



# Recognizing Diseases of Pecan

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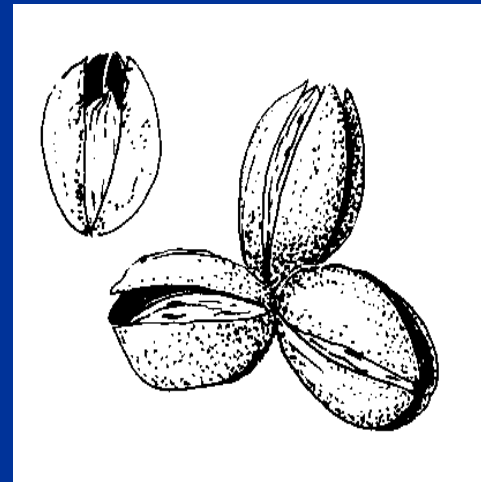
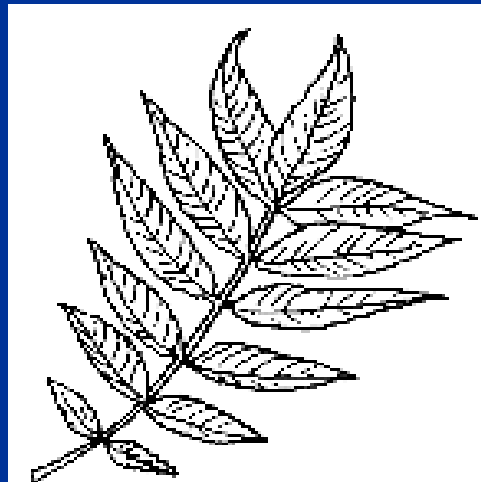
# Benefits to Disease Recognition

- Better disease management
  - Proper fungicide selection
  - Make adjustments for certain diseases
  - Need to be proactive for disease control
- Better insect management
  - Elimination of unneeded insecticide applications

# Diseases to be Covered

- Pecan Scab
- Downy Spot
- Anthracnose
- Leaf Scorch
- Zonate Leaf Spot
- Powdery Mildew
- Phytophthora Shuck and Kernel Rot

# PECAN SCAB





# Pecan Scab

- The most wide-spread and destructive disease of pecan.
- The disease that drives management programs.
- Favored by prolonged periods of wetness (12 hours)
- Symptoms develop immature tissue – including leaves, twigs, and shucks.

# Pecan Scab Symptoms

- Small, dark spots (1-5 mm)
- Lesions might coalesce.
- On leaves, older lesions stop growing, dry out, & crack (might have 'shot holes').
- More common on lower leaf surface
- Upper & lower lesions do not always match.
- When pathogen is sporulating, lesions look 'velvety' (green to black).

# Pecan Scab





# Pecan Scab on Twigs

- Lesions are elongated and run parallel to the twig axis.



# Pecan Nut Scab







# Pecan Scab Damage

## ■ Leaf Scab

- Reduced photosynthesis
- Defoliation (when scab is severe)
- Source of inoculum

## ■ Nut Scab

- Reduced size
- Nut drop
- Reduced % kernel

# SCAB DAMAGE

**REDUCED NUT SIZE**

**EARLY NUT DROP**

**LOWER %KERNEL**

**LEAF DROP**

**TWIG DEATH**

# Control of Pecan Scab

- Resistance (?)
  - Fungicide application
    - Typically 7-10 applications
    - Bud break to 100% leaf out
    - Most critical time is between that set to shell hardening.
      - Post-pollination period
      - June/July sprays
- Most susceptible cultivars were once thought to be scab resistant.  
Pathogen is cultivar specific.  
This complicates screening.**



# DOWNY SPOT



# Downy Spot Symptoms

- Typically starts in lower part of tree
- First appear on lower surface (late spring to early summer)
- Circular, yellowish spots (2-5 mm)

# Downy Spot Symptoms

- During wet periods, lesions might look 'frosty' or white due to fuzzy fungal growth.
- Lesions become visible on upper surface 6-8 weeks later
- Lesions turn golden brown on lower surface



# Downy Spot Damage

- Reduced photosynthesis
- Early leaf drop, which can lead to
  - Reduced nut quality
  - Late season growth flushes
    - Results in fewer flowers for the next year

