

Disease Prevention



Pecan IPM Toolbox

Variety of Causal Agents

- ∞ Diseases affecting pecans are caused by bacteria, fungi, nematodes, mycoplasma, and physiological problems.
- ∞ Although viruses have not been shown to occur on pecans, it is suspected that with time and closer observation, some of the problems involved with obtaining maximum production will be found to be a result of a viral infection.
- ∞ Diseases are controlled with a variety of practices. Some of the most important of these will be discussed in this section.

Disease-Resistant Varieties of Pecan Trees

- ☞ The use of resistant varieties is one of the most important methods of reducing losses from diseases such as pecan scab. This can reduce the amount of fungicides required to produce a crop.
- ☞ Resistance can delay the occurrence of scab during periods of inclement weather when spraying is not possible.

Preventing Fungicide Resistance in Pecan Scab

- ☞ Fungicides labeled for control of pecan scab differ in their chemical properties, their activity on the fungus, and the ease by which the pathogen can become resistant to them. It is important to understand this relationship so that the best fungicide choices can be made for control of scab. Some fungicides with excellent control properties against scab are also highly prone to resistance.
- ☞ [Read article](#), "Pecan Scab: Understanding Fungicide Activity to Prevent Fungicide Resistance"

Air Circulation Is Important

- ☞ Crowded trees increase the likelihood that serious disease epidemics will occur. Poor air circulation slows down the drying of foliage and increases the potential for infection within an orchard.
- ☞ Where possible, the rows should run with the prevailing wind. This will allow for better movement of wind through the grove. If the rows are planted perpendicular to the prevailing wind, the outer rows will block air movement into the inner orchard. This is particularly important when trees are closely spaced.

Pruning is Helpful

- ☞ Pruning to remove low-hanging limbs can also help to reduce disease build-up within an orchard. By removing the lower-hanging limbs, air movement is enhanced beneath the trees, and this not only encourages drying but also facilitates better movement of the released spores away from the tree.

Crop Sanitation

- ☞ Sanitation within the orchard is extremely important, because many of the diseases overwinter in old shucks, leaves, leaf petioles, and twigs. Disking or removal of old plant debris will help to reduce the amount of fungal pathogens present in a grove.

Fungicides – A Last Line of Defense

- ∞ The final step in disease control for pecan trees is the use of fungicides on a timely basis.
- ∞ If used properly, fungicides can prevent significant losses to disease.
- ∞ BUT, it is not enough to just *use* a fungicide.
- ∞ Total coverage is important to achieving effective control.
- ∞ When spraying, always check to see if you are leaving a moist film on all of the foliage.
- ∞ If you are not achieving thorough coverage, check:
 - tractor speed
 - pump pressure
 - nozzle size
 - nozzle arrangement

Major Diseases of Pecan

Disease Prevention



Nut & Foliage Diseases

- [Pecan scab](#)
- [Powdery mildew](#)

Nut Diseases

- [Stem end blight](#)
- [Shuck dieback](#)
- [Pink mold](#)
- [Kernel discoloration](#)

Foliage Diseases

- [Downy spot](#)
- [Brown leaf spot](#)
- [Vein spot](#)
- [Articularia leaf mold](#)

Twig or Limb Diseases

- [Bunch disease](#)
- [Fungal twig dieback](#)

Root Diseases

- [Cotton root rot](#)
- [Crown gall](#)
- [Root knot nematodes](#)

Pecan Scab

- ∞ The **pecan scab fungus**, *Cladosporium caryigenum*, invades the young, rapidly growing shoots and leaves and, later, the developing nuts. Severely infected nuts on highly scab-susceptible varieties fall or fail to develop, resulting in a **total nut crop loss**.
- ∞ **Early season defoliation** often occurs in seasons of **frequent rains and high humidity**, which facilitates the rapid development and spread of the **scab fungus**. The scab fungus overwinters in infected shoots and in old shucks and leaves in the trees.
- ∞ In the spring when temperature and moisture conditions become favorable, the **fungus resumes its growth in the old lesions**, and within a few days, **produces great numbers of spores**.

Pecan Scab - continued

- ☞ Based on work done in Georgia, 70°F appears to be the **minimum** temperature at which spores are formed.
- ☞ These spores are spread by wind and rain to newly developed leaves where they germinate and invade the tender tissues, initiating a primary infection.
- ☞ It is to control this primary infection that the bud break and pre-pollination sprays are applied.
- ☞ The fungus produces a great abundance of spores on the surface of these primary infection sites and then spreads throughout the trees infecting young shoots, leaves, and nuts.

Pecan Scab – continued

- ∞ When **infection** is severe, the entire **nut surface** is **black**, kernel development is stopped, and the **nut drops prematurely**.
- ∞ Pecan varieties vary in their susceptibility to scab disease. Refer to [Table 1](#) for varieties and their disease reactions.
- ∞ Scab disease development is favored by **rainy periods** and **cloudy days** when the leaf surfaces are wet.
- ∞ Under these conditions, **spores** of the fungus in contact with the wet leaf surface of a pecan leaflet **germinate rapidly**, invade the tender tissues, and initiate **infection within 6 hours**.

Pecan Scab – continued

- ∞ **Lesions** resulting from these infection sites become visible to the naked eye within **7 to 9 days**, depending on environmental conditions.
- ∞ **Control** of pecan scab disease depends primarily on the protection of tender leaves, nuts, and shoot surfaces with the application of an **effective fungicide**.
- ∞ A **thin film** of the fungicide prevents the **scab fungus** from developing, by **killing the spores** before they can invade susceptible tissues.
- ∞ Unfortunately, once the fungus has invaded the tissues, it becomes protected from most fungicides and can continue to produce spores.

Pecan Scab – continued

- ∞ Therefore, **thorough coverage** of leaf, nut, and shoot surfaces with a fungicide must be maintained during the season to **prevent secondary infections**.
- ∞ **Sanitation measures**, such as plowing or disk harrowing under fallen leaves and shucks, help reduce primary infections.
- ∞ **Pruning** to open up the tree for better air circulation will help reduce scab occurrence by reducing the number of infection periods occurring during the year.

Nut and Foliage Diseases

Disease Prevention

Table 1. Comparison of Different Areas of Texas Using Days Above 90° F: Days Receiving Measurable Rainfall Ratio on Pecan Scab Severity

	Mar	Apr	May	June	July	Aug	Sept	Severity
Texarkana	0	0	0.5	2.5	5.2	4.6	2.4	Severe
Palestine	0	0	1	3.8	6.8	6.8	3.2	Severe
Dallas	0	0.3	0.7	3.2	5.4	5.2	2	Mod. severe
Victoria	0	0.2	0.9	2.9	4.7	3.5	1.6	Severe
Austin	0.1	0.1	0.8	3.5	7.3	5.8	2.1	Mod. severe
Seguin	0.3	1.3	3.2	8.7	15	10	4	Moderate
Weatherford	0	0.1	1.2	5	7	9	3.5	Mod. light
Brownwood	2	1.3	2.2	6	9.7	9.7	4.3	Light
Uvalde	0.5	2.3	3.3	8.3	14.5	9.7	3.8	Light

Powdery Mildew (fungus *Microsphaera alvi*)

- ☞ When pecans become infected with this fungus, they appear to be covered with a **white, powdery material**.
- ☞ The fungus develops on the outside of the shuck and only feeds on the outer layer of plant cells.
- ☞ Thus, although it appears to be causing considerable damage, no significant yield losses can be attributed to the presence of the fungus.
- ☞ Powdery mildew can develop at very low humidity, and is a problem during the mid-summer months.
- ☞ Once fall rains begin, the fungus is washed off the shuck leaving only the dead epidermal cells of the shuck.

Powdery Mildew - continued

- ☞ When the foliage is infected, it becomes slightly distorted and covered with a faint white, powdery substance.
- ☞ Foliage infection is a problem only on the lower, immature leaves of a tree and on nursery trees.
- ☞ Control is based on following a scab fungicide program with no special sprays.
- ☞ In nurseries where the foliage is all immature, Benlate sprays may be required if mildew begins to develop.

Stem End Blight (fungus *Botryosphaeria ribis*)

- ☞ Stem end blight is a fungal disorder associated with **insect feeding**.
- ☞ **Nuts** show signs of attack in the latter part of **July and August**.
- ☞ The **lesions** are black, sunken, and shiny.
- ☞ Shucks turn black rapidly and drop soon after infection.
- ☞ When the nuts are cut open, the **liquid in the kernel has turned brown**.

Stem End Blight (fungus *Botryosphaeria ribis*)

- ☞ Stem end blight can be controlled with **foliar sprays of a fungicide**, applied at the initiation of the water stage and a second application 10 days later.
- ☞ Losses to this fungus can be reduced, but complete eradication has not been achieved.
- ☞ **Benomyl-type fungicides** have proved the most effective.
- ☞ Losses due to this fungus should not be confused with other nut drops that occur in the fall caused by other pathogens and physiological problems.

Shuck Dieback (physiological)

- ∞ Shuck dieback is a physiological disease of pecan nuts, possibly caused by hormonal imbalance.
- ∞ This condition is commonly associated with Success and Success hybrids.
- ∞ Nuts infected with this disorder do not fill properly, due to the peduncle being girdled earlier, and drop from trees 1 to 2 weeks early.
- ∞ This results in the formation of what are known as "pops."
- ∞ The shucks turn black at the tip and open in a normal manner, but no kernel is formed.
- ∞ No effective control has been found for this condition.

Pink Mold (fungus *Trichotecium roseum*)

- ∞ Pink mold usually occurs on **nuts** infected with the **scab fungus**.
- ∞ The pink mold fungus apparently **enters the nuts through scab lesions** on the shucks and continues to produce masses of pink spores on shuck surfaces until late fall.
- ∞ The fungus sometimes invades the kernel of **thin-shelled pecan varieties** causing "pink rot", which is characterized by the nut shell having an oily appearance and a rancid odor.
- ∞ Pink mold rarely occurs on the shucks of nuts in the absence of scab disease. If scab is controlled, pink mold will not be a problem.

Kernel Discoloration (several fungi)

- ∞ There are several fungi that have been associated with discoloration of pecan kernels.
- ∞ Certain insects (stink bugs) can cause kernel discoloration.
- ∞ Since delayed harvest can also cause this problem, do not allow pecans to lay on the ground for any length of time.
- ∞ Pecans should be dried before sacking and forced ventilation in storage is recommended.

Downy Spot (fungus *Mycosphaerella caryigena*)

- ☞ Only the **foliage** of pecan trees is susceptible to the downy spot fungus, *Mycosphaerella caryigena*.
- ☞ Infection occurs in the spring, near **budbreak**, when new leaves are infected by spores produced in old, overwintered leaves.
- ☞ **Downy spots** usually appear during the **late summer months** on the under surface of the leaflets.
- ☞ The downy character of the lesions is due to the production by the fungus of thousands of minute spores on the surface of each spot.
- ☞ The spores are **spread by wind** and **rain** to adjacent leaves and to **neighboring trees**.
- ☞ After spore dissemination is complete, the lesions, which are visible on both surfaces of the leaf, are **1/8 to 1/4-inch in diameter** and **greenish yellow**.

Downy Spot (fungus *Mycosphaerella caryigena*) - continued

- ☞ **Later** in the season, the **lesions turn brown** due to the death of the leaf cells in the diseased area.
- ☞ Eventually, the lesions take on a **frosty** appearance.
- ☞ **Moneymaker and Stuart** varieties are most susceptible to downy spot disease, although **all pecan varieties** are **moderately to slightly** susceptible.
- ☞ Primary infections of new leaves may be controlled by **disking under old, fallen leaves in the early spring**, before the leaf buds begin to swell.
- ☞ This practice **covers the leaves with soil** and **prevents the discharge of spores** into the air.
- ☞ , **Fungicides** applied at **budbreak** will also reduce primary infections.

Brown Leaf Spot (fungus *Cercospora fusca*)

- ∞ The disease of pecan tree foliage known as *leaf spot* affects only **mature leaves** and usually does not appear until **mid-June or July**.
- ∞ **Primary lesions** develop on the **lower leaf surfaces** as small dots that gradually enlarge and become reddish-brown with a gray cast.
- ∞ The **shape of the lesions** may be **circular or irregular**, especially where two or more lesions develop adjacent to one another.

Brown Leaf Spot (fungus *Cercospora fusca*)

- ∞ In seasons favorable for brown leaf spot development, pecan trees may be **completely defoliated** within 3 to 4 months if the disease is not controlled.
- ∞ Most pecan varieties, which are maintained in a vigorous state of growth are not as susceptible to this disease.
- ∞ The fungus has been observed causing the most damage in the **West Cross Timbers** and on the '**Burkett**' variety.

Vein Spot (fungus *Gnomonia nerviseda*)

- ☞ The symptoms of vein spot disease on pecan trees are similar to the leaf lesion symptoms of the scab fungus, but the fungus which causes vein spot, unlike the scab fungus, affects only the leaves.
- ☞ Lesions of vein spot disease develop on the **veins or petioles of leaves** and are usually less than ¼-inch in diameter and are characteristically **dark brown to black**.
- ☞ Leaves which are severely affected drop, resulting in premature defoliation.

Vein Spot (fungus *Gnomonia nerviseda*)

- ☞ The fungus lives in **fall leaves** over the **winter**.
- ☞ **Fungicides** applied for scab plus **orchard sanitation** will help reduce losses due to this disease.
- ☞ The disease has not been observed to cause significant economic losses in Texas.

Articularia Leaf Mold (fungus *Articularia quercina*)

- ∞ Articularia leaf mold occurs after **rainy periods** and on the **leaves of weak pecan (and other) trees**.
- ∞ On the **lower surface** of the leaves, the fungus produces a conspicuous growth of **white tufts**, which contain masses of spores.
- ∞ Articularia leaf mold does not occur in trees or in orchards that have been sprayed for disease control.
- ∞ A single application of fungicide, when the disease is first detected, is usually sufficient to control Articularia leaf mold disease.

Bunch Disease (mycoplasma)

- ⌘ Although the cause of bunch disease on pecan trees is not completely understood, evidence indicates it is a **mycoplasma**.
- ⌘ Affected trees exhibit the **bunching symptom** - excessive growth of slender succulent twigs from lateral buds that normally remain dormant on the main limbs.
- ⌘ In moderately affected trees, one or several branches will show the "bunch" growth symptom.
- ⌘ Bunching in severely affected trees may involve all **main limbs**, which produce thick masses of **sucker-like growth** and **few, if any, nuts**.

Bunch Disease (mycoplasma) - continued

- ∞ There is no known effective control for bunch disease.
- ∞ **Early detection** of the first symptoms of bunch and pruning out the affected branches may prevent spread of the disease throughout the tree.
- ∞ When pruning, make sure **cuts are 2 to 3 feet below the infected area.**
- ∞ When the tree is **severely affected**, it should be **destroyed** to protect nearby healthy trees from infection.

Fungal Twig Dieback (fungus *Botrydiplodia* sp.)

- ☞ Infected twigs are covered with small, raised pustules with black centers.
- ☞ This can result in **1 to 4 feet of dieback**.
- ☞ **No control** is suggested at this time except to carry out **normal disease control programs** and **maintain sanitation** and **adequate moisture** around trees.
- ☞ Based on preliminary studies, it appears that this problem will be most severe during years of heavy production and **low moisture**.
- ☞ It has also been found on **young trees** at the **graft union** and on older trees where limbs are pruned out.

Cotton Root Rot (fungus *Phymatotrichum omnivorum*)

- ∞ Cotton root rot disease is a **soil-inhabiting pathogen** that attacks a wide range of host plants including the pecan.
- ∞ The **roots** of the pecan tree are invaded and killed, **disrupting the transportation of water** to the leaves.
- ∞ The fungus **girdles the trunk** near the soil line.
- ∞ Trees invaded by the cotton root rot fungus produce **yellow foliage and become defoliated**.

Cotton Root Rot - continued

- ☞ Diseased **trees die quickly** after becoming infected.
- ☞ Losses have been observed as long as 13 years after planting.
- ☞ An **effective control** for cotton root rot disease has **not** been developed.
- ☞ New orchards should not be planted in soil having a history of cotton root rot disease and replanting is not recommended in those sites where trees have been lost to this fungus.

Crown Gall (bacteria *Agrobacterium tumefaciens*)

- ☞ Infected roots have **large, rough galls** which may be several inches in diameter.
- ☞ Invasion occurs through **breaks or tears on the roots.**
- ☞ Once inside the root, the **bacteria** can move systemically within the root system.
- ☞ The galls can be formed on any below-ground tissue.

Root Knot on Pecans (nematodes - *Meloidogyne incognita*)

- ☞ Symptomatic of root knot nematodes are small **swellings** are found on the **rootlets of pecan trees**.
- ☞ Aboveground symptoms are **stunted, rosetted trees** that do not respond to **fertilizer and zinc** applications.
- ☞ Growers should examine all nursery trees before planting.
- ☞ **Chemical control** is not recommended at this time.
- ☞ Trees found to be infected with root knot should be **removed**, making sure to remove as many roots as possible.