COLLEGE OF AGRICULTURAL, CONSUMER AND ENVIRONMENTAL SCIENCES

Diseases and Disorders of Pecan in New Mexico

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The pecan is well adapted as a commercial crop or an ornamental shade tree in southern New Mexico. Because of dry atmospheric conditions during the growing season, few infectious diseases are a problem in New Mexico compared to other pecan growing areas. **The pecan, however, is not exempt from all problems**; there are a few diseases that are caused by infectious microorganisms as well as some abiotic disorders caused by non-living entities that can result in extensive losses for commercial pecan growers and home orchardists. This publication will briefly discuss these potential problems for pecans. Pecan scab is a disease that is not currently known to occur in New Mexico but will also be briefly discussed to help growers recognize symptoms.

DISEASES (CAUSED BY INFECTIOUS MICROORGANISMS)

Phymatotrichum Root Rot

Phymatotrichum root rot, also known as cotton root rot or Texas root rot, is caused by the soil-borne fungus *Phymatotrichopsis omnivora*. This is one of the most destructive diseases known to occur on broadleaf plants. It is extremely difficult to manage this disease because the pathogen has an incredibly wide host range and surefire survival mechanisms, such as production of overwintering structures called sclerotia. The disease may appear shortly after tree planting which results in the loss of young trees, but more significant economic losses occur when the pathogen attacks mature trees in an established orchard. Most orchards affected by Phymatotrichum root rot only suffer loss of a small number of trees. In these orchards, it is best not to replant in spots where trees have died.

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***Figure 1*. Pecan tree killed by *Phymatotrichopsis omnivora*.**

The fungus is limited geographically and occurs only in the southwestern United States and in northern Mexico. Fortunately, even in this geographical area, this fungus is generally limited in distribution and does not readily spread from one location to another. Additionally, it occurs only at elevations below 5,000 ft, which limits its distribution to Southern New Mexico counties, and is typically found in relatively small areas. The fungus is also restricted to alkaline soils with low organic matter. It attacks over 2,300 species of broadleaf plants but does not attack grasses or other monocots. The fungus spreads slowly from plant to plant by growing from an infected plant through the soil to a nearby healthy plant or through root grafting. The fungus does not produce viable spores, and there is no means of air-borne spread.

The fungus is active in the warm season when air temperatures are above 104°F and soil temperatures at 1 foot depth are above 80°F.[1] When environmental conditions are favorable, the pathogen invades plants through their root systems. Infected roots rot and cannot transport water to the above-ground portion of the plant. The first symptom is a slight yellowing of the leaves followed by the leaves quickly turning a bronze color. The tree dies, but the leaves remain firmly attached (Figure 1). In some cases, trees die so quickly that the leaves hardly change color; they will, however, become brittle and dry. When pecan roots are infected, tree death may occur suddenly or more slowly over time, depending on tree maturity and root structure, but the end result is the same.

Additional signs and symptoms include extensive rotting of the roots, the presence of a reddish lesion around the crown of the tree just above the soil line, and fungal strands called rhizomorphs on the roots (Figure 2). A good hand lens or microscope may be needed to confirm the presence of fungal strands on the roots. The fungal strands are made of cruciform shaped hyphae (Figure 3), which are unique to this fungus. As such, confirmation of the disease can be made with microscopic examination of the roots, if rhizomorphs are present on roots of symptomatic trees. Lastly, during warm, wet conditions, a whitish-tan spore mat may develop on the soil near infected trees. These spore mats indicate the presence of the pathogen; however, the spores produced are not viable, and the mats do not lead to infection of healthy trees.

