2017 Peanut Production Guide Disease Section

Diseases and Nematodes: Basic training to protect your peanut crop

The importance of disease and nematode management:

Losses to and protection from diseases and nematodes cost peanut growers in Georgia millions of dollars every year. Management of diseases and nematodes is one of the most important, and also one of the most costly, aspects of peanut production.

In this section, succinct information will be provided on the diseases and nematodes likely to be found in the peanut fields of Georgia, as well as on several "disease-like" symptoms. For each disease, practical information will be presented on the following topics:

Factors that increase the risk to disease outbreaks.

The "disease triangle" is a conceptual model often used to describe the development of disease. The disease triangle is made up of three parts. These include disease-causing pathogens, a susceptible host and a favorable environment. Disease develops when each of factors is present; diseases are managed by disrupting or minimizing one or more legs of the triangle.

In the case of peanut diseases, the "pathogens" are those organisms, typically fungi, which cause the disease. The "host" is the peanut plant and a "favorable environment" is one that is conducive for the development and spread for disease. For many diseases affecting peanut, warm and wet weather is most conducive to the spread of disease. Based upon environmental conditions during the season, growers can anticipate diseases that are likely to be of increased concern.

A. Cooler and wetter conditions at planting and early in the season increase the risk for seedling diseases, as caused by *Rhizoctonia solani*, and may also increase to Cylindrocladium black rot (CBR). Early-season infection for CBR is favored by cool, wet conditions; symptoms of the disease typically occur later in the season.
B. Hotter conditions and warmer soils early in the season can increase the risk to white mold; *Sclerotium rolfsii*, causal organism of white mold (southern stem rot), becomes active under such conditions. Hotter and drier conditions also favor outbreaks of Aspergillus crown rot. Hot soils, especially without rainfall of irrigation, can damage the young taproot and predispose the injured plant to the crown rot disease.
C. Abundant moisture during the growing season predisposes the crop to fungal diseases, especially leaf spot diseases. Abundant rainfall not only provides the moisture needed for infection, growth and spread of disease, but it also may delay the application of timely fungicide applications which adds to the difficulty in managing disease.
D. Hot and dry conditions during a growing season typically reduce the threat to leaf spot diseases, but increase risk to white mold, especially in non-irrigated fields. During warm conditions, white mold disease may be more problematic. Under dry conditions, the disease is likely to be more problematic just below the soil surface where moisture allows the fungus to attack the pods and

pegs. Not only is this "underground" white mold difficult to detect, but it is also difficult to manage as it is difficult for the fungicide to reach the target area.

Strategies for management of the diseases that include:

"**AVOIDANCE**" includes decisions in peanut production that allow growers to reduce exposure of the crop to disease causing organisms and the environmental conditions that favor development and spread of diseases. Factors that help growers to "avoid" diseases include:

1. Planting dates: As per Peanut Rx, earlier planting dates reduce risk to leaf spot diseases; planting dates in early May reduce risk to tomato spotted wilt.

2. Conditions at planting: Planting seed into warm soils with adequate moisture often result in rapid germination, uniform emergence and vigorous growth. Such reduces risk to Rhizoctonia seedling disease and also to tomato spotted wilt.

   However, planting into very hot and dry soils increases risk to Aspergillus crown rot and perhaps white mold (southern stem rot). Planting into cool and wet soils increases risk to Rhizoctonia seedling disease and to Cylindrocladium black rot (CBR).

"**To REDUCE populations of pathogens**" is an effective strategy to reduce the disease severity of disease in a field. Fungal pathogens often survive in the soil or in the peanut debris (stems, leaves, pods, roots, etc.) remaining in the field after harvest. Tactics to reduce the amount of survival over time include:

1. Rotation with a non-host crop. By increasing the interval between peanut crops in a field (and crops that are susceptible to the same diseases) growers ca n reduce the impact of diseases and nematodes and also the reliance on chemical control methods. Note: Winter cover crops do not count as "rotation" crops for reducing nematode populations, though they will have other benefits in crop production.

   It is recommended that peanuts be planted not more than once in field over a three-year period; increasing rotation to where peanuts are planted in a field on even longer intervals is of increased benefit to protecting the crop from diseases and nematodes. Planting peanuts in the same field more than once in three years is not recommended. That is, growers should have two years between each peanut crop.

   Rotation crops:

   A. Bahiagrass is an excellent rotation partner with peanut as the crops do not share pathogens or the peanut root-knot nematode (*Meloidogyne arenaria*). Bahiagrass is one of the very best crops to rotate with peanut. Note that bahiagrass and peanut are both hosts to the lesion nematode (*Pratelynchus* spp.), though this nematode is typically not a problem for peanut growers.

B. Corn is also an excellent crop for rotation with peanut and does not share any of the same diseases, though it is a host for the peanut root-knot nematode. Nonetheless, it is a very good crop to rotate with peanut.
C. Cotton is a good host to rotate with cotton. Both crops are affected by seedling diseases caused by the fungus *Rhizoctonia solani*, but that is typically the only disease they share in common. Cotton and peanut are generally not susceptible to the same nematodes, though there is concern that the sting nematode (Belonolaimus sp.) which is a important concern for the cotton crop could, in some situations, affect the peanut crop.
D. Soybean is generally not considered to be a good rotation crop with peanut. Though soybean is not a host for peanut leaf spot diseases , it is susceptible CBR, peanut root-knot nematodes (unless a resistant variety is planted) and to some extent, Rhizoctonia disease and southern stem rot (white mold). Note: Legumes (bean crops) are not recommended for rotation because they are likely to share similar diseases with peanut, also a legume crop.)
E. For questions regarding rotation with other crops, please contact your local UGA Extension agent.

