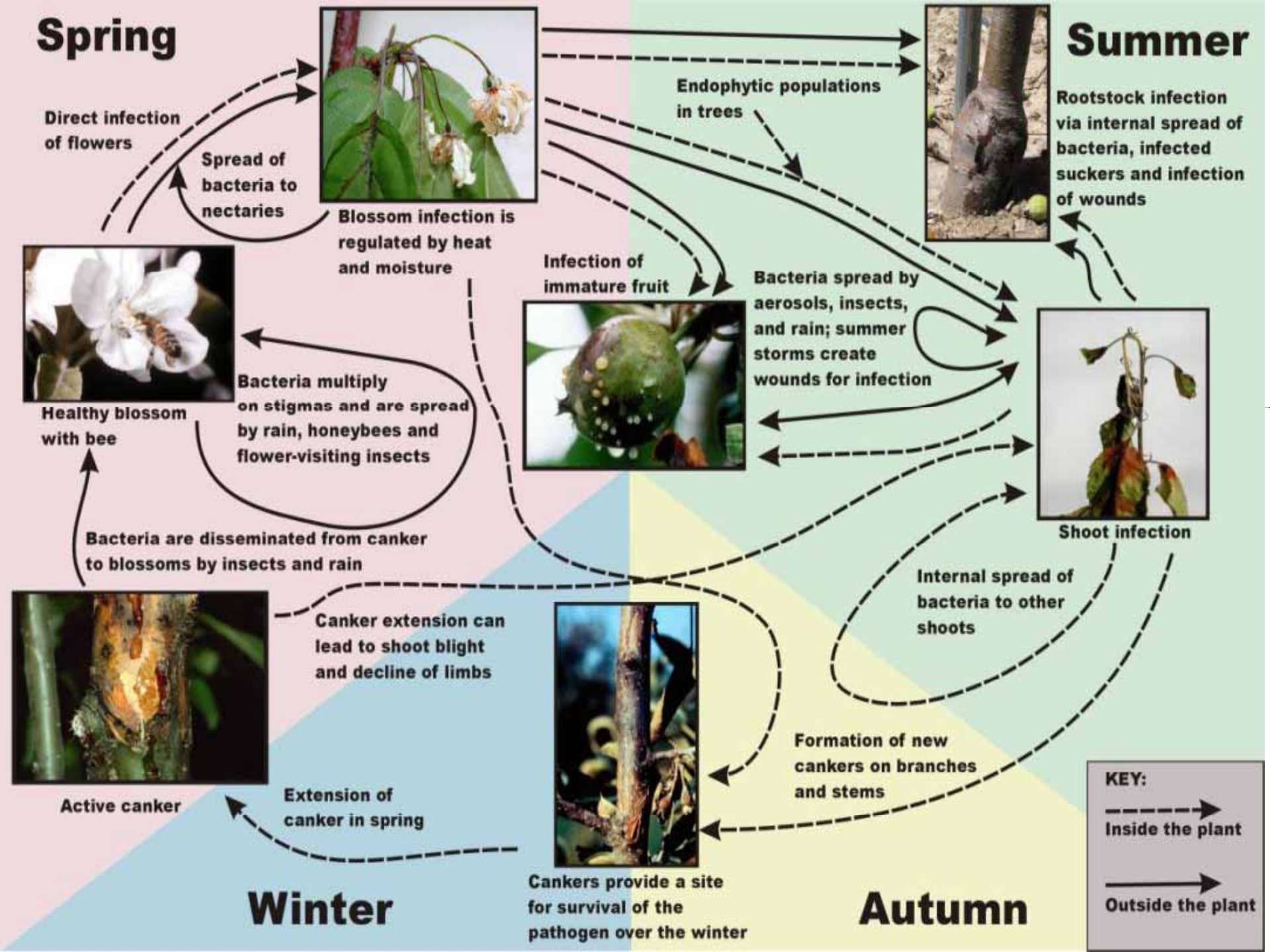
Bailing Out When Fire Blight Strikes

Deborah Breth

Cornell Cooperative Extension

Acknowledgements:

Aldwinckle, Sundin, Russo, Norelli


Spring
Summer
Winter
Autumn
Direct infection of flowers
Spread of bacteria to nectaries
Blossom infection is regulated by heat and moisture
Endophytic populations in trees
Rootstock infection via internal spread of bacteria, infected suckers and infection of wounds
Infection of immature fruit
Bacteria spread by aerosols, insects, and rain; summer storms create wounds for infection
Healthy blossom with bee
Bacteria multiply on stigmas and are spread by rain, honeybees and flower-visiting insects
Shoot infection
Bacteria are disseminated from canker to blossoms by insects and rain
Internal spread of bacteria to other shoots
Canker extension can lead to shoot blight and decline of limbs
Active canker
Formation of new cankers on branches and stems
Extension of canker in spring
Cankers provide a site for survival of the pathogen over the winter
KEY:
Inside the plant
Outside the plant

What control window did we miss?