# Downy Spot







**117.** Downy spot lesions on the upper surface of pecan leaflets. (Courtesy K. L. Stevenson)



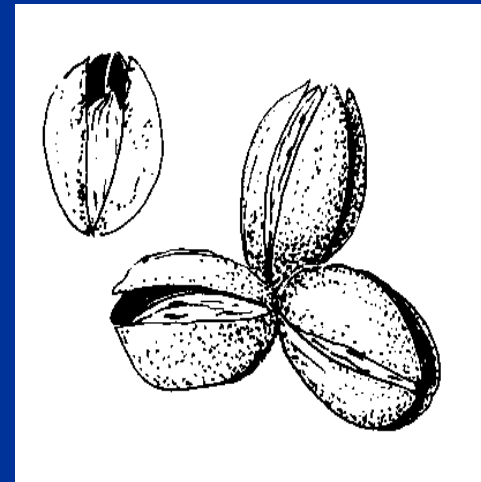
**118.** Downy spot lesions, having turned from yellow to brown, on the lower surface of a pecan leaf. (Courtesy K. L. Stevenson)

# Control of Downy Spot

- Pre-pollination is the critical time for management.
- Stick to the scab control program.



# ANTHRACNOSE



# Anthracnose

- Favored by rainy weather and temperatures in the mid to upper 80s °F.
- Damage: reduced yield and quality
  - Reduced kernel size
  - Nut drop
  - Nuts stick tight
- Stick to scab control program

# Symptoms on shuck

- Shiny, dark brown sunken lesions usually near proximal end or along shuck sutures
- Lesions can enlarge and cover entire shuck
- Salmon-colored spores within sunken lesions



115. Anthracnose lesion along a pecan shuck suture where clustered fruit are in contact. (Courtesy T. B. Breneman)

# LEAF SCORCH





# Leaf Scorch – Similar symptoms

- Scorch due to nutrient imbalance (Desirable)
  - High [N] & low [K]
- Fungal leaf scorch
  - *Phomopsis* sp.
  - Anthracnose (*Glomerella cingulata*)
- Bacterial leaf scorch (*Xylella fastidiosa*)
- Mites

# Leaf Scorch Symptoms

- Brown to tan lesions on the margin or at the apex of the leaf.
- Lesions progress inward.
- Lesions have a distinct margin separating healthy and necrotic tissue.
- Can be confined to limbs or throughout the tree

