

ANR-598

Peanut Pest Management Scout Manual

Scouting is a tool that peanut producers have used since 1975 to make appropriate treatment decisions about pests. Scouting is only one part of an overall management program called Integrated Pest Management (IPM). The goal of IPM is to apply the most up-to-date technology to keep pest populations below economic levels so that growers can produce a quality crop more profitably with minimal effects on the environment.

Scouting is a fundamental part of IPM. It involves correctly identifying the pest, determining the pest population level, and evaluating the amount of damage to the crop. Then treatment decisions can be based on established thresholds for a particular pest or on the level of damage caused to the crop plants.

IPM includes many other techniques for managing pests, including crop rotation, use of resistant varieties, proper use of tillage, fertility management, conservation of beneficial insects, biological control materials, irrigation management, and use of pheromone traps to monitor adult insect populations. Blending or integrating any or all of these techniques into a program for each farm is the goal of peanut IPM in Alabama.

This manual was developed to assist growers, scouts, agri-fieldmen, and Extension agents in putting current IPM technology into practice on a field-by-field

basis. Public concern over residues in food and water makes the adoption of IPM even more important. The adoption of recommended IPM practices by peanut growers will also help them to manage pests more economically and efficiently.

Objectives of This Manual

This manual was designed to show the reader how to:

- Identify the pest
- Evaluate levels of crop damage
- Use proper scouting techniques
- Use safe methods to scout treated crops
- Keep good field histories of pest problems

Scouting for Peanut Pests

When to Scout

As soon as peanuts emerge from the soil and until just prior to digging, fields should be checked for various pests. The scouting calendar below shows the critical or "most probable" times that specific pests will occur in a peanut field. These are times when scouting

Scouting Calendar

	April	May	June	July	August	September	October	November
Planting	██████████							
Weeds	██████████	██████████	██████████	██████████		██████████		
Thrips	██████████	██████████						
Leaf spot			██████████	██████████	██████████	██████████		
Soil diseases (white mold)				██████████	██████████	██████████		
Leafhopper				██████████	██████████	██████████		
Lesser cornstalk borer			██████████	██████████	██████████	██████████		
Rootworm				██████████	██████████	██████████		
Spidermites				██████████	██████████	██████████		
Fall armyworm				██████████	██████████	██████████		
Corn earworm			██████████	██████████	██████████	██████████		
Weed/disease mapping						██████████	██████████	██████████
Nematode samples						██████████	██████████	██████████
Cutworms		██████████	██████████	██████████	██████████	██████████		
Velvetbean caterpillar					██████████	██████████		

should concentrate on these pests. This does not mean, however, that you will never have a problem at some other time. There is no substitute for walking peanut fields looking for problems throughout the growing season. To become a good peanut scout, you must learn **what** to look for and **when** to look.

Mid-June to mid-September is the critical time to scout for most insect pests. During this period, scout fields once a week to monitor pest populations and evaluate plant damage.

Where to Scout

To make an accurate evaluation of the whole field situation, walk peanut fields in a random manner to check for pests. Since some pests are likely to be a problem in sandy soil fields and others in heavier, clay soils, **all** areas of a field should be covered. Some pests may occur in "hot spots" or along field margins, so some samples should be taken in these areas, too. You should also walk different routes each time you scout a particular field. Figures 1 and 2 show how a peanut field might be walked for 2 consecutive weeks.

How to Scout

Sampling for insects and leaf spot can be done at a scouting site. A scouting site is a location picked at random as you walk the patterns described below.

Select ten scouting sites for an average 20-acre peanut field. For larger fields, check a proportional number of sites to adequately cover the field. In smaller fields, no less than five sites should be selected for scouting.

Why Scout

Taking many sites per field allows the scout to get a sample of the pest populations and conditions in the field. The producer can use this information to make treatment decisions.

Weekly scout information for a particular field is recorded on a peanut scout form. These scouting reports, other information on weed and soil-disease losses, and results of nematode and fertility soil tests should be

compiled yearly on each field to develop a field history. Plans for next year's weed, nematode, and fertilizer management program can be obtained from this field history.

Peanut Crop Growth

Alabama's peanut acreage is planted primarily to the Georgia Green variety. Other minor varieties are Florida MDR98, Southern Runner, Florida C99R, Virugard, Agra Tech 1-1, and Agra Tech 201. These varieties are prostrate-growing, runner types; the plants have a central main stem and two cotyledonary branches (the first branches produced by the plant embryo) that extend to the sides. Normally, most of the peanuts are produced from these two branches and a smaller amount from the lower sub-branches of the main stem.

The growth of a peanut crop is divided into two basic components: vegetative (leaves and stems) and reproductive (pegs and pods). During the growing season, the time and rate of development for each of these components will greatly affect cultural and management decisions.

Vegetative Growth

Stem elongation and leaf development are relatively slow during the first 40 days after planting. After this point, growth increases rapidly until plants reach 100 to 110 days of age. When adequate moisture is available, a four- to five-fold increase in leaf surface may occur during this 60- to 70-day period.

Vegetative growth, under optimum moisture conditions, is complete by 110 days after planting if the plants are setting pods normally. This is not true, however, for the Southern Runner variety; these plants continue to grow vegetatively until harvest.

Reproductive Development

Flowering. Peanut blooms originate in leaf axils at reproductive nodes on stems of the cotyledonary branches. Flowering normally begins at the nodes nearest the taproot 25 to 35 days after planting. Later flower-

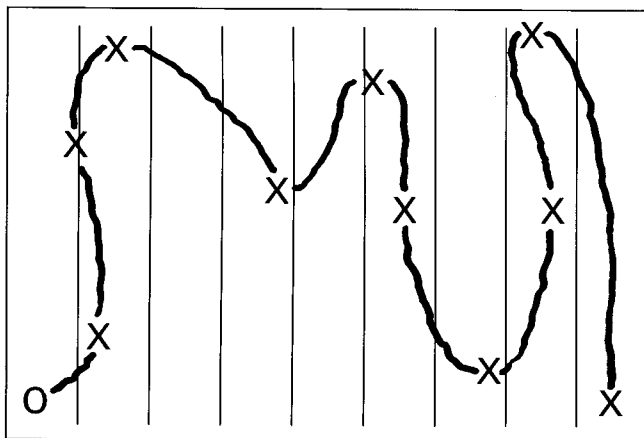


Figure 1. Field scouting pattern for first week

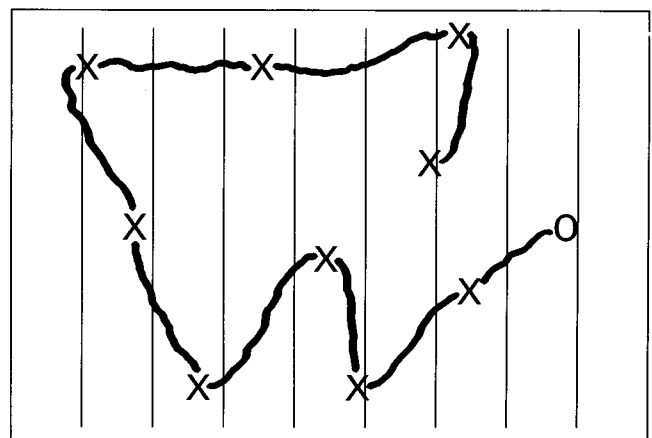


Figure 2. Field scouting pattern for second week

O = Start X = Scouting Site

ing occurs at nodes farther out on these branches and on the lower sub-branches of the main stem. Although flowering may continue until peanuts reach maturity, **peak flowering** generally occurs 4 to 6 weeks after the first flowers appear.

Peanut flowers open at night, are self-fertilized during the hours just before sunrise, and are generally withered by mid-afternoon except during cool weather. During fertilization, pollen is released inside the flower and travels down the pollen tube inside the flower stalk. The ovaries, which become the seeds inside the pod, are located at the base of the flower stalk where it joins the branch.

Peg and Pod Development. After fertilization, cells located behind the ovaries begin to grow longer, forming the peg. The developing peg is pulled down by gravity, and in 5 to 7 days it penetrates the soil to a depth of 1½ to 2 inches. Pegging can be delayed or prevented, however, by dry weather. After the peg reaches the maximum depth in the soil, the tip containing the fertilized ovaries begins to grow horizontally, forming the pods and seeds.

Although the developing pod reaches maximum size in 14 to 21 days after the peg enters the soil, the seeds require 30 to 60 more days to mature. The pegs near the taproot, which enter the soil early in the season, are generally larger and require longer to mature than those farther out on the branch. However, maturity of the later-set pods can be delayed by cooler temperatures or drought.

Improving Peanut Yield and Quality

Maximum yield and quality depend upon development and maintaining a strong, healthy plant. When you use cultural practices such as cultivation, you should be careful to prevent damage to the cotyledonary branches, where most of the peanuts originate.