- Canker blight
- Blossom Blight
- Shoot Blight
- “Trauma” Blight
- Rootstock blight

Season long fire blight control program!

Integrated Control Program

1. Reduction of inoculum
2. Reduction of host susceptibility
3. Inhibition of infection

Reduction of inoculum…

- Dormant Pruning!
  - Every year
  - Prune out infected branches or whole tree?
  - Remove large infected limbs from orchard, chop small twigs

Beware! The active cankers will be hard to see in dormant!

Some cankers are obvious, some not so obvious…

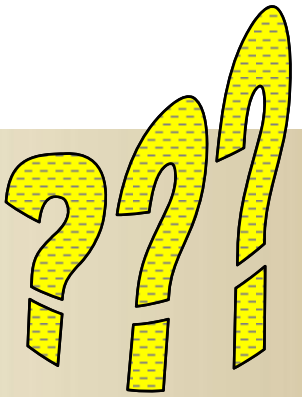
Reduction of inoculum...

- Pre-bloom Copper application
  - 1/4 inch green
  - no later than 1/2 inch green
- Copper applications in summer if FB established in processing orchards
  - Low rates as recommended on label
  - Low water volume
  - Fast drying conditions
- RISK of PHYTOTOXICITY!

Copper Phytotoxicity

- Black speckle
- Russett

Reduction of inoculum...



- To cut or not to cut?
- How far back do we cut?
- To disinfect or not to disinfect?
- Weather conditions? Not with high RH or rain
- To burn or not to burn?

Reduce host susceptibility...

- Resistant varieties?
- Resistant rootstocks? – B9 or CG rootstocks
- Manage fertility -fertilizer regimes that optimize growth but minimize risk of FB
  - Soil pH of 6.0-6.5
  - N:K ratio of 1.5
  - Avoid heavy N applications and organic N sources
  - Trees with high levels of Ca and Mg are more resistant to FB

Reduce Host Susceptibility...

Shoot blight from blossom and canker blight-

Use Apogee !

- If there are high risk conditions of blossom blight during bloom and/or
- If severe problem last season.

Apply at 1-3 inches (2.5-7 cm) of shoot growth, usually late bloom to petal fall.

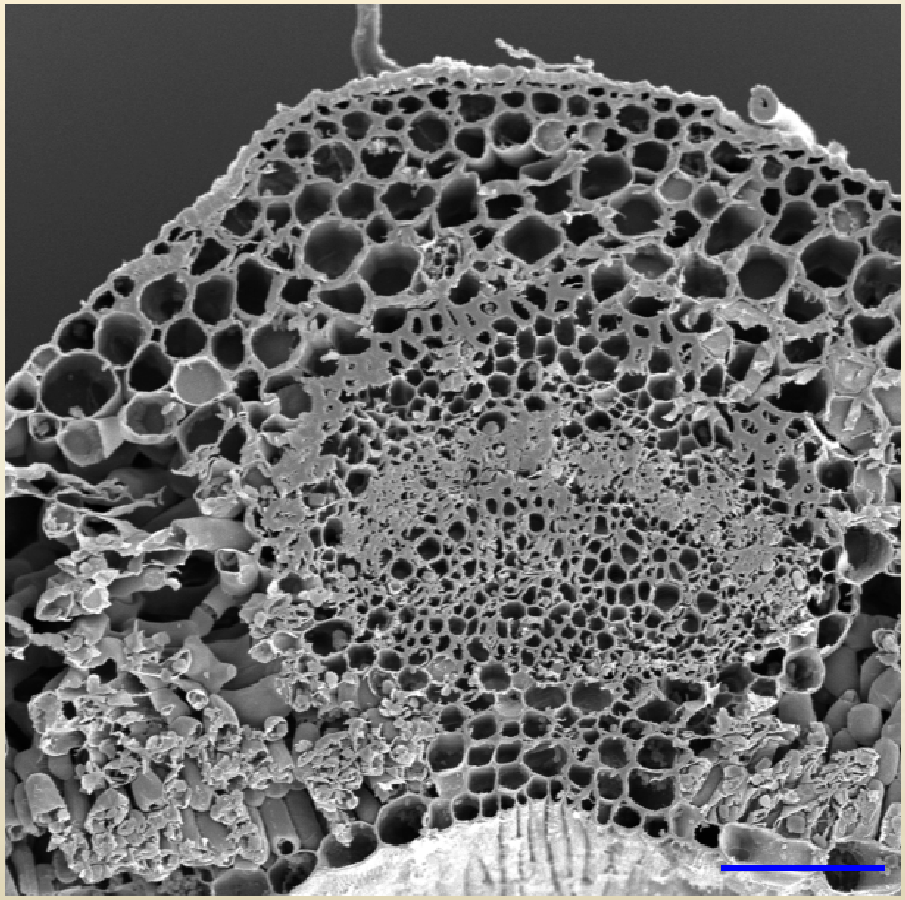
3-6 oz/100 if <5 years old, or 6-12oz/100