# Nutrient related



**32.** Leaf scorch on leaflets of the pecan cultivar Desirable.  
(Courtesy R. Worley)

Source: Compendium of Nut Crop Diseases in Temperate Zones



Distinct Margin

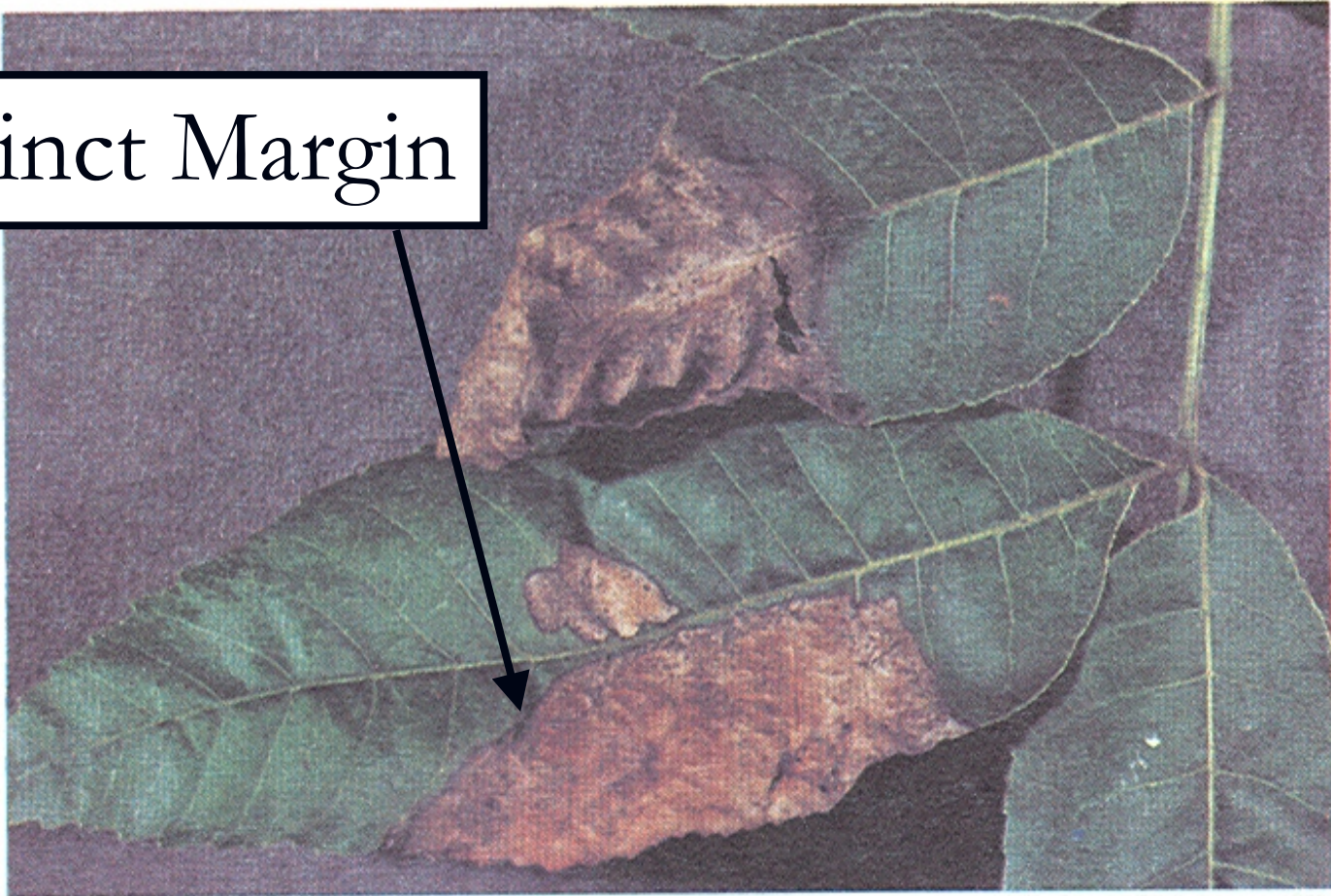


Figure 19. Pecan fungal leaf scorch.

Source: Pecan Pest Management in the Southeast, CAES



# Xylella Leaf Scorch





**126.** Pecan bacterial leaf scorch lesion at the apex of a leaflet, with a distinct dark line between healthy and diseased tissues. (Courtesy T. B. Brenne-man)

Source: Compendium of Nut Crop Diseases in Temperate Zones

# ZONATE LEAF SPOT



# Zonate Leaf Spot

- More severe in over-crowded orchards
- Erratic distribution
- Favored by prolonged wet periods



# Zonate Leaf Spot

## ■ Symptoms

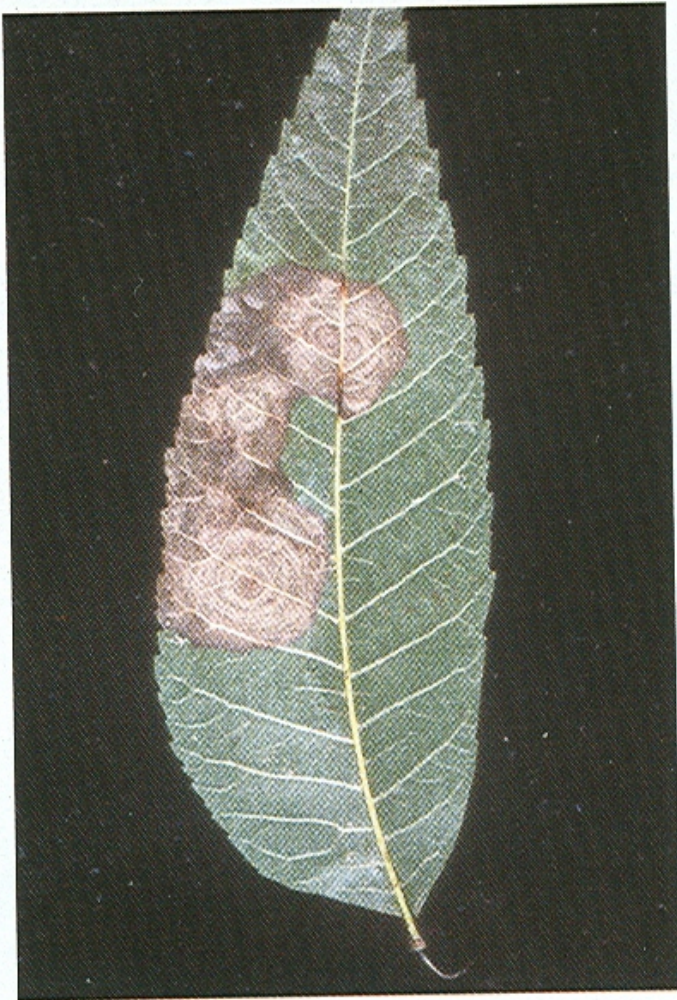
- Leaf spots (15-20 mm) with concentric rings
- More obvious on the lower leaf surface
- Lesions appear light brown to tan on the lower leaf surface and grayish white on the surface.
- Late summer, infected leaflets begin to drop.