Vegetative growth is most rapid between 40 and 110 days after planting; little or no growth occurs after 110 days. The Southern Runner variety will continue vegetative growth until harvest. During this period, new leaves are unfolding at the end of each branch every 3 to 5 days, so your foliar-disease and insect control programs should be keyed on this rapid growth stage. You must ensure a full canopy of healthy leaves to furnish food for pod development later in the season. The photosynthesis process declines rapidly after plants reach maturity, so late-set pods may depend more on food stored in the leaves and stems.

Most harvestable pods are set between 50 and 100 days after planting. Irrigation, if available, will increase yield and quality most if applied during this 40- to 50-day period and on an "as needed" basis from 100 days until harvest.

Scouting for soil insects that attack peanut pods should be emphasized during the entire period from planting until harvest.

Peanut Insects and Control

Peanuts are attacked by many insects. They may damage any part of the plant. However, because cultural practices, weather conditions, and other factors vary widely, it is impossible to predict the insect problems a producer will encounter in a given year.

While some peanut insects are controlled by cultural practices, most are controlled by the use of insecticides. Some years, producers are able to grow a crop of peanuts without using any insecticides. Other years, producers have needed to make several insecticide applications. With the continually increasing cost of insecticides and the importance of keeping the environment as pesticide-free as possible, **a peanut producer should use insecticides only as needed.**

Common Peanut Insects

White grubs are the larvae of May or June beetles. There are about 200 known species. Mature grubs are about ½ to 1 inch long with six prominent legs. The rear of the body is smooth, shiny, and usually black. Grubs have curved bodies. They live in the soil and feed on the underground parts of the peanut plant. The life cycle varies in length from 1 to 4 years, depending on the species. These insects seldom cause problems but are more often present where peanuts follow sod. Check for the presence of these insects when soil preparation begins.

Wireworms are slender-bodied larvae that vary from dark brown to yellowish in color. Their bodies are segmented, hard, and shiny. There are several species of wireworms that attack peanuts. The adults are commonly called click beetles. The larval stage lasts from 3 months to 2 years. They have often been a problem following sod, but recently they have caused problems in fields where row crops were grown the previous year. Check for wireworms during soil preparation.

Whitefringed beetle larvae are white, legless grubs that are up to ½ inch long. The head of the larva is recessed, and only the dark colored mandibles (jaws) are visible at the forward end of the abdomen. The adult is a beetle that is up to ½ inch in length. It is somewhat robust. It varies from light to dark gray, with a faint white stripe on each side. It looks like a large boll weevil without a snout.

Adults emerge from the soil beginning in May and continuing throughout the summer. They feed on foliage and lay eggs in the soil. The young overwinter in the larval or egg stage. The life cycle usually requires 1 year, but sometimes lasts 2.

Most economic damage is caused by larvae feeding on the underground parts of the plants. Stands are often drastically reduced. To control these insects, an effective preplant soil insecticide must be applied broadcast and mixed into the top 3 to 4 inches of soil. At present, there is no effective, labeled insecticide that will control this pest.

Bahiagrass borers are the larvae of a large, long-horned beetle. The larvae vary from less than ½ inch to 2½ inches in length. This insect was a major problem in many peanut fields several years ago. It cuts the tap root below the soil surface, killing the plant. Every reported infestation has occurred where peanuts followed Bahiagrass. No problems have been reported with this insect in recent years.

Thorough soil preparation, preferably with a power-driven rotary tiller, may reduce the problem. Some control has been obtained with a heavy application of soil insecticide before turning the soil.

Southern corn rootworms damage peanuts by feeding on pegs and pods in the soil. They have been a problem in certain areas of southwest Georgia since 1960. Sporadic problems have occurred in Alabama during very wet years. Infestation by rootworms is more common in heavy, poorly drained soils, but may occur in sandy soil if it is excessively wet for an extended period of time. Damage varies from a slight decrease in yield and grade to complete destruction of the crop.

The southern corn rootworm is the larva of the spotted cucumber beetle. The beetle is greenish-yellow, about ¼ inch long, and has twelve irregular black spots on its back. Economic damage to peanuts is caused by the larval stage. The larva is a slender, white to cream-colored "worm" that is about ½ inch long when mature. It has a fragile, wrinkled body with three pairs of legs. The head and the last segment of the body are dark brown to black; the head is the narrower of the two. Development from egg to adult requires 30 to 40 days. There may be more than one generation a year.

The most effective control measure is a preventive application of granular insecticide at early pegging time. However, such applications are not generally recommended because damaging infestations are present in so few fields. Satisfactory control can also be obtained by checking peanuts closely for peg and pod damage and applying the insecticide at the earliest indication of a general infestation. Light to moderate rainfall following application will improve control.

Lesser cornstalk borers are dark, blue-green larvae ranging from ½ to ¾ inch in length with brown or purple bands around their bodies. They feed on leaves, pegs, and pods; bore into the plant near the soil line; and tunnel throughout roots and stems. They live in silken tubes or webs on or just beneath the soil surface. These tubes are usually attached to the plant wherever the insect is feeding. Damage is more common on light sandy soils and is usually more severe in hot, dry weather.

Fields should be closely checked for fresh feeding signs and the presence of borers. At the first sign of a general infestation, an application of a recommended granular insecticide should be made. It should be applied in a 16- to 18-inch band over the row when the foliage is dry so the insecticide granules will filter down to the soil surface. Light to moderate rainfall or an application of irrigation water following treatment will improve control.

Thrips are tiny, slender insects that jump or fly around when disturbed. Larvae are similarly shaped and are usually yellow. They feed in the buds of plants on

the young, folded leaflets. This feeding causes scarred, deformed leaves that are often called "possum-eared." In the past, controlling thrips has not consistently resulted in yield increases.

Thrips are vectors for tomato spotted wilt virus (TSWV), a relatively new disease on peanuts in Alabama. To control thrips use a granular systemic insecticide in the seed-furrow at planting, or make two foliar applications of insecticides at 7-day intervals beginning at the first sign of damage.

Spidermites are very tiny, insect-related pests that feed by sucking juices from the undersides of the leaves. The feeding causes very small yellow specks on the upper surface of the leaves. The leaves then gradually become chlorotic, turn brown, and die. There is always some very fine webbing found where spidermites feed. Spidermites are a very serious problem in spots within fields in some years. Problems with this pest may develop following an application of insecticide for another pest. Spidermites can be controlled by the use of an effective miticide, but thorough coverage of the foliage is necessary.

Leafhoppers are small, green, hopping insects, sometimes called "sharp shooters" because of their shape. They feed by sucking plant juices. Their feeding causes peanut leaflets to turn yellow, especially around the mid rib to the tips. If damage is severe, the yellow area becomes necrotic, and the leaves are shed from the plant. Leafhoppers are usually controlled by the use of foliar-applied insecticidal sprays.

Three-cornered alfalfa hoppers are light green, wedge-shaped insects about ¼ inch long. The nymph of the insect is similarly shaped, but it does not have wings and its body is covered with many spines. The nymph and the adult have piercing and sucking mouthparts; they feed by sucking juices from the stems of plants. In feeding, they girdle stems and leaf petioles. The girdled area on a stem forms an enlarged scar-tissue callous that impedes or prevents movement of nutrients. In an effort to make up for the blockage, the plant often develops aerial roots. Girdled stems and the leaves on them may become discolored and die.

This insect and its damage have become relatively common. It can be controlled with a relatively light application of a recommended foliar-applied insecticide. The economic importance of three-cornered alfalfa hopper damage has not been determined.

Aphids (plant lice) are small, sucking insects that secrete a sticky substance known as "honeydew." They are usually controlled by beneficial insects. They seldom build up to sufficient numbers to require insecticidal treatment. A foliar application of insecticide will control this pest if populations become great enough to cause damage.

Granulate cutworms are fat, tan to dark-colored caterpillars. They are often called "night crawlers." They hide under trash, in cracks, or below the soil surface during the day. Occasionally, they cut young plants off at or below the soil surface and feed on pods and pegs. However, their primary damage is caused when they climb the plants and feed on the foliage.

At times these pests are present in large numbers and seem to be causing little or no damage. When they begin to feed on the foliage, they may cause significant defoliation. Foliage feeding usually occurs at night and the “worms” return to the soil during the day.

Cutworms can be controlled with recommended foliar-applied insecticides.

Corn earworms and **tobacco budworms** vary in color from light green to almost black. They are one of the most common caterpillars that feed on peanut foliage. The life cycle requires about 30 days, with 14 to 16 days of this time spent in the larval stage. There may be several generations in peanuts during a single growing season. These worms usually are controlled by the use of insecticidal sprays.

Fall armyworms are multi-colored, striped larvae usually having a light-colored inverted “Y” on the head. The life cycle requires about 30 days with about half of this time spent in the larval stage. There may be several generations during a year. They feed on the foliage on peanut plants. This pest can be effectively controlled by the use of a recommended insecticidal spray.