It must be applied before you see symptoms!

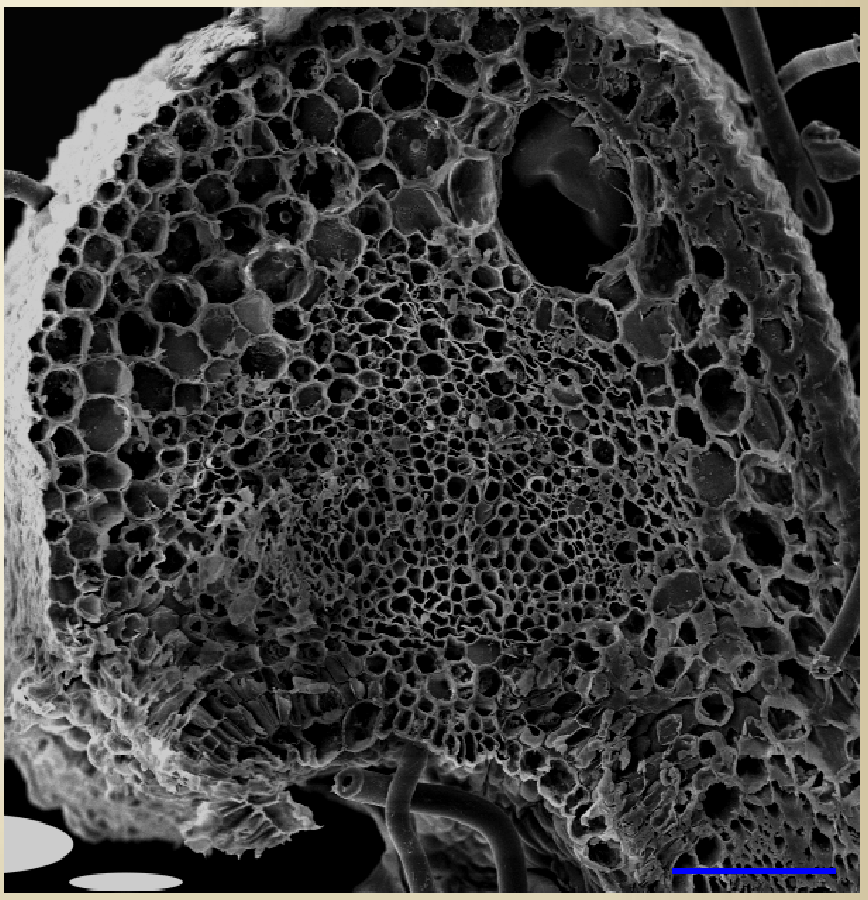
Apogee - Prohexadione-Ca

- Inhibits the synthesis of gibberellins -- reduces longitudinal shoot growth
- Absorbed by apple foliage, transported acropetally to growing shoot tip
- Shoot specific treatment, no blossom blight control
- Takes 7-10 days for effect. Repeat sprays
- Excellent control of shoot blight when applied late bloom!