2. Tillage and residue management are tactics that can be helpful in reducing pre-season levels of some pathogens.
    a. Many fungal pathogens can survive in crop debris, for example *Rhizoctonia solani*. Burying the debris helps in the decomposition of the debris and hence reduced the
    b. Conservation/reduced tillage advantages,,,

RESISTANCE and RESISTANT VARIETIES can be very effective ways to minimize both the impact of disease and the use of chemical control measures. Both of these factors can make the crop more profitable by a) increasing yields and b) lowering the cost of production. Also, resistant varieties can be especially important when chemical control and other production tactics are limited for management, as in the case of tomato spotted wilt. In some instances, as in the case of root-knot nematode varieties, use of resistant varieties will not only protect the crop for this season, but will also help to reduce nematode populations for future crops.

Partial resistance, tolerance and immunity are all terms that may be used when describing varieties that are used in the management of diseases and nematodes. “Immunity” indicates that the variety will not be affected by the disease or nematode at all; immunity is not common. However, our current root-knot nematode varieties are “nearly immune”. “Partially resistant” varieties are not immune to a disease; however they are less affected by disease than are other “susceptible” varieties. Disease development on partially resistant varieties is likely to be delayed from that on susceptible varieties and is typically not as severe. In terms of fungal diseases, such as leaf spot diseases, white mold and Rhizoctonia limb rot, “partially resistant” varieties may require lower fungicide usage to maintain disease control and protect yield. Highly root-knot-nematode resistant varieties also have the

advantage over susceptible varieties in that they greatly inhibit nematode reproduction and reduce nematode populations in the soil.

1. Plant breeders have been able to develop varieties with improved resistance to leaf spot diseases and white mold. The specific (and practical) benefits of this resistance can be found in the latest version of Peanut Rx. Growers who plant these more-resistant varieties will have less threat from disease and may have the opportunity to reduce the use of fungicides.
2. When planted in fields where diseases or nematodes are not a problem (often because of excellent crop rotation), resistant varieties may not yield as well as our best, susceptible varieties. However, the true value of our resistant varieties is measured when they are planted in fields with increased nematode populations of with higher risk to disease.

Protection from diseases with fungicides is a critical component of production for the majority of peanut growers in Georgia. Deploying a fungicide program can be quite frustrating for growers for at least four different reasons. First, an effective fungicide program must control a number of different diseases, most notably late leaf spot, early leaf spot and white mold (stem rot). Second, fungicides are applied throughout the entire season and timing of multiple applications can be confusing. Third, peanut growers have an ever expanding arsenal of fungicides from which to choose. Growers must make decisions based on efficacy and cost. Lastly, fungicide resistance management is important for the long-term efficacy of the classes of chemistries. nnnnnnnnnn

Common questions associated with fungicide programs:

What are the components of a fungicide program? Growers need to consider protecting their crop with fungicides during three different phases of the growing season.

1. **At-plant options:** Planting high quality seed is an important consideration for achieving a good stand and for protecting the seed and young plants for disease. A fungicide seed-treatment is essential to getting a good stand of peanuts and to protect the seed and seedlings from diseases like Aspergillus crown rot and others caused by *Rhizoctonia solani* and other fungal pathogens. Commercial seed will come pre-treated; growers who are using farmer-saved seed should insure that their seed is treated with an effective fungicide package by a reputable seed treater. Poor stands due to seedling diseases also impact the risk for Tomato spotted wilt disease.

   Growers can also use in-furrow fungicides, such as azoxystrobin, to compliment fungicide seed treatments for control of seedling diseases. Complimenting a seed-treatment with an in-furrow fungicide application is generally not needed where quality seeds are planted. However, where the quality of the seed is questionable, or where farmer-saved-seed is planted, use of the seed treatment and the in-furrow fungicide may beneficial.

In-furrow fungicides may also be used to protect the peanut crop against Cylindrocladium black rot (CBR) and early-season outbreaks of white mold (stem rot). In-furrow fungicide applications of some materials may also provide early benefits for leaf spot control as well.

2. All peanut growers must protect their crop from leaf spot diseases and, occasionally, peanut rust. Fungicide programs for leaf spot diseases typically begin approximately 30 days after planting; however with improved fungicides and the development of Peanut Rx and the ability to assess risk in a field, fungicide programs for management of leaf spot can be initiated as late as 45 days after planting. The peanut crop should be protected against leaf spot diseases throughout the growing season. Fungicides are typically applied on a 14-day interval. Where risk to leaf spot is high, for example in fields with short rotations, where a susceptible variety is planted, where extended periods of rain are in the forecast, or where peanut rust is found, growers may tighten this interval to 10-12 days. Where growers follow Peanut Rx and assess their field to be "low" or "moderate" risk, or during extended periods of dry weather, grower can extend the application interval beyond 14 days, sometimes to as much as 21-28 days.

   To protect against leaf spot diseases, growers have a number of fungicides that can be used. The most commonly used fungicide for peanut farmer is chlorothalonil, which is sold under of brands, most notably "Bravo". Clhorothalonil is a protectant fungicide that needs to be applied before leaf spot diseases occur in a field. Once leaf spot diseases occur in a field, or in anticipation for disease, grower may choose to use "systemic" fungicides which have limited "curative" activity. "Systemic" fungicides have the ability to move to some degree within the plant and to help "cure" very recent infections. However, systemic fungicides will not be able to eliminate older, well-established infections, such as when leaf spots are clearly evident,

   Full-season fungicide programs include a number of applications for management of soilborne diseases like white mold (stem rot) and Rhizoctonia limb rot. Growers often focus on the "white mold" control from these fungicides; however they should also insure that leaf spot management is considered in every application.

3. Growers must also protect their crop from soilborne diseases, to include white mold (stem rot) and Rhizoctonia limb rot. Typically white mold (stem rot) and Rhizoctonia limb rot become problematic when the peanut canopy of leaves becomes dense and traps moisture and humidity, thus creating near-perfect conditions for infection and development of disease. While the peanuts are still small, these diseases are less likely to be problematic because without the canopy of foliage and the peanut limbs resting along the moist soil, the fungal pathogens are less likely to cause disease.

Historically, fungicide programs for management of white mold and Rhizoctonia limb rot in Georgia have been initiated approximately 60 days after planting and continued over the next six to possibly eight weeks.

How late should fungicide applications continue?