Velvetbean caterpillars are green to black larvae that usually have white stripes the length of the body. These larvae are very active when disturbed. They feed on the foliage and may completely strip plants of all leaves and destroy the terminal buds.

Development from egg to adult requires 4 to 5 weeks. The destructive larval stage usually lasts from 16 to 21 days. Two or three generations may occur late in the peanut growing season. This insect is very easily controlled with recommended insecticidal sprays.

Beet armyworms are sporadic pests of peanuts. They feed on plant foliage. They are quite variable in color but always have a dark stripe down the middle of the back and two light yellow stripes down each side. There is usually a small black spot on each side above the second pair of true legs just behind the head. This caterpillar is mature when it is slightly more than 1 inch long. Beet armyworms are very difficult to control with insecticides.

Loopers are often found feeding on peanut foliage. Larvae pass through six instars (stages of development) in a period of 2 weeks or slightly longer. Pupae are attached to the plant by a web. The complete life cycle requires 30 to 35 days.

Larvae are green and sometimes have fine white lines on their backs. Some have black spots on their body and black markings on the head and legs. They are tapered from the rear toward the head. They have two sets of fleshy prolegs under the main part of the abdomen and crawl with a distinct looping motion. Loopers are very difficult to control with insecticides, and applications should be made when they are small.

Red-necked peanutworms are very small, white to cream-colored larvae with brown heads and a reddish band just behind the head. They feed in the buds of plants. They usually have little or no effect on yield. Control can be obtained with recommended foliar-applied insecticides.

Scouting and Treatment

When preparing soil before planting peanuts, check for soil insects. If white grubs, wireworms, whitefringed beetle larvae, and Bahiagrass borer larvae are going to be a problem, they will be present at this time. These insects are much more likely to cause problems where peanuts follow sod crops. If adult whitefringed beetles were noticed feeding on the crop grown in a field the previous year, check the soils closely for larvae. Eggs are laid where the adults feed, and the small larvae will be present when land is prepared.

Control measures for all of these soil pests must be applied **before** the crop is planted and incorporated into the soil. Unfortunately, there are no effective labeled insecticides for whitefringed beetle larvae, so it may be necessary to move peanuts to an uninfested field.

Good thrips control can be attained with an in-furrow applied insecticide, a hopper box seed treatment, or early post emergent foliar sprays. A systemic insecticide applied into the seed furrow at planting is a very effective method of thrips control, which requires the least amount of management effort, but usually is the most expensive. The hopper box seed treatment is the least expensive method of thrips control, but requires placing the insecticide into the planter box when seed are poured into the hopper. Foliar sprays of insecticides are very effective in controlling thrips, but must be made in a very timely manner to prevent peanut thrips damage.

After peanuts are up, they should be scouted at least once a week to determine the presence of pests and beneficial insects in order to make treatment decisions. To scout for insects, walk diagonally across it and around at least half of the borders. Look for any abnormal plants or plant parts and, if any are found, try to determine the cause.

Look for discolored leaves and examine the undersides closely to determine whether spidermites are present. At ten locations in the field (as shown on page 2), examine 2 feet of row carefully. To examine each 2 feet of row, shake the vines thoroughly. Then fold them back to count foliage-feeding pests on the surface of the soil. Identify and record the numbers of each kind of insect present.

Carefully examine the undersides of leaves and limbs for signs of lesser cornstalk borer damage. As the vines are folded back, some pods and pegs will be pulled out of the soil, and these should be examined for damage.

It will be necessary to remove a few plants from the soil in order to thoroughly check for southern corn rootworms, wireworms, and lesser cornstalk borers and their damage. If larvae or fresh damage from either of these insects is found at three or more of the ten locations, apply a recommended insecticide.

Spidermites should be controlled as soon as they are found. If they are confined to a part of the field, acceptable control can be obtained by treating only the infested areas. Re-check treated fields after 3 days, and, if live mites are found, make a second application of a miticide. Damaging populations of spidermites often “flare” following the use of insecticides for other pests.

Foliage-feeding caterpillars should be controlled when an average of four or more per foot of row are present in a field. However, insecticides used in early or mid-season may cause larger populations of foliage-feeding caterpillars later in the season because of the destruction of beneficial insects that help control these caterpillars.

Specific insecticides and application rates can be found in Extension publication ANR-360, "IPM for Peanuts."

Peanut Diseases and Nematode Management

Diseases and nematodes are major factors limiting the size, quality, and profitability of peanut production in Alabama. Alabama's hot and often wet summer climate favors the development of several destructive diseases. Leaf spot diseases, white mold, and root-knot nematodes cause the greatest damage to peanuts. Substantial losses have also been attributed to *Rhizoctonia* limb rot and peanut rust.

Peanut producers must continuously monitor the condition of their peanut crops to avoid large losses in yield or crop quality. In addition, producers must use disease-management strategies such as crop rotation, deep tillage, and proper soil fertility to reduce the amount and cost of pesticides needed to protect peanuts from fungi and nematodes.

Leaf Spot Diseases

Symptoms

Early leaf spot (caused by *Cercospora arachidicola*) and late leaf spot (caused by *Cercosporidium personatum*) are the most widespread and potentially destructive diseases of peanuts. Late leaf spot is the more destructive of the two.

Early leaf spot may be seen on peanuts by mid-June, but late leaf spot is usually far more common by August. However, the sequence may differ from year to year, depending on prevailing weather patterns.

The earliest symptoms of both diseases appear as small yellow spots on the leaves, ranging in size from 1/8 to 1/4 inch in diameter when mature. Spots of early leaf spot on peanut leaves are usually reddish brown and surrounded by a yellow halo. Those of late leaf spot are dark brown to almost black, particularly on the lower leaf surface; they may have a yellow halo only in June and early July.

Spots of early leaf spot appear smooth, because the fungus produces few spores on the upper surface of the leaves. Because the late leaf spot fungus produces many spores on both leaf surfaces, the spots have a raised or tufted appearance. The spore masses of both fungi can be seen with a hand lens (20X). On plants severely damaged by late leaf spot, the characteristic black spots may also be seen on the leaf petioles and stems.

Heavily spotted leaves are shed well before harvest. Leaf shed usually starts at the base of the stem and continues upward until all but the youngest leaves are lost. To avoid heavy losses to early pod shed, badly defoliated peanuts must be harvested well before their expected crop maturity date.

Leaf spot diseases can easily be mistaken for injury caused by soil- and foliar-applied pesticides. Pesticide injury is more likely on fast-growing young peanuts, while leaf spot diseases are more likely from mid-season to harvest.

The common symptoms of injury from soil-applied pesticides are early-leaf-spot-like spots (up to a dozen) around the margin of young peanut leaves. Typically, injury from foliar-applied pesticides will be seen within a day or two of the application; the randomly scattered brown to reddish brown spots will appear, concentrated in the upper canopy of the plants. In indirect light, white areas of pesticide residue may be seen within these spots.

Scouting for Leaf Spot Diseases

Costly protective fungicide applications are required to control leaf spot diseases on your peanuts. Failure to control these two diseases will seriously reduce crop yield and quality. Since control is difficult before noticeable leaf spotting occurs, a quick walk through your fields won't help you monitor the effectiveness of your spray program. Program performance can be evaluated when you scout your fields for insect pests.

If disease outbreaks are caught early, corrective action will prevent leaf spot diseases from causing any crop losses. The method for scouting for leaf spot diseases on the peanut cultivars Florunner, Sunrunner, and GK-7 is described below. This method was developed by personnel of the University of Florida.

Scouting Methods

1. Each field has a different cropping history; **separate** counts must be made in **each** field.
2. Scout each field about 9 weeks after planting (early July). This first visit should pick up outbreaks of early leaf spot.
3. Collect a total of fifty **leaves**, each with four or five **leaflets**, from five to ten separate locations in each field. Without looking, select leaves in the peanut canopy midway between the ground and newest leaves.
4. Count the total number of leaf spots on the leaves. Do not include spots caused by pesticides, leaf rust pustules, or other blemishes in the total count.
5. Make two more collections at 2-week intervals to further assess the effectiveness of your leaf spot spray program. Late leaf spot and peanut rust are the primary targets of these later assessments.

Using the Graph

Locate the number of leaf spots counted on the left side of the graph in Figure 3. Pinpoint the age of the peanuts at the base of the graph. Then, connect the vertical and horizontal lines within the graph to determine the effectiveness of your leaf spot spray program.

Adjusting Your Fungicide Spray Program

If leaf spot becomes a threat to your peanut crop, you must adjust your fungicide spray program to bring the disease under control. Adjustments made after considerable spotting and leaf shed have occurred will not give the control needed to prevent sizable loss.

