

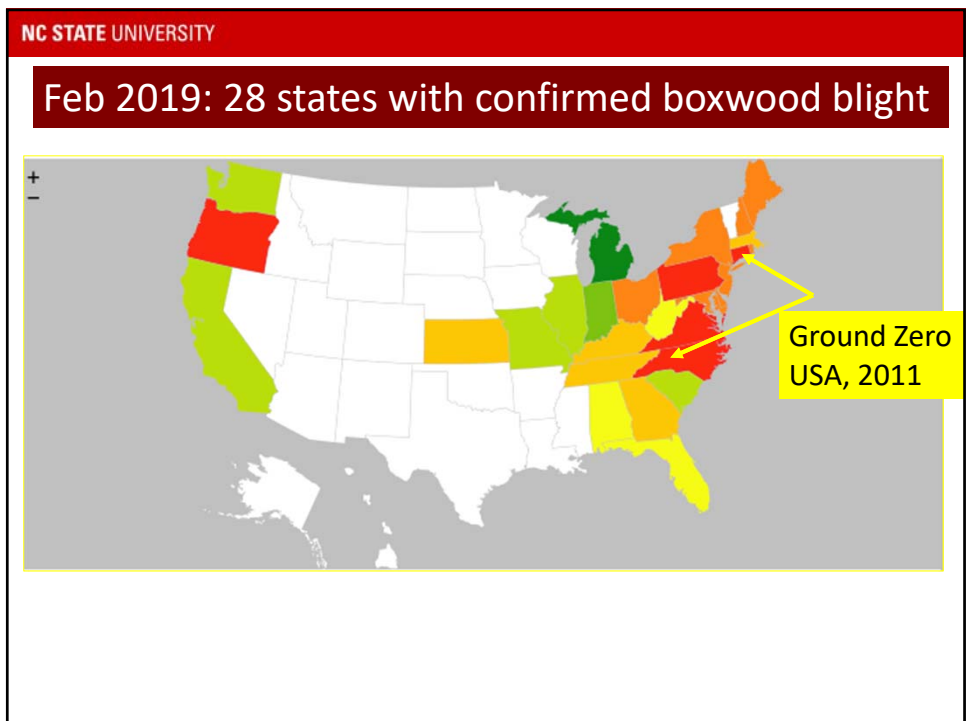
## Winning the Battle Against Boxwood Blight



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Professor  
NSCU-MHCREC

## Presentation Game Plan

- Boxwood Blight Overview
  - Brief history of the disease
  - Disease diagnostics
- Boxwood Blight Management
  - Integrated management strategies
- Boxwood Research Updates
  - Fungicide Research Trials
  - Future Work



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## Why is there so much concern surrounding Boxwood Blight?

- Historical plantings with highly susceptible cultivars
- Popular in landscapes
  - Very little disease management traditionally
- “Retirement Income”
  - Christmas wreaths and decorations
- Without management: Often death on susceptible cultivars



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## Susceptible Boxwood Cultivars



*Buxus sinica* var. *insularis* ‘Justin Brouwers’



*Buxus sempervirens* ‘Suffruticosa’

Photos:  
Saunders’s  
Brothers



*Buxus sempervirens*



*Buxus microphylla* var. *japnoica* ‘Morris Dwarf’

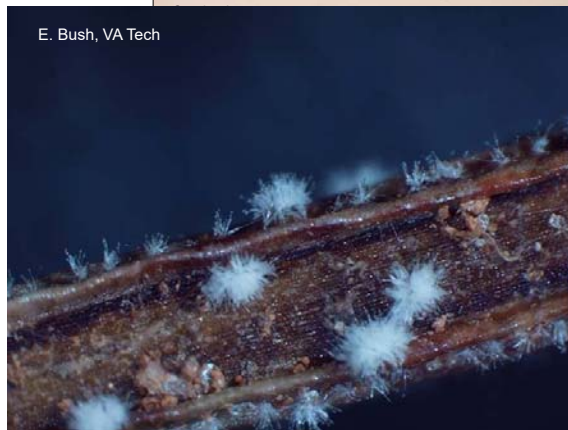


*Buxus microphylla* var. *japnoica* ‘Green Beauty’