Growers often request advice on adjusting digging dates based upon disease in the field. Generally, it is best to wait until harvest maturity is reached in order to assure maximum grade, rather than digging the peanuts early. For example, though tomato spotted wilt may be severe in a field, I recommend waiting until harvest maturity to dig the peanuts. However, where defoliation from leaf spot is severe, then it is worth considering digging earlier. Where white mold is severe, for example greater than 50% incidence, the grower should consider if digging early is appropriate. Significant defoliation from leaf spot diseases and severe outbreaks of white mold can increase digging losses by weakening peg-strength.

NOTE: A critical consideration late in the season is that pre-harvest intervals (PHI) vary with the choice of fungicides. For example, Alto has a 30-day PHI, and Convoy has a 40-day PHI, compared to 14-day PHI for other fungicides. Growers must always check the label to make sure on all of these.

Below are some typical situations that peanut growers may find themselves in and suggestions for control:

Grower is 4 or more weeks away from harvest and currently has excellent disease control.

Suggestion – I recommend the grower apply at least one more fungicide at least for leaf spot control.

Suggestion – Given the low cost of tebuconazole, the grower may consider applying a tank-mix of tebuconazole + chlorothalonil for added insurance of white mold and leaf spot.

NOTE 1: If white mold is not an issue, then the grower should stick with a leaf spot spray only.

Note 2: If grower has planted Georgia-06G or Georgia-12Y and the plants are leaf spot-free at 4 weeks prior to the anticipated digging date, an additional fungicide application for leaf spot may not be needed if grower is willing to watch/scout the field for other disease, for example peanut rust.

Grower is 4 or more weeks away from harvest and has disease problems in the field.

If the problem is with leaf spot – Grower should insure that any fungicide applied has systemic/curative activity. If a grower wants to use chlorothalonil, then they would mix a product like thiophanate methyl (Topsin M) or cyproconazole (Alto), with the chlorothalonil. Others may consider applying Priaxor, if they have not already applied Priaxor twice earlier in the season.

If the problem is white mold – Grower should continue with fungicide applications for management of white mold. If they have completed their regular white mold program, then they should extend the program, perhaps with a tebuconazole/chlorothalonil mix. If the grower is unhappy with the level of control from their fungicide program, then we can offer alternative fungicides to apply.

If the problem is underground white mold – Underground white mold is difficult to control. Applying a white mold fungicide ahead of irrigation or rain, or applying at night, can help to increase management of this disease.

Grower is 3 or less weeks away from projected harvest and does not currently have a disease issue. Good news! This grower should be good-to-go for the remainder of the season and no more fungicides are required. **SEE NOTE BELOW ABOUT HURRICANES**

Grower is 3 or less weeks away from harvest and has a problem with disease.

If leaf spot is a problem and 2-3 weeks away from harvest, a last leaf spot fungicide application may be beneficial. If leaf spot is too severe, then a last application will not help. Tank mixing chlorothalonil with a systemic fungicide, like thiophanate methyl or other appropriate systemic fungicide, could be beneficial.

If white mold is a problem and harvest is 3 weeks away, then it is likely beneficial to apply a final white mold fungicide. If harvest is 2 weeks or less away, then it is unlikely that a fungicide will be of any benefit.

NOTE: If harvest is likely to be delayed by threat from a hurricane or tropical storm, then the grower may reconsider recommendations for end-of-season fungicide applications.

How often should fungicides be applied? Historically, fungicide programs were initiated approximately 30 days after planting and continued on a 14-day interval, typically concluding after a total of seven applications. However, with the development of Peanut Rx and prescription fungicide programs, the recommended interval between fungicide intervals can vary between 14 days, for higher risk, and 21-28 days for lower-risk fields. Additionally, where conditions are favorable for disease, or where disease is present in the field, growers may be encouraged to shorten the interval between applications to 10-12 days.

Resistance management includes efforts made in developing fungicide programs to protect the longevity of a fungicide or a class of fungicides in order to protect their efficacy and usefulness over time.

Fungicides are an important tool for the management of many diseases affecting the peanut crop. To obtain the greatest benefits from a fungicide, growers must not only decide which is the best fungicide to use, but also the most appropriate and effective application strategies. Use of the "wrong" fungicide impacts diseases control. Improper application will also reduce efficacy of the product no matter which is selected.

Classes of fungicides: Fungicides are grouped together into "classes" based upon the way in which they affect fungal pathogens, also known as "mode of action". All fungicides within the same class affect the pathogen in the same way. Growers can find the "FRAC Code" on the front page of the pesticide label. ("FRAC" stand for "Fungicide Resistance Action Committee".) All fungicides with the same "FRAC Code" belong to the same family and have the same mode of action.

Understanding the "FRAC Code" and classes of fungicides is important to peanut farmers for two reasons. First, in selecting a fungicide, growers are able to determine if two products are closely related, or not. This is important when deciding best fungicide to use, especially if a grower is trying to find a "better" product. Second, in order to minimize the risk of fungicide resistance and to extend the useful life of a fungicide, it is important to avoid over use of any single class of chemistries.

Protectants versus systemic fungicides: Growers should recognize that fungicides are largely divided in to two groups, the protectant fungicides and the systemic fungicides. Protectant fungicides, most notably chlorotahlonil, must be applied BEFORE infection has occurred, as they do not enter the plant. Systemic fungicides are able to enter the plant tissue to some degree and therefore may has some limited "curative" activity.

Strategies for Application: In addition to selecting the "best" fungicide, peanut growers must also apply the fungicides correctly in order to achieve maximum control of disease. Two of the most important considerations for growers are to protect the plants before disease is established in the field and to insure the fungicide reaches the intended target. Getting good coverage of the leaves is fairly easy; however reaching the crown and limbs of the plants and even the pegs and pods is much more difficult. The dense canopy of foliage make it more difficult to get coverage of these parts.

Below are some of the factors that can affect the performance of a fungicide program.

Pressure: Increasing spray pressure at time of application is one tactic deployed to try and get better penetration of the leaf canopy and coverage of the crown and limbs of the plants, thus protecting them from soilborne diseases.