## ■ Signs of the pathogen

- Sporulation might be observed on the lower leaf surface within the lesions

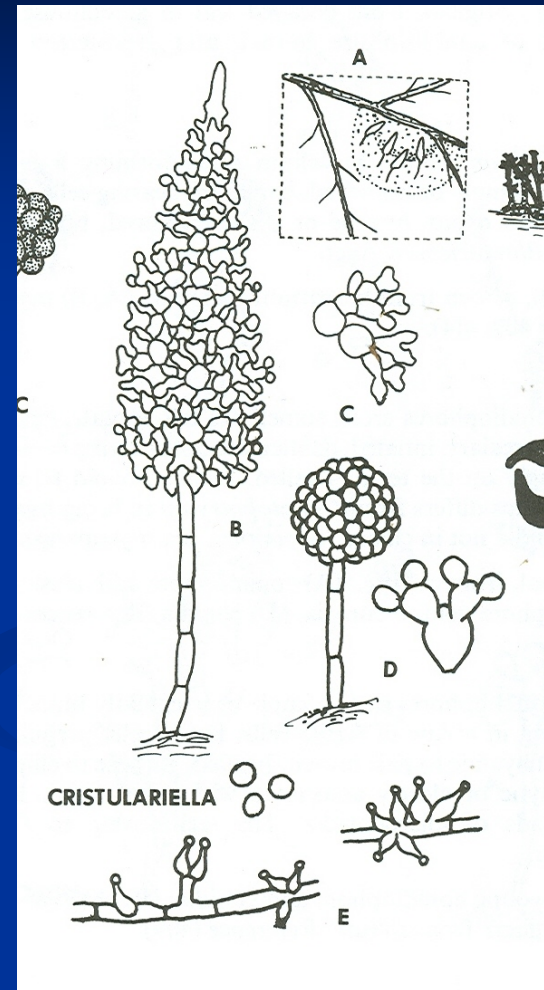






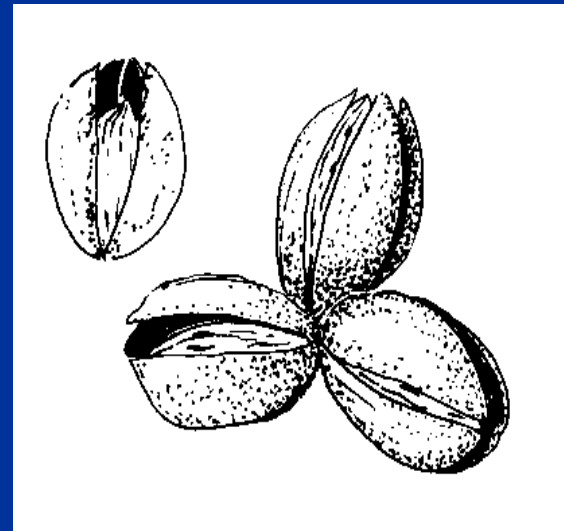
125. Zonate leaf spot on the lower surface of a pecan leaflet. (Courtesy P. F. Bertrand)

Source: Compendium of Nut Crop Diseases in Temperate Zones



Source: Illustrated Genera of Imperfect Fungi, 4<sup>th</sup> Ed.