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## Boxwood Blight Pathogen: *Calonectria pseudonaviculata* (Cps)

- Thrives in humid, warm environments
- Produces overwintering structures
  - Microsclerotia (hard mass of fungal mycelium) that survive on leaf litter



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## Symptoms of Boxwood Blight

- Leaf lesions/spots: Initially observed in lower canopy and shaded areas
  - Circular to irregular; Darker boarder with lighter brown to purple center





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## Symptoms of Boxwood Blight



Black lesions or streaks on stems

Mary Ann Hanson, Virginia Polytechnic Institute and State University, Bugwood.org

5507242

This image shows a close-up of several boxwood stems. The stems are light brown and show distinct black, longitudinal lesions or streaks, which are characteristic symptoms of boxwood blight. Some leaves are visible, some are green and others are yellowed or wilted.



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Leaf drop and defoliation:  
Symptoms often begin on  
shady side of boxwood

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### Look-a-Like Boxwood Problems: Volutella Blight


Mary Ann Hansen, VT



**Symptoms**

- Leaves: Light green to tan
- Leaves remain on plant > box blight
- Salmon color spores

David L. Clement, University of Maryland, Bugwood.org



5541016

- Occurs when boxwood is under abiotic or biotic stress

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## Look-a-Like Boxwood Problems: Boxwood Leafminer

Lee Townsend, U. Kentucky



M. J. Raupp

- Lesions or swellings on leaves
- May have a blistered appearance
- Leaves turn yellow and can defoliate

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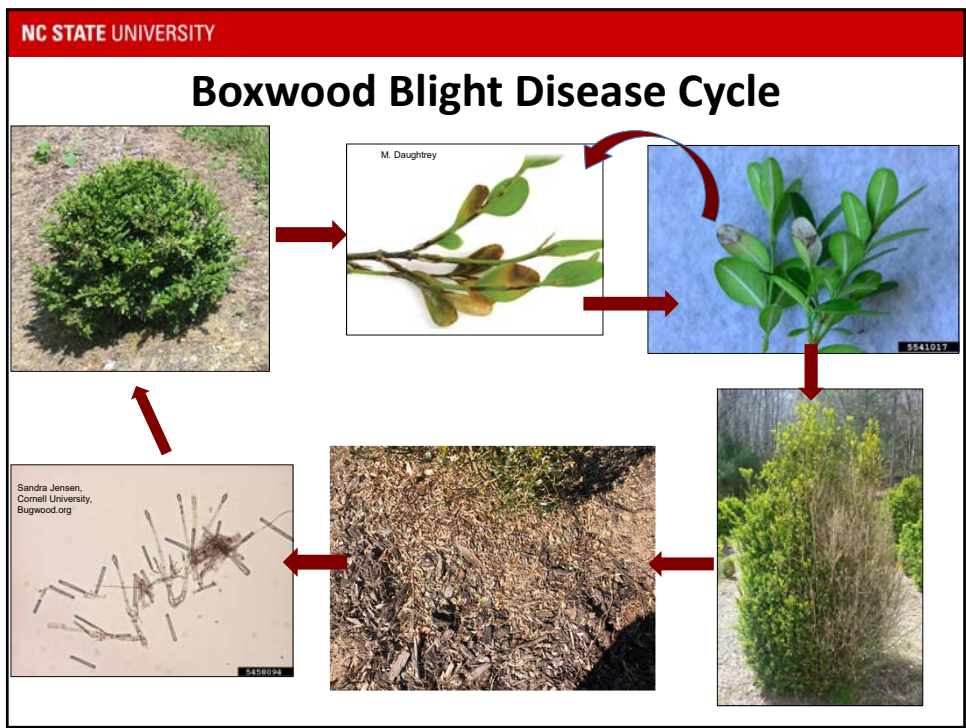
## Look-a-Like Boxwood Problems: Boxwood Leafminer

- Typically see immature larva of small, orange fly
- Flies seen in the spring when they lay eggs
- The larva mine around in the leaf, feeding on plant tissue
- Overwinter and emerge as adults the following spring
- One generation per year



Rachel Kreis, NC State University





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## How does boxwood blight spread?

### Short Distances (within/surrounding plant)

- Abundant production of sticky spores
  - Rain/water splashed; not spread easily by wind
- Overwintering structures in leaf debris (organic matter) and soil




Sandra Jensen, Cornell University, Bugwood.org 5457981

Crouch et al. 2018

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## How does boxwood blight spread?

### Moderate to Long Distances





Photo: Green Mountain Nursery

Landscape East





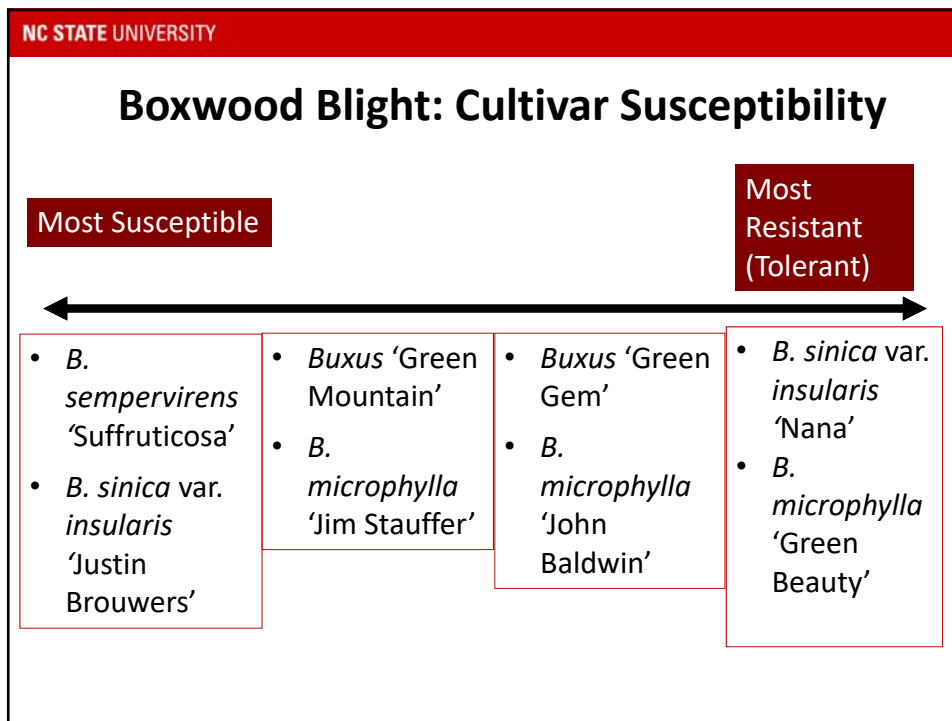
Photo: Gail Nutt, Purdue

## Prevention and Management of Boxwood Blight in the Landscape

### Management of Boxwood Blight

***There is no silver bullet- Integrated approach is best!***

- Avoid introducing the pathogen on infected boxwoods
  - Purchase plants from a reputable source: Are nurseries/grower participating in the “Boxwood Cleanliness/Compliance Program”?
  - Know the symptoms! Inspect plants (particular inner + lower foliage) for leaf spots and stem lesions
  - Be careful of holiday greenery
  - Asymptomatic introduction through more tolerant varieties



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## Boxwood Blight: Tolerant Cultivars

- Avoid planting near alternate hosts and susceptible cultivars

**Moderately resistant**

- B. microphylla* 'Winter Gem'
- B. sempervirens* 'Dee Runk'
- B. sempervirens* 'Fastigiata'
- Buxus* 'Green Gem'
- B. microphylla* 'John Baldwin'

**Most resistant** (recommended for new plantings)

- B. microphylla* 'Golden Dream'
- B. harlandii*
- B. sinica* var. *insularis* 'Nana'
- B. microphylla* var. *japonica* 'Green Beauty'

Be careful of 'Trojan Horse' introductions!

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## Boxwood Blight: Tolerant Cultivars



- “Better tolerance to boxwood blight, better resistance to leaf miner...”
- Saunders Bros. evaluated over 150 cultivars for tolerance to boxwood blight in cooperation with universities and private industry

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## Boxwood Blight Management: Sanitation

- Sanitation of equipment, clothing/boots, pruning shears, shovels, vehicles
  - Be mindful of “order” in which you work
  - Wear disposable booties/shoe covers, tyvek suits, gloves



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## Boxwood Blight Management: Sanitation

- Pruning tools: 70% ethanol or Lysol Disinfectant Spray Brand III: 10 seconds to five minutes

Product	Remarks
Green-Shield	Highly corrosive; contact time: 10 minutes for most surfaces
ZeroTol 2.0	Product foams; good for hard to reach areas; Contact time: 1 to 10 min.
Chlorox	Inactivated by organic matter, corrosive to metal; Contact time: 10 to 15 min

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## Boxwood Blight Management: Cultural

- Prune out disease stems/foilage, remove from planting and destroy/double bag
- Do NOT compost diseased tissue: Double bag and destroy
  - Do not leave to “rot” on side of road
- Remove top layer of soil (especially if replanting)
- Mulch around base of plants, bury microsclerotia



## Boxwood Blight Management: Cultural

### Minimize leaf wetness

- Promote airflow: Choose cultivars w/ more open growth habit
- Promote airflow: Maximize spacing between plants
- Avoid overhead irrigation
- Be mindful of planting in excessively shaded area



## Boxwood Blight Management: Fungicides

- Boxwood blight cannot be cured by fungicides
- Fungicides CAN help management of boxwood blight through protective applications
- In NC: Fungicide applications ~14 day intervals: Mid April to Early October
- Many fungicides labeled for boxwoods, but not specifically boxwood blight

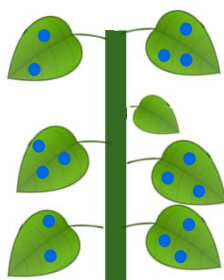
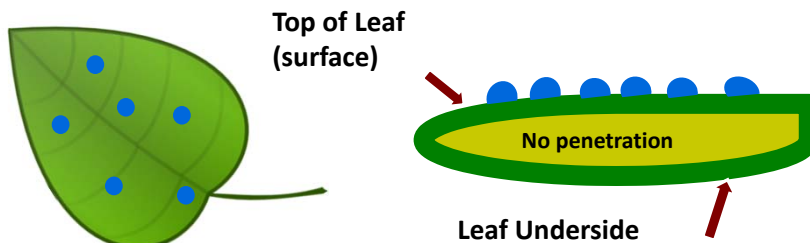
## Boxwood Blight: Fungicide Management

- Multi-site fungicides: Chlorothalonil (protectant)
  - Prohibit fungal spore germination
    - (-) Application by prediction, schedule, gut feeling
    - (-) Risk of harming non-targets: Phytotoxicity
    - (+) Low risk for resistance development



## Protectant/Contact Fungicides

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- Fungicide remains on surface where applied
  - Rain can **redistribute** (move it to other surface parts)
- Plant tissue (i.e. leaves) emerging after application or tissue missed during application not protected
  - Unless material redistributed



## Protectant/Contact Fungicides

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- Surface active/contact fungicide that is not/should not be absorbed by plant tissue (surfactant/mixing partner)
  - **Phytotoxic** if absorbed
- Work by direct contact with pathogen on the plant surface: **Coverage is critical**
- Physical M.O.A.: Usually protective
  - Inhibits spore germination



