Pecan Disease Management

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Insect Symptoms





Herbicide Symptoms





Nutritional Symptoms









Pecan Scab

- Pecan Scab is by far the most widespread and overall destructive disease of pecan.
- Fungicide programs are designed around the management of scab and adjusted as needed for other diseases.

Pecan Scab

- Scab is a major limiting factor in pecan production.
- Favored by prolonged periods of wetness (12 hours).
- Symptoms develop on <u>immature</u> tissue – including leaves, twigs, and shucks.

Pecan Scab Damage

Leaf Scab

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

Nut Scab

- Reduced size
- Nut drop
- Reduced % kernel

Life cycle of the pecan scab pathogen



Pecan Scab

- Pecan fungicides must be applied on a regular basis to maintain a protective barrier over the foliage and fruit.
- The application schedule will need to be adjusted depending on season, varieties, orchard history, etc.











Management of Pecan Scab

What makes scab so difficult to control?

- weather
- susceptible cultivars
- tight orchards (restricted air movement, high RH, long periods of leaf wetness)
- poor spray coverage
- reduced sensitivity of the scab pathogen to fungicides



Pecan Brown Spot

- Foliage disease caused by a fungus, Cercospora fusca
- Shortly after brown spot infection, circular, reddish brown spots appear on the leaflets. As the disease progresses, the spots develop grayish concentric zones and become irregular in shape.













Pecan Brown Spot

- Brown spot will defoliate the tree if infection is heavy and no steps are taken to control it.
- Brown spot symptoms can be confused with those of *Gnomonia* leafspot. The two diseases can be distinguished in that brown spot lesions can develop beyond the lateral veins, but *Gnomonia* leafspot lesions remained confined within the veins.





Downy Spot Symptoms

- Caused by Mycosphaerella caryigena
- 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)

Source: Compendium of Nut Crop Diseases in Temperate Zones

Downy Spot-Mycosphaerella caryigena



Damage: Foliage Only. Leaf loss can reduce nut quality.



Control of Downy Spot

- Cultivar differences have been documented
- Early season fungicide and timing are critical to break disease cycle on early season foliage. Combo products that contain Group 3 & 11 are good choices. Group 1 (thiophanate methyl) also known to provide control.

Most susceptible -- Western,
Pawnee, Desirable, Delmas,
Moneymaker, Stuart

- Moderately susceptible --Wichita, GraBohls, Cheyenne, Barton
- Moderately resistant --Choctaw, Mohawk, Kiowa, GraKing, Success, Cape Fear

Wichita

Photo/slide by Mark Black

Western





Cristulariella pyramidalis

- Bulls-Eye target lesions, contributing to late season poor leaf condition and retention.
- Inoculum enters from wooded areas, hedgerows around orchard.
 - Hosted on maple, magnolia, box elder, other.
- Cooler, wet conditions in late summer drive disease development.
 - 40-81 F, >90 % RH
 - Uncommon conditions & occurrence
- Fungicides must continue after scab program ends if conditions are favorable. TPTH and dodine not very effective.



Neofusicoccum caryigenum

- Widespread in Georgia (some in AL, LA, OK, and TX)
- Infection can occur as early as May, but generally occurs later in the season.
- More prevalent on scab-susceptible cv's, but can infect scab resistance cultivars.
- Can cause severe defoliation





Leaf Dieback

Photo by Dr. Tim Brenneman, UGA

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Fungicides for Neofusicoccum

- Strobilurins (FRAC Code 11): Abound, Headline, Sovran
- DMIs (FRAC Code 3): Enable, Orbit, Propimax, TopGuard, etc.
- Dodine (FRAC Code U12): Elast
- Organotin (FRAC Code 30) Super Tin



Powdery Mildew

The fungus *Microsphaera penicillata* (Wallr.:Fr.) Lev causes powdery mildew of pecan.

On pecan, powdery mildew primarily appears mid-to-late season and will generally only affect fruit, but can be found on leaflets occasionally.