Spray Tips: There are a number of different spray tips that are used by farmers when protecting their peanut crop from diseases, insects and weeds. While there may be some small differences in control of diseases based upon choice of spray tips, these differences are likely dwarfed by other factors to include timing of application, time to an irrigation or rainfall event, and spray volume.

Volume: The general thought is that an increased spray volume also increases the coverage of the fungicide application and also increases the amount of fungicide that penetrates the canopy of the plant, thus protecting against soilborne diseases. However, increasing spray volume may also increase the amount of time and the amount of water needed to treat a field. In general, fungicide applications by ground-driven equipment should not be less than 10-12 gal/A. Aerial applications should be at what volume can be negotiated with the pilot.

Speed: Growers are pressed to cover ground as quickly as possible when spraying a field. However, it is likely that in travelling to fast across a field, effective coverage with a fungicide is significantly reduced as the spray booms bounce and sway. Growers are likely to improve coverage and disease control if they can reduce their speed as they travel through the field.

Aerial vs ground application: Many growers ask for a comparison of disease control when a peanut field is sprayed using ground-driven equipment versus an airplane. Though data is lacking, it is generally believed that spraying a field with ground-driven equipment is advantageous because of a) increased pressure, b) increased spray volume and c) potential for reduced drift. Aerial applications have three applications of ground equipment. First, fields can be sprayed using an airplane at times when it would be impossible to get a tractor in the field. Second, a plane may be able to spry a field more quickly than would be possible with a tractor, should the need arrive. Third, applying a fungicide by air eliminates the need to damage vines as a tractor moves through the field; damaged vines increase risk to diseases like white mold.

Timing: In addition to selection of fungicide, the timing of a fungicide application is critical for the success of a fungicide program. Application of a fungicide too early is likely to add to production costs while resulting in little, if any, yield increases. Applying a fungicide to late, for example once disease is established in a field, may result lost ability to control the disease and also lost yields. Growers get best results if fungicides are applied ahead of disease. Once disease is established, control becomes much more difficult, if not impossible. Timing of applications should be based upon time since last fungicide application, scouting observations and weather conditions that are more favorable or less favorable to disease development and spread.

Irrigation and rainfall events: Water in the form of irrigation or rainfall can play a significant role in the efficacy of a fungicide program in several different ways. For example, during periods of abundant rainfall, diseases tend to be more severe while during period of drought, fungal disease tend be to be less severe. However, white mold, in particular “underground white mold”, can actually be more sever in non-irrigated fields during periods of extended dry weather.

Fungicides are typically applied to the upper canopy of the plant; however redistribution to the crown of the plant is important for the management of soilborne diseases such as white mold and Rhizoctonia limb rot. An effective way to move a fungicide from the leaves of the plant to the crown of the plant is through rainfall or irrigation. Optimal timing of such is somewhere between 8 and 24 hours after the fungicide is applied. Applying the fungicide too early will still be beneficial for control of soilborne diseases but may reduce efficacy of control of leaf spot diseases. Irrigation or rainfall beyond 24 hours will likely result in reduced benefit for redistribution of fungicides and disease management. Note: Irrigation of 0.1-0.25 in/A should be enough to assure sufficient redistribution of the fungicide.

Night-time versus day-time applications: as mentioned above, one of the difficulties in managing soilborne diseases is to redistribute the fungicide from the leaves to the crown and limbs of the plants. When fungicide applications are made during the day, the leaves of the peanut plant are fully expanded and intercept much of the spray. However the leaves of the peanut plant fold up at night, thus exposing the crown and limbs of the plant to direct fungicide deposition. Fungicides sprayed at night typically provide better control of white mold than do the same fungicides sprayed during the day. Growers often ask, “When at night is the best time to apply the fungicide?” In truth, the most important consideration is that it is dark enough that the leaves are folded. However, there may be a slight benefit to spraying in the early morning when the leaves are folded and dew has fallen, thus

wetting the leaves and further assisting in redistribution of the fungicide. Growers are rightfully concerned about the impact of spraying fungicides at night on control of leaf spot diseases as only the underside of the leaf is exposed. Leaf spot control is not a problem so long as the fungicide has some systemic activity and is able to enter the leaf tissue. If a protectant fungicide like chlorothalonil is applied, then it advisable to tank-mix and additional systemic fungicide for enhanced leaf spot control.

IN-furrow fungicide treatments and seed treatments: Seed-treatment fungicides are most commonly used to protect the seeds and young seedlings from seed rot and seedling diseases. Vigorous germination and growth is important not only to achieve a good stand but also to reduce risk to Tomato spotted wilt disease. Generally, the seed treatments are highly effective to control seedling diseases like Aspergillus crown rot and Rhizoctonia seedling blight. However, there are times, for example when environmental conditions are favorable for seeding disease of the quality of the seed is in question, that growers may choose to enhance seedling disease control by applying an in-furrow fungicide. In rare instances where seed it to be planted without a fungicide seed treatment, use of an in-furrow fungicide is essential to protect young plants and maintain stand.

Historically, in-furrow fungicides have been used to improve stand and to protect seed and young plants from diseases. Recently, however, in-furrow fungicides are now used to assist in the management of Cylindrocladium black rot (CBR) and white mold. In-furrow applications of Proline fungicide is a standard treatment for management of CBR. In-furow applications of some fungicides, to include Proline, are now used to provide early-season control of white mold. Though the "critical" timing for protecting the peanut crop from white mold with foliar-applied fungicides begins approximately 60 says after planting, during unusually warm planting seasons white mold may become active in the field very early in the season. In-furrow fungicides of the appropriate fungicides can reduce impact of early-season white mold.

Banded applications: As mentioned above, when weather conditions are unusually warm during planting and the early part of the season, starting a white mold/soilborne program within the first five weeks can be beneficial. Though some fungicides may be "broadcast" applied, the most effective applications are made by applying the full broadcast rate in a narrow band over the small plants. To date, the greatest amount of data has been collected for Proline. A single banded application is recommended sometime between the second and fifth week after planting where conditions are favorable for development of white mold. This application is also effective for initiating a leaf spot program as well.

