#### Pecan Disease Management 2019 Beginner's Pecan Production Course

Jason Brock Dept. of Plant Pathology University of Georgia – Tifton





#### Pecan Diseases

#### • Scab

- Bacterial leaf scorch
- Downy spot
- Zonate leaf spot

- Powdery mildew
- Anthracnose
- Phytophthora shuck rot
- Many other minor diseases





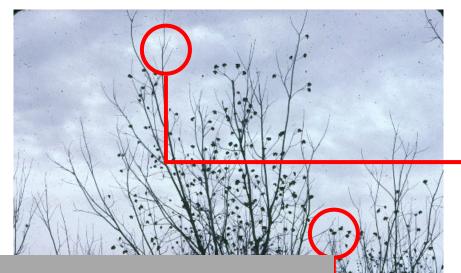
#### Pecan Scan

- Caused by the fungus Venturia effusa (Fusicladium effusum)
- a known problem since 1888
- the driving force in pecan disease management

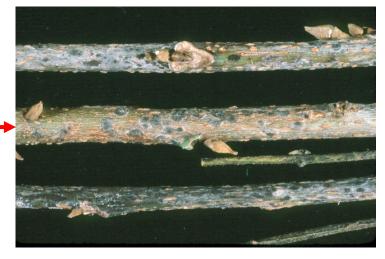




#### Pecan Scab



Overwinters on tissue infected in previous years





#### Pecan Scab

- Temperature range: 50-95 °F
- 12 hours of wetness required?
   Reported to occur within 4-6 hours
- Combined effects of duration of wetness & temperature not fully understood.



#### Pecan Scab

- Rain frequency is more important than total rainfall.
- Heavy rain at any time of day favors scab.
- Light evening rain that keeps trees wet all night lead to more scab than rainfall ending early enough to allow trees to dry.





On current-season twigs

- Infected in the rapid growth stage
- Lesions are elongated
- Dieback is uncommon except in very susceptible cultivars



• Will serve as inoculum source in following years





On immature, expanding leaves

- black spots (1-5 mm)
- appear velvety or rough when sporulating
- More common on lower surface
- Upper & lower lesions do not always match.







- Leaves are most susceptible
  7 21 days after bud-break
- New leaves & shoot elongation for ~ 90 days



• March – April – May





### Leaf Scab Damage

- Reduced photosynthesis
- Leaf retention in the fall

• Source of inoculum



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On shucks

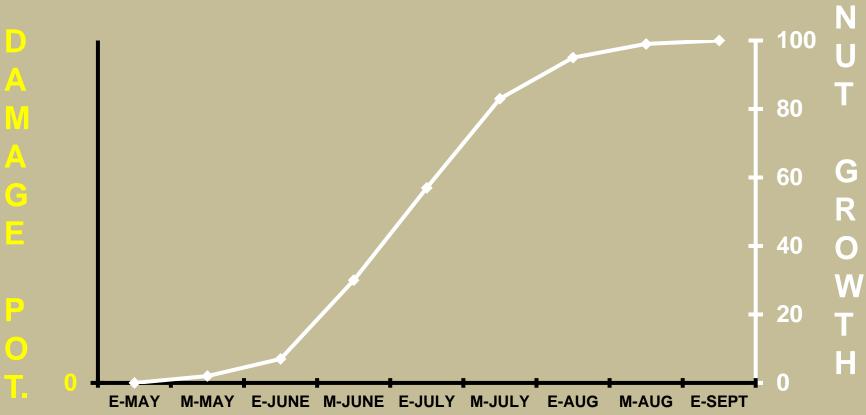
- lesions are circular (2-8 mm)
- Once the shell hardens, subsequent infection is apparently more cosmetic then damaging.

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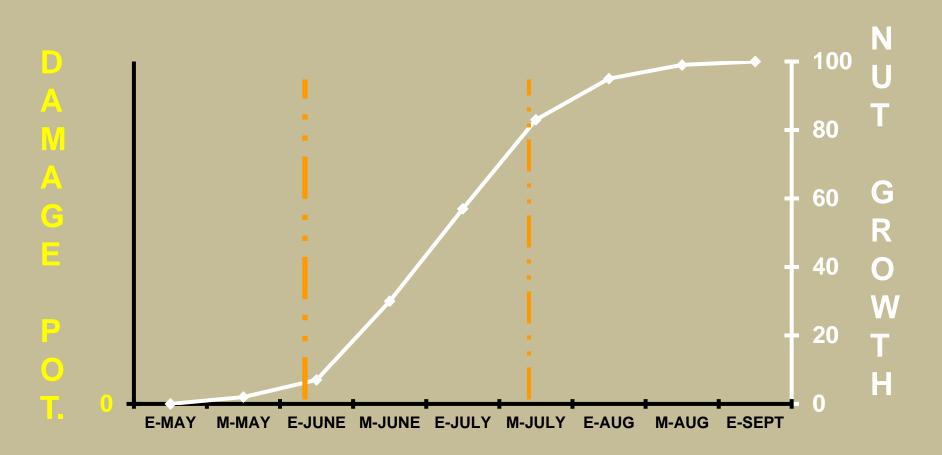
#### Nut Growth & Damage Potential



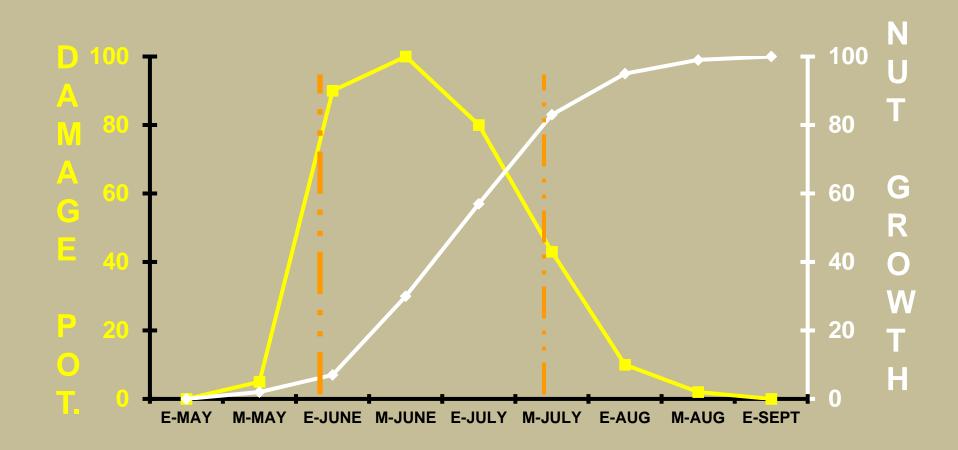
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#### Nut Growth & Damage Potential



#### Nut Growth & Damage Potential



• Early infections

 tremendous yield and crop quality reductions

- Late infections
  - less damaging to both yield and quality.



• Critical period = early June - early August

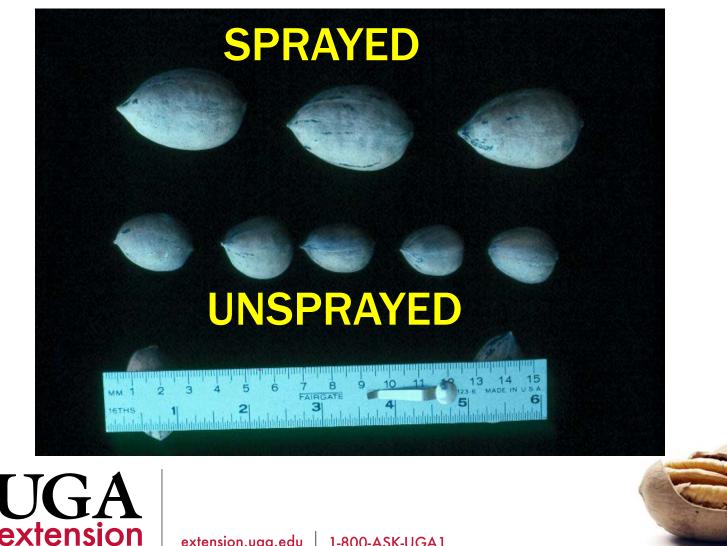








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- Resistant Cultivars
  - Scab has multiple races
  - Most economical and practical measure
  - Host resistance is not always durable
  - Cultivar recommendations are available.





- Cultural considerations
  - Plant more resistant cultivars
  - Increase cultivar diversity
  - Improve air flow
    - Spacing
    - Thinning
    - Pruning
  - Maintain tree health

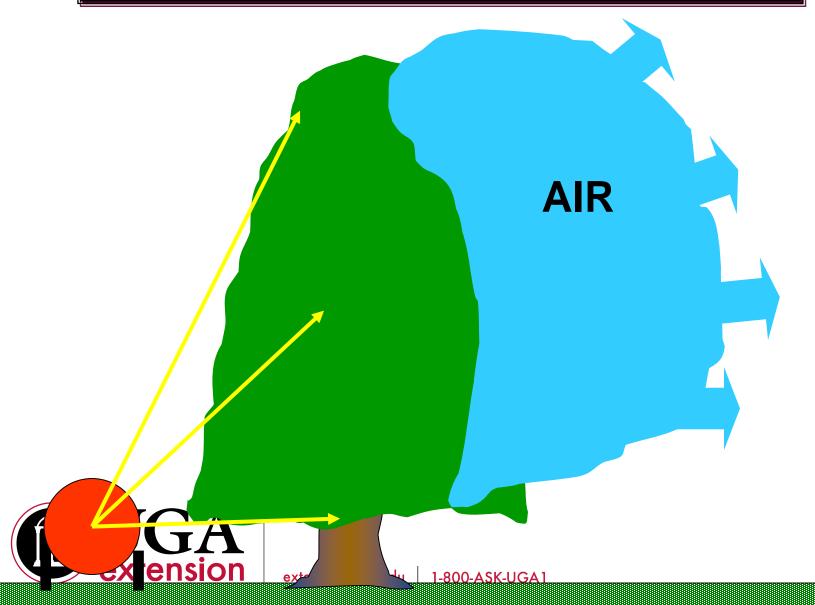




- Fungicide Applications producing trees
  - Budbreak (early April) through shell hardening (mid August)
  - 7 to 11 sprays possible (15-20 not uncommon)
  - Air blast sprayers
  - Coverage will become the biggest challenge.
    - Tree size
    - Tree spacing
    - Sprayer operation







# **AIR BLAST SPRAYING**



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- Fungicide Applications young trees
  - Benefits from air movement & sunlight
  - Fewer fungicide applications
  - Shorter protection window
    - Protect leaves & new growth





#### AU Pecan

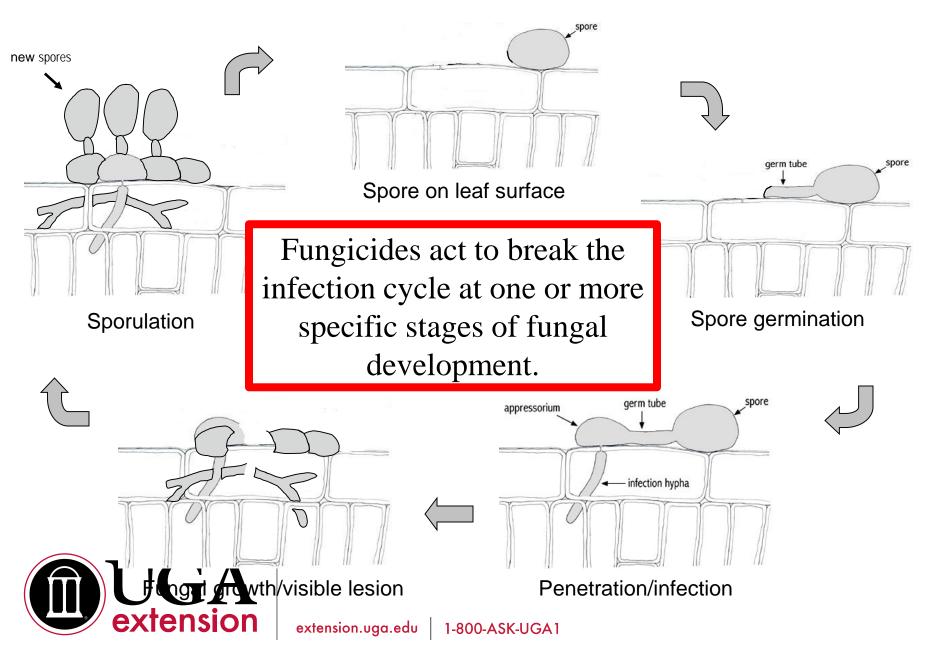
- Pecan weather for the Southeast
- Registration of a farm is free; provided to pecan growers by AWIS Weather Services.
- Provides advice on timing of fungicide sprays based on recorded rainfall and the 5-day forecast.
- <u>www.awis.com</u> or search "AU Pecan"



FRAC Code	common name	Trade Names
1	thiophanate-methyl	Topsin; T-methyl
3	fenbuconazole	Enable
3	metconazole	Quash
3	propiconazole	Orbit, Bumper, Propimax, Tilt
3	tebuconazole	Folicur, Monsoon, Orius, Tebuzol, Toledo
3	tetraconazole	Andiamo
11	azoxystrobin	Abound, Azaka
11	kresoxim-methyl	Sovran, Narvos
11	pyraclostrobin	Headline
30	triphenyltin hydroxide (TPTH)	Super Tin; Agri Tin
33	phosphite	Phostrol, ProPhyt, FungiPhite, Reliant, Fosphite, Kphite, Phiticide, Rampart, Topaz
U12	dodine	Elast
М	ziram	Ziram
3 + 11	difenoconazole + azoxystrobin	Quadris Top, Amistar Top
3 + 11	flutriafol + azoxystrobin	Topguard
3+11	propiconazole + azoxystrobin	Quilt
3 + 11	tebuconazole + trifloxystrobin	Absolute
3 + 11	tebuconazole + azoxystrobin	Custodia, Helmstar
3 + 33	tebuconazole + phosphite	Viathon
3+1	tebuconazole + thiophanate-methyl	Topsin XTR
3 + 30	tetraconazole + TPTH	Minerva Duo
3 + 11	tetraconazole + azoxystrobin	Brixen



#### Infection Cycle

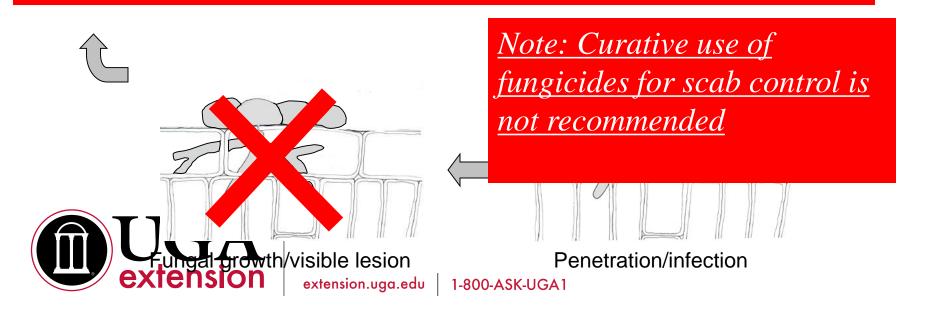


#### **Curative Activity**

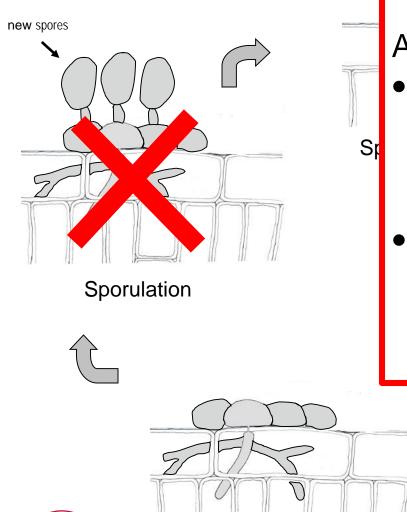
spore

Curative (eradicant or "kick-back") activity

- fungicide applied <u>after</u> infection has occurred prevents further growth and development of the fungus
- some systemics have both preventive and curative activity, and can be effective within 1-4 days after infection
- curative fungicide activity has not been conclusively demonstrated under field conditions for pecan scab



#### Anti-sporulant Activity



growth/visible lesion

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Anti-sporulant activity

- some systemics when applied to existing infections can effectively inhibit sporulation (spore production)
- there is little or no experimental data for pecans under field conditions

- infection hypha

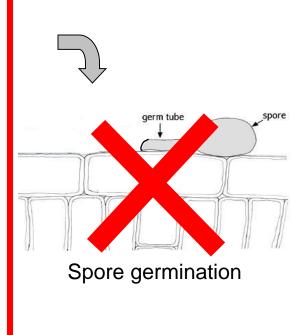
Penetration/infection

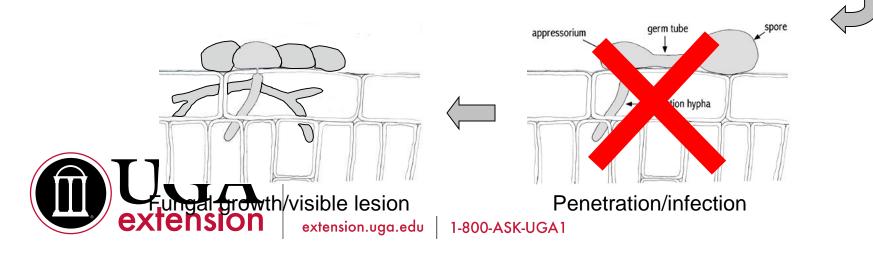
appressorium

#### **Preventive Activity**

Preventive activity

- fungicide acts on the plant surface to prevent spore germination and/or penetration and infection
- fungicide must be applied <u>before</u> infection occurs
- protectant fungicides have preventive activity <u>only</u>
- most systemic fungicides have preventive activity





- Fungicide Resistance Risk
  - Fungicide mode of action (FRAC group)
    - All fungicides have SOME risk
    - Some have higher risk based on MOA
  - Fungicide use
    - Cumulative amount of fungicide with the sample MOA
    - Rate of fungicide used





- Fungicide Resistance Management
  - Use formulated mixtures or tank mixes
  - Alternate different MOA
  - Maintain effective rates
  - Use low-risk fungicides when possible
  - Use when most effective



MBCs (thiophanates)	1	Topsin; T-methyl, <i>TopsinXTR</i> 2
DMIs (triazoles, sterol inhibitors)	3	Orbit, Orius, Propimax, Bumper, Enable, Quash, Folicur, Tebuzol, Toledo, Monsoon, Topguard, Andiamo <i>Absolute, Quilt, Quilt Xcel, Quadris Top, Custodia,</i> <i>Minerva Duo, TopsinXTR2, Viathon, TopguardEQ,</i> <i>Amistar Top, Brixen, Helmstar Plus</i>
Qols (strobilurins)	11	Abound, Azaka, Sovran, Headline, Narvos, Absolute, Quadris Top, Quilt, Quilt Xcel, Custodia, TopguardEQ, Amistar Top, Brixen, Helmstar Plus
Guanidines	U12	Elast
Organo-metallics	30	Super Tin, Agri Tin, <i>Minerva Duo</i>
Phosphonates	33	Phostrol, ProPhyt, FungiPhite, Reliant, Fosphite, Kphite, Phiticide, Rampart, Topaz, <i>Viathon</i>
Ziram	М	Ziram



Fungicide class	FRAC group	Common name	Irade name(s)	stance isk	
<b>MBCs</b> (benzimidazoles)	1	thiophanate- methyl	Use sparingly; strict limitations		
<b>Qols</b> (strobilurins)	11	azoxystrobin pyraclostrobin kresoxim-methyl trifloxystrobin	Best suited for foliar diseases Effective for diseases other than scab		
<b>DMIs</b> (sterol inhibitors, triazoles)	3	propiconazole fenbuconazole metconazole difenoconazole tebuconazole	Limitations on number of uses zole nazole		
Organotins	30	fentin hydroxide			
Guanidines	U12	dodine	Best suited for nut scab		
Phosphonates (phosphites)	33	phosphorous acid and salts	3-5 applications; every other spray, starting on	every other spray, starting on Apr/May	



### **Pre-pollination Sprays**

DMIs (triazoles, sterol inhibitors)	3	Andiamo, Bumper, Enable, Folicur, Monsoon, Orbit, Orius, Propimax, Quash, Tebuzol, Toledo, <i>Minerva Duo, TopsinXTR2, Viathon</i>		
Qols (strobilurins)	11	Abound, Azaka, Headline, Sovran, Narvos		
	11 + 3	Absolute, Amistar Top, Brixen, Quilt, Quilt Xcel, Quadris Top, Custodia, Helmstar Plus,TopguardEQ		
Phosphites	33	Phostrol, ProPhyt, FungiPhite, Reliant, Fosphite, Kphite, Phiticide, Rampart, Topaz, <i>Viathon</i>		
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### **Post-pollination Sprays**



- Elast
- Tin + Elast

+ Group 3

or

+ Phosphite

- Groups 11+3
- Group 11



 Label = information printed on or attached to the container





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- To the manufacturer, the label is a "license to sell."
- To the state or federal government, the label is a way to control the distribution, storage, sale, use, and disposal of the product.
- To the buyer or user, the label is a source of facts on how to use the product correctly and legally.
- To physicians, the label is a source of identification and information or proper treatment for poisoning cases.



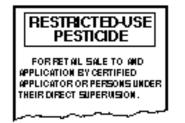
ACTIVE INGREDIENT Benom yi Dileth yi 1-(butyicarbamoyi)-2-benzimidazolecarbamate ... 50% INERT INGREDIENTS ... 50% U.S. PAT.S AS 1.174 EPA REG. NO. 252-254 A

- Identifying information
  - pesticide's classification, names, contents, signal words, manufacturer's name and address, and the EPA registration ....
- Precautionary statements
  - environmental and other hazards, PPE, first aid treatments, ...







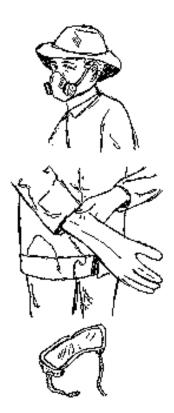


- Directions for use
  Where, how, when, ....
- Storage and disposal











- The label is the law!
- Read before
  - -Buying
  - Mixing & applying
  - Storing
  - Disposing





#### Take Home Messages

- Cultivar selections
- Scab is the major concern.
- Fungicide classes and resistance management