Apple Leaf midvein Cross-sections - Sundin



ProCa treated



Untreated

Mechanism of Action of Apogee for Shoot Blight Control - Sundin

- Anatomical changes - increase thickness of cell wall
  - Ea bacteria inject proteins by way of pilus into plant cell to begin the disease process (Hrp system)
  - Cell wall widths are thicker than Hrp pilus

- CONCLUSION -- Apogee exerts effect through generation of a physical barrier that excludes pathogen

New Plantings?

Blossoms 1st year.

Bloom after established orchards.

Focus on thinning sprays

Prune or Rogue?

New trees…

- Usually involves central leader
- Only takes 21 days from infection to reach the rootstock

New trees...

- Reputable nursery who rogues infected trees
- If trees come from strep resistant region, look for evidence of infection
- Copper at planting and 2 weeks later
- De-blossom trees, or use models to predict blossom blight and apply treatment
- Tree training practices in dry weather!

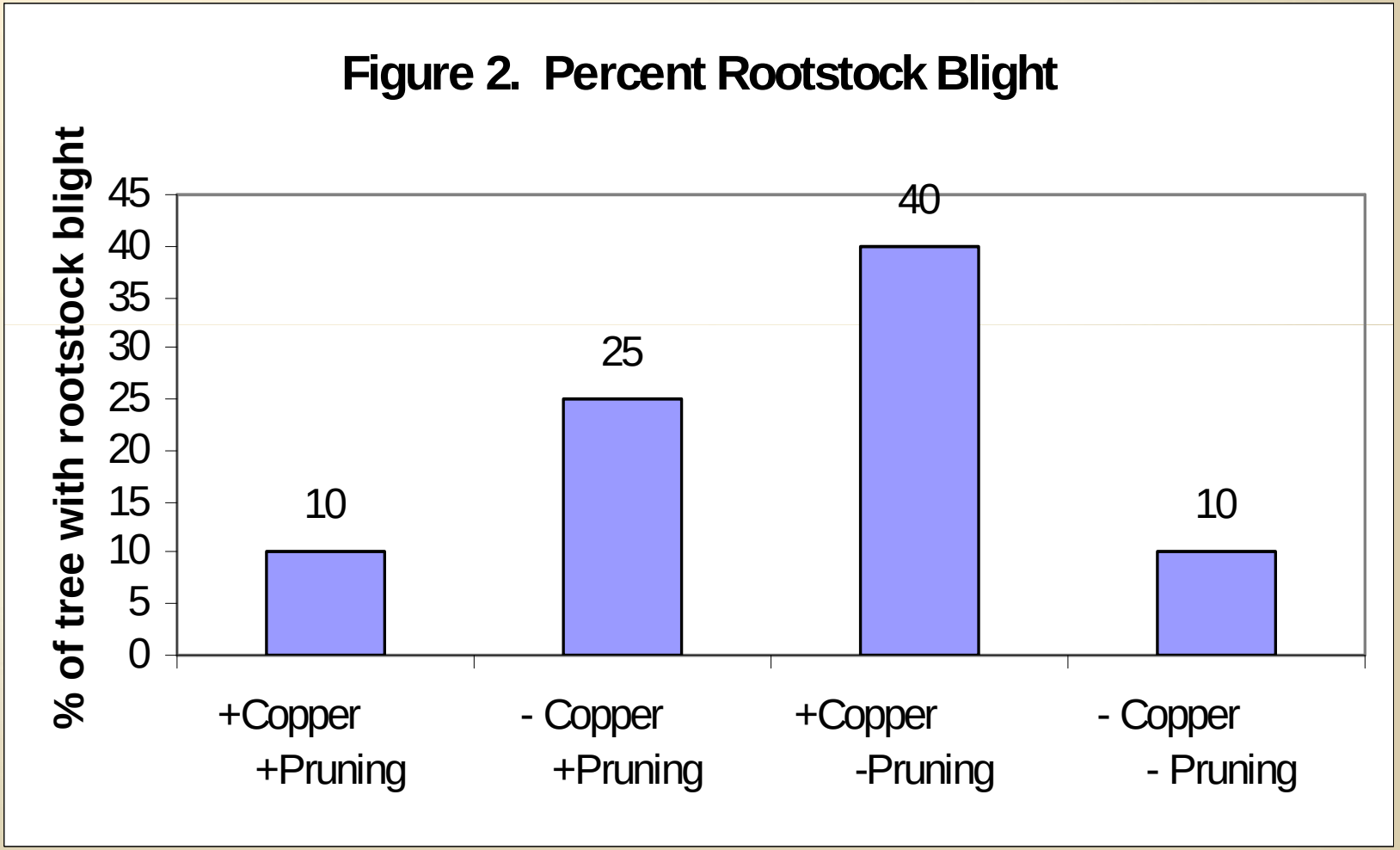
De-blossom New Trees

- Under dry conditions
- Before infection conditions possible

Rootstock Blight Control...