***Figure 2.* Fungal strand of *Phymatotrichopsis omnivora* on a pecan root.**

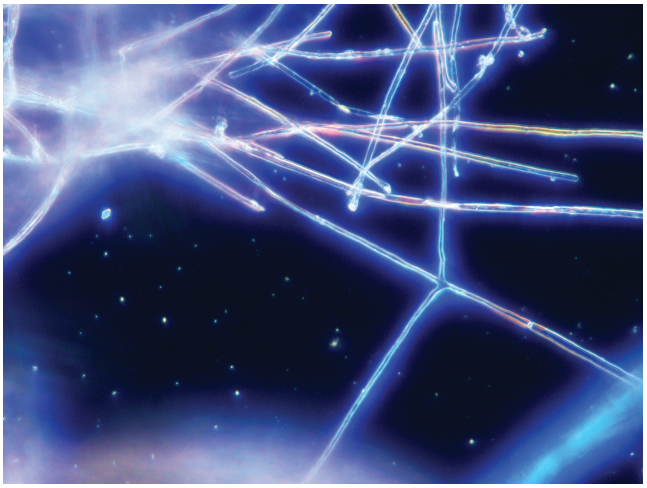

***Figure 3*. Microscopic cruciform hyphae unique to *Phymatotrichopsis omnivora*.**

Research on ways to manage Phymatotrichum root rot has been extensive, yet no effective long-term management methods exist. There are no resistant or tolerant pecan varieties. The best recommendation is to avoid planting pecan orchards in sites known to be infested with the fungus. Old, abandoned cotton or alfalfa fields are risky sites for orchard plantings because the pathogen is likely to be present. Additionally, uncultivated land heavy in mesquite or creosote are poor locations for orchards, as these plants are known to harbor the pathogen without exhibiting symptoms of disease. Currently, and only in New Mexico and Arizona, there is an active FIFRA 2(ee) recommendation until the end of 2027, this allows the use of a fungicide with the active ingredient flutriafol (Rhyme®; FRAC Group 3) within pecan orchards for management of Phymatotrichum root rot.

Cultural practices, such as altering the soil environment so that it does not favor pathogen, has been used in some areas to reduce fungal activity or delay the appearance of disease symptoms. This practice consists of tilling the soil in a broad and relatively shallow basin just beyond the drip line around infected trees. The area is then covered to a depth of 2 inches with manure or similar organic matter. Ammonium sulfate and sulfur are layered on top of the organic matter, each at a rate of 1 lb/10 ft^2. The basin is then immediately flooded with enough water to wet the soil to a depth of 3 ft. This high level of soil moisture must be maintained for several weeks. If trees are treated before permanent wilting, they may recover. Known root rot–infested areas should be treated every year in March or April. The labor and costs involved make this strategy impractical for commercial pecan growers. This practice may reduce the activity of the fungus if it is followed every year; however, the disease will re-occur if the soil returns to its typical state (high pH and low organic matter).

Some success has been achieved in reducing the effect of the disease by growing and incorporating a green manure cover crop over the orchard floor. This helps to stimulate vigorous rooting of the trees, enabling them to better withstand disease pressure. Additionally, the incorporation of the cover crop into the soil may help to stimulate soil microflora, which compete with *P. omnivora*. However, with tillage, care is needed to avoid infection points of entry for other soilborne pathogens through injuries to major roots or the lower trunk by implements.

Pecan Bacterial Leaf Scorch

Pecan bacterial leaf scorch is caused by the bacterium *Xylella fastidiosa*. The bacterium is spread by xylem- feeding insects, such as sharpshooters and spittle bugs, or through infected scions or rootstock. *X. fastidiosa* does occur in New Mexico and causes disease in other hosts, such as peach, chitalpa, oak, sycamore, and grape. The disease was known to occur in pecans in the southeastern United States for many years but was only documented to occur in pecans in the Southwest, including New Mexico, in 2015.[2] Both genetic variability in the pathogen and susceptibility within pecan cultivars may account for the lack of disease symptoms in some pecans.

Pecan bacterial leaf scorch appears during warm summer months when trees' water demands are high. The bacterium invades the xylem vessels and restricts water flow in the trees; as a result, symptoms resemble water stress. Symptoms begin as brown to tan necrotic lesions on the tips or margins of leaflets (Figure 4). As the disease advances, necrotic areas progress inward. Symptoms typically express on a few leaflets on one side of a leaf. Symptomatic leaflets often abscise from the rachis (leaf stem), which can also later abscise from the shoot. Dieback and death of limbs associated with this disease in other hardwood trees has not been found to occur in pecans. The disease results in reduced tree growth and poor nut production. Long-term effects of the disease on trees are unknown. There are currently no control options available for this disease.