## Boxwood Blight: Fungicide Management

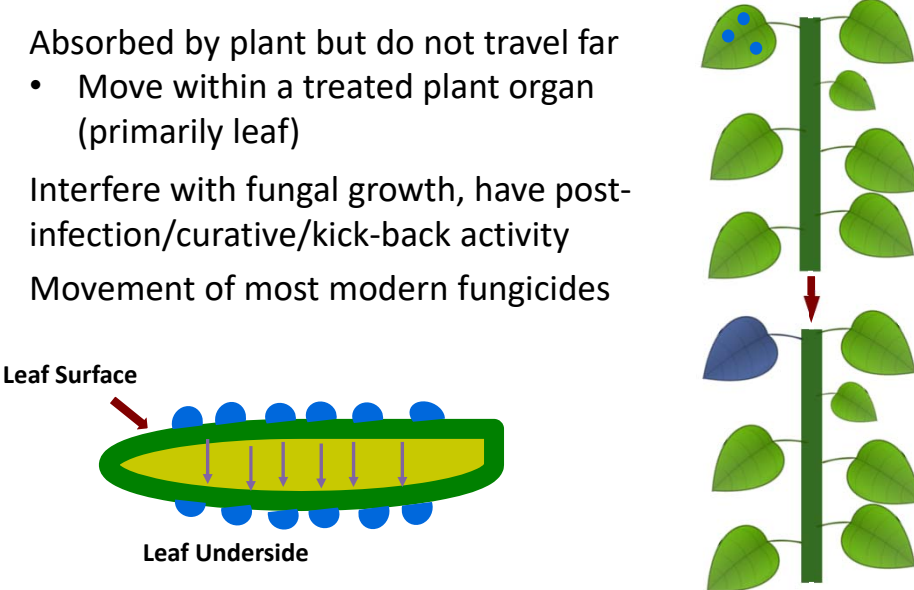
- Single-site fungicides
  - (+) Manage number of phytopathogenic fungi
  - (+) Minimize harmful effects to non-targets and environment
  - (+) High level of protective and curative(?) activity
  - (-) Specificity fosters development of resistant populations with repetitive use

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## Locally Systemic/Single Site Fungicides

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- Absorbed by plant but do not travel far
  - Move within a treated plant organ (primarily leaf)
- Interfere with fungal growth, have post-infection/curative/kick-back activity
- Movement of most modern fungicides