Resistance management: Many of the most important and effective fungicides used today in peanut production are at significant risk for resistance. When resistance develops, fungicides that were once effective in disease management become less effective and, perhaps, ineffective. Steps that growers can take to reduce the risk of fungicide resistance include applying the fungicides in a timely manner to slow the development of disease and to use fungicides at labeled, rather than reduced rates. As mentioned earlier, the "FRAC Code" found on the front page of each fungicide label identifies the chemical class of the fungicide. Growers should insure that they do not overuse fungicides from a given class. Overuse increases the risk for development of resistance.

PEANUT RX: Risk in a field to tomato spotted wilt, leaf spot and white mold can be measured based upon a number of factors to include the variety planted, planting date, crop rotation, tillage, plant population, use of in-furrow insecticides, and field history. Using Peanut Rx, growers can modify their production practices to reduce risk in the field. For fungal diseases, growers have the opportunity to use "prescription" fungicide programs. Fields found to be "low risk" can be effectively treated with a reduced fungicide program as compared to a "moderate risk" or "high risk" field without compromising yield. The risk points in Peanut Rx are updated yearly.

Diseases and Specific Recommendations

Diseases caused by viruses:

Disease; Tomato Spotted Wilt

Symptoms: Plants affected by tomato spotted wilt are often stunted and leaves demonstrate characteristic rings and mottled patterns.

Causal Organism: Tomato spotted wilt virus (TSWV) which is spread (v ectored) by infected thrips, typically rhe tobacco thrips and the western flower thrips.

Factors influencing increased risk: See Peanut Rx for a complete list of risk factors.

Management tactics: Follow management tactics outlined in Peanut Rx.

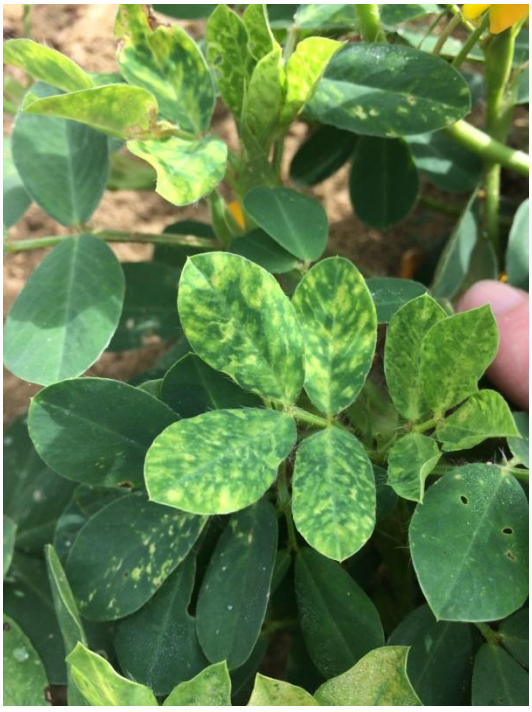


Figure 1. Typical symptoms of tomato spotted wilt.

Diseases Caused by Fungi:

Disease: Early leaf spot

Diagnostic Symptoms: Tan to dark brown spots developing first in the interior of the canopy. Spores, sometimes difficult to see without a hand lens, are found on the top of the leaf.

Causal Organism: *Cercospora arachidicola*

Factors influencing increased risk: Peanut planted too often in the same field, frequent rain events and high humidity. See Peanut Rx.

Management tactics: Cop rotation, resistant varieties, judicious use of fungicides. See Peanut Rx.

Figure 2. Early leaf spot, note sporulation on top of leaf.

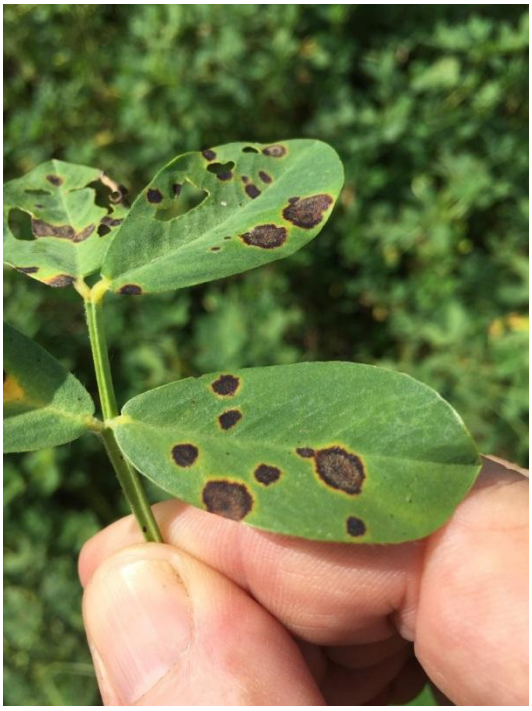


Figure 3. Early leaf spot, note sporulation on top of leaf.

Disease: Late leaf spot

Diagnostic Symptoms: Dark brown to black spots developing first in the interior of the canopy. Many dark spores are typically visible on the underside of the leaf..

Causal Organism: *Cercospordium personatum*

Factors influencing increased risk: Peanut planted too often in the same field, frequent rain events and high humidity. See Peanut Rx.

Management tactics: Cop rotation, resistant varieties, judicious use of fungicides. See Peanut Rx.