1. Shorten the spray interval to 7 to 10 days between fungicide applications. In irrigated peanuts, several applications on a 7-day spray schedule may be needed to maintain disease control. Never exceed 14 days between applications.

2. Use the full label rate of a recommended fungicide. See Extension publication IPM-360, "IPM For Peanuts," or ANR-500A, *Alabama Pest Management Handbook*, for leaf spot fungicide recommendations. ANR-500A, *Alabama Pest Management Handbook*, can also be accessed on the Internet at <http://www.aces.edu/departments/extcomm/publications/anr/anr.pm.html>.

3. Replace worn spray nozzles with the correct hollow cone nozzles recommended for use with fungicides. Recalibrate spray equipment accordingly.

4. If your leaf spot fungicides are applied by air, make sure that there is some overlap between passes to prevent disease development between spray swaths.

Leaf Spot Control Recommendations

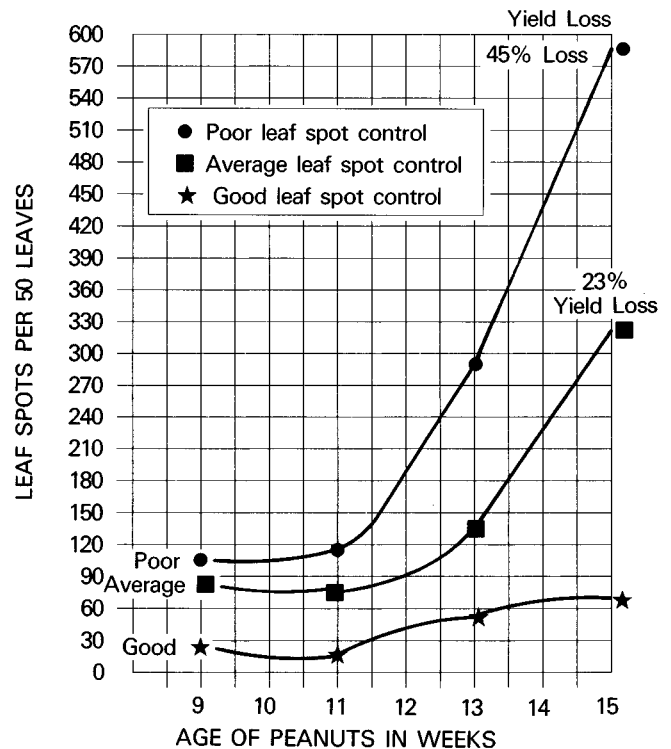
1. Crop rotation or summer fallow will slow the early-season development of leaf spot diseases on future peanut crops. Ideally, peanuts should be grown no more often than every third year in a given field.

2. Deep-turning the debris from the previous peanut crop will also help delay disease development.

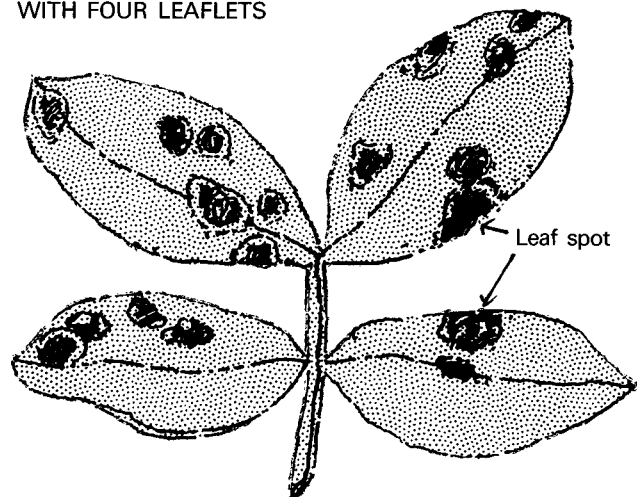
3. Begin applying a recommended fungicide within 45 days of planting or no later than June 1 on early-May-planted peanuts. In most fields, fungicide applications made on a 12- to 14-day schedule should give good protection from leaf spot. In irrigated fields frequently cropped in peanuts, consider following 10- to 12-day spray schedules for fungicide applications from early July through mid-August. Continue fungicide applications until 2 weeks before digging in all fields.

4. Establish a leaf-spot-tolerant cultivar such as Southern Runner, Georgia Green, or C99R in fields where heavy leaf spot pressure is expected. Although leaf spot resistant cultivars need just as many sprays as susceptible peanuts, the level of leaf spotting and leaf shed is lower. As a result, leaf spot resistant peanuts give a little margin for error.

5. Early planted peanuts (mid- to late April) may escape leaf spot damage. Early planting is suggested in irrigated fields where peanuts follow peanuts and leaf spot diseases have previously caused significant damage.



PEANUT LEAF WITH FOUR LEAFLETS



50 leaves should be collected *midway* from the ground to the top.

Figure 3. Assessment of peanut leaf spot control

6. See Extension publication ANR-369, "Foliar Diseases of Peanut," for more information on leaf spot diseases and their control.

Peanut Rust

Peanut rust, caused by *Puccinia arachidis*, occurs only sporadically, but it is very destructive when left uncontrolled. This disease is rarely seen on peanuts before early August and is more likely to occur in Baldwin and Mobile counties.

Symptoms

Peanut rust may be easily identified by its numerous small, reddish-orange pustules containing masses of orange spores on the lower leaf surface. Affected leaves will quickly turn light brown and die, but they will not be shed by the plant. When left unchecked, diseased plants take on a scorched appearance, quickly die, and shed most mature pods.

Peanut rust usually appears in scattered circular spots or "hot spots," usually 3 to 6 feet in diameter, of off-color peanuts. In hot, humid weather, these areas quickly increase in size until much of the field is destroyed. These patches are easily mistaken for spider-mite injury.

Scouting Methods

Generally, fungicide applications made for leaf spot control will also protect peanuts from peanut rust. When scouting fields for leaf spot diseases and insects, look for circular areas of yellowed or chlorotic peanut vines. Carefully examine the underside of the leaves and shoot terminals for the characteristic rust pustules and for the spidermite crawlers and fine webbing found where they feed. A hand lens is invaluable when trying to distinguish between peanut rust and spidermites.

Adjusting Your Spray Program

1. Immediately reduce the interval between fungicide applications to 7 days.
2. Use the full label rate of a recommended fungicide. See Extension publication IPM-360, "IPM For Peanuts," or ANR-500A, *Alabama Pest Management Handbook*, for rust fungicide recommendations.
3. Recalibrate your spray equipment.

Control Recommendations

1. Follow the spray program for leaf spot control described above.
2. Early planting (mid- to late April) is suggested where peanut rust has previously caused significant crop loss.
3. Southern Runner, which has some peanut rust resistance, may be useful in rust-prone areas.

White Mold

White mold, which is also known as Southern stem rot and stem blight, is among the most damaging diseases of peanuts. This disease, caused by *Sclerotium rolfsii*, occurs in nearly every field where peanuts have

been cultivated. Yield loss to white mold is heaviest where peanuts are grown each year or every other year. Estimated losses in these fields may reach 20 percent or more of expected yields.

White mold is primarily a mid- to late-season disease on peanuts. Wilting or flagging of a vine or central stem(s) starts to occur on randomly scattered plants across a field in mid-July as the vines begin to cover the row middles. The leaves on the wilted vines or stems quickly turn brown and die. The wilting and death of the remaining stems on a diseased plant usually follow. The white mold fungus will also attack the roots, pods, and pegs of a peanut plant. Pods on damaged pegs are usually shed. Diseased pods turn dark brown and disintegrate. Sometimes, the severe pod rot may occur without any apparent damage to the rest of the plant.

A dense white mat of mycelia (filaments) of the white mold fungus may be seen on the soil surface, nearby crop debris, stems on or just above the soil surface, and occasionally lower leaves during humid, hot weather. This mat may grow across the soil surface to colonize adjacent healthy plants.

Round, light tan to brown, seed-like bodies called sclerotia usually form on this mat of filaments. They are usually most abundant on decaying peanut stems and leaves. These dense white mats usually disappear when the soil dries or weather cools, but the sclerotia remain. The white mold fungus will survive in the soil as sclerotia until the next susceptible crop.

Scouting Methods

To make an informed decision on white mold control, you need good cropping history and scouting records for each field going into peanuts. Fungicides will give a good return in fields where light to moderate disease pressure is anticipated. In some fields, white mold causes such severe crop loss that rotation to a non-host crop is the only viable control measure.

Fields should be checked for white mold shortly before or after digging. Best estimates of white mold damage can be made 1 to 2 days after you've inverted your peanuts.

1. Count the number of "hits" in 100 continuous feet of row on each side of a windrow at four or five randomly selected locations in each field. A hit is a dead plant or group of dead plants no more than 1 row-foot in length. Groups between 1 and 2 row-feet are counted as two hits; those between 2 and 3 row-feet are three hits; and so on.
2. Add the total number of hits at each location in that field. Divide the total by the number of locations checked.
3. If you counted the hits on both sides of the windrow, divide by 2 to get the number of white mold hits per 100 feet of row.
4. Record that number on your Pest Management Data Sheet for that field.