# POWDERY MILDEW





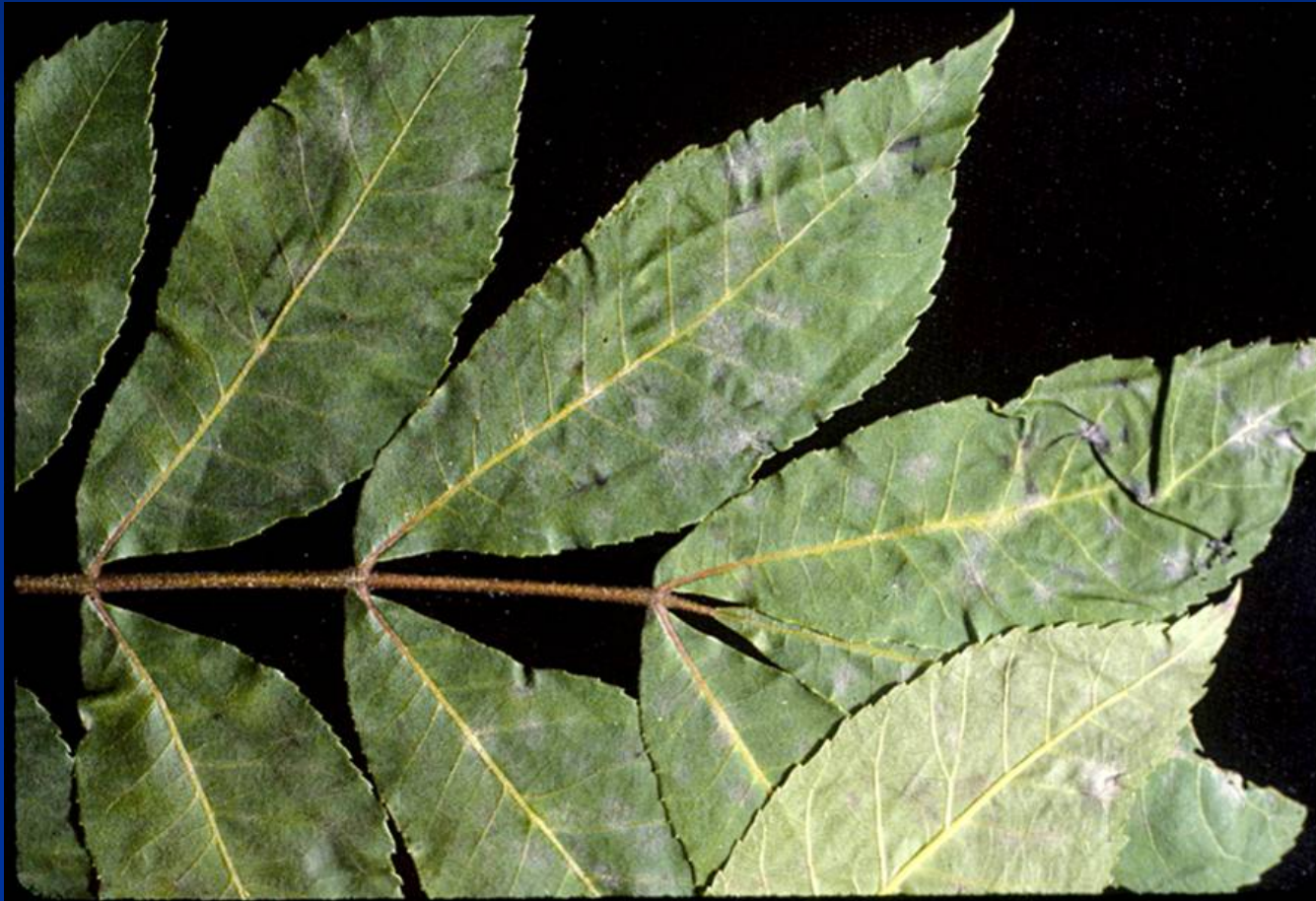
# Powdery Mildew

- Only grows on living tissue
- Appears midseason to late
- Reduces kernel weight (up to 20%)

# Powdery Mildew - Leaves

- Initial lesions are circular, but become irregular.
- Large irregular faded areas develop.
- Little fungal growth
- Early infections may lead to misshapen leaflets.

# Powdery Mildew

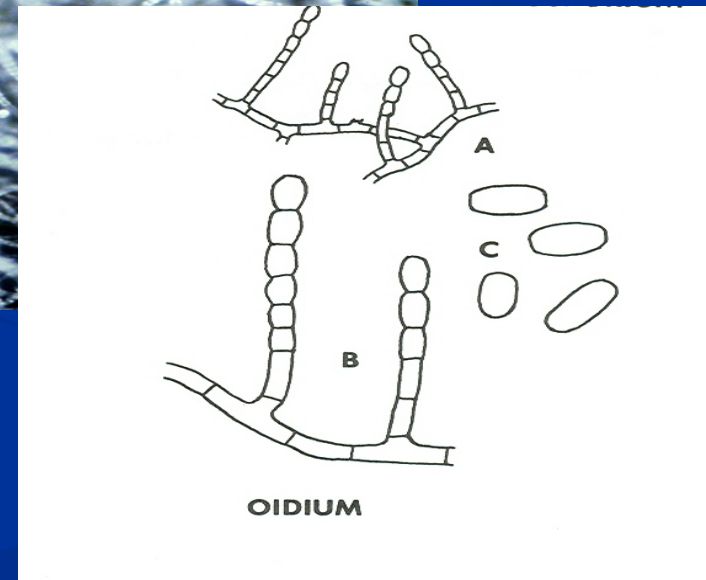
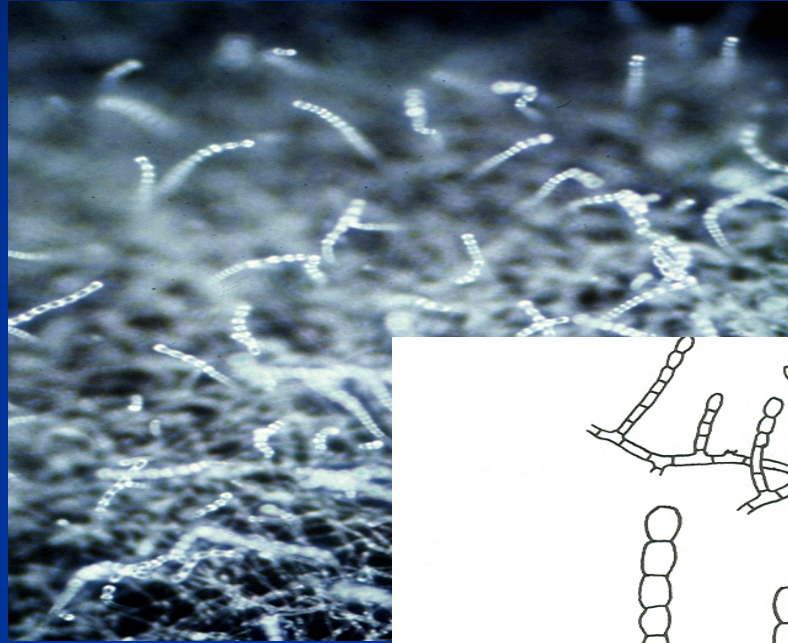


# Powdery Mildew - Shucks

- More common on fruit than leaves
- Dusty white spots (3-6 mm)
- Shucks might become completely covered with dusty white growth
- Older lesions might not have the “powdery mildew”, but will appear russeted.



# Powdery Mildew



Source: Illustrated Genera of Imperfect Fungi, 4<sup>th</sup> Ed.



Figure 10. Late in the season the mildew fungus disappears leaving the shucks with a russeted appearance.

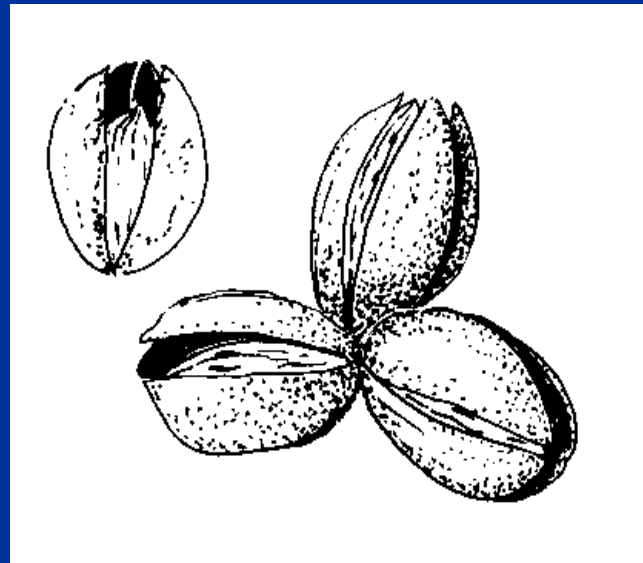
Source: Pecan Pest Management in the Southeast, CAES



# Control of Powdery Mildew

- The critical time is during rapid nut expansion (June-July)
- Not all 'scab fungicides' work.
- When powdery mildew is a concern:
  - ▶ Enable/AgriTin/ co-pack
  - ▶ Orbit/SuperTin co-pack
  - ▶ Elast/Enable tank mix
  - ▶ Stratego
  - ▶ Sulfur

# PHYTOPHTHORA SHUCK ROT





# Phytophthora Shuck Rot

- Occurs after prolonged wet periods and air temperature less than 87 F for daily high
- Appears mid to late August, early September
- Sporadic occurrence; not found every year.

# Phytophthora Shuck Rot Damage

- Nuts lost as stick tights (up to 50%).
- Kernels totally rotted.
- Late season infections - rancid kernels.
  - Not able to separate infected from healthy nuts.
  - Mix with healthy kernels during shelling, quality reduced.

