1 **Nursery Disease Management:**
Blights, Diebacks, Root Rots, and Leaf Spots

Jean Williams-Woodward
Extension Plant Pathologist

2 **Basic Principles for Disease Management**

- Disease management relies on PREVENTION
- You cannot cure a plant of a plant disease
- You cannot manage diseases by reacting to symptoms
- The time between infection and symptom development may be 1 day to 21 days or more (latent infections)
- By the time you see symptoms, it is often too late to manage the disease on that plant
- Fungicides do not kill pathogens
  - Fungicides suppress fungal sporulation, germination, growth (fungistatic)

3 **Plant disease survival and spread**

- Pathogens survive in infected plant tissues (leaves, roots)
- Also in soil, in water, in insects
- Can be introduced via propagative material, liners, plants
- Can be spread by water-splashing, in soil movement, on tools and people, or be blown in from surrounding area
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- Sanitation is critical to reducing pathogen survival, which limits pathogen spread and disease development
- Start clean and finish clean
  - Pathogens can survive for years on infected plants residue or in soil

4 **Fungal Leaf Spot Diseases**

- Every plant has a leaf spot disease
- Warm days, cool nights, high humidity, prolonged leaf wetness increase leaf spot development
- Can peak in mid-late summer when plants irrigated frequently and late afternoon thunderstorms wet foliage late in the day
- Control by applying fungicides preventively to protect new growth flushes

5 **Cercospora leaf spot on ligustrum**

6 **Cercospora leaf spots**
- Common in late summer
- Warm days, cooler nights
- Susuceptiblity varies on cultivars
  - Ex. Crapemyrtle
- Can cause premature leaf drop,
  - Mostly not detrimental to plant health, especially when occurring in the fall on decidiuous trees

7 **Pseudocercospora on Loropetalum**
- Common leaf spot disease on all loropetalum cultivars
- Often seen on interior leaves
- Causes leaf discoloration and leaf drop
- Thought to be the same pathogen causing leaf spots on sweetgum trees
- Fungicides do not seem to be effectively managing the disease

8 **Is fungicide resistance developing?**
- Conducted in-vitro fungicide assays to identify effective fungicides on both sweetgum and loropetalum isolates
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9 **Ornamental Fungicide Efficacy Table**
- https://bugwoodcloud.org/bugwoodwiki/Orn_efficacy_table2017.pdf

10 **Bacterial stem gall on *Loropetalum***

11 **Bacterial stem gall on *Loropetalum***
- Relatively new disease
  - *Pseudomonas amygdali* pv. *loropetali*
- Causes swelling and rough galls on stems and branches
- Can limit plant growth
- Spread by water-splashing and possibly on tools
  - Galls often develop at pruning sites
- Coppers, mancozeb may help

12 **Needle Blight**

13 **Passalora needle blight**
- Damaging in nurseries, Christmas trees, and landscapes

- Leyland cypress, Arborvitae, Calocedrus, Arizona cypress

14 **Passalora needle blight**
- Symptoms often develop following shearing
- Seeing more blight showing up in landscapes
  - Often associated with lawn sprinkler irrigation hitting trees
  - Wet weather – water splashed disease
- Fungicides containing chlorothalonil, mancozeb, copper, azoxystrobin can reduce disease
  - Early May through September

15 **Cryptomeria branch and tip dieback**
- Often associated with root and/or environmental stresses
- Few "minor" pathogens recovered from foliage
  - Phomopsis branch cankers
  - *Phyllosticta, Alternaria, Pestalotiopsis* on necrotic needles
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16 **Cryptomeria tip dieback management**
- Protect roots from heat stress and root disease

17 **Kabatina tip blight/Phomopsis blight**
- All junipers/cedars
- *Kabatina* affects last year's growth (symptoms in the very early spring) or older current year's growth (seen in late summer)
- *Phomopsis* infects current year's new growth in the spring
- DMI (FRAC 3) – metaconazole, propiconazole
- Thiophanate methyl (FRAC 1), mancozeb (FRAC M3), coppers

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19 **Seiridium canker**
- Very common
- Affects drought-stressed and wounded trees
- No chemical control
- Irrigate trees during periods of drought
- Pruning out branches improves aesthetics, but does little to slow disease spread

20 **Bot Canker**

- Botryosphaeria canker
- Caused by several fungi
  - *Lasiodiplodia*
  - *Sphaeropsis / Diplodia*
  - *Fusicoccum*
  - *Macrophoma*
- Cause branch and trunk cankers that expand longitudinally and horizontally to girdle the branch
- Also, follows the rays of the wood causing internal decay
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21 **Bot Canker**

- Seen in tree nurseries this spring as dark lesions
- Affected branches did not leaf out
- Cankers seen as slightly sunken; scratch beneath bark to see discolored cambial tissues
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22 **Bot Canker**

- Requires a wound or natural opening
- Disease often follows a “stress”
- Causes canker that girdles and kill
- Mostly affecting deciduous trees
  - Red maples, dogwood, more

23 **Bot Canker**

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- Decay can extend into the trunk from dead, infected branches

25 **Verticillium wilt**

- Vascular disease that causes branch dieback and eventual death of the tree.
- Affects numerous tree species, including maple, redbud
- Caused by fungus, *Verticillium dahliae* (mostly)
- Soilborne – microsclerotia survival spores

26 **Verticillium wilt**

- Diagnostic symptom is discoloration of the vascular tissues
  - Streaking, black discoloration
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- Management:
  - Slow-progressing disease (depends on tree size)
  - Build roots – fertilize low nitrogen, higher potassium
  - Provide adequate water
  - Less of a problem in acidic soils
  - No chemical control

27 **Root and crown disease**

- Individual plant death; death of lower and interior leaves
- Plants off-color; there may be a pattern associated with terrain or irrigation
- Most often due to *Phytophthora* sp.

28 ***Phytophthora* disease**

- Plant wilt and drop interior leaves
- Branch and stem dieback common
- Leaf spots at petiole and leaf tip

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- Often symptoms of root rot are the same as drought symptoms
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- Foliage on entire tree yellows, browns, desiccates and dies

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- Infection moves from the roots to the lower stem
- Infected stem tissue turns rusty brown

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- Discard dying plants quickly to reduce spreading disease to adjacent plants

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- Graded, gravel beds or ground-cloth covered gravel can reduce root disease

34 **Phytophthora Disease Management**

- Control primarily through irrigation management – reduce overwatering, use well-draining mixes, etc.
- Sanitation to reduce spreading pathogens into production
- Fungicide drenches, sprenches, sprays
  - Mefenoxam (Subdue Maxx)
  - Aliette (Fosetyl-Al) and other phosphonates
  - Etridiazole (Truban, Terrazole, Banrot)
  - Fenamidone (FenStop)
  - Dimethomorph (Stature)
  - Cyazofamid (Segway)
  - Fluopicolide (Adorn)
  - Mandipropamid (Micora)
  - Oxathiapiprolin (Segovis)
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35 **Pythium root rot**

- Wet conditions – rain, saturated soils, over irrigation
- Roots slough; honey-brown color; soft

36 **Pythium root rot**

- Plants wilt, small plants collapse, tissues brown and disintegrate
- Discard infected plants, drench with etridiazole, tris aluminum (fosetyl-Al), mefenoxam, cyazofamid or fenamidone

37 **Rhizoctonia**

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38 **Rhizoctonia web blight**

- Affects any plant with a tight canopy – holly, azalea, juniper, arborvitae
- Needs warmer, humid conditions
  - Develops July-Aug
- Preventively apply fungicides July 1 and Aug 1, if using fludioxonil (Medallion) or flutolanil (ProStar) – 28-day residual
- Also azoxystrobin, pyraclostrobin, triadimefon

39 ***Rhizoctonia* hyphae**

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40 **Rhizoctonia root rot**

- Symptoms include plant wilting, chlorosis, stem dieback, stunting, root

discoloration, plant death
- Hyphae often present
- Fungicides that control *Rhizoctonia* do not work on *Phytophthora* diseases
  - KNOW your pathogen

41 **Black root rot: *Thielaviopsis basicola***
- Yellowing foliage
- Leaf drop, dieback
- Japanese Holly, Illicium

42 **Black root rot control**
- Maintain soil pH at 5.8 or below
- Do not over water and plant in well-draining mix
- Discard infected plants
- Fungicide drenches can help reduce infection
  - Thiophanate methyl (3336, 6672) – high labeled rates
  - Fludioxonil (Medallion)
  - Polyoxin-D (Affirm)

43 **Disease management recommendations**
- Know your plants and what diseases they can get
- Keep plant foliage as dry as possible
- Keep a record of when you see the disease show up in your nursery (or landscape)
- Apply preventive fungicide applications to reduce disease development
- Look for early symptom development – Fungicides applied after leaf spots develop have NO effect on the pathogen on that leaf/plant
- Fungicides applied after symptoms can help protect new growth, if present

44
- https://wiki.bugwood.org/IPM_book

45 **Questions?**
- Jean Williams-Woodward
- jwoodwar@uga.edu