Using Scouting Records

Records of white mold hits for a given field are a good indicator of white mold pressure on any peanut crop(s) grown over the next two growing seasons. After 3 years of rotation away from peanuts or other host crops (i.e., tomato and soybean), populations of the white mold fungus in the soil decline to the point that significant disease-related losses are unlikely.

Cropping History and White Mold

The severity of white mold in a particular field can be roughly estimated on the basis of cropping history. Generally, the more often peanuts are cropped in a given field, the greater the loss from white mold. For fields kept in continuous peanut production, particularly those under irrigation, an average of 20 or more hits per 100 feet of row is not uncommon. Yield loss in such cases may exceed 2,000 pounds per acre.

White mold also causes serious damage in the many fields where peanuts are grown every other year. In fields cropped to peanuts every other year, an average of 7 to 15 hits per 100 feet of row and a yield loss of 500 to 1,500 pounds per acre are usually recorded. Counts will be lower after a dry summer. The impact of white mold on yield drops when the period of time between peanut crops exceeds 2 years. Refer to Extension publication ANR-368, "Soilborne Diseases of Peanut," for more information concerning white mold control on peanut.

Control Recommendations

1. Crop rotation is the most effective control for white mold. A 2-year minimum between peanut crops is suggested.
2. Deep turn the residue from the previous peanut crop.
3. Some losses to white mold may be prevented by planting early (mid- to late April) in a disease-prone field.
4. Plant the cultivar Southern Runner, Georgia Green, or CP99R in fields prone to heavy white mold pressure.
5. Flat cultivate between peanut rows to minimize soil movement over the vines. Burying vines and leaves when cultivating for weed control will greatly increase the incidence of white mold.

Table 1. Damage Thresholds for White Mold

Hit Count Per 100 Feet of Row	Disease Pressure	Control Recommendation
0-4	light	Follow good rotation; no fungicides needed.
5-15	moderate	Fungicide justified on peanuts grown in field in next 2 years. Longer rotation would help reduce disease.
16+	severe	Fungicides will help recover some lost yield. Recommend 4- to 6-year rotation to grass or non-host field crop.

6. Recommended fungicides will give good disease control but should be used only as needed. Preventive fungicide applications must begin in late June to early July, shortly before symptoms are seen. See Extension publication IPM-360, "Peanut Pest Management," or ANR-500A, *Alabama Pest Management Handbook*, for white mold fungicide recommendations. ANR-500A is also available on the Internet at <http://www.aces.edu/departments/extcomm/publications/anr/anripm.html>.

Rhizoctonia Diseases

In recent years, limb rot caused by *Rhizoctonia solani* has greatly increased in importance, and it has become particularly common on peanuts under irrigation. Overwatering, frequent showers, dense vine growth, overfertilization, and frequent production of peanuts increase the severity of the disease in most fields. Damage to the vines caused by tractors has also been shown to increase the amount of disease.

The limb rot fungus usually invades the vines at or near the soil surface during hot, humid weather. This disease is particularly damaging in fields with a thick leaf canopy. Circular to oval, brown, sunken spots, often with a distinctly zonate pattern, develop on diseased vines. As these spots enlarge, they girdle the vine, causing the foliage to wilt and die.

Under ideal conditions, many of the lower vines will be killed and the limb crop lost. Individual leaves will collapse and turn dark brown to black. The roots, pegs, and pods, independent of limb rot, may also be damaged.

Scouting Methods

No specific guidelines for evaluating limb rot damage on peanut have been established. However, noting the extent of limb rot damage on the Peanut Scouting Form or in your yearly records would be valuable in deciding which control measures to use on future peanut crops. One method of assessing limb rot damage is to estimate the percentage of the total limb area that shows typical symptoms of this disease within 1 to 2 days of digging. Each 10 percent of limb area damaged may result in a 7 percent reduction in yield.

Control Recommendations

1. Follow soil test recommendations to reduce nitrogen fertilization on prior corn and small grain crops. This practice will provide minimal levels of nitrogen in the soil for following peanut crops. Excessive vine growth in some fields under irrigation may be caused by the carryover of nitrogen in the soil. Refer to ANR-368, "Soilborne Diseases of Peanut," for more information on practices for the control of *Rhizoctonia* limb rot.
2. Avoid overwatering.
3. Several fungicides currently registered for white mold control will also control *Rhizoctonia* limb rot on peanuts. See ANR-500A, *Alabama Pest Management Handbook*, or IPM-360, "Peanut Pest Management," for a list of recommended fungicides.
4. Rotation practices described for the control of white mold may also help control limb rot.

Nematodes

Plant parasitic nematodes can severely limit the production of peanuts. Yield loss is closely tied to cropping sequence; the more often peanuts are grown, the higher the risk of significant crop injury. The peanut root-knot nematode (*Meloidogyne arenaria*) is the most widely distributed and destructive nematode pest of peanuts. It is found in about 40 percent of Alabama's peanut fields. Other nematodes reported to damage peanuts are the lesion nematode (*Pratylenchus brachyurus*) and the ring nematode (*Criconemoides* species). Nematode populations are usually highest in light, sandy soils.

Nematode injury is difficult to diagnose on the basis of above-ground symptoms. The damage may easily be mistaken for nutritional deficiency, a soil-related disorder, or drought stress. Unthrifty and stunted nematode-damaged peanut plants are usually found in circular to irregular patches ranging from a few feet to several acres.

Symptoms of nematode injury never occur uniformly across a field. The foliage of damaged plants turns yellow and wilts at mid-day, even when soil moisture is plentiful. During periods of hot, dry summer weather, the death of severely damaged plants is common. At times, sizable yield reductions will occur without any apparent damage to the plant.

Galls form on roots invaded by the peanut root-knot nematode; these galls can be several times the normal root diameter in size. Pegs and pods attacked by this nematode are also galled. Elongated, swollen areas may appear on heavily infested roots and pegs. Galls associated with root-knot should not be confused with the easily removed *Rhizobium* root nodules.

Development of the fibrous root system is greatly restricted by the peanut root-knot, lesion, and ring nematodes. Affected roots usually are discolored and stunted. Small, brown to black spots associated with the feeding of the lesion nematode often give damaged pods a speckled appearance. Pods weakened by nematode feeding often break when the vines are inverted and are left scattered across the soil surface.

Detection and Trouble-Shooting

An assay of soil for plant parasitic nematodes is generally needed for the accurate diagnosis of these damaging pests. More importantly, soil assays can also be used to identify fields with potentially damaging nematode populations and to begin effective control measures before significant loss occurs.

Presently, collecting soil samples for nematode analysis is recommended for **all** fields going into peanuts the next year, regardless of previous cropping history. Particular attention must be paid to those fields cropped to peanuts nearly every year. Fields fallowed the previous summer should also be sampled for nematodes, particularly those where volunteer peanuts matured.

The best time to collect soil samples for nematode analysis is late summer to late fall when nematode populations reach their peak. Sampling in late winter or early spring is little better than not sampling at all.

Nematode populations are often so low that accurate control recommendations cannot be made. In a few cases, damage has occurred after no nematodes were found in spring-collected samples. Trace or low root-knot populations at this time of year often indicate that this nematode may cause damage to the next year's peanut crop. Also, samples for nematode analysis should not be collected when the soil is dry because nematode numbers are likely to be low.

When trouble-shooting a possible nematode infestation on peanuts during the growing season, collect soil samples for both nematode and fertility analysis. These samples should be taken near plants showing typical symptoms. Avoid sampling around dead or dying plants because the nematode populations there will be low. Collect soil samples for fertility and nematode analysis from "healthy" plants as well. Be sure to carefully mark samples to avoid any confusion in the Plant Diagnostic Laboratory.

Sampling Procedures

1. For sampling purposes, divide the field into 5- to 10-acre sections, particularly if crop sequences differ across the field.
2. Collect a minimum of twenty soil cores with a soil probe or shovel to a depth of 6 to 8 inches within each sample section. Do not sample when the soil is dry or saturated with water.
3. If the crop is still present, collect the sample in the root zone of the crop. Otherwise, randomly take samples in a zig-zag pattern across the sample area. Thoroughly mix the soil cores from each section.
4. Place 1 pint of soil in a plastic bag, mark each sample for easy identification, and keep them in a cool place until shipment.
5. Add the nematode assay results to your farm records.

Additional directions on collecting soil samples for nematode analysis may also be found in Extension publication ANR-114, "Collecting Soil and Root Samples for Nematode Analysis." In Alabama, sample boxes and shipping cartons are available from your county Extension office.