# Phytophthora Shuck Rot Symptoms

- Rot begins at the proximal end.
- Entire shuck will become rotted (within 4 days).
- Necrotic tissue is dark brown, but does not collapse.
- Infected in late Aug/early Sept: dry and stick tight
- Infected in late Sept/Oct: open before drying; nuts have bitter taste





**120.** Phytophthora shuck and kernel rot of pecan fruit.  
(Courtesy C. C. Reilly)

Source: Compendium of Nut Crop Diseases in Temperate Zones



# Inoculated young cluster



# Phytophthora Shuck Rot Control

## ■ Key Questions

1. Has this been a problem in the past?
2. Has the weather been conducive for disease development?

## ■ YES - Look for symptoms.

## ■ Apply fungicide before a rain and make all applications prior to shuck split.

- TPTH (AgriTin or SuperTin) 7.5 oz/A

# Disease Management

# Cultivar Recommendations\*

Resistance Level	Recommended	Recommended for Trial	Not Recommended
Excellent	Elliot Kanza (in north)	Gafford Syrup Mill Jenkins Carter Excel	Gloria Grande Curtis Barton
Good	<b>Sumner</b>	McMillan	Candy
Mediocre	Oconee Caddo Pawnee Forkert		Stuart Moreland Cape Fear Kiowa
Poor	Sioux <b>Desirable</b>		

\* Patrick J. Conner, Horticulture Department, UGA -Tifton.



# Know Your Orchard

- Cultivars
- History of scab pressure
- History of other diseases
  - e.g. downy spot; zonate leaf spot, powdery mildew; Phytophthora shuck & kernel rot
- How long to complete application
- When your schedule is tight, hit trouble areas first.

# Fungicide Groups

## Risk of Resistance

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Low

Moderate

High

- AgriTin
- Super Tin

- Enable
- Orbit
- Propimax

- Abound
- Headline

- Elast

- Stratego



# Three Part Season

## 1) Pre-pollination

- Bud break through nut set (mid-May or casebearer time)
- 10-14 day intervals

## 2) Post-pollination

- Nut set to shell hardening
- 10-21 day intervals

## 3) After shell hardening

# Rules to Follow

- If you use **Enable** or **Propimax** alone, then DO NOT use **Enable**/AgriTin; **Orbit**/SuperTin; Elast+**Enable**; or **Stratego** later in season.
- Do NOT make more than 3 applications of **Headline** and/or **Stratego**.
- DO NOT use **Elast** full season.



# Fungicide Application

- Choice
  - What to use?
- Timing
  - When to apply?
- Coverage
  - How to apply?

# What to spray for nut scab?

- Post-pollination is the critical period for protection.
- Decide what you want to spray during this time, and work from there.
- Resistance management dictates certain uses of fungicides.

# PRE

**Orbit**/SuperTin co-pack

**Enable**/AgriTin co-pack

Elast + **Enable**

Not all 'scab fungicides' are suitable for powdery mildew or zonate leaf spot.

# POST

Agri-Tin

Super Tin

**Orbit**/SuperTin co-pack

**Enable**/AgriTin co-pack

Elast

Elast + Tin

Elast + **Enable**

**Stratego**

# POST: Agri-Tin or Super Tin

## USE

**Orbit**/SuperTin co-pack

**Enable**/AgriTin co-pack

Elast + **Enable**

Elast + Tin

**Stratego**

**Enable**

**Propimax**

**Headline**

## DO NOT USE





# POST: Co-packs

## USE

**Orbit**/SuperTin co-pack

**Enable**/AgriTin co-pack

Elast + **Enable**

Elast + Tin

**Stratego**

**Headline**

## DO NOT USE

**Enable**

**Propimax**

# POST: Elast or Elast + Tin

## USE

**Orbit**/SuperTin co-pack

**Enable**/AgriTin co-pack

**Stratego**

**Enable**

**Propimax**

**Headline**

## DO NOT USE

Elast + **Enable**

Elast + Tin

# POST: Elast + Enable

## USE

**Orbit**/SuperTin co-pack

**Enable**/AgriTin co-pack

**Stratego**

**Headline**

## DO NOT USE

Elast + **Enable**

Elast + Tin

**Enable**

**Propimax**

# POST: Stratego

## USE

**Orbit**/SuperTin co-pack

**Enable**/AgriTin co-pack

Elast + **Enable**

Elast + Tin

## DO NOT USE

**Stratego**

**Enable**

**Propimax**

**Headline**



	Tin	* Co-packs	Elast	Elast + Tin	* Elast + Enable	* Stratego
Co-packs	Green	Green	Green	Green	Green	Green
Elast + Tin	Green	Green	Red	Red	Red	Green
Elast + Enable	Green	Green	Red	Red	Red	Green
Headline	Green	Green	Green	Green	Green	Red
Stratego	Green	Green	Green	Green	Green	Red
Enable	Green	Red	Green	Green	Red	Red
Propimax	Green	Red	Green	Green	Red	Red

# Pre-pollination Period

- Leaf Scab and Downy Spot

Orbit/SuperTin co-pack

Elast+Tin

Enable/AgriTin co-pack

Elast+Enable

Headline

Propimax

Stratego

Enable

# After Shell Hardening

- Scab and other leaf diseases can occur in August and September – Protect next year's crop.
  - Enable/Super Tin co-pack
  - Orbit/Super Tin co-pack
- Phytophthora shuck & kernel rot
  - Agri-Tin
  - Super Tin

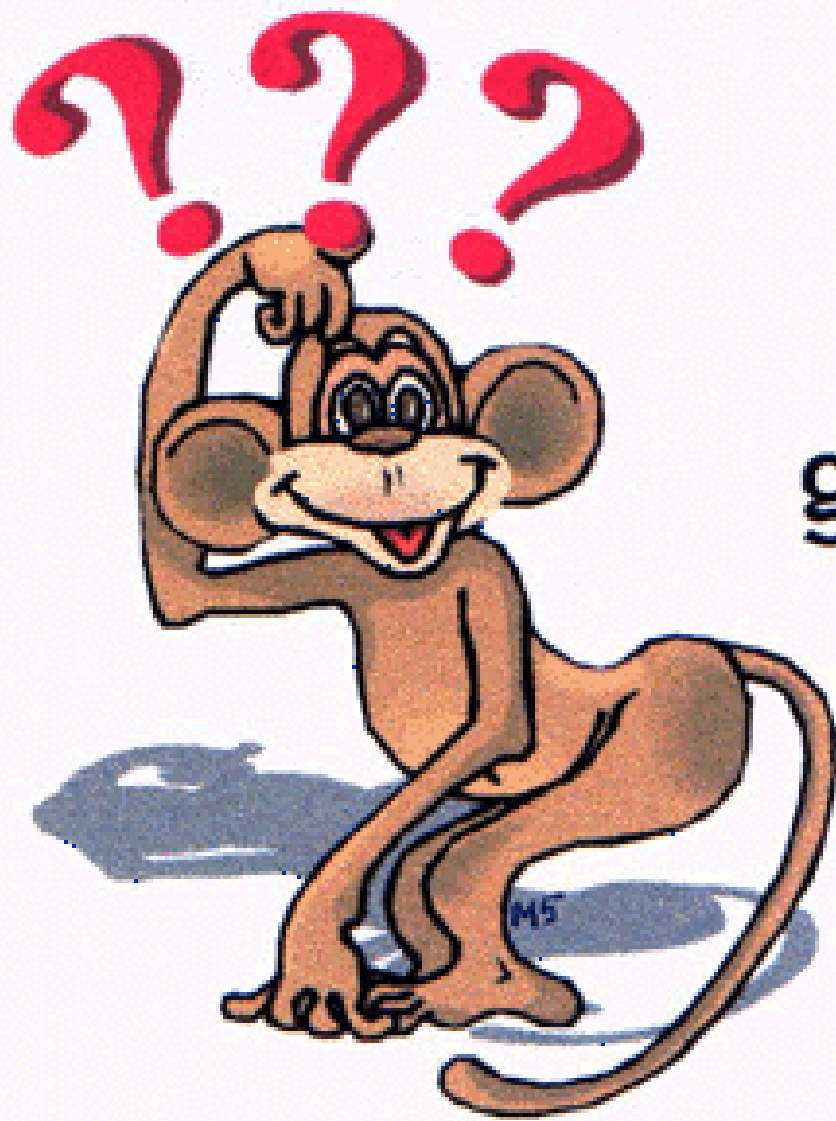
# Fungicide Timing

- Set Schedule
  - In south GA 'Desirable' is sprayed about every 14 days
  - Pre-pollination: 10-14 days
  - Post-pollination: 10-21 days
- Weather Based – AUPecan
- Combination



# Fungicide Coverage

- Good coverage might be as important as fungicide selection.
- Pay attention to Paul Sumner's talk at 11:00.



Questions  
are  
guaranteed in  
life;  
Answers  
aren't.