Figure 4. **Pecan bacterial leaf scorch (photo by Rebecca A. Melanson, Louisiana State University AgCenter, Bugwood.org).**

Powdery Mildew

This fungal disease, caused by *Erysiphe penicillata*, is of minor importance in New Mexico, but pecan trees may occasionally be affected following periods of high humidity and cool summer nights where airflow through the canopy is restricted. The fungus forms a white powdery growth on the nuts (Figure 5) and, in some cases, may be found on the leaves. The white powdery fungal growth may disappear, but affected nuts will have a brown russet appearance. Nuts may be small and not reach their full size when they are infected early in the growing season, or the shucks may split prematurely and kernels may be shriveled. Powdery mildew typically does not cause significant damage to pecan trees; therefore, treatment for the disease is typically unnecessary.

Figure 5. Powdery mildew on pecan nuts

Crown Gall

Crown gall is a disease caused by the soil-borne bacterium *Agrobacterium tumefaciens*. It occasionally infects pecan trees. The disease appears in many other plant species, encompassing more than 40 plant families. The most common symptom is the presence of wart-like growths or tumors on the roots (Figure 6, left) or, more often, at the base of the trunk near the soil line (Figure 6, right). The galls are usually rounded with irregular, rough surfaces. They vary in size from pea-size to several inches in diameter. Symptoms on infected trees develop slowly over many years, with infected trees exhibiting poor vigor. Infected trees may also fail to produce new leaves and may exhibit dieback. Severely infected trees eventually die.

The bacterium enters plant tissue through wounds caused by cultivation, chewing insects, and nematodes. In young orchards, tillage equipment is frequently responsible for injuries that lead to crown gall infection. The bacterium can be passed from diseased to healthy plants by contaminated grafting and pruning tools. Tools should be sterilized between trees by treating with rubbing alcohol. Growers should also avoid laying tools on the soil. Young trees may also be infected in the nursery, and the bacterium can be carried long distances in nursery stock.

There are no practical management options for plants infected with crown gall. Growers should inspect nursery stock carefully upon arrival and reject any plants with suspicious knots or galls.

Root Parasitic Nematodes

Plant-parasitic nematodes are a diverse group of microscopic roundworms that feed on the roots of susceptible plants. Nematodes usually cause little damage to pecan orchards in New Mexico. One exception is the pecan root-knot nematode (*Meloidogyne partityla*), which can cause moderate to severe root damage resulting in dieback of young branches and tree decline. These canopy symptoms can resemble drought and nutrient deficiency. Damage is worse in years following heavy nut production (Figure 7).

Mouse ear (see Mouse Ear section) symptoms may also be observed due to nickel deficiency caused by disrupted nutrient uptake in nematode-damaged roots. Careful examination of feeder roots from infected trees will reveal small knots or galls produced by pecan root-knot nematodes (Figure 8).

Pecan root-knot nematodes are limited to only pecan, walnut, oak, and hickory and have been detected parasitizing pecan trees in Arizona, New Mexico, Oklahoma, Texas, and several other areas. Regionally, this pest has been found in a small number of orchards in Doña Ana and Chaves counties, Cochise County in Arizona, and El Paso County in Texas.

Damage occurs when the nematode invades young pecan roots using a hollow, spear-like mouthpart called a stylet. Once inside, the parasite transforms root tissue to form specialized feeding sites and galls. The nematode utilizes carbohydrates that would normally be used by developing leaves and nuts. Nematode feeding sites and the associated galls also disrupt root tissue function, interfering with normal water and nutrient uptake. Nematodes begin laying eggs 3 to 4 weeks after plant cell invasion. Each female produces 200 to 500 eggs, and several generations may occur each year. As a result, trees can become heavily colonized very quickly, particularly in sandy soils that favor nematode movement. Nematode populations are largest in early fall and early spring following flushes of new root growth, but galled roots can be observed throughout the year.