Control Practices

1. Crop rotation can be used to prevent nematode populations, particularly those of the peanut root-knot nematode, from reaching damaging levels. The best rotation is 1 to 2 years of peanuts behind 4 to 5 years of a pasturegrass. Otherwise, a 2-year minimum between peanut crops is recommended. Avoid peanut-soybean rotations.
2. Disk summer-fallowed fields several times to destroy volunteer peanut stands.
3. Root-knot resistant peanut cultivars may be available in the next few years. The later-maturing Southern Runner variety may be more sensitive to nematode injury than other runner varieties.
4. Granular and fumigant nematicides will give some control of nematodes in peanuts. Use the results of your nematode soil assay to target fields with damag-

ing nematode populations for treatment. Nematicide recommendations are listed in Extension publication IPM-360, "IPM For Peanuts," and in ANR-500A, *Alabama Pest Management Handbook*.

5. See ANR-393, "Nematode Pests of Peanut," for more information on the management and chemical control of root-knot nematode on peanut.

Tomato Spotted Wilt Virus

Tomato spotted wilt is among the more damaging virus diseases of peanuts. The tobacco and western flower thrips are vectors of the tomato spotted wilt virus (TSWV). Although this disease is widely distributed throughout peanut-producing counties in Alabama, the numbers of TSWV-infected peanuts in most fields have remained low. Severe virus outbreaks have recently occurred in Texas and Georgia.

Symptoms may be seen first about 14 to 21 days after seedling emergence. Brown speckles on the underside of the first leaf below the terminal bud, along with a chlorotic ringspotting or mottling, are the earliest symptoms of this disease. Often, this leaf appears wilted.

Any additional new leaves are only half their normal size and crinkled (or "possum-eared"), and they display an array of chlorotic ringspots and line patterns. A downward twisting of some leaf petioles and shoot terminals may also occur.

Severe stunting and poor pod set are often seen, particularly on young plants. Late TSWV infections often cause a decline in plant vigor, yellowing of the foliage, vine collapse, and finally plant death.

Early in the season, virus-infected peanut plants are randomly scattered across the field. As the season progresses, clusters of diseased plants may appear. Disease spread often occurs down, not across, the rows. A detailed description of TSWV in peanuts can be found in Extension publication ANR-574, "Tomato Spotted Wilt Virus On Peanuts."

Scouting

The incidence of TSWV in peanuts has not been specifically related to yield loss. Reduced pod set, however, shows that this disease can reduce yield. Make notes on the level of TSWV in your peanuts as you scout fields for insects in mid-August. Keep these notes in your records. These figures will be a very rough approximation, because estimates of numbers of diseased plants are often several times higher than actual counts. If your records indicate that TSWV was a problem on past peanut crops, use some of the following control measures to reduce disease in your next peanut crop.

The incidence of TSWV may be determined more accurately by counting the number of plants showing typical TSWV symptoms in 100 feet of row in four locations in each field. Determine stand counts by counting the number of plants in 1 or more feet of row at each location and dividing the number of plants counted by the number of feet of row used to make the estimate. This figure is the number of plants per foot of row.

Multiply the number of plants per row foot by the total number of row feet checked to get the total number of plants examined. To determine the percentage of plants infected with TSWV, divide the number of TSWV-infected plants by the total number of plants and multiply by 100.

Control Recommendations

1. Use soil-incorporated systemic insecticides to control thrips. See ANR-500A, *Alabama Pest Management Handbook*, or IPM-360, "IPM for Peanuts" for up-to-date insecticide recommendations.

2. The lowest incidence of this disease has been seen in peanuts planted in late April to mid-May. Avoid early planting dates (mid-April) because thrips populations are heaviest on early-planted peanuts. An increase in disease has also been seen in peanuts planted in June.

3. The Southern Runner, Georgia Green, ViruGard, and C99R peanuts have some TSWV resistance. Plant one of these varieties in fields that in past years have been hard hit by TSWV.

4. Reduced tillage practices that leave some litter on the soil surface as well as going to twin-row planting patterns, may help slow disease spread.

5. Plant when soil moisture and temperatures favor rapid seed germination and simultaneous seeding emergence.

Cylindrocladium Black Rot

Cylindrocladium black rot (CBR), caused by the fungus *Cylindrocladium crotalariae*, occurs sporadically on peanuts in Alabama. However, serious losses have been reported on peanuts grown along the Florida panhandle. Damage has often been heaviest where Virginia-type peanuts have been previously grown. Cool, wet, late-summer weather favors disease development. Stand loss due to other soil fungi has often been attributed to CBR.

Yellowing, marginal leaf burn, and wilting of the main stem are usually the first visible symptoms of CBR. Diseased plants usually occur in clusters, which may range from a few feet to several acres in size. Roots and pods invaded by the CBR fungus are dark brown to black and appear shredded because of the destruction of soft tissues. Numerous brick-red fruiting bodies of the CBR fungus about the size of a pin head are the main symptom of CBR on peanuts. These red dots appear on the main stem, tap root, and pegs and pods at or just below the soil line after periods of mild, wet weather.

Scouting Methods

Check fields for CBR within 2 weeks of the expected digging date. Sites where CBR has caused extensive stand loss should be marked on a diagram of each field or noted on a Peanut Scouting form for your records. This information should be used when making future cropping decisions.

Control

The occurrence of this disease is very sporadic, even in those few fields known to be heavily infested with the CBR fungus. As a result, specific control measures for avoiding losses to CBR are rarely necessary. Some commonly recommended control measures include:

1. Rotating peanuts with non-hosts of the CBR fungus such as corn, grain sorghum, cotton, or pasture grasses may help reduce disease incidence but lengthy rotations to permanent pasture may be needed to grow peanuts in some fields.

2. The Virginia peanut NC-8c has partial resistance to the CBR fungus.

3. The soil fumigant Vapam has been successfully used to control CBR in peanuts. In particularly troublesome fields, a combination of CBR-resistant NC-8c peanut and Vapam has been used. Vapam will also control nematodes.

4. Several white mold fungicides may give some protection from CBR.

5. See ANR-368, "Soilborne Diseases of Peanut," for more information on CBR and its control in peanut.

Seed Rot and Seedling Disease

Seed rot and seedling disease of peanut are caused by several soil-inhabiting fungi. *Aspergillus niger*, *Rhizoctonia solani*, and several *Pythium* species are the most common fungi known to attack peanut seed and seedlings. Seed rot and seedling disease generally occur when conditions do not favor rapid seed germination and seedling growth. Severe stand thinning and yield loss are most likely on peanuts planted in early to mid-April in cool, wet soils. Cropping patterns will also affect the severity of seed rot and seedling disease. Stand loss due to seed rot and seedling disease is rarely severe enough to necessitate reseeded.

The seed and all parts of a peanut seedling are subject to attack by the above fungi. Poor stand density usually indicates that the seed or seedlings have been destroyed before emergence. Sudden wilting and collapse of the seedlings will continue until weather conditions favor rapid plant growth or suppress fungal activity.

A mushy, water-soaked rot of the seed, roots, and hypocotyl is often associated with damage caused by *Pythium* species and *A. niger*. Tissues attacked by *A. niger* are usually covered with the sooty black spore mass of the causal fungus. Stand thinning associated with damage caused by *A. niger* often continues well into July.

Distinct brown, elongated, and sunken spots occur on the hypocotyl of peanut seedlings attacked by *R. solani*. Foliage of diseased seedlings may appear yellow and their growth is slowed. Eventually, these spots or lesions encircle the hypocotyl, killing the seedling. Considerable problems with *R. solani*-incited seed rot and seedling disease have sometimes occurred when peanuts are grown behind cotton.

Control

1. Sow peanuts in a well-prepared seed bed with good moisture.

2. Adjust soil fertility and pH according to soil test recommendations.

3. Plant peanuts no earlier than late April, when soil temperatures reach 65 degrees F at a depth of 4 inches. Seed rot and seedling disease are far worse on peanuts planted in cool, wet soils.

4. Cropping peanuts behind 2 or more years of corn, grain sorghum, or pasture grasses may reduce the severity of seed rot and seedling disease. Peanuts grown behind cotton should be planted in early May to reduce severe stand loss.

5. Always use seed that has been treated with a fungicide seed dressing. Commercial seed is always treated with a fungicide seed dressing. Farm-produced peanut seed should be treated with a fungicide seed dressing when it is shelled, cleaned, and bagged. Fungicide seed dressings recommended for use on peanuts are listed in Extension publications IPM-360, "Peanut Pest Management," and ANR-500A, *Alabama Pest Management Handbook*.

Table 2. Relative Effectiveness of Selected Practices for the Control of Peanut Diseases

Disease	Destroy Volunteer Peanuts	Planting Date	Tolerant Varieties	Crop Rotation	Deep Tillage	Seed Quality	Traffic and Cultivation	Pesticides	Other
Early Leaf Spot	3	3	2	2	3	-	-	1F	
Late Leaf Spot	3	3	2	2	3	-	-	1F	
Peanut Rust	-	3	3	-	-	-	-	1F	
Seedling Disease	3	1	-	2	2	2	-	2SD	
White Mold	2	3	2	1	3	-	2	1F	W
Rhizoctonia Limb Rot	-	-	-	3	3	-	2	1F	W
Cylindrocladium Root Rot	-	-	2	3	3	-	-	2SF	
Nematodes	2	2	-	1	3	-	-	2N	
TSWV	3	2	2	-	-	3	-	3I	

Numerical Rating for Relative Effectiveness: 1 = very effective, 2 = moderately effective, 3 = slightly effective. F = fungicide, W = water management, N = nematicide, SF = soil fumigant, I = insecticides, SD = seed dressings.

*() = pending registration of new fungicide

Weed Control in Peanuts

Because peanuts are a low-growing crop, weeds can out-compete them for light, water, and nutrients. Weeds also cause losses during harvest. The presence of weed seed and/or plant parts in the harvested crop may cause spoilage during drying and dockage. All these factors result in reduced yield or quality and thereby reduce economic return.

Other factors that make weed control more difficult in peanuts than in other crops such as corn or soybeans include:

- Slow early-season growth
- The limited number of herbicides available
- The need for precision, flat, “non-dirting” cultivation

Although herbicides are the main method of weed control, they usually will not stand alone. Sound agronomic and management practices such as adequate soil fertility, liming, use of high-quality seed, uniform plant population, and timely disease and insect control are necessary for good growing conditions. Optimum growing conditions often affect the level of weed control achieved and yield potential.

The key to weed management is knowing what weeds are in the field and keeping these weeds from competing with peanuts for the first 6 weeks after planting. Cooperative Alabama-Georgia-USDA research has shown that peanuts compete effectively with weeds such as Florida beggarweed and sicklepod if the crop is maintained weed-free for 4 to 6 weeks after planting. Weeds emerging in the drill within 4 to 6 weeks after planting, if not controlled by cultivation, can tower over peanuts at harvest time. So, peanut fields must be checked often during the first 6 weeks after crop emergence.

Cultivation

Before the use of herbicides, weed control in peanuts was traditionally accomplished by cultivation and hand hoeing. Grower experience and research data show that using herbicides along with cultivation offers an advantage over cultivation alone. Some herbicides can prevent weed emergence during periods of heavy rainfall following planting and permit control of troublesome weeds such as nutsedge and Texas panicum. They also reduce or eliminate mechanical damage to the crop resulting from improper hoeing and cultivation.

Peanut research has shown that one or two **precision**, flat, “non-dirting” cultivations will **significantly improve weed control** and **peanut yields** in most years. **Precision cultivation** requires the use of sweeps adjusted to skim just beneath the soil surface or a rolling, ground-driven cultivator with gangs adjusted to prevent soil shifting and plant injury.

Positive depth and lateral control of the cultivator is absolutely necessary to prevent peanut injury. Haphazard use or adjustment of cultivation equipment may seriously reduce peanut yield and quality. The improper use of cultivator sweeps or cultivators will damage peanut plants and provide an entry point for disease organisms. If soil is thrown onto the peanut plants during cultivation, the flowers, pegs, and pods may not develop normally.

Crop Rotation

Crop rotation is just as important for weed control as it is for disease control. The best time to start a weed control program for peanuts is 2 or more years **before** planting the crop. In peanuts, deep-germinating broadleaf weeds such as Florida beggarweed, sicklepod (coffeeweed), bristly starbur (goathead), and nutsedge (nutgrass) are extremely difficult to control. If these troublesome weeds are controlled in previous crops, the number of weed seeds in the soil will be reduced and less-severe weed problems should result.

Herbicides

Herbicides used in peanuts may be classified into three groups on the basis of time at which these materials are applied. These groups are:

- Preplant soil-incorporated treatments
- Preemergence treatments
- Postemergence treatments

Preplant Soil-Incorporated Treatments.

Herbicides in this group must be thoroughly incorporated into the soil soon after they are applied to prevent loss of activity. The optimum incorporation depth and the amount of delay time possible between application and soil incorporation varies with the herbicide.

These herbicides are somewhat volatile and decompose in sunlight. They may be rapidly lost from wet soils, especially under windy conditions (winds in excess of 10 mph). Apply herbicides in this group only when the soil moisture level is suitable for normal tillage operations.

Uniform incorporation can be achieved with either a double disc or a power-driven rotary tiller. With a double disc, the treated area should be disked twice, with the second disking at right angles to the first. As a rule-of-thumb, herbicides will be incorporated to about one-half the depth at which a disc is set to cut, and to the full depth at which a power-driven tiller is set to cut.

Preemergence Treatments. Herbicides applied in this manner are typically applied at planting or after planting, but before peanuts emerge. This treatment can be applied broadcast on every acre or applied in a band. Granular application in a band is a popular way of applying a preemergence herbicide. Consistent control depends upon moisture, rainfall, or irrigation for activation of the herbicide. Application of the same herbicide in both preplant incorporated and preemergence treatments is not recommended. This practice can cause crop injury in cool soils or with excessive rains.

Postemergence Treatments. Depending upon the herbicide, postemergence treatments may be applied from after ground cracking to approximately 40 days before harvest. The use of preplant incorporated or preemergence herbicide treatments can delay the timing of postemergence herbicides. If a vigorous canopy of peanut foliage can be produced, less herbicide will be necessary.

Where preplant soil-incorporated or preemergence herbicides are applied as preventive treatments, post-emergence treatments are applied only after a weed

problem develops. From this standpoint, postemergence treatments may be advantageous because they are not necessary unless weeds become established.

The timing of applications for postemergence herbicides is critical. To obtain effective results, these herbicides must be applied when weeds are small, usually less than 2 inches in height, and actively growing. Results are usually poor if treatments are applied to large, well-established weeds or to weeds that are not actively growing (such as is the case with plants under moisture stress).

Weed control in peanuts often requires the use of sequential preplant, preemergence, or postemergence herbicides. However, research indicates that the intensive use of herbicides may result in peanut injury. The combined effect of environmental stresses, soilborne diseases, nematode injury, and herbicide injury may cause significant reductions in peanut vigor and yield. All management practices that ensure vigorous crop growth will minimize potential hazards from intensive use of herbicides.

Weed Pests

Common and troublesome weeds in peanuts are aggressive, prolific, and persistent plants. In many cases, troublesome weeds have growth and physiological characteristics that are similar to the crop. These characteristics make the weeds difficult to control by either cultural or chemical means. Broadleaf weeds, especially weedy members of the legume family, are extremely difficult to control because of their similarity to the crop. Peanut weeds can generally be divided into two groups, annuals and perennials, based on their life cycle or when they grow.

Annuals. Weeds in this group complete their life cycle in one season. They owe their persistence to their production of large quantities of seed. Seed of these weeds generally possess dormancy factors, which cause germination at different periods during the season and may even delay germination for many years. Because of their prolific seed production and erratic seed germination, weeds in this group are essentially impossible to eradicate from any given field.

Bristly starbur has an erect stem that is 1 to 3 feet tall, branched, and hairy. Leaves are oval, shallow-toothed, very hairy, and light green. Flower heads radiate yellow petals, forming two-horned or barbed burs.

Broadleaf signalgrass has reclining stems up to 2 feet tall and roots at lower nodes. The leaf blades are wide, smooth, and relatively short. The flowers are produced on two to six racemes at the end of the stems. The terminal raceme grows at a peculiar, distinctive angle.

Common cocklebur has a stout taproot and a woody stem that is 1 to 6 feet tall, branched, and rough-hairy, with small, dark red spots. The alternate leaves are rough-hairy, dark to yellowish-green, and pale green beneath. The leaf margin outline varies.

Florida beggarweed has erect stems that are reddish-purple, 3 to 9 feet tall, and hairy. Trifoliate leaves are 3 to 4 inches long and light or yellowish-green. The stems are marked with light green bands at the leaf axils. Leaves are hairy. Flower clusters of pea-

like blooms produce jointed pods that break into pieces with one seed. The hairs on the pod segment stick onto clothing and animals.

Large crabgrass has stout, smooth stems; when prostrate, it roots at nodes along the stems. Leaves are hairy; the leaf sheaths are covered with long hair. The flowers and seeds are borne on three to ten finger-like racemes at the end of the stems.

Redroot pigweed has erect stems 1 to 6 feet tall. The plant is rough-textured and freely branching, with dull green leaves and long petioles. It bears small green flowers in dense spikes in the upper leaf axils and stem ends, with three spiny bracts around each flower. The seeds are shiny black and very tiny. Several other species, including smooth pigweed and spiny amaranth, can also occur in peanut fields.

Sicklepod has a branching, erect stem that is 1 to 6 feet tall. The light green leaves have two or three pairs of bluntly oval leaflets. The plant bears yellow flowers on drooping stalks in the leaf axils. The round, curved seedpods are long and slender, with many brownish angular seeds. Coffee senna has more numerous, pointed leaflets and flattened seed pods.

Smallflower morningglory is characterized by erect or twining hairy stems. The leaves have long petioles with prominent veins. The plant's small blue flowers are closely crowded with leafy bracts into tight clusters on long stalks.

Tall morningglory has trailing or twining stems. The alternate leaves are broad and heart-shaped. Funnel-like flowers appear in clusters of three to five and are red, purple, blue, or white. The seeds are brown to black. Many other members of the genus *Ipomoea* may occur as problems in peanuts, including cypressvine, entireleaf, and ivyleaf morningglory.

Texas panicum has many robust stems that are erect to recumbent; it roots at nodes along the stems. The pale or yellowish-green leaves are velvety and hairy; they extend to the leaf sheaths and nodes. The panicle is closed, but not tight. The seeds are large and marked with green, vertical stripes; they resemble cultivated millets.

Perennials. Weeds in this group possess perennial underground structures (tubers, rhizomes, and bulbs) that tolerate both cultural and chemical control treatments. These weeds can reproduce vegetatively as well as by seed. Preplant incorporated and postemergence herbicide treatments are available for control of nutsedge. No satisfactory herbicide treatment is presently available for control of horsenettle in peanuts.

Horsenettle has extensive, deep, creeping rootstocks. The stems are single or branched and 1 to 2 feet tall. The leaves are alternate, wavy edged or lobed, with yellow spines on the midribs, veins, and stems. Purplish or white flowers grow in clusters from the stem ends. The plant bears smooth, large, yellowish-orange berries. These berries may cause mold growth and spoilage when present in harvested peanuts.

Purple nutsedge is similar to yellow nutsedge except the plants are smaller, dark green, with reddish-purple seedheads. Rhizomes radiate from the first plant, producing new plants or bulbs in a series, forming "tuber chains."

Yellow nutsedge has slender, smooth three-angled stems 6 inches to 2 feet tall and basal leaves, except for leaf-like bracts at the seedheads. It reproduces by seed, rhizomes, and tubers. The plants are yellowish in color. Rhizomes radiate from the first plant, ending in bulbs or tubers, which may produce new plants. It does not form "tuber-chains." Yellow nutsedge may occur on all soils in the peanut belt.

Scouting for Weeds

Scouting in peanuts involves identifying and determining the numbers of insects and disease- and nematode-infested areas. By the time that full-time scouting begins, most weed control treatments will have been made for the growing season. So what role can a scout play in scouting for weeds?

Scouts serve as the eyes of the producer. This effort does not involve random sampling sites or complicated record keeping. As a scout moves through different fields, he or she should be careful to notice any new weed problems as well as the presence of insects and diseases. Any new flushes of weeds should be brought to the attention of the producer. A scout may wish to compile a list of the most common weeds in each of the scouted fields. This list will be helpful to the producer as a future reference.

The most important thing that a scout can do in scouting for weeds is to prepare a **weed map**. A weed map is nothing more than a diagram of the scouted field with notes as to the location and general abundance of weeds (light, moderate, or heavy) and, if possible, the estimated size of the weed-infested areas.

Maps with the locations of different weed infestations are extremely helpful in planning and conducting future weed control programs. Knowing the location of perennial weeds such as vines, nutsedge, or horsenettle in a field will help a producer to plan weed control programs and perhaps future spot treatments with herbicides.

The best time to prepare the weed map of a scouted field is during the last visit to the field prior to harvest. It is important to take the time necessary to ensure accuracy so that the weed map reflects the weed problems present in the field. Weed mapping is the best way to predict what weeds will be of concern next season. The use of weed maps takes the guesswork out of herbicide selection.

Pesticide Safety for Scouts

Peanut scouts have an excellent safety record with pesticides. Nevertheless, pesticides can present certain hazards. Individuals scouting fields for pests and pest problems need to be aware of the chemicals being used by farmers, the general toxicity of the chemicals, and the effect that pesticides can have on people. Safety is a topic that cannot be overemphasized. Safety is a frame of mind or an attitude you develop and practice for your well-being and for that of the public. A lack of knowledge about pesticides is the basic reason for most adult pesticide-related injuries.

There are three routes of entry to the human body by a chemical. These are dermal, oral, and respiratory.

Dermal exposure during formulation, mixing, loading, and application in the field has been reported as the most critical type of human exposure. The following factors affect dermal exposure and skin penetration: (1) physical and chemical properties of the pesticide; (2) health and condition of the skin; (3) temperature; (4) humidity; (5) presence of other chemicals (solvents, surfactants, etc.); (6) concentration of the pesticide; and (7) type of formulation. Collectively, the factors affecting absorption will influence dermal toxicity. Of the factors listed above, only the health and condition of the skin are independent of these factors. Concentration, physical and chemical properties of the pesticide, and the presence of other chemicals are established by the manufacturer or farmer. Temperature and humidity are the environmental conditions existing at the time of application. Persons with cuts, abrasions, scratches, scuffs, or any other skin damage should exercise caution by minimizing exposure in treated areas.

Skin absorption increases as you perspire. Skin pores open in response to increased body temperature. This allows for faster and increased chemical absorption. To prevent skin absorption, wear a long-sleeved shirt of tightly woven material to protect your arms. Try not to enter the field immediately behind application equipment.

To minimize dermal exposure: (1) wear clean clothing; (2) bathe or shower daily; (3) avoid wearing canvas shoes when plant foliage is wet from dew; (4) do not enter any field before the restricted entry interval (REI) has expired (see pesticide label); (5) avoid wiping face or forehead with shirt sleeves; (6) avoid rubbing eyes with contaminated hands; and (7) wear long-sleeved shirts and full-length trousers.

Granular insecticides and nematicides that are applied preplant in furrows and postplant on the soil surface are often applied in very small amounts. However, the scout who scratches in the soil with bare hands looking for insect damage can come into contact with significant amounts of these pesticides. So, a scout

should always follow good personal hygiene by washing his or her hands before eating, drinking, or wiping or rubbing the mouth, nose, or eyes. Where highly toxic granular insecticides were applied at planting, the scout should always wear rubber gloves to scratch in the soil.

The scout who works in different fields day after day in hot, humid weather will probably be exposed to several different chemicals that are present on the plant foliage. As the skin pores open in response to the increased body temperature, more of the chemical will be absorbed through the skin. So despite the heat, a scout should wear a long-sleeved shirt of tightly woven material to protect the forearms from chemical contact.

Another reason to protect the skin is the possibility of chemical irritation. For example, chlorothalonil (Bravo) is considered a moderate skin and respiratory tract irritant. However, irritation from this chemical is not likely, except for someone who has a special sensitivity to Bravo.

Oral exposure by ingestion is usually caused by not practicing proper personal hygiene. Accidental ingestion has occurred when applicators were loading spray equipment. Scouts can minimize oral exposure by following these procedures: (1) never eat or drink while handling pesticide-treated plant parts; (2) always wash hands and face with soap and water before eating; (3) do not wipe mouth with hands; and (4) do not chew on treated plant parts.

Respiratory exposure is not a threat to scouts if other precautions are followed. Some of the highly toxic organophosphates may volatilize or cause a vapor-like action within the field shortly after being applied. For this reason and because of dermal contact possibility, many products have a 24- or 48-hour REI (see pesticide label).

Fields that have been treated with any pesticide **should not be entered** until the REI has expired (see pesticide label). Your employer (farmer) is required by Worker Protection Standards (WPS) to notify you (scout) of recent pesticide applications and the corresponding REI. WPS requires that scouts use the appropriate Personal Protective Equipment (PPE) if entering a field before the REI has expired (see pesticide label).

A scout should know the symptoms of pesticide poisoning so that medical attention can be sought if needed. Symptoms of blurred vision, abdominal cramps, tightness of chest, nausea, diarrhea, headache, and confusion are associated with organophosphate poisoning. Medical attention should be obtained promptly if symptoms exist. If medical treatment is needed, be sure to take the pesticide label since it has valuable information for the attending physician. In addition, Poison Control Centers have current treatment information and can be reached 24 hours a day by any physician. The Poison Control Center at Children's Hospital in Birmingham can be reached by calling toll-free, 1-800-292-6678.

In summary, a scout should follow these procedures to minimize exposure to chemicals.

- Change to clean clothing daily.
- Bathe or shower daily.
- Do not wear canvas shoes when plant foliage is wet from dew.
- Do not enter a field until the REI has expired.
- Do not wipe your face or forehead with your shirt sleeve.
- Do not rub your eyes with unwashed hands.
- Wear a long-sleeved shirt and long pants.
- Carry a source of water in your car and wash your hands before eating or using toilet facilities.

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Use pesticