

PEANUT DISEASE CONTROL GUIDELINES

QUICK GUIDE TO PEANUT DISEASES

DISEASE (PATHOGEN)	SYMPTOMS	CONTROL
Seedling disease (<i>Rhizoctonia solani</i> , <i>Pythium</i> spp., <i>Fusarium</i> spp.)	Seed rot, pre- or post-emergence death of seedlings. Dark brown sunken lesions on stems. Seedlings are stunted or die at a later date. Inadequate stand may result.	(1) Plant high quality seed with strong vigor. (2) In-furrow or planter box application of fungicide. See Table 1.
Aspergillus crown rot (<i>Aspergillus niger</i>)	Swelling of lower stem below soil line, becoming corky and brittle, eventual dark decay develops; branches or whole plants wilt and die; extensive crown and root decay; decayed crown and stem bases covered with black, powdery mass.	(1) Plant high quality seed with strong vigor. (2) Plant seed treated with fungicide(s). (3) Do not throw dirt to peanuts. (4) Control stem and root boring insects where warranted.
Early leaf spot (<i>Cercospora arachidicola</i>)	Circular, brown to dark brown spots on leaves usually surrounded by a yellow border. Spots are brown on lower leaf surface. Infected leaves turn yellow and drop. Stems and pegs have oval, dark brown spots.	(1) Apply foliar fungicides either on a 14-day schedule or according to the early leaf spot advisory where available. (2) Practice crop rotation. (3) Utilize residue management program. See Table 3.
Late leaf spot (<i>Cercosporidium personatum</i>)	Symptoms are similar to early leaf spot except spots are darker in color and the yellow border is faint absent. Spots are black on the lower leaf surface.	(1) Apply foliar fungicides on a 10 to 14-day schedule. (2) Same cultural controls as for early leaf spot. See Table 3.
Pepper spot (<i>Leptoshpaerulina crassiasca</i>)	Numerous small, dark brown to black spots on one leaf surface which lack yellow borders. Leaves may develop a V-shaped scorch before yellowing and dropping. Similar spots on stems.	(1) Apply foliar fungicides on a 14-day schedule. (2) Same cultural controls as for early leaf spot. See Table 3.
Web blotch (<i>Phoma arachidicola</i>)	First appears as a greenish-gray to brown webbing or irregularly-shaped blotch on upper leaf surface, later becoming darker brown and extending through to the lower leaf surface.	(1) Apply foliar fungicides on a 10 to 14-day schedule. (2) Same cultural controls as for early leaf spot. See Table 3.
Tomato Spotted Wilt (Tomato spotted wilt virus (TSWV))	Symptoms are variable and may include leaf mottling and distortion; ring spots on new leaflets; plant stunting; and yellowing, wilting, and death of shoots or entire plants.	Plant varieties with resistance to tomato spotted wilt.
Southern blight (<i>Sclerotium rolfsii</i>)	Yellowing and wilting of branches or whole plants, wilted branches turn brown and die. White, coarse mold covers lower stems and may grow over the soil surface and plant debris on ground. Numerous small, round, brown sclerotia are formed on stems and debris.	(1) Rotate peanuts with cotton, corn, or grain sorghum. (2) Moldboard plow to bury sclerotia. (3) Do not throw soil to plants during cultivation. (4) Make preventive applications of a suggested fungicide. See Table 4.
Limb rot (<i>Rhizoctonia solani</i>)	Circular, sunken lesions on lower limbs contacting soil, light to dark brown in color, becoming elongated and zonate (banded). Infected branches wilt and die, infection may spread inward to kill several branches or whole plant.	(1) Rotate with grain crops to slow disease build-up. (2) Avoid excessive mechanical damage to vines. (3) Time irrigations to avoid excessive canopy wetness. (4) Manage peanuts to avoid excessive top growth. (5) Make foliar applications of a suggested fungicide. See Table 4.
Sclerotinia blight (<i>Sclerotinia minor</i>)	May be confused with southern blight. White and fluffy mold, most evident when canopy is wet, growing on lower stems near crown or on lateral branches. Light tan to pale white lesions develop. Affected branches or whole plants wilt, die, and turn dark brown to black. Small, irregularly shaped, black sclerotia found on and in infected stems, pegs, pods, and seeds.	(1) Plant a resistant variety (Tamspar 90). (2) Avoid spreading sclerotia to clean fields on equipment, animals, or hay. (3) Time irrigations to avoid prolonged canopy wetness. (4) Harvest and/or plant early to avoid cool, wet conditions late in season. (5) Apply suggested fungicide to susceptible runner varieties. See Table 4.
Verticillium wilt (<i>Verticillium dahliae</i>)	Symptoms usually become apparent at mid-season; leaves turn yellow with brown marginal scorch. Branches or whole plants are stunted, turn yellow, and may wilt and may die when drought stressed. Cutting across petiole bases, stems, or roots reveals brown discoloration of vascular system.	(1) Long-term rotation with non-host crops may provide control. (2) Avoid rotations with cotton, okra, or potatoes in infested fields. (3) Irrigate to maintain adequate soil moisture. (4) Clean equipment when moving from infested to clean fields.

PEANUT DISEASE CONTROL GUIDELINES (CONT'D)

QUICK GUIDE TO PEANUT DISEASES (CONT'D)

DISEASE (PATHOGEN)	SYMPTOMS	CONTROL
Northern root-knot nematode (<i>Meloidogyne hapla</i>)	Infected plants form dense, bushy root system. Tiny galls (swellings) are formed at the points of root branching. Galls may also form on pods and pegs. On sandy soils, plants may be stunted and pale green in color. Stunted plants are usually clustered and rows grow unevenly.	Sample soil to determine population level. Where populations are damaging rotate with corn, grain sorghum, sudan grass, or cotton and sample again. Apply a suggested nematicide if necessary. See Table 2.
Peanut root-knot nematode (<i>Meloidogyne arenaria</i>)	Large galls form on roots and pods causing extreme swelling and disfiguration of below ground plant parts. Severly affected plants are stunted and pale green in color. Stunted plants are usually clustered and rows grow unevenly.	Sample soil to determine population level. Where populations are damaging rotate with corn, grain sorghum, sudan grass, or cotton and sample again. Apply a suggested nematicide if necessary or plant a resistant variety. See Table 2.
Root-lesion nematode (<i>Pratylenchus brachyurus</i>)	Brown pin-point spots on pods and pegs. Spots enlarge and turn darker in color leaving a peppered appearance. High populations reduce plant growth and pod set. Pegs may be weakened leaving pods in soil at harvest.	Rotation is not effective for this nematode. Sample soil and roots and apply a suggested nematicide if damaging levels are present. See Table 2.
Pod rot (<i>Rhizoctonia solani</i> , <i>Pythium</i> spp.)	Light brown to reddish-brown areas on pods, later becoming black, entire pod may be affected. Pod may rot completely and be either soft and mushy or firm and skeletonized. Kernel and inner pod wall may be covered with cream to dark brown mold (mycelium). Kernels are often completely decayed.	(1) Rotate peanuts with summer grain crops or sudan grass. (2) Spanish varieties are more tolerant than runners. (3) Maintain adequate levels of calcium fertility in soil. (4) Avoid excessive use of low-quality irrigation water. (5) Make preventive applications of a fungicide suggested for pod rot control where severe. See Table 4.
Black hull (<i>Thielaviopsis basicola</i>)	Superficial, large, dull black patches on pod hulls. May cause seed discoloration and peg decay when severe.	Rotate infested fields with grain sorghum.

For additional information about peanut diseases and their control consult EPP 7186, 7187, 7655, 7663, and 7664.

SEEDLING DISEASE CONTROL IN PEANUTS

The goal of seedling disease control is to achieve an adequate and uniform stand. Seedling diseases are effectively controlled in most instances by fungicide seed treatments already applied by seed dealers. However some growers report difficulty in stand establishment. Hopper-box or in-furrow treatments (See Table 1) may increase the level of seedling disease control in problem fields over a seed treatment alone. Expect about 2-3 weeks of protection from these treatments. Other stresses such as cold soil, a poorly prepared seedbed, herbicide injury, excessive rain, and poor quality seed may also contribute to stand failures.

TABLE 1. FUNGICIDES FOR AT-PLANT CONTROL OF PEANUT SEEDLING DISEASE

COMMON NAME (FUNGICIDE MOA GROUP): FORMULATION AND RATE	REMARKS
azoxystrobin (11): Abound 2.08F 0.4 to 0.6 fl oz/1000 ft row	Spray in furrow at planting.
<i>Bacillus subtilis</i> : Kodiak HB 0.3D 2 to 4 oz/cwt seed	Biological seed treatment that can be used in combination with a fungicide seed treatment. Treat seed in planter box.
carboxin (7) + PCNB (14) + metalaxyl (4): Prevail 33.1D 4 to 8 oz/cwt seed	Treat seed in planter box.
flutolanil (7): Moncut 70WDG 1.1 lb/acre Convoy 3.6F 25 fl oz /acre	Apply in furrow at planting.
mefenoxam (4) + PCNB (14): Ridomil Gold PC 10.5G 12.5 to 25 lb/acre	Apply in a 4-inch band at planting.
PCNB (14): Blocker 4F 2 to 4 pt/acre	Apply in furrow at planting.

Check labels for feeding restrictions.

MOA Group Tables start on page 46 of the handbook.

PEANUT DISEASE CONTROL GUIDELINES (CONT'D)

NEMATODE CONTROL IN PEANUTS

Plant parasitic nematodes are microscopic, slender worm-like organisms that live in soil and feed on plant roots. The most important nematode pest of peanuts in Oklahoma is the northern root-knot nematode. The peanut root-knot nematode was recently identified in a few fields in southwestern Oklahoma. Root-lesion and ring nematodes are also common in peanuts, but they are less damaging. Reductions in plant growth and yield result when nematode populations exceed critical levels. High populations may damage peanuts to an extent that a crop cannot be grown profitably. The goal of nematode management is to reduce populations below damaging levels. Crop rotation is very effective in reducing populations of root-knot nematodes. Cotton, corn, grain sorghum, and sudan grass are excellent rotation crops for root-knot control. However, rotation is not as effective against the root-lesion nematode because it can reproduce on a wide range of crops. If rotation cannot be practiced or if root-lesion nematode is a problem, chemical control should be considered. Fields can be checked for potential nematode problems by examining roots and pods during the season for symptoms of nematode feeding. Above-ground symptoms of nematode do not always develop, but where they do, these areas of poor growth or stunted plants should be examined. Declining yields are also symptom of a nematode problem.

Efficient nematode management depends upon knowing which species is present and its population level in the soil. Symptoms of nematode feeding on plants during the growing season are a warning of a potential nematode problem. Soil sampling also is useful for assessing the potential for economic damage. Sampling must be done before a peanut crop is planted because nematode problems cannot be corrected during the growing season. Samples can be collected before planting in the spring. However, sampling late in the season, just prior to or at harvest will increase the chances of accurately measuring nematode levels. Root-lesion nematode can be difficult to detect in soil. Therefore, both roots and soil are needed for more accurate analysis of this nematode. Entire fields, areas in fields where plants are growing poorly, or both may be sampled. If a large field is to be sampled, divide it into smaller units and process the samples separately or sample along a w-shaped pattern across the entire field to ensure a representative sample. Collect soil from root zone (2-10 inches deep avoiding the upper 2 inches of soil). Include some fibrous (feeder) roots when possible. Bulk the samples in a bucket, thoroughly mix the sampled soil and roots, and retain approximately one quart for analysis. Avoid letting the samples dry or exposing them to intense heat or freezing temperatures. Mail samples as soon as possible after collection to the OSU Plant Disease and Insect Diagnostic Laboratory, Oklahoma State University, 125A Noble Research Center, Stillwater, OK 74078; either directly or through the local county extension office.

If the test report indicates a potentially damaging level of nematodes, management strategies should be implemented. Infested fields with damaging populations may either be rotated to a non-host crops for two years, a nematicide applied (See Table 2), or a nematode resistant variety (NemaTAM) can be planted where peanut root knot is found. ‘NemaTAM’ is not effective against the northern root-knot nematode. Where crop rotation is applied, fields should be sampled again to ensure nematode populations have declined to safe levels before planting peanuts without nematicide. Nematicides are dangerous pesticides and should be used with utmost caution.

TABLE 2. NEMATICIDES FOR CONTROL OF PEANUT NEMATODES

COMMON NAME (INSECTICIDE MOA GROUP): FORMULATION AND RATE	REMARKS
aldicarb (1A): Temik 15G [†] 15 to 22 oz/1000 ft of row - single application or Temik 15G [†] 11 oz/1000 ft of row- split application	Single application at planting. Apply in a 6 to 12-inch band and incorporate 2 to 4 inches deep. Split application. Apply in seed furrow or banded (6 to 12 inches) and incorporate 2 to 4 inches deep. Make second application 45 days after planting in a 12 to 18-inch band over the row, and incorporate immediately. Do not apply within 90 days of harvest.
dichloropropene: Telone II [†] 52 to 106 fl oz/1000 ft	Row fumigation at least 7 days before planting. Apply when soil is dry to allow fumigant penetration. Inject through one or two (8 to 12 inches apart) chisels 12 inches deep and seal by packing. Plant when odor is no longer detectable at the fumigation depth.

[†] Restricted Use Pesticide
MOA Group Tables start on page 46 of the handbook.

CHECK LABELS FOR FEEDING RESTRICTIONS

FOLIAR DISEASE CONTROL IN PEANUTS

Early leaf spot is the most important foliar disease of peanuts in Oklahoma. The disease affects nearly all of the peanut acreage in the state each year. Web blotch is a problem mainly in the western half of the state on Spanish varieties. Late leaf spot is less common, but more difficult to control. Pepper spot also is an occasional problem. Foliar disease control is essential in the production of a high-yielding peanut crop. Yield losses can exceed 50% where foliar diseases are allowed to defoliate plants.

PEANUT DISEASE CONTROL GUIDELINES (CONT'D)

FOLIAR DISEASE CONTROL IN PEANUTS (CONT'D)

Spanish varieties are particularly prone to leaf spot damage because they often become infected earlier in the season than runner varieties.

While crop rotation is useful in delaying the development of foliar diseases, fungicide sprays (See Table 3) are required for effective control. Fungicides provide from 10 to 14 days of protection before weathering and loss of effectiveness occurs. In addition, fungicides only protect healthy foliage from infection and do not cure established infections. Therefore, they must be applied preventively, and repeated applications are required to provide season-long control. Fungicides should be applied in a sufficient volume of water to achieve thorough coverage. A minimum volume of 15 gal/acre is suggested for ground applications while aerial applications should be in a minimum volume of 5 gal/acre. While chemigation is effective when targeting soilborne diseases, it is not very effective in the control of foliar diseases because residue left on the leaf after chemigation is not sufficient to provide adequate disease control. Chlorothalonil (e.g. Bravo) at the maximum labeled rate would be the only recommended fungicide for foliar disease control by chemigation.

Spray programs should be started 30 to 45 days after planting. Delaying spray programs until disease appears is risky and resulting disease control may not be satisfactory. Once the first application is made, sprays should be repeated on 14-day intervals until two weeks before anticipated harvest.

Early Leaf Spot Advisory (MESONET) - Daily spray advisories are freely available on the internet to assist growers who spray routinely in the efficient application of fungicides for control of early leaf spot, or to warn growers who do not spray routinely that increased levels of disease are likely to develop. Using the calendar to time sprays is very effective, but unneeded sprays are sometimes applied. The advisory program permits growers to spray only when weather conditions are favorable for disease development. Weather variables are collected from automated weather stations located in each county of the state that make up the *Oklahoma MESONET*. The advisory program identifies and accumulates hours of weather favorable for infection of peanut leaves by the fungus that causes early leaf spot. An *infection hour* is one hour when the relative humidity is 95% or greater and temperature is between 60.8 and 86.7F. The program can be accessed at <http://agweather.mesonet.org> by clicking on *Crops*, and then *Peanut Leaf Spot Advisor*. The program can be used by clicking on tabs that produce different products to assist the user in determining the risk for disease and the need for a fungicide application.

Under the *State-wide maps* tab (this is the default tab when the *Peanut Leaf Spot Advisor* is first selected), maps show where conditions have been most favorable for disease development for the last 14-days and over the entire season. If the user is considering a fungicide application, he/she might look at the 14-day map to help make that decision. For example, areas of the *14-day map* colored in red indicate where recent conditions have been very favorable for leaf spot and areas colored in blue where conditions have not been favorable.

Under the *Local Mesonet Sites* tab, the user enters a nearby MESONET site to obtain a site-specific spray recommendation, or to examine local trends to help in the spray decision. The *Leaf Spot Spray Advisor* is an interactive tool that issues a specific spray recommendation. The user enters the location, planting date, and the date of the previous spray if there has been one. This product accumulates infection hours beginning 30 days after planting if the field has yet to be sprayed, or 10 days after the previous spray. The assumptions are that peanuts 30 days old or older are vulnerable to leaf spot, and that a fungicide spray provides protects the peanuts for a period of 10 days during which time weather is not important. For the first spray, a spray is recommended when 36 infection hours have accumulated beginning 30 days after planting. For the second and all other sprays, a spray is recommended when 36 infection hours have accumulated since the end of the 10-day protection period afforded by the previous spray. Planting date, the 10-day protection period, and the 36-hour threshold are all used to calculate the *last effective spray date*. The *last effective spray date* moves forward in time as infection hours accumulate over the season. A spray is recommended when the *last effective spray date* first passes 30 days after planting (for fields not yet sprayed) or the date of the previous application. The *last effective spray date* also indicates how near the user is to needing an application, and how far the user might be behind schedule. For example, if the field was previously sprayed on July 15 and the *last effective spray date* is July 14, the field is close to needing another spray. Conversely, if the *last effective spray date* is July 29, the user is two weeks late!

Also under the *Local Mesonet Sites* tab, a *Last 14 Day and Forecast Leaf Spot Hours Graph* is updated each day. This graph shows the accumulation of infection hours over the last 14-days as well as projecting the accumulation of infection hours over the next 3.5 days using the National Weather Service (NWS) 84-hr forecast. This feature is intended to provide advanced warning on the need for a fungicide spray. Other products available show similar information in table form and comparisons of current year accumulation of infection hours to that for previous years.

Use of the advisory program to schedule a season-long spray program often permits a reduction of the number of sprays compared to a 14-day calendar program. . The advisory program has been extensively tested in Oklahoma and proven to be effective. However, extending spray intervals beyond 14-days carries some risk. Fields must be monitored to ensure that early

leaf spot does not exceed damaging levels and for the presence of other foliar diseases that may not be adequately controlled when using the advisory program.

Advisories should be checked regularly once the peanuts are thirty days old or it has been 10 days since the last spray. Other risk management rules for the advisory program are:

- 1) If fields cannot be sprayed within three days of exceeding the last effective spray date, spray on a 14-day schedule.
- 2) Use only highly effective fungicides. If formulations of copper hydroxide, copper sulfate, mancozeb, mancozeb + copper, propiconazole, and propiconazole + flutolanil are used; spray on a 14-day schedule.
- 3) If levels of early leaf spot exceed 25% (leaflets with spots or defoliated), revert to a 14-day schedule.
- 4) If late leaf spot or web blotch are identified, revert to a 14-day schedule.
- 5) Be wary of weather forecasts and err on the conservative side if rain is in the forecast
- 6) Maintain the spray program until 14 days before anticipated harvest

Leaf Spot Advisory Program (AUPnuts) - AUPnuts is another spray advisory program that can be used by growers to efficiently time fungicide sprays for foliar disease control. The program was developed in Alabama and has been tested for early leaf spot in Oklahoma and proven to be effective. The program also is effective where late leaf spot is a problem. Its effectiveness against web blotch is unknown. The AUPnuts program is likely to recommend more sprays than the Early Leaf Spot Advisory. Risk management rules described above for the Early Leaf Spot Advisory also must be followed for AUPnuts except for rule 4 (AUPnuts controls late leaf spot) and rule 5 (weather forecasts are part of the AUPnuts program).

The main weather variable used in AuPnuts is a rain event. A rain event is any day with 1/10 of an inch or more of rain and/or irrigation. The program also uses five-day NWS precipitation forecasts which can be obtained from the news media or at the National Weather Service web site (<http://www.srh.noaa.gov/oun/>). For days when irrigation is planned, substitute 100% for the precipitation forecast. Calculate an average precipitation forecast for next five days (add the precipitation forecasts for the next five days and divide by five). A rain gauge (one per field) is the only equipment needed to run AUPnuts. Rules for the AUPnuts advisory program are:

First spray: After emergence, begin counting rain events and spray if:

- 1) four rain events have been counted since emergence and the average chance of rain for the next five days is 50% or greater; or,
- 2) five rain events have been counted since emergence and the average chance of rain for the next five days is 40% or greater; or,
- 3) six or more rain events have been counted since emergence. If leaf spot is seen (two or more spots per plant), spray immediately.

Note: Spraying peanuts less than 30 days old is not recommended.

Second and all later sprays: Ten days after the previous spray, begin counting rain events and check the five-day forecast daily. Spray if:

- 1) no rain event has been counted and the average chance of rain for the next five days is 50% or greater; or,
- 2) one rain event has been counted and the average chance of rain for the next five days is 40% or greater; or,
- 3) two rain events have been counted and the average chance of rain for the next five days is 20% or greater; or,
- 4) three rain events have been recorded. Continue the program until 14 days before anticipated harvest.

Fungicide resistance management - The potential for development of resistance in leaf spot fungi is a concern for several fungicide classes that have a site-specific mode of action. Resistance development can result in loss of effectiveness and control failures. Most of the at-risk fungicides are systemic to some degree. At-risk fungicides can be grouped according to mode of action. Group 1 fungicides (benzimidazoles) such as Topsin, and Group 11 (strobilurin) fungicides such as Abound and Headline are very prone to resistance development and sudden losses in effectiveness have been reported for some diseases. Group 3 (triazole) fungicides such as Folicur and Tilt are less prone to resistance development. However, a slow decline in sensitivity to triazole fungicides can develop after prolonged use. The following resistance management guidelines should be followed when using at-risk fungicides:

- 1) Reduce initial pathogen levels through the use of good cultural practices such as crop rotation.
- 2) Follow label directions - do not exceed the maximum number of consecutive applications, and do not use less than the minimum labeled rate.
- 3) Do not exceed the maximum allowed amount or number of applications per season. Extending the allowed amount of one group 11 fungicide with another, or one group 3 fungicide with another will increase the risk of resistance development.
- 4) Keep the disease pressure low by using an effective application schedule.
- 5) Calibrate the sprayer. Configure spray tips to apply a sufficient volume of water to achieve good coverage.
- 6) Avoid using Group 1, Group 3, or Group 11 fungicides all season long. Use alternating sprays or blocks of sprays of these fungicides with unrelated fungicides or tank-mix with unrelated fungicides. For example, Group 3 and Group 11 fungicides can be applied in alternating sprays or blocks of sprays with a protectant (multi-site, Group M) fungicide such as chlorothalonil (e.g. Bravo) or mancozeb (e.g. Dithane). Group 3 and Group 11 fungicides also can be applied in alternating

sprays or blocks of sprays with each other. Tank mixtures of at risk fungicides with a protectant or with fungicides in another group are appropriate.

- 7) Alternating or tank-mixing one Group 3 fungicide with another or one Group 11 fungicide with another will not help prevent resistance development.

PEANUT DISEASE CONTROL GUIDELINES (CONT'D)

TABLE 3. FUNGICIDES FOR CONTROL OF FOLIAR PEANUT DISEASES

COMMON NAME (FUNGICIDE MOA GROUP) FORMULATION AND RATE/ACRE	REMARKS
azoxystrobin (11): Abound 2.1F 18.5 to 24.6 fl oz	Controls leaf spots, southern blight, and limb rot (see Table 4). Apply 60 and 90 days after planting. Apply a non Group 11 fungicide for foliar disease control as needed during other parts of the season.
boscalid (7): Endura 70WG 6.5 to 10 oz	Apply on 14-day intervals. Also controls Sclerotinia blight at 8 to 10 oz (See Table 4).
chlorothalonil (M): Bravo, Chloronil, Chlorothalonil, Echo, Equus, or Initiate 6F 1.0 to 1.5 pt Bravo Ultrex, Chlorothalonil, or Equus 82.5DF 0.9 to 1.36 lb Echo 90DF 0.87 to 1.25 lb	Apply on 14-day intervals. Use the high rate when applied alone or the low rate when applied in a tank mixture with another fungicide.
chlorothalonil (M) + phosphorous acid (33): Catamaran 5.27F 3 to 5.5 pt/A	Apply on 14-day intervals. Use the high rate (5.5 pt/A) for pod rot (See Table 4).
copper hydroxide (M): Kocide 101, Nu-Cop DF, Kocide DF, or Champ WG 1.5 to 3 lb Kocide 4.5LF, Nu-Cop 3L, or Champ 4.6F 1 to 2 pt Kocide LF 2 to 4 pt Kocide 2000 or Champ Dry Prill 1 to 2 lb Kocide 3000 or NuCop HB 0.75 to 1.5 lb	Tank mix or alternate with another fungicide on 14-day intervals. Use the high rate when applied alone or the low rate when applied in a tank mixture with another fungicide.
copper sulfate (M): Cuprofix Ultra 40DF 1 to 2 lb	Tank mix or alternate with another fungicide on 14-day intervals. Use the high rate when applied alone or the low rate when applied in a tank mixture with another fungicide.
fluoxastrobin (11): Evito 480SC 5.7 fl oz	Controls leaf spots, southern blight, and limb rot (see Table 4). Apply on 14-day intervals. Do not make more than two sequential applications before alternating with a non Group 11 fungicide.
fluoxastrobin (11) + tebuconazole (3) : Evito T 4F 6 to 9 fl oz	Also controls southern blight and limb rot at the higher rates (See Table 4). Apply in alternation with chlorothalonil.
mancozeb (M): Dithane, Manzate, or Penncozeb 75DF 1.5 to 2.0 lb Dithane, Manzate, or Penncozeb 4F 1.2 to 1.6 qt	Tank mix or alternate with another fungicide on 14-day intervals. Use the high rate when applied alone or the low rate when applied in a tank mixture with another fungicide.
mancozeb (M) + copper (M): Mankocide DF 3 to 4 lb Cuprofix MZ Disperss 2.5 to 4.75 lb	Tank mix or alternate with another fungicide on 14-day intervals. Use the low rate for tank-mixes and the high rate when applied alone in alternation with another fungicide. .
propiconazole (3): Tilt, Bumper, Propimax, or Propiconazole 3.6E 2.5 to 4 fl oz	Tank mix the low rate with another fungicide or use the high rate alone on 14-day intervals. Utilize resistance management strategies.
propiconazole (3) + chlorothalonil (M): Tilt Bravo SE 4.3F 1.5 pt	Contains an equivalent of 2 fl oz Tilt and 1 pt Bravo 6F per acre. Apply on 14-day intervals.
propiconazole (3) + flutolanil (7): Artisan 3.6F 1.6 to 2 pt	Combination of Tilt (0.6 lb/gal) for foliar diseases and Moncut (3 lb/gal) for southern blight and limb rot (See Table 4). Apply at mid season and repeat 4 weeks later. Use resistance management strategies.
propiconazole (3) + trifloxystrobin (11): Stratego 2.08F 7 fl oz	Apply on 14-day intervals. Use resistance management strategies.
prothioconazole (3) + tebuconazole (3): Provost 3.6F 7 to 8 fl oz	Controls leaf spots, southern blight, and limb rot (see Table 4). Make up to 4 mid-season applications on 14-day intervals. Use resistance management strategies.
pyraclostrobin (11): Headline 2.08E 6 to 12 fl oz	Controls foliar diseases, and southern blight and limb rot (See Table 4). For foliar diseases, use 6 fl oz on 14-day intervals or 9 to 12 fl oz for 21-day intervals. Do not make more than two sequential applications before alternating with a non Group 11 fungicide.
tebuconazole (3): Folicur, Monsoon, Muscle, Orius, Tebu, Tebucon, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 7.2 fl oz	Controls leaf spots, southern blight, and limb rot (see Table 4). Use a spreader/sticker. Make up to 4 mid-season applications beginning 60 days after planting. Use another fungicide for early and late-season leaf spot control. Use resistance management strategies.

Check labels for feeding and days to harvest restrictions.

MOA Group Tables start on page 46 of the handbook.

PEANUT DISEASE CONTROL GUIDELINES (CONT'D)

TABLE 3. FUNGICIDES FOR CONTROL OF FOLIAR PEANUT DISEASES (CONT'D)

COMMON NAME (FUNGICIDE MOA GROUP) FORMULATION AND RATE/ACRE	REMARKS
tebuconazole (3) + trifloxystrobin (11) : Absolute 500SC 4.36F 3.5 fl oz	Apply on 14-day intervals, but do not make more than 2 consecutive applications before alternating with a non Group 11 fungicide. Use a spreader/sticker.
tetraconazole (3) : Eminent 125SL 13 fl oz	Apply on 14-day intervals in alternation with a fungicide from a different mode of action group.
tetraconazole (3) + chlorothalonil (M) : Echo 720 / Eminent 125SL Co-Pak 1.45 pt	Equivalent to 1 pt/A Echo 6F and 7.2 fl oz Eminent 1F. Apply the combination on 14-day intervals.
thiophanate methyl (1): Topsin or T-Methyl 70W 8 oz Topsin or T-Methyl 4.5F 10 fl oz Thiophanate Methyl 85 WDG 6.4 oz	Apply on 14-day intervals in a tank mixture with chlorothalonil (e.g. Bravo) or mancozeb (e.g. Dithane).

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MOA Group Tables start on page 46 of the handbook.

SOILBORNE DISEASE CONTROL IN PEANUTS

Important soilborne diseases of peanuts include southern blight, Sclerotinia blight, pod rot, and Verticillium wilt. Limb rot can also be a problem in the production of irrigated runner varieties. These diseases usually appear from mid-season to late-season. Soilborne diseases can increase to high levels with continuous cropping of peanuts, causing substantial yield losses. Crop rotation should be practiced in the long-term management of these diseases. Fungicides are effective in reducing losses to these diseases, but they must be applied preventively for maximum effectiveness. Knowledge of field history is essential in anticipating outbreaks of these diseases.

Southern blight can be reduced with cultural practices. These include: 1) Long rotations (at least 2 years out of peanut) with corn, grain sorghum, cotton, or sudan grass; 2) Moldboard plow to reduce levels of the fungus in the upper soil profile; 3) Planting on a raised bed; 4) Avoid throwing dirt against peanut vines during cultivation; 5) Avoid frequent irrigation with small amounts of water. Fungicides (See Table IV) should be applied where long rotations have not been practiced and where southern blight is a yield-limiting factor.

Sclerotinia blight is extremely destructive so precautions should be taken to avoid contamination of clean fields. Avoid carrying sclerotia (seeds of the fungus) into clean fields in soil or on infested plant debris with equipment or animals. Sclerotia can survive for long periods (at least five years), but crop rotation will slow disease build-up. Avoid frequent irrigations with small amounts of water. Tamspan 90 is a resistant variety and should be planted where Sclerotinia blight is anticipated. The fungicide registered for Sclerotinia blight (See Table IV) provides only about 40% control and a yield increase of about 750 lb/acre on susceptible runner varieties. Yield increases with this fungicide in Tamspan 90 and other spanish varieties have not been sufficient to offset the cost of treatment.

Verticillium wilt can be severe some years in contaminated fields. Spanish varieties are most susceptible. There are no effective controls for this disease except to avoid drought stress with adequate irrigation and to dig peanuts before infected plants die where a large number of plants show symptoms. Avoid rotations with cotton which is also susceptible to this disease. Avoid spreading the fungus to clean fields in soil or infested plant debris.

Limb rot is not normally severe in Oklahoma, but can become a problem in wet years on irrigated runner varieties. Avoid over-irrigation and excessive vine injury. Several fungicides effectively control this disease (See Table 4). Crop rotations with corn, grain sorghum, and sudan grass also may be beneficial.

Pod rot is a complex disease caused mostly by the fungi Pythium and /or Rhizoctonia (the cause of limb rot). It can be severe on some sandy soils, on some runner and most virginia varieties, and may be aggravated by nematode and soil insect feeding. Calcium deficiency may be involved in the pod rot complex, but most soils in Oklahoma are innately high in calcium and do not respond to applications of gypsum. Salty irrigation water also has been implicated in increasing pod rot. Crop rotation with corn, grain sorghum, or sudan grass is suggested where pod rot becomes severe. A fungicide program (See Table 4) may provide partial disease control and an economic return.

PEANUT DISEASE CONTROL GUIDELINES (CONT'D)
TABLE 4. FUNGICIDES FOR CONTROL OF SOILBORNE PEANUT DISEASES

DISEASE	COMMON NAME (FUNGICIDE MOA GROUP): FORMULATION AND RATE/ACRE	REMARKS
Southern blight Limb rot	azoxystrobin (11): Abound 2.08F 18.5 to 24.6 fl oz	Ground sprayer and aerial applications. Controls southern blight, limb rot, and leaf spots (see Table 3). Apply 60 and 90 days after planting. Use resistance management strategies.
	fluoxastrobin (11): Evito 4F 5.7 fl oz	Ground sprayer and aerial applications. Controls southern blight, limb rot, and leaf spots (see Table 3). Apply on 14-day intervals during mid-season. Use resistance management strategies.
	fluoxastrobin (11) + tebuconazole (3) : Evito T 4F 9 to 11 fl oz	Also controls leaf spots at lower rates (See Table 3). Apply in alternation with chlorothalonil. Use resistance management strategies.
	flutolanil (7): Moncut 50W 2 to 4 lb Convoy 3.8F 1 to 2 pt	Make ground, aerial, or chemigation application 60 days after planting. Use the higher rates where disease pressure is heavy. A split application may be used by making a second 2-lb application 30 days after the first.
	propiconazole (3) + flutolanil (7): Artisan 3.6F 1.6 to 2 pt	Ground, aerial, or chemigation application. Apply at mid season (60-70 days after planting) and repeat 4 weeks later. Also controls leaf spots (See Table 3).
	propiconazole (3) + trifloxystrobin (11): Stratego 2.08F 14 fl oz	<u>Limb rot only.</u> Ground and aerial applications. Apply 60 days after planting and repeat 30 days later. Applications for limb rot will also control leaf spots (See Table 3). Use resistance management strategies.
	prothioconazole (3) + tebuconazole (3): Provost 3.6F 7 to 8 fl oz	Ground and aerial applications. Controls southern blight, limb rot, and leaf spots (see Table 3). Make up to 4 mid-season applications on 14-day intervals beginning 60 days after planting. Use resistance management strategies.
	pyraclostrobin (11): Headline 2.08E 12 to 15 fl oz	Controls southern blight, limb rot, and leaf spots (see Table 3). Apply on 14-day intervals by ground sprayer, aircraft, or chemigation. Use resistance management strategies.
	tebuconazole (3): Folicur, Monsoon, Muscle, Orius, Tebu, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 7.2 fl oz	Controls southern blight, limb rot, and leaf spots (see Table 3). Make up to 4 mid-season applications by ground sprayer or aircraft on a 14-day schedule beginning 60 days after planting. Use a spreader/sticker.
	tebuconazole (3) + trifloxystrobin (11) : Absolute 500SC 4.36F 7 fl oz	<u>Limb rot only.</u> Make ground sprayer or aerial application 60 days after planting and repeat 30 days later. Also controls leaf spots (See Table 3).
Pod rot	azoxystrobin (11): Abound 2.08F 18.5 to 24.6 fl oz	Reduces Pythium and Rhizoctonia pod rots when applied as recommended for southern blight and limb rot (See above). Also controls leaf spots (See Table 3).
	chlorothalonil (M) + phosphorous acid (33): Catamaran 5.27F 5.5 pt/A	Apply on 14-day intervals. Also controls leaf spot (See Table 3).
	mefenoxam (4) + PCNB (14): Ridomil Gold PC 10.5G 50 lb	<u>Pythium and Rhizoctonia pod rots.</u> Apply in a 12-inch band at pegging to early pod set (45 to 60 days after planting). Do not apply within 75 days to harvest.
	mefenoxam or metalaxyl (4): Ridomil Gold 4E or SL 4F 0.5 to 1 pt Twist 2E 1 to 2 pt Metastar 2E 2 to 4 qt Ridomil Gold 2.4G 11.8 lb	<u>Pythium pod rot only.</u> Apply by foliar spray followed by irrigation or by chemigation at pegging to early pod set (45 to 60 days after planting). Apply in a 12-inch band at pegging to early pod set.
	phosphorous acid (33): Fosphite 3.9L or KPhite 4.4L 1 to 4 qt Fungi-Phite 3.4L 1 to 2.5 qt	<u>Pythium pod rot only.</u> Apply on 2 to 4 week intervals beginning at pegging to early pod set (45 to 60 days after planting) by foliar spray (ground or aerial) followed by irrigation, or by chemigation.
Sclerotinia blight	boscalid (7): Endura 70WG 8 to 10 oz	Ground-sprayer, aerial, or chemigation applications. Make first application after row closure when conditions become favorable, or at the first sign of disease. Make up to two additional applications on 14 to 21 day intervals. Also controls foliar diseases (see Table 3). Do apply within 14 days of harvest.
	fluazinam (M): Omega 4F 1 to 1.5 pt	Ground sprayer, aerial, or chemigation applications Make the first application at canopy closure, after canopy closure when conditions become favorable, or at the first sign of disease. Make up to 2 additional applications at 3 to 4 week intervals. Do not exceed 4 pints per season or apply within 30 days of harvest.

Check labels for days to harvest and feeding restrictions.

MOA Group Tables start on page 46 of the handbook.