Three other root-knot nematodes, the southern (*Meloidogyne incognita*), northern (*M. hapla*), and tropical root-knot nematodes (*M. javanica*), can parasitize weeds or other plants in orchards and can also be recovered from soil samples. Research at New Mexico State University found that New Mexico populations of these species do not reproduce on common pecan rootstocks, so species identification is crucial to determine whether orchards are infested with the pecan root-knot nematode or these other species.

To determine if a tree is infected with pecan root-knot nematodes, a sample of soil and roots should be sent to a lab that performs nematode analyses. Soil and feeder roots (roots about half the diameter of a pencil or smaller) should be collected from several locations 7-12 feet away from a mature tree and from several additional locations closer to the tree's trunk. Reaching feeder roots may require digging about 18 in. deep at each location. Thoroughly mix all the soil and roots sampled from a tree in a bucket. Collect a part of the mixture to fill up a gallon resealable plastic bag (be sure to return the unused part of the soil sample to the

Figure 6. **Crown gall on pecan roots (Clemson University, USDA Cooperative Extension Slide Series, Bugwood.org).**

Figure 7. **Dieback and tree decline caused by root-knot nematode, *Meloidogyne partityla*.**

original sampling spot so as to avoid risk of infesting more pecan trees with root-knot nematodes). The bag of soil and root mixture should be kept at room temperature and away from direct sunlight until it reaches the lab.

The most important consideration with pecan root-knot nematode is to avoid introducing the pest to new pecan-growing areas. Transplanting trees or moving equipment with attached soil from infested orchards to non-infested orchards should be avoided. Pecan transplants should be obtained from nurseries known to be free of this nematode.

Dry fallowing of a pecan root-knot nematode-infested site is not recommended because nematode eggs can survive in unirrigated soils for many years. Irrigation stimulates egg hatch allowing emerged nematodes to starve in the absence of a suitable plant host. Pecan root-knot nematodes that have emerged from eggs cannot survive without a suitable plant host for more than 2 years, so they will only occur where pecans and other suitable plant hosts have recently been grown. Before replanting an orchard site known to be infested with pecan root-knot nematode, plant a non-host crop, such as alfalfa, for at least three years to starve out the pest.

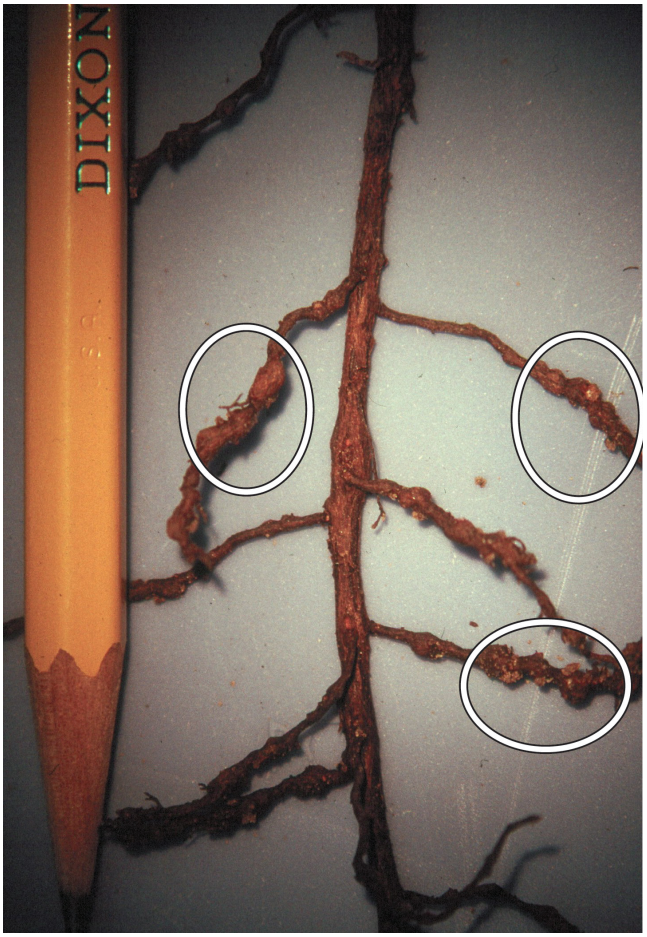

Figure 8. **Galls on pecan roots caused by root-knot nematode.**

There are some nematicides on the market labeled for use in pecan production. For the most effective results, consider timing the application in accordance with the limitations on the nematicide label while also keeping in mind the timing for the highest probability of encountering root-knot nematode juveniles in the soil. Research at New Mexico State University has shown that the presence of root-knot nematode juveniles in the soil fluctuates season-

ally to coincide with the early flush of new root growth in the spring and again in the fall as the trees start to senesce.

Adjusting management practices to minimize stress on trees can greatly reduce damage from the pecan root-knot nematode. Such practices include reducing overall tree size by pruning, managing irrigation and fertilizer applications to avoid moisture stress or excessive nut load, and avoiding orchard floor management practices that result in root wounding. Careful attention to such management practices has allowed some Southwest growers to achieve acceptable production from orchards infested with pecan root-knot nematodes.

DISEASES NOT KNOWN TO OCCUR IN NEW MEXICO

Pecan Scab

Pecan scab, caused by the fungus *Venturia effusa*, is a common and damaging disease in many growing areas of the United States. The disease is favored by frequent rains, high humidity, and temperatures over 70°F. It is not known to occur in New Mexico, where dry growing conditions prevail. If inoculum is present and conditions are favorable for infection, the disease could possibly occur, but in New Mexico's normally dry climate, it would be unlikely to become a recurring problem. Nevertheless, growers should be aware of common symptoms associated with the disease and report any suspected outbreaks to their local Extension personnel.

The fungus infects young, rapidly growing plant tissues and may cause symptoms on leaves, stems, and shucks. The first symptom of the disease is the appearance of small, olive-brown to black, somewhat elongated lesions on infected tissue (Figure 9). As the disease develops, spots may enlarge or coalesce to form black blotches. On nuts, infection begins as small, black spots that become sunken and crusty over time. Shucks of severely infected nuts may be completely blackened by the fungus (Figure 10). Infected nuts may fall or fail to develop. Severe infections may result in a complete loss of the crop. Severe early-season infections may result in defoliation.

DISORDERS AND SYMPTOMS COMMONLY MISTAKEN FOR DISEASES

There are numerous symptoms that regularly occur in New Mexico pecan orchards that can easily be mistaken for disease symptoms but are actually caused by insects or nonliving ("abiotic") factors.

Chlorosis

The term chlorosis refers to a yellowing of leaves. Chlorosis is usually caused by deficiencies in one or more essential mineral nutrients, including nitrogen (N) and iron (Fe).

N-deficient pecan trees exhibit general yellowing throughout the canopy. For N-deficient trees, chlorosis tends to worsen as the season progresses, especially as demand for N spikes during the kernel fill stage in "on"

Figure 9. **Advanced scab infection on pecan leaf (University of Georgia Plant Pathology Archive, University of Georgia, Bugwood.org).**

Figure 10. **Pecan scab infection on pecan shucks (Rudinei De Marco, Bugwood.org)**

(high-yield) years. N deficiency can be corrected over time through soil application of N fertilizers (e.g., urea, ammonium sulfate, UAN 32, etc.). Manures, compost, and N-fixing legume cover crops may also help to supply N. Fe deficiency differs from N deficiency in that the yellowing occurs primarily between the leaf veins, with the veins retaining a green color ("interveinal chlorosis"; Figure 11). Leaves with severe Fe chlorosis may be very light, almost white, in color. Fe chlorosis is most prevalent in pecan orchards with very high soil bicarbonate levels or poorly drained, waterlogged soils. Often, within affected pecan orchards, only a few scattered trees will display Fe deficiency symptoms, and on affected trees the severity of Fe chlorosis typically varies dramatically among branches within a canopy. Fe deficiency is usually very difficult to correct. Foliar applications of Fe fertilizers (e.g., iron sulfate) in the spring may afford some benefit, but soil Fe fertilizer applications have generally proven ineffective or impractical. In pecan orchards where soil waterlogging occurs, Fe chlorosis can sometimes be prevented or corrected by breaking up hardpans or other drainage barriers beneath the soil surface,

mixing clay and sand layers of stratified soils, and avoiding over-irrigation.