- PREVENT SCION INFECTION !
- Remove root suckers? Dormant cutting.
- Borers?
- Plant FB Resistant rootstocks
- Trees susceptible from early fruiting to 7 years

Figure 2. Percent Rootstock Blight

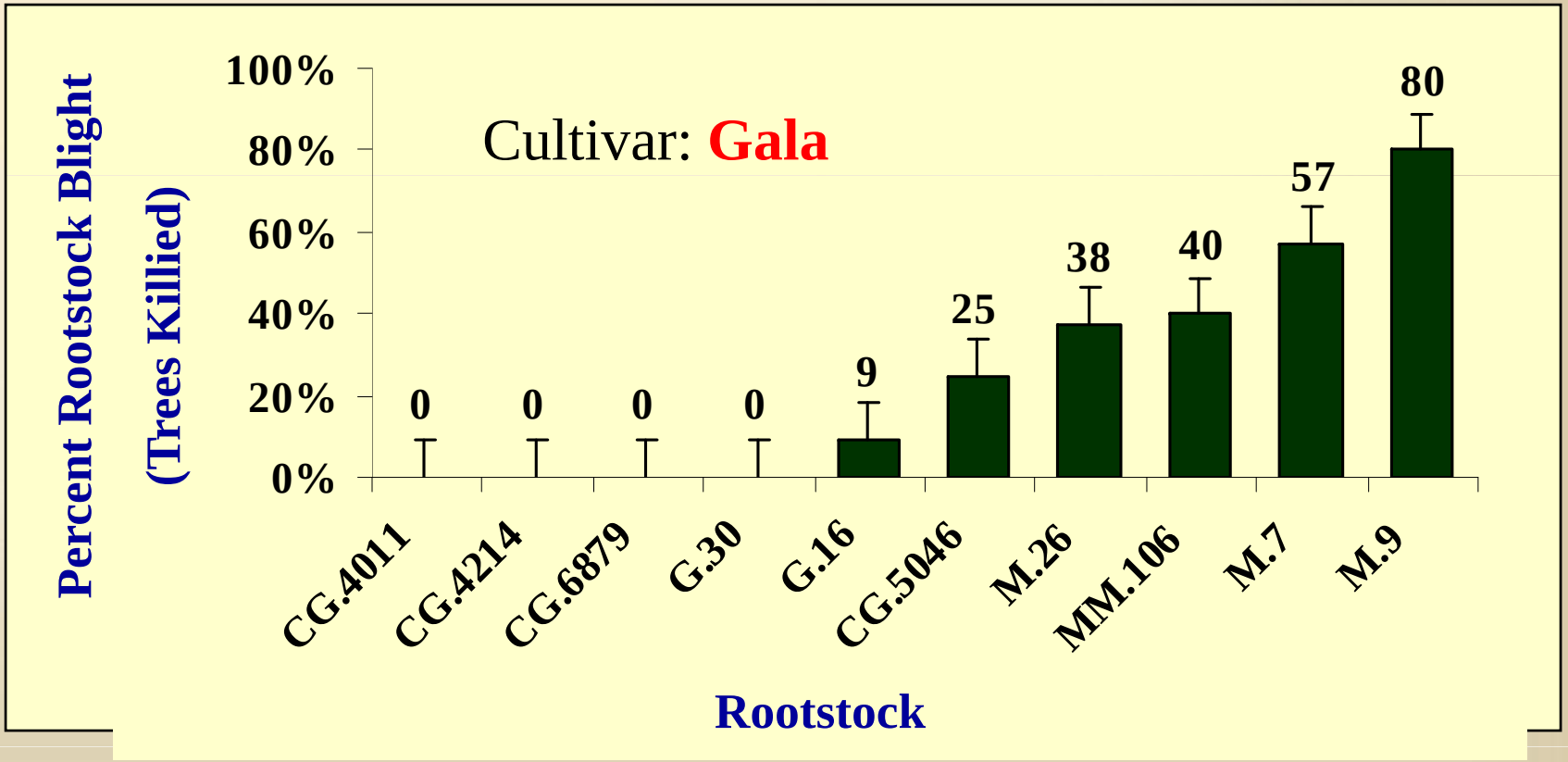


August 2007

Rootstock Evaluation of Grafted Trees