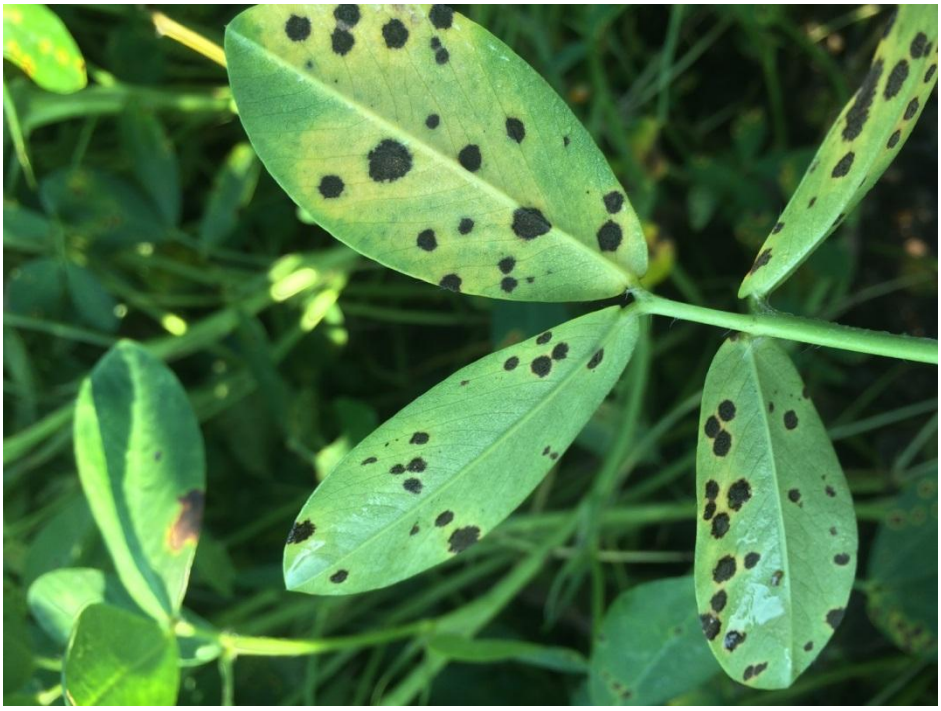


Figure 4. Late leaf spot, not dark sporulation on the underside of the leaflets.

Figure 5. Late leaf, note the yellow halos around the dark spots. Though yellow halos are more commonly observed on spots caused by early leaf spot, they can occur with late lead spot as well.

Characteristics important for identification of leaf spot diseases. Both of these diseases form spots that are typically found on the leaves in the interior of the canopy. While symptoms can be variable,

spots resulting from “early leaf spot” tend to be dark brown and often, but not always, encircled by a yellow “halo”. The most critical symptom is the presence of small, fine spores on the UPPER side of the leaf. These spores can be very difficult to see without magnification and are not always present, especially during periods of dry weather.

Spots associated with “late leaf spot” are typically a darker, chocolate brown and are only rarely encircled by a halo. A thick carpet of spores is typically found on the UNDERSIDE of the leaf.

Note: Symptoms that may be confused with early and late leaf spot diseases: Phytoxicity from use of Thimet/Phorate: Numerous spots are frequently observed near the leaf tips/margins after Thimet and other products containing the active ingredient phorate is used in-furrow at plant. Leaves may also yellow and drop; plants typically outgrow this damage quickly. No control measures are needed in response to these symptoms.

Disease: Peanut rust

Diagnostic Symptoms: small brown and orange pustules on the underside of the leaf. Leaves severely affected by rust die, but do not fall from the plant as they do with leaf spot diseases.

Causal Organism: *Puccinia arachidis*

Factors influencing increased risk: Peanut rust typically appears late in the season, often after tropical storms and hurricanes.

Management tactics: A good fungicide program is essential to protect a peanut crop from peanut rust. Once rust is established in a field, growers are encouraged to shorten the interval between fungicide applications to 10-12 days.

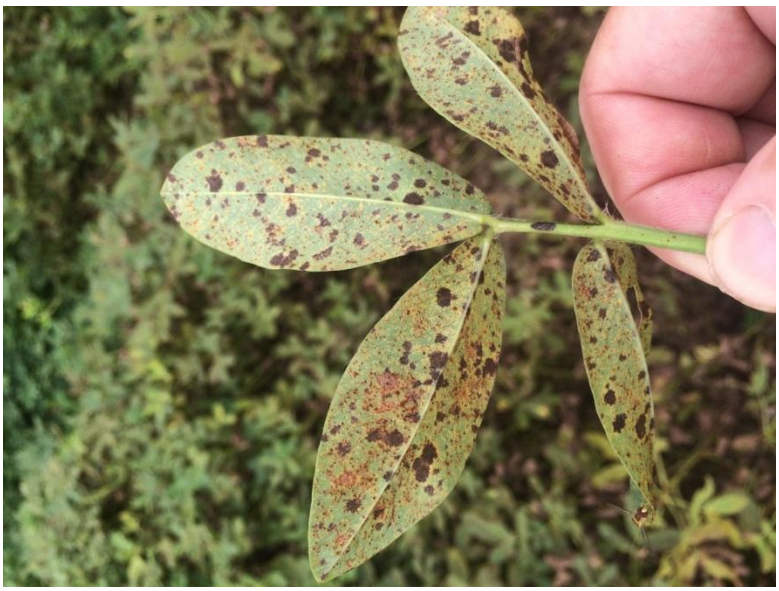


Figure 6. Peanut rust pustules (orange) and late leaf spot on the underside of a peanut leaf.

Disease: Aspergillus Crown Rot

Diagnostic Symptoms: Typically seedlings and young plants wilting suddenly and dying.

Causal Organism: *Aspergillus niger*

Factors influencing increased risk:

Management tactics:

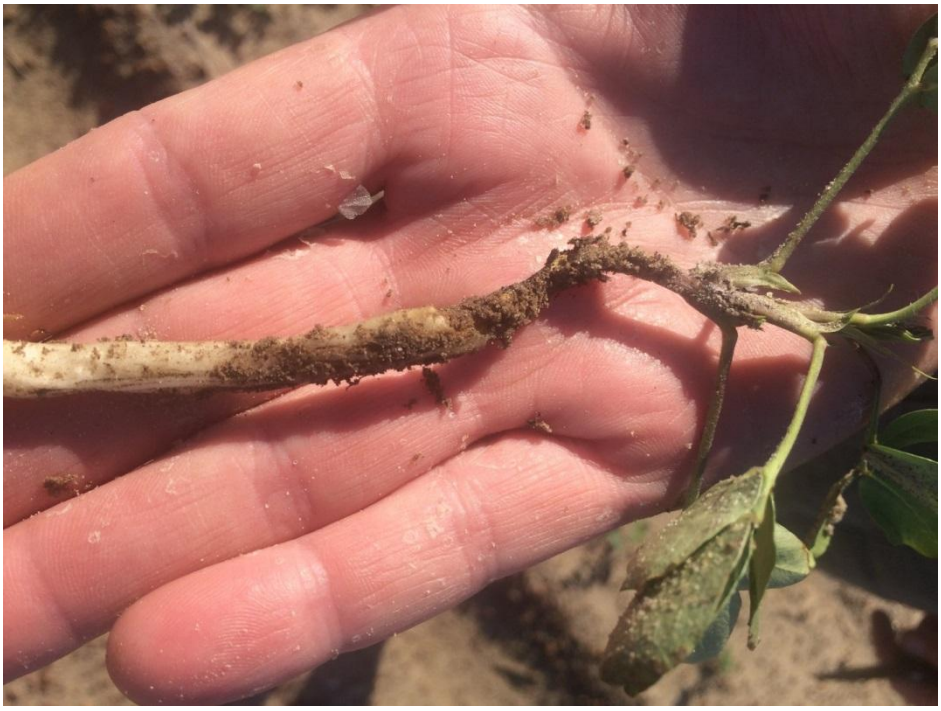


Figure 7. Aspergillus crown rot.

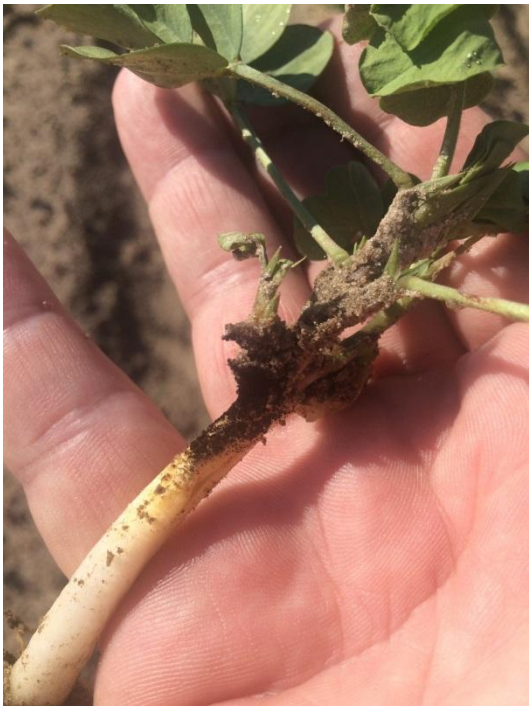


Figure 8. Aspergillus crown rot.

Figure 9. Aspergillus crown rot.

Disease: White Mold (southern stem rot)

Diagnostic Symptoms:

Causal Organism: Factors influencing increased risk:

Management tactics:

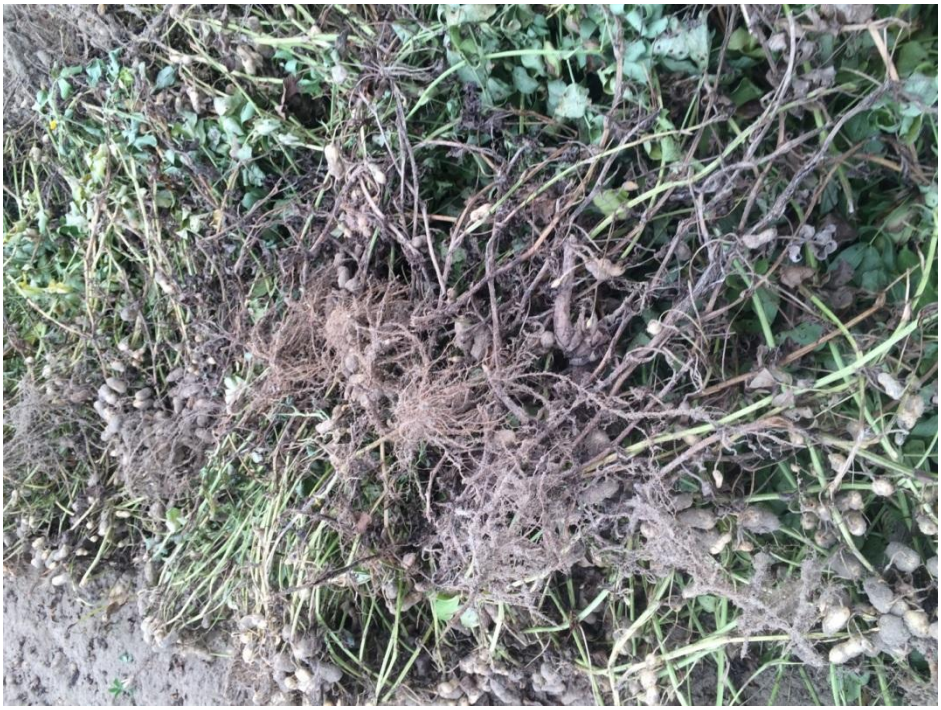


Figure 10. White mold (southern stem rot)

Figure 11. White mold (southern stem rot)

Disease: Leaf scorch

Diagnostic Symptoms:

Causal Organism*: Leptosphaerulina crassiassca*

Factors influencing increased risk:

Management tactics:

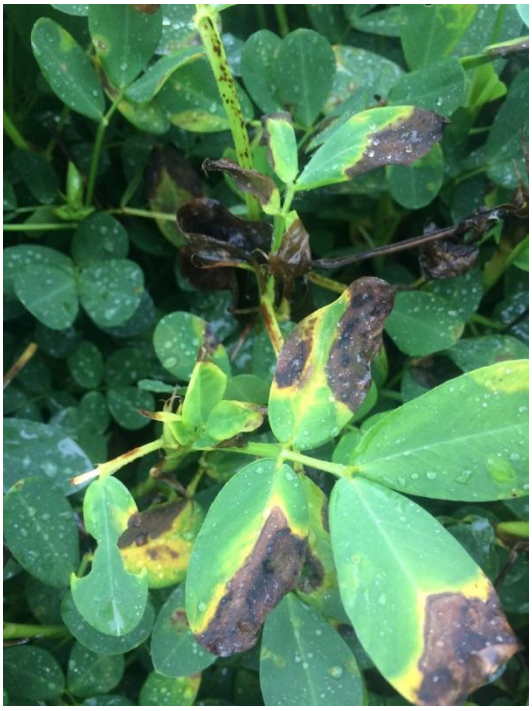


Figure 12. Leaf scorch

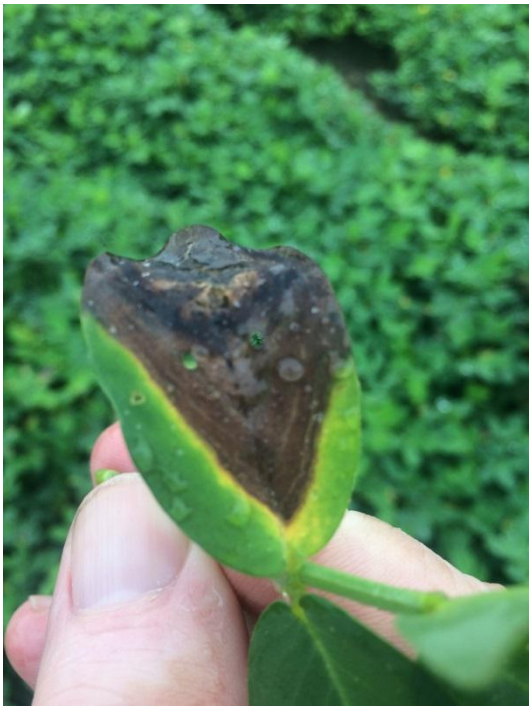


Figure 13. Leaf scorch

Disease: Cylindrocladium Black Rot

Diagnostic Symptoms:

Causal Organism: *Cylindrocladium parasiticum*

Factors influencing increased risk:

Management tactics:

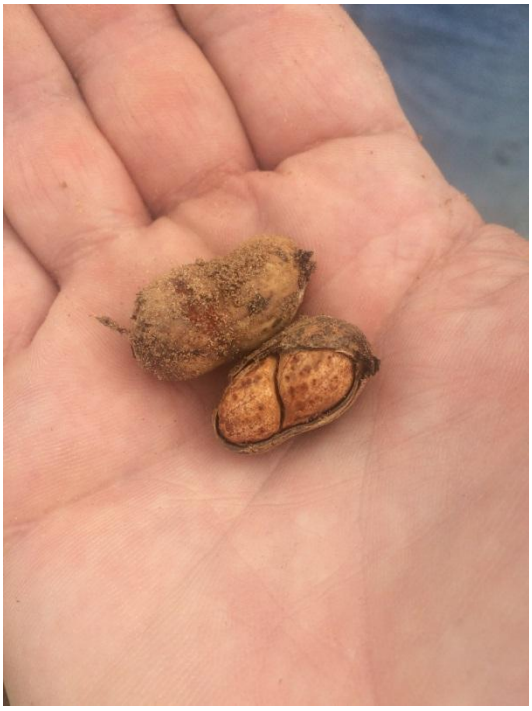


Figure XXX, Cylindrocladium black rot

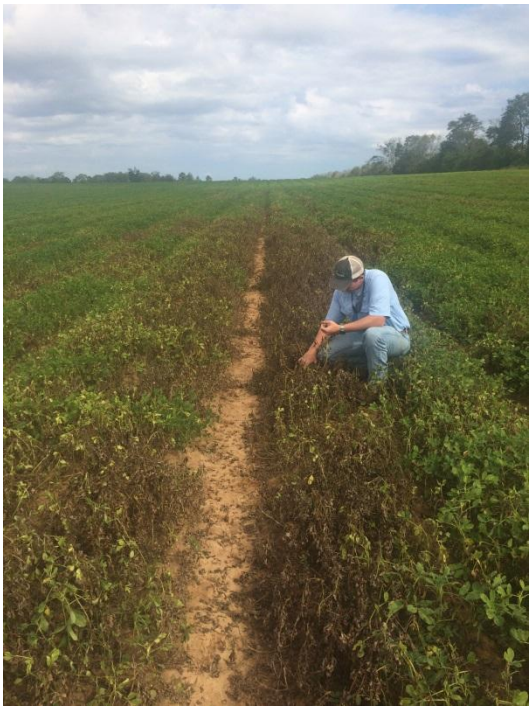


Figure XXXX. Cylindrocladium black rot

Disease: Rhizoctonia limb rot

Diagnostic Symptoms:

Causal Organism: *Rhizoctonia solani*

Factors influencing increased risk:

Management tactics:

Disease: Diplodia Collar Rot

Diagnostic Symptoms:

Causal Organism:

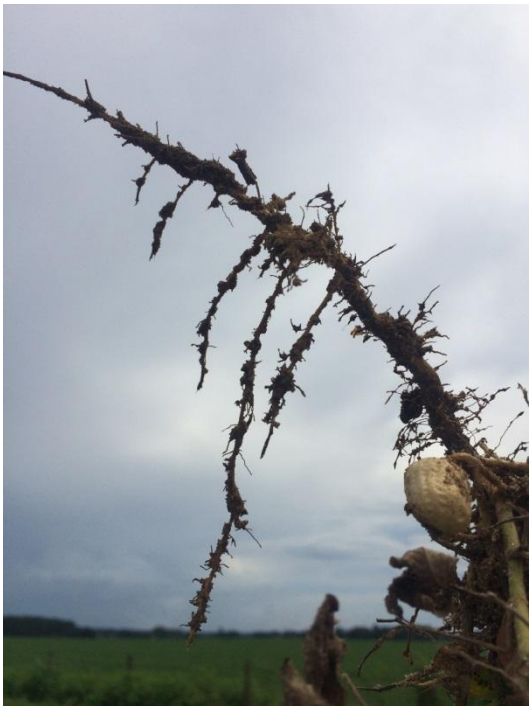
Factors influencing increased risk:

Management tactics:

Figure XXXX. Diplodia collar rot.

Plant-parasitic Nematodes

Peanut Root-knot Nematode



Lesion Nematode