Powdery mildew can occur sporadically and may not be present each year.





Conditions-Damage-Control

- Hot & humid
- July is popular month for appearance
- Growing nuts can be stunted from heavy presence.
- Light infections cause no damage.
- Cultivar differences presumed to exist, but not well documented.
- Early season Scab fungicide programs control by default.
- Responds well to sulfur and many other fungicides, especially Group 3 and 11.

Powdery Mildew

Tolerant

Susceptible

- Caddo
- Gloria Grande
- Kiowa
- Moreland
- P-Cou 2
- Sumner

- Jackson
- Littlepage
- Maramec
- Pawnee

Highly Susceptible

- Curtis
- Desirable
- Forkert
- Melrose
- Nacono
- Oconee
- Schley

Summary

- Powdery Mildew infection is sporadic in occurrence and not considered a significant economic problem, therefore specific fungicide application for powdery mildew control is not recommended.
- Fungicide choice for pecan scab control will impact powdery mildew infection.

Fungicides Labeled

- Group 30, organotin
- Group 3, DMI's
- Group M, guinidine acetate
- Group 11, strobilurin
- Group 1, thiophanate-methyl
- Group 33, phosphonates
- Group 6, G3 & G11 Mixtures

Fungicides Labeled

- Agri-Tin, Super Tin 4L, Super Tin 80WP
- Enable, Orbit, Propimax, Bumper
- Elast 400F
- Abound, Sovran, Headline
- T Methyl 70 WSB, Topsin-M
- Agri-fos, Fosphite, ProPhyte, Rampart
- Stratego, Quilt





Pecan Bacterial Leaf Scorch

Pecan Bacterial Leaf Scorch--Xylella fastidiosa

A chronic bacterial disease that can cause leaf scorching, drop and devigored trees with yield loss.

- Symptoms of PBLS
 - Begins with necroses of leaflet tips and margins, later progressing in a uniform pattern toward the leaf base and midribs.
 - Lesions are tan to light brown in color when spreading through leaflet tissue.
 - Defoliation can be severe and may occur on individual limbs or systemically across the entire plant.



Symptoms of PBLS

- Symptoms can be expressed every year
- Most prominent late in the growing season





PBLS in pecan leaflets

Bare rachises remain after defoliation Systemic PBLS symptoms in mature pecan

Photo's: Rebecca Melanson, MSU





Effects of PBLS from 3-year study on severely diseased mature 'Cape Fear'

- 58% defoliation of affected limbs
- 11.7% in-shell weight loss
- 15.9% kernel weight loss

Cultivar Susceptibility to PBLS

Barton Caddo **Cape Fear** Candy Cherokee Cheyenne Desirable Elliott Farley **Forkert** Jackson Kiowa Mahan **Melrose**

Moreland Navaho Nacono Oconee Pawnee Rome Schley Shoshoni Stuart Sumner Woodman

Natives/seedlings






Bunch Disease

Phytoplasma disease of pecan

– Prunus X-disease group

- First recognized as a disease in 1932 near Shreveport, LA
 - Previously confused with pecan rosette (Zinc deficiency)
- Occurs in scattered areas throughout southeastern U.S.

Bunch Disease Symptoms

- Characteristic abnormal, dense "bunched" growth of numerous, thin shoots (witches brooms)
 - Brooms generally localized, but may occur throughout the tree
 - Infected terminals develop foliage 1-2 weeks earlier than healthy terminals.
 - Infected terminals do not produce nuts



Bunch Disease

- Pecan varieties vary in susceptibility to bunch disease
 - Some highly susceptible varieties include: Bradley, Desirable, Elliott, Jennings, Mahan, Schley
 - Some resistant varieties include: Brooks, Candy, Curtis, Farley, Gloria Grande, Jackson, Lewis, Moreland, Owens, and Stuart

Bunch Disease Management

- Avoid collecting scions from diseased trees.
- Plant in well isolated areas away from sources of infection.
- Plant resistant varieties.
- Branch or tree removal
 - Limited success

Other Pecan Diseases

- Anthracnose Glomerella/Colletotrichum
- Gnomonia Leaf Spot Gnomonia dispora
- Liver Spot Gnomonia caryae
- Leaf Blotch Mycosphaerella dendroides
- Tumor Disease Phomopsis ??
- Crown Gall Agrobacterium tumefaciens
- Cotton Root Rot Phymatotrichopsis omnivora

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.





Non-chemical Disease Management

- Tree thinning
- Limb Pruning
- Hedging
- Scab-resistant cultivars

Cultivar Recommendations*

Resistance Level	Recommended	Recommended for Trial	Not Recommended
Excellent	Elliot Kanza Lakota Hark	Gafford McMillan Excel Avalon	Gloria Grande Curtis Barton
Good	Sumner	Candy	Cape Fear
Mediocre	Oconee Caddo Moreland Pawnee Forkert	Nacono Zinner	Stuart Kiowa
Poor	Desirable		

Generalizations on Fungicides

Protectants (Tin and Elast)

- excellent residual but do not move in plant
- will not "cure" existing infections
- foundation of nut scab sprays
- Systemics (Tebuconazole, Abound, Absolute, Phosphites, Orbit, etc.)
 - move into leaves and some even from leaf to leaf
 - have some "post-infection" activity
 - <u>foundation for pre-pollination sprays</u> (use some for nut scab and "minor" diseases)

Why use systemics early season?



- Up to 90% of shoot growth can occur in the first 30 days after bud break!
- Control with protectants is less consistent; <u>depends on timing of</u> <u>infection periods and</u> <u>applications</u>

Commercial Disease Spray Guide

First Prepollination Spray	Group U12	Elast
	Group M3	Ziram
Second Prepollination Spray	Group P07	KPhite 7LP
First Cover Spray	Group 11	Abound
Second Cover Spray	Group 3	Enable
Third Cover Spray	Group 30	Super Tin
Fourth Cover Spray	Group 3+7	Miravis Top
Fifth Cover Spray	Group 30	Super Tin
Sixth Cover Spray	Group P07	Kphite 7LP

Organic Disease Spray Guide

First Prepollination Spray	BM 02	Double Nickel 55
Second Prepollination Spray	Group P5	Regalia
First Cover Spray	Group BM 02	Serenade
Second Cover Spray	Group BM 01	Timorex ACT
Third Cover Spray	Group P5	Regalia
Fourth Cover Spray	Group BM 02	Serenade
Fifth Cover Spray	Group P5	Regalia
Sixth Cover Spray	Group BM 01	Timorex ACT

Should You Apply Fungicides When There Is No Crop?

- Protect the foliage from diseases through their growth period, usually around mid-June.
- After mid-June, the use of fungicides without nuts on the trees may not provide much economic return.
- Still should control leaf insects, yellow aphids, black aphids, and scorch mites.

Concluding Points

- Becoming familiar with all of the pecan diseases allows pecan growers to properly identify and correctly manage emerging problems.
- Those growers making preventative or weather-based sprays for Pecan Scab control generally control most secondary/minor diseases by default.
- Growers in central Oklahoma, who spray fungicides infrequently due to low rainfall or growers with scab resistant varieties who do not spray fungicides, are at some risk for problems with Downy Spot, Brown Spot and other minor fungal problems.
- Good orchard management (sunlight, fertility, pruning/thinning, irrigation, crop thinning) and proper sanitation improves overall tree health and elimination of many pecan disease problems.

NEED MORE HELP?

- Plant Disease and Insect Diagnostic Lab (PDIDL)
- Jen Olson, sickplants@okstate.edu
 405-744-9961
- Alex Harmon, gotbugs@okstate.edu (405) 744-9961



We're Done – QUESTIONS?







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