Pecan Diseases

Pecan trees (*Carya illinoensis*) are widely grown in South Carolina mainly for both their tasty edible nuts and shade. Pecan trees are susceptible to several diseases in our area due to the hot and humid environmental conditions typical of the state. Fortunately, disease or a combination of diseases never reach a level that kills the tree. However, they generally do impact the tree in two ways. First, disease can reduce the tree’s vigor, which in-turn causes the foliage and branches to shed, resulting in a loss of shade value. Secondly, diseases can also infect the nuts and reduce both nut quality and quantity. At times the disease pressure can be so great that no viable nuts are available.

The majority of diseases are difficult to control with either natural or chemical fungicides because their application requires special, expensive equipment that most home owners do not have. In addition, the entire tree canopy must be treated by the fungicide application for effective control. Once again, this creates a challenge for most homeowners after the tree reaches a certain height. Because of these challenges it is not uncommon for many homeowners to call these trees “trashy” and then don’t reap the rewards of the wonderful nuts.

**Scab**

Scab is the most prevalent and challenging disease not only in South Carolina, but where ever pecans are grown. There is not a year when this disease does not impact each pecan tree to some degree. It typically infects both the leaves and nut shucks (the protective shell or husk around the nut), especially when they are young and actively growing in the early part of the growing season. Leaves are susceptible from bud break until they reach maturity. However, once leaves are full expanded, they are no longer susceptible to pecan scab. Nut shucks are susceptible from nut-set to maturity. At times, it can infect young developing twigs and catkins (male flowers) if conditions are favorable. Overall, this disease is a perennial problem without a simple solution.

Pecan scab is caused by the fungus *Cladosporium caryigenum*. At first, the fungus forms small, circular, olive-green to black spots on leaves, leaf petioles and outer nut shuck. With time the lesions increase in size and become blackened and sunken in appearance. Lesions crack as the leaves expand.

Scab lesions often run together, causing the terminals to die and the catkins to drop. When scab attacks young expanding leaves and nuts, it stunts and deforms them. The greatest scab damage occurs when the nuts become infected. Early-season infection can significantly reduce yield and quality. Nut shucks, infected early in the season, often drop or crack where scab lesions run together, and these lesions serve as points of entry for other pathogenic fungi.

The scab fungus survives the winter on plant parts infected the year before. Most spores are released in mid-April, just after bud break. Spores are spread locally by dew and splashing rain and over longer distances by wind. Scab spores need free moisture to germinate, usually supplied in the form of dew. Spores also require moderate temperatures to germinate, between 65 and 85 °F. This is a weather related disease, because with more rainfall and increased hot, humid conditions, the disease will become more severe. However, if the weather is dry with only minimal rainfall and less humidity, the impact of the disease will be significantly less. During favorable weather, the homeowner will typically see a healthy crop of nuts.
Improper fertilization and the excessive use of nitrogen can also produce favorable conditions for this disease. Therefore, it is highly recommended not to fertilize or lime without properly testing the soil (See HGIC 1652, Soil Testing).

**Prevention & Treatment:** The best way to reduce the overall impact that pecan scab will have is to plant scab-resistant pecan varieties. As of the summer of 2014, the following varieties are currently known to have the best resistance to this disease: Elliott, Excel, and Kanza. Others that offer average resistance are Cape Fear, Sumner, Creek, Candy, Moreland and Gloria Grand. However, resistance only means the trees are more tolerant of disease pressure and do not get the disease as severely. It does not guarantee that the pecan variety will not become infected at all.

Complete removal and destruction of leaves and shucks during the winter can reduce carry-over of scab. A very effective - but for homeowners not very feasible - means of controlling scab is a preventive fungicide spray program. It is critical to begin fungicide applications at bud break to prevent early scab infection. A continuation of sprays based on the label directions, weather, and rotating three different fungicides from nut start to maturity is recommended to mitigate this problem. Therefore, on average one can expect to make approximately 12 spray treatments during each growing season. In addition, thorough coverage of the entire tree canopy is very important, which makes spray treatments impractical for the homeowner.

**Downy Spot**

This fungal leaf spot, caused by *Mycosphaerella caryigena*, can cause early leaf loss on susceptible cultivars like Stuart, Pawnee and Moneymaker. Repeated defoliation from severe downy spot infection can cause losses in nut production and tree vigor. Downy spot first appears on the lower surface of young foliage in late spring as small yellow spots. These spots may turn white as spores are produced. Later in the season, the lesions turn brown and begin to appear on the upper surface of the leaf. Heavily infected leaves drop earlier than healthy ones in the fall. Downy spot survives the winter in fallen leaves. Spores are released prior to budbreak. Downy spot begins in the lower parts of the tree and spreads upward.

**Prevention & Treatment:** Plant resistant or tolerant varieties such as Schley, Success, Mahan and Western. Unfortunately, Schley and Western are highly susceptible to pecan scab and Success and Western are susceptible to shuck dieback. Remove and destroy fallen leaves. Apply a preventative fungicide spray program.

**Brown Spot**

Brown spot, caused by the fungus *Cercospora fusca*, only affects mature leaves and does not appear until June or July. Brown spot is found primarily in neglected orchards in areas that have abundant rainfall or high humidity. Primary lesions develop on the lower leaf surfaces as small dots, which enlarge and become reddish-brown with a gray cast. Brown spot may defoliate the tree by October if steps are not taken to control it. Brown spot symptoms can be confused with those of Gnomonia leaf spot (see below). Brown spot lesions can develop beyond the lateral veins, while Gnomonia leaf spot lesions remain confined within the veins.

**Prevention & Treatment:** Brown spot is best controlled by keeping the trees healthy. Eliminate any stress by watering and fertilizing the trees when needed. Leaves on trees that are fertilized properly seldom are infected with the brown spot fungus. Fungicides that control scab also effectively control brown spot.
Gnomonia Leaf Spot
The fungus *Gnomonia dispora* only infects poorly nourished trees that are deficient in zinc. The first symptoms appear in June a few days after infection. The spots resemble those caused by the brown spot fungus, but as they expand, they are restricted by the lateral veins. They develop large, elongated, dead areas within the lateral veins. The fungus overwinters in fallen leaves.

**Prevention & Treatment:** Sanitation (the removal of dead and diseased plant material) and proper fertilization will control this fungus. Fungicides applied for scab control are also effective against Gnomonia leaf spot.

Liver Spot
Liver spot is a leaf disease caused by the fungus *Gnomonia carvae*. The first sign of the disease appears in May and June. Circular, dark brown spots appear along the midrib on the lower surface of the leaves. In late summer the spots turn a cinnamon brown or liver color. Liver spot can cause severe defoliation, particularly during prolonged periods of wet weather. Weak trees are more susceptible to liver spot than are healthy trees.

**Prevention & Treatment:** The best control for liver spot is keeping trees healthy by watering and fertilizing them when needed. This disease can also be controlled by fungicide sprays used for scab.

Zonate Leaf Spot
Zonate leaf spot, caused by the fungus *Cristulariella moricola*, causes severe defoliation of pecan trees during July and August of rainy summers. Leaf spots on the upper surface of pecan leaves are grayish brown, with concentric ring formations that are more distinct on the lower side of the leaf. Leaf spots on the lower surface are light brown in the center, becoming darker brown toward the edge. A film of crystalline-like fungal spores forms over the leaf spot surface. Leaves with extensive lesions dry out, curl up from the margins and eventually fall from the tree. The fungus overwinters in hard resting bodies, called sclerotia. The fungus requires moisture to develop, growing most rapidly when the leaves are wet.

**Prevention & Treatment:** Zonate leaf spot can be controlled through sanitation and fungicides. No pecan cultivars are known to be resistant to the fungus. Zonate leaf spot is a problem in areas with high soil moisture, high relative humidity and poor air movement. If pecan trees sustain sporadic outbreaks of zonate leaf spot, wild hosts such as hackberry, maple, poison oak, sassafras, Virginia creeper and other vines should be eradicated. Pruning out low tree branches will increase the air flow and permit better penetration of sunlight and drying of foliage. The following fungicides may be applied at first sign of the disease: copper hydroxide or thiophanate-methyl. Follow the instructions on the label. Preventative sprays are generally not required.

Anthracnose
Anthracnose is a fungal disease, caused by *Colletrotrichum* species. The disease starts as brown-black, sunken lesions on the leaves and shucks. There may or may not be cream to salmon-colored spores in concentric rings on shucks. The spores are spread during spring and early summer rainfall. The more frequent the rainfall, the greater the incidence of disease in the fall. The variety Wichita is very susceptible.

**Prevention & Treatment:** Plant resistant varieties. Remove and destroy infected plant material. There are no fungicides available for homeowners.

Powdery Mildew
This fungal disease, caused by *Microsphaera alni*, forms a characteristic superficial powdery-like growth on both the leaves and the nuts. Infected leaves are seldom seriously damaged by the fungus. Nuts are affected more adversely than leaflets. The amount of damage powdery mildew causes to nuts depends on their stage of development at the time of infection. Nuts infected early may abort or be undersized with poorly developed kernels. Nuts infected when they are mature sustain little or no injury from the disease.

**Prevention & Treatment:** Some pecan cultivars are more susceptible to powdery mildew than others. Stuart and Schley are extremely susceptible. Fungicides applied in the course of the regular scab spray program will control powdery mildew.
Crown Gall

Crown gall is caused by the bacterial pathogen *Agrobacterium tumefaciens*. The bacteria transform normal plant cells into tumor cells, which become wart-like growths of disorganized tissues. Initially, the tumorous growths can be confused with callus tissue, but later they become round, rough and dark. The bacteria can survive in the soil for several years. They enter pecan roots or stems near the soil line through wounds often caused by insects, grafting and cultivation. Galls reduce tree vigor by retarding the flow of water and nutrients in the vascular tissue. The external portions of the galls deteriorate from lack of water and slough off. These tissues often contain the bacteria and reintroduce them into the soil.

Prevention & Treatment: Crown gall is controlled through preventive cultural and sanitation practices. Only healthy, vigorous, disease-free trees should be planted. Take care during transplanting not to wound the roots and trunks. Biological control of crown gall with the antagonistic bacterium *A. radiobacter* strain K84 can only be used as a preventive measure since roots of healthy trees must be dipped in a solution of the bacterium prior to planting.

Shuck Dieback & Stem End Blight

The cause of shuck dieback and stem end blight is not fully known, but a *Phomopsis* species has been associated with these diseases. Both diseases kill shuck tissue and reduce nut quality. The cultivar Success is especially susceptible, but both diseases have been observed on a number of other cultivars as well. Shuck dieback is generally most severe on trees with large crops and on crowded trees. It usually begins with the shuck turning black and dying at or near the tip of the nut. The blackened area can spread over the entire shuck, and often the shuck will flare open. Almost any factor that stresses a tree can apparently increase the incidence of shuck dieback. Stem end blight begins as a brown or black spot on the shuck near the base of the nut. This black area usually enlarges to cover the entire nut. The nut can be easily dislodged from its stem. The earlier the symptoms of these two diseases appear in the season, the poorer the kernel quality.

Prevention & Treatment: No cultural practices or use of fungicides have been effective in controlling shuck dieback. Reduction of tree stress by application of sufficient irrigation to support the crop load, thinning and tree removal will greatly decrease the incidence of disease.

Note: Chemical control of diseases and insects on large trees is usually not feasible since adequate coverage of the foliage with a pesticide cannot be achieved.

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