Other nutrients may also cause chlorosis in pecan. Leaf tissue nutrient analysis can be used to determine which nutrient is deficient. Additionally, chlorosis may be a symptom of black pecan aphid feeding injury or accidental exposure of pecan trees to certain herbicides (see Black Pecan Aphid and Herbicide Injury sections).

Rosette and Little Leaf

The complex of symptoms known as "rosette" and "little leaf" in pecan is characterized by very short internodes (the portion of stems between nodes or leaves) and small, often chlorotic leaflets with wavy margins (Figure 12).

Figure 11. **Healthy leaf (on top) and leaf exhibiting interveinal chlorosis (on bottom) caused by iron deficiency.**

Figure 12. **Little leaf symptoms caused by zinc deficiency.**

Rosette is a symptom of zinc (Zn) deficiency (Figure 13). Zn deficiency is a widespread problem in New Mexico pecan orchards because Zn is poorly available in New Mexico's alkaline and calcareous soils. However, Zn deficiency may be readily prevented through multiple foliar applications of Zn fertilizers (e.g., Zn sulfate) each spring as the leaves are expanding. Foliar Zn applications should be made before the rosette symptoms arise, because these symptoms cannot be reversed within a given season.

Figure 13. **Rosette and little leaf caused by zinc deficiency.**

Mouse Ear

Mouse ear (Figure 14) is characterized by small, roundish leaflets. This disorder was long thought to be caused by manganese deficiency or freeze injury, but in a USDA-ARS study published in 2004, deficiency in the micronutrient nickel was identified as the cause of mouse ear in pecan. Nickel deficiency may be prevented through foliar application of chelated nickel in spring or fall.

Figure 14. **Mouse ear caused by nickel deficiency.**

Marginal Leaf Burn

Excessive soil salt levels (salinity) are the primary cause for marginal leaf burn in New Mexico pecan trees (Figure 15). Additionally, boron toxicity causes marginal leaf burn symptoms. In a pecan orchard where there is leaf burn, laboratory soil analyses should be used to confirm that symptoms are indeed due to soil salinity. Irrigation water always contains dissolved salts, and even if salt levels in the irrigation water are relatively low, these salts can accumulate in the soil over time, eventually reaching injuri-

ous levels. Orchards with poorly drained clay soils or with physical barriers to water percolation, such as a hardpan layer, are much more prone to salinity issues than orchards with well-drained soils. Since pecan trees are sensitive to soil salts, salinity issues should ideally be addressed before the pecan orchard is planted. Irrigation water and soil from a proposed orchard site should be tested by a laboratory for salt levels, and soils should be evaluated for stratification or physical barriers to water drainage. If irrigation water with acceptable salt levels cannot be practically supplied to the potential orchard site, or if the costs of amending physical drainage barriers at the site are not economically justifiable, then it is best to avoid planting pecans at that site.

Figure 15. **Marginal leaf burn caused by excessive soil salt levels.**

If laboratory soil analyses indicate that salinity problems are developing in an existing orchard, the only way to reduce soil salts is by supplying excess water above the tree irrigation requirement (i.e., a "leaching fraction") to leach salts below the trees' rootzone. The amount of water required to adequately leach the salts out of a saline soil depends on the levels of salts in both the soil and the water. Amendments, such as gypsum, sulfuric acid, and elemental sulfur, can be applied to soils with high sodium salt levels to increase water infiltration and allow greater salt leaching. Lastly, in existing orchards, it may still be possible to amend the underlying soil drainage problems contributing to the salinity issue by breaking up hard pans or mixing layers between the tree rows.

Premature Nut Drop

As the nuts develop during the season, pecan growers often observe three or four waves of premature nut drop. Weak and unpollinated flowers are shed by pecan trees during the first two waves of nut drop, which occur in May and June. Good orchard management practices (e.g., pruning, irrigation, nutrition, and pest control) year after year to minimize tree stresses and proper placement of compatible pollinizer trees may help to reduce crop loss during these early waves of nut drop. The severity of the third ("July drop") and fourth ("August drop") waves can be decreased by providing adequate irrigation and mineral nutrition during the water (liquid endosperm) and kernel fill stages of nut development. Additionally, nuts that have been injured by hail, insects, or animals may also be shed prematurely.