Leaf Surface

Leaf Underside

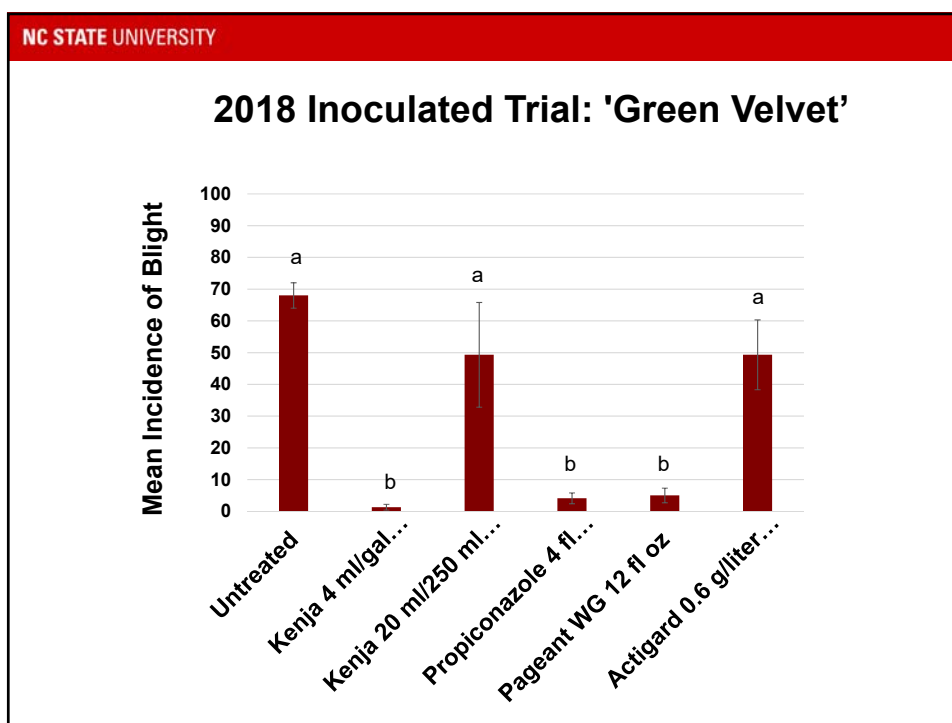
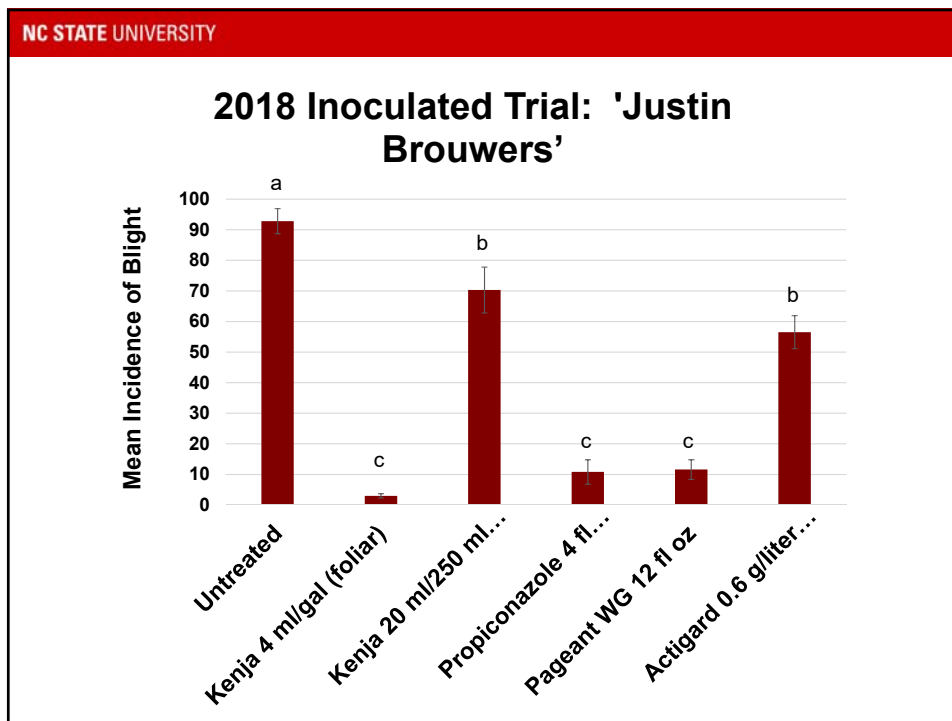
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## Boxwood Blight Chemical Control: MHCREC Container Pad

- Applications: 14 day intervals: Jul 13-Aug 10, 2018
- Inoculated with  $1 \times 10^4$  : Jul 14, 2018
- Covered with plastic for 24 hours
- Watered with overhead irrigation

2018  
Potted +  
Inoculated  
Fungicide  
Trials

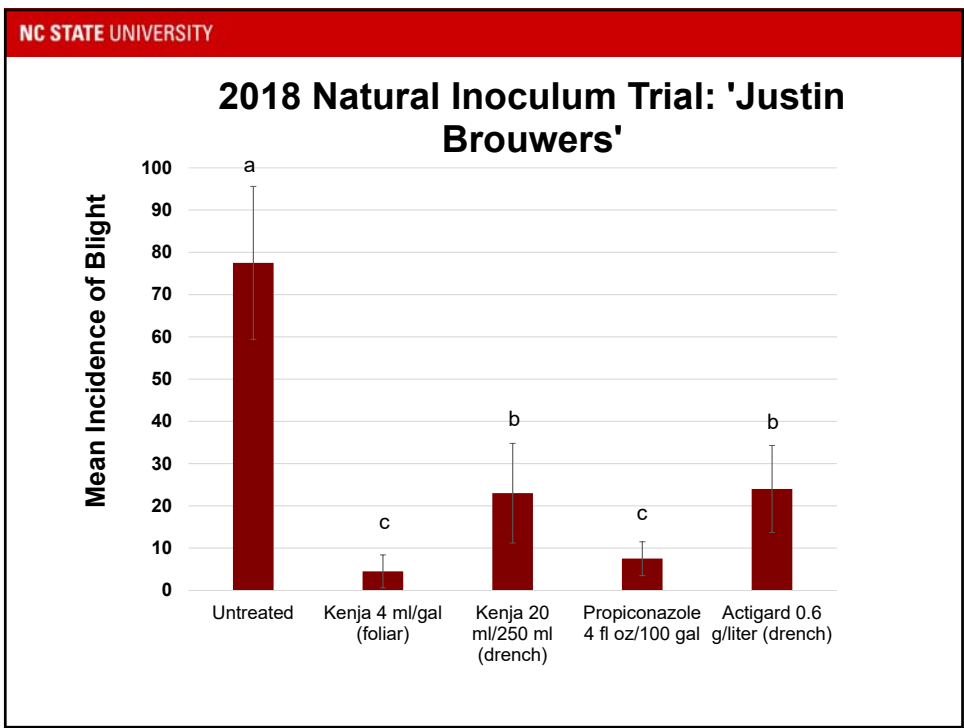




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## Boxwood Blight Chemical Control: Established Planting, Surry County, NC

- Applications: 14 day intervals: Jun. 5-Oct. 2, 2018
- Incidence Rating: Oct. 17, 2018
- Cultivars: 'Justin Brouwers' and 'Green Velvet'

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<b>Boxwood Blight Management: Fungicides (nursery)</b>	
<b>Product</b>	<b>FRAC Group</b>
Concert II (propiconazole + chlorothalonil)	3 + M5
Strike Plus 50WDG (trifloxystrobin + triadimefon)	11 + 3
Medallion (fludioxonil)	12
Daconil (chlorothalonil)	M5
Spectro 90WDG (chlorothalonil + thiophanate methyl)	M5 + 1
Palladium (cyprodinil + fludioxonil)	9 + 12

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<b>Boxwood Blight Management: Homeowner Fungicides</b>	
<b>Product</b>	<b>A.I.</b>
Fung-onil (Bonide)	chlorothalonil
Ortho Max Garden Disease Control (Scott)	chlorothalonil

- **Protectant Fungicide: Apply every 14 days or less if rain**

## **Boxwood Blight Chemical Control: A Few Reminders...**

- Always read the label! Test small section for phytotoxicity if you haven't applied fungicide previously to particular cultivar
- Practice resistance management: Certain FRAC Groups are only allowed a certain number of sprays per season-Rotate!
- Regular applications are necessary for boxwood blight management.
- 60F to 86F and rain in forecast: Spray preventatively
- Good coverage is essential for good disease control

## **Future Research**

- Collecting isolates for fungicide sensitivity monitoring
- Fungicide efficacy field trials with SDHI
- Plant Host Defense Inducers
  - Field Trials
  - Host Gene expression
  - Effects of fertilizers on defense inducer efficacy

## Resources

- NCSU Plant Disease and Insect Clinic
- NC Cooperative Extension Website for Ornamental Pathology
- Virginia Tech
- Connecticut Agricultural Experiment Station