2002- Field Trial for Fire Blight Resistance

Inoculated twice with $1x10^7$cfu/ml Ea4001A
Average blossom infection **~60%**

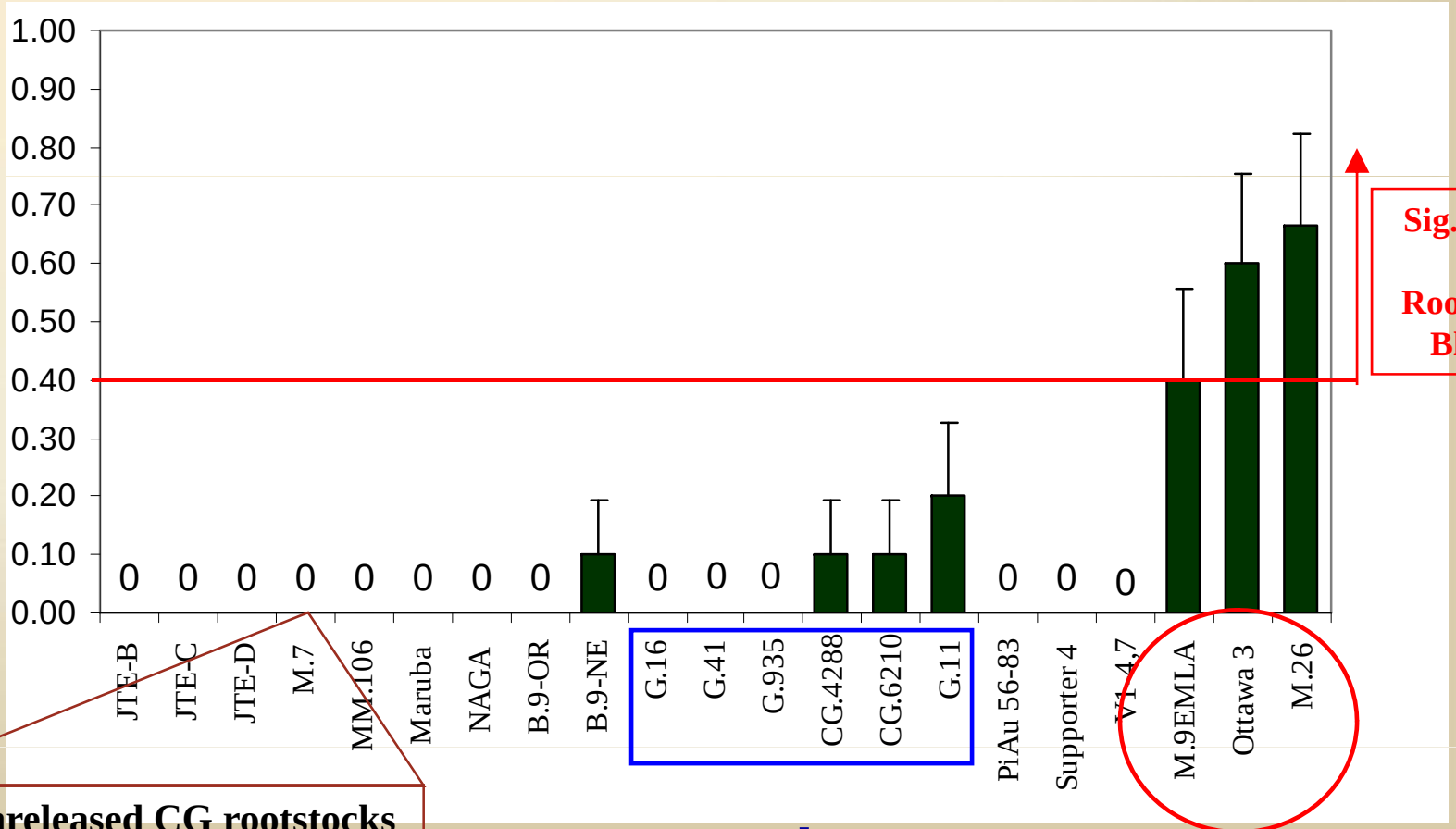


Resistance Screening: 2005

Cultivars: **Golden Delicious**
Inoculated with 1x10^{7}cfu/ml Ea4001A
Average blossom infection **~80%**

Golden Delicious

	Df	Deviance	AIC	LRT	Pr(Chi)
<none>		67.89	81.89		
Rootstock	6	84.80	86.80	16.91	<0.0001 **



22 unreleased CG rootstocks had no RSB development

B.9 Rootstock: Background

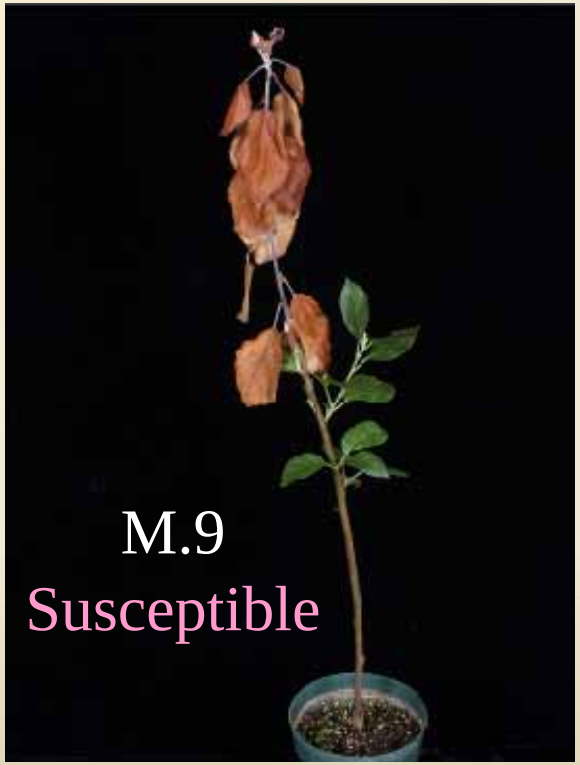
- *Budagovsky 9* (B.9) is a potential candidate for new plantings
  - Initially developed at the Michurinsk College of Agriculture in Russia
  - Hybrid between M.8 and unknown variety “Red Flag”
  - Bred for cold hardiness and productivity
  - Similar to M.9 horticulturally, e.g. tree size and productivity, in recent rootstock trials

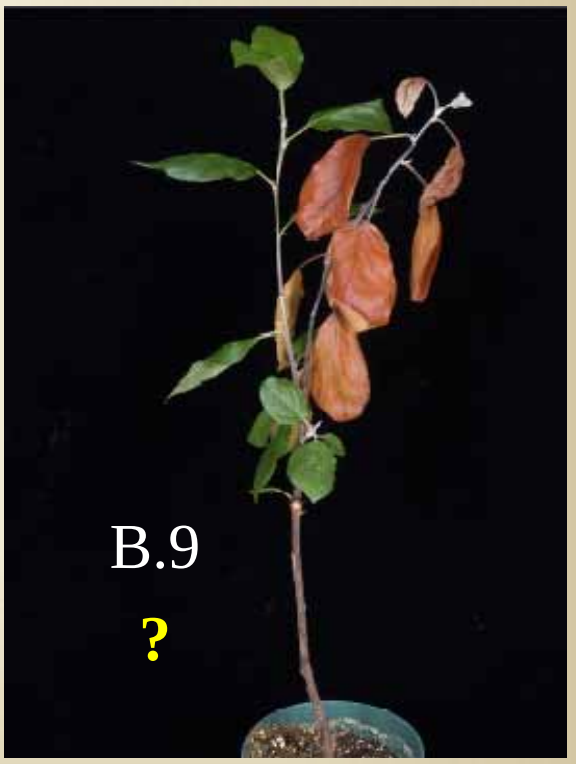
B.9 Leaves

B.9 Blossom

Rootstock Susceptibility

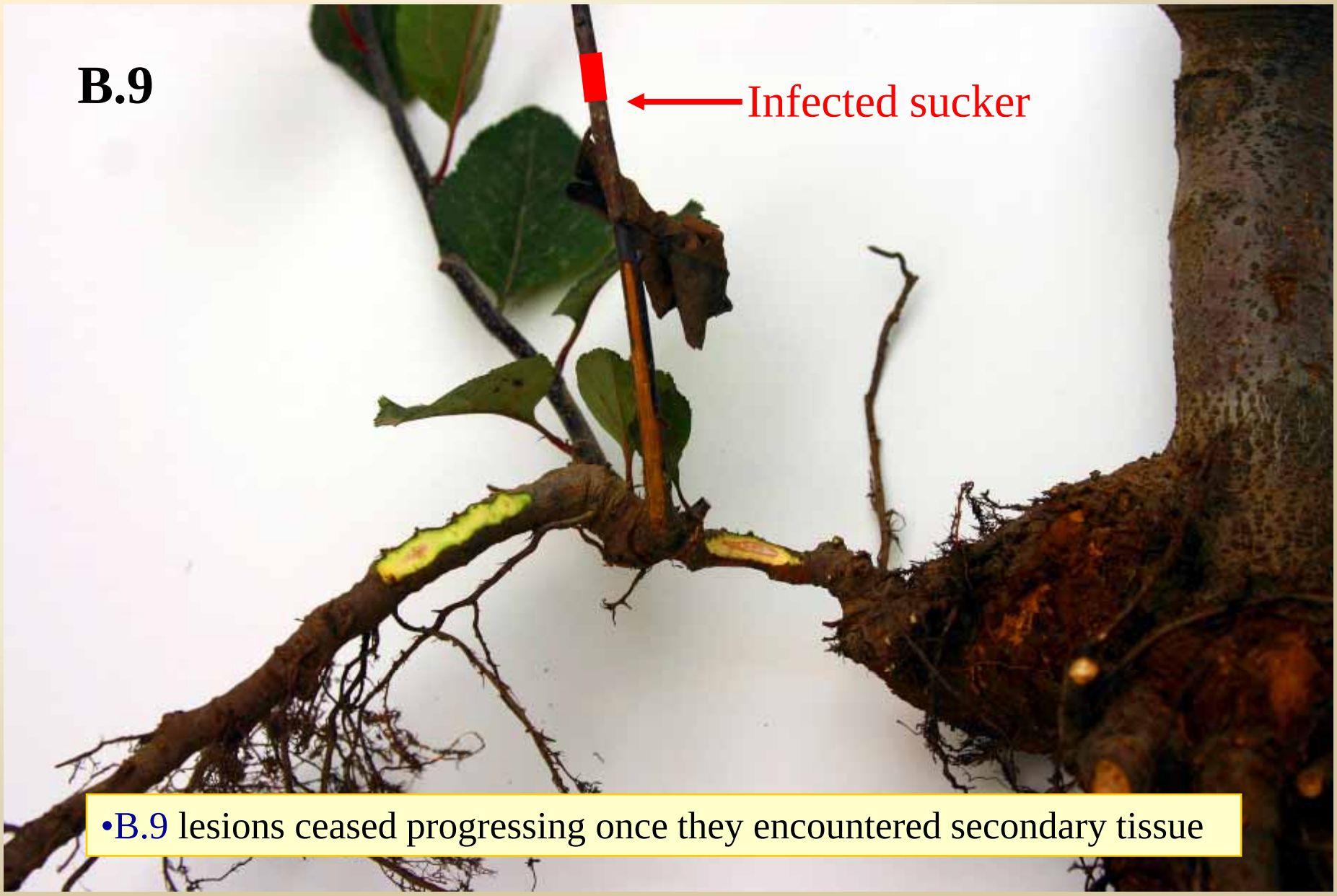
*Shoots are inoculated at the growing tip and % lesion length is recorded as a measure of susceptibility





- B.9 is highly susceptible to fire blight infection when leaf inoculated
- G.16 displays typical resistant response, no visible necrosis

•M.9 lesions continued into underground root system and in some cases resulted in rootstock blight symptoms



•B.9 lesions ceased progressing once they encountered secondary tissue

“Trauma” blight

- Hail
- Wind
- Wounds to any part of tree

Apply streptomycin within 24 hours of these conditions if light disease pressure, sooner the better !

Bailing Out!

- Apogee if FB severe last season or models predict high risk during bloom
- Remove canker blight infections as soon as they appear in bloom.
- Pruning out > 12 inches back from infection symptoms – twice per week
- Prune into 2 year or older wood leaving stub
- Processing – low rates of copper