Shuck Necrosis

Various manifestations of shuck tissue necrosis (death) in September and October prior to kernel ripening are a common occurrence in New Mexico pecan orchards. Affected nuts often become "sticktights" (i.e., have tightly adherent shucks, Figure 16) and have poorly filled or absent kernels, which represent significant nut quality concerns in the pecan industry. While the cause for shuck necrosis has not yet been identified, minimizing tree stresses through adequate irrigation, fertilizer, pest control, and pruning seems to reduce the incidence of shuck necrosis.

Figure 16. **Shuck necrosis.**

Water Stage Fruit Split

The nuts of some pecan varieties grown in New Mexico, especially 'Wichita,' can develop lengthwise splits through both the shuck and shell in the middle of the growing season (Figure 17). Affected nuts eventually drop prematurely. Fruit split typically occurs after periods of heavy rainfall and high humidity. There are currently no controls for water stage fruit split.

Figure 17. **Lengthwise split resulting from periods of heavy rain and high humidity (a disorder known as water stage fruit split).**

Premature Germination

When temperatures remain warm late in the autumn after nut ripening is complete, the natural shuck splitting process may be delayed in many of the common New Mexico pecan varieties. The combination of warm temperatures and high humidity inside the closed shuck triggers germination of the pecan kernel, especially when nut load is heavy (Figure 18). Affected nuts are considered inedible. Premature germination is rarely a concern in New Mexico, but in warmer pecan production areas where it occurs more frequently, producers may "green harvest" their pecans before normal shuck split and before kernels have initiated germination. "Green harvest" creates additional processing expense because, unlike the traditional pecan harvest, it requires mechanical removal of the unsplit pecan shucks and drying of the nuts.

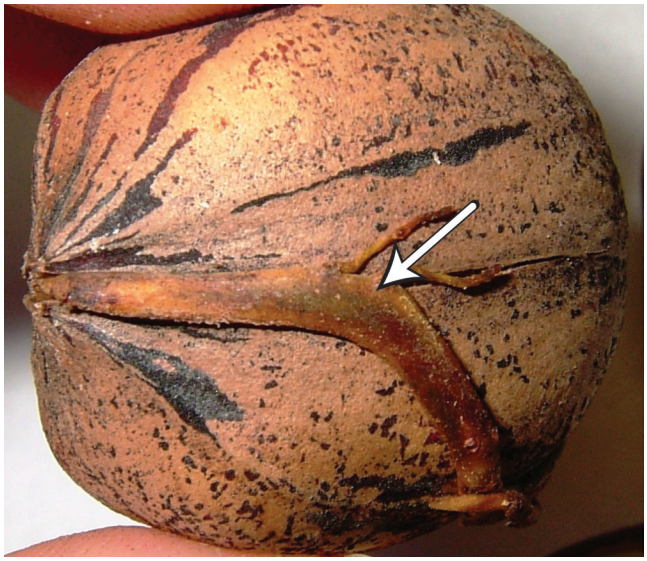

Figure 18. **Premature germination (photo by Richard Ng, former Otero County Extension Agent).**

Freeze Injury and "Southwest Injury"

Occasionally, pecan trees may be injured by cold temperatures, even in southern New Mexico. Late spring and early fall freezes injure or kill actively growing tissues, including shoots, leaves, flowers, and nuts. In midwinter, it requires extremely cold temperatures (≤0°F) to directly injure healthy, fully dormant pecan trees, but thin bark tissues on the south and southwest sides of trees more commonly exhibit "southwest injury" caused by cycling between freezing nighttime temperatures and warm daytime temperatures from intense direct sunlight. "Southwest injury" is characterized by dead bark that flakes away from the south- and southwest-facing parts of the trunk or limbs (Figure 19). Painting exposed limbs and trunks with white water-based paint effectively and inexpensively prevents "southwest injury" by reflecting sunlight during the day.

Figure 19. **Southwest injury.**

Black Pecan Aphid Damage

Feeding by black pecan aphid (*Melanocallis caryaefoliae*) results in the development of chlorotic (yellow) and necrotic (dead; reddish or brown) spots on pecan leaves (Figure 20). Some of the affected leaves may prematurely fall from the tree. Black pecan aphid damage may considerably reduce photosynthetic leaf area, especially during the latter half of the growing season, and, consequently, nut yield and quality may be affected in current and subsequent years. Several insecticides are labeled and registered for use against this pest in New Mexico.

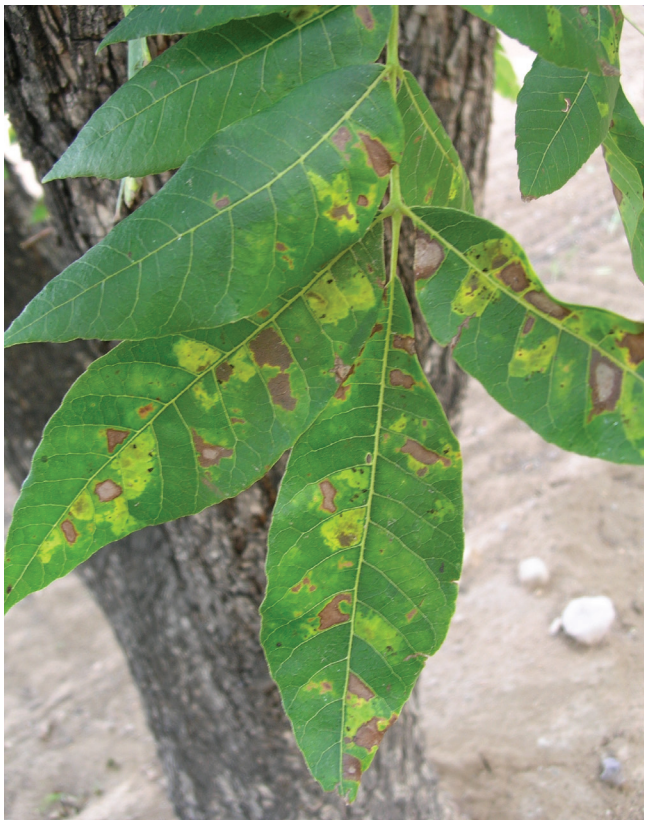

Figure 20. **Symptoms caused by black pecan aphid feeding.**

Figure 21. **Sooty mold.**

Sooty Mold

Sooty mold is a conspicuous black, sooty fungus that may be observed on leaves (Figure 21) and nuts of pecans. This fungus is not pathogenic on plants and can easily be removed by rubbing with a clean cloth. It grows on honeydew produced by sucking insects. The direct damage to plants is minimal; however, severe infestations will reduce the amount of light reaching the leaf surface, thus reducing the production of carbohydrates in the tree. Controlling aphids and other honeydew-producing insects should help to control sooty mold.

Herbicide Injury

Exposure to herbicides applied in or near orchards may result in serious injury or even death of pecan trees. Symptoms of herbicide injury vary depending on the type of herbicide to which the trees are exposed. When applying herbicides, all necessary precautions should be taken to avoid inadvertently exposing sensitive pecan tree tissues. Special care should be taken to use properly shielded sprayers, avoid herbicide application on windy days, and use only herbicide rates and timings directed by the herbicide label.

SUBMISSION OF PLANT SPECIMENS FOR DISEASE DIAGNOSIS

The New Mexico State University Plant Diagnostic Clinic provides diagnostic services to clientele in New Mexico, including identification of plant diseases, nematodes, abiotic disorders, arthropods, and weeds. Instructions for submitting plant samples to the clinic can be found in NMSU Extension guide A-154, Collecting and Submitting Plant Specimens for Disease Identification and Diagnosis through the New Mexico State University Plant Diagnostic Clinic and on the New Mexico State University Plant Diagnostic Clinic website (http:// plantclinic.nmsu.edu). Growers who wish to use the clinic are advised to contact their local county Extension agent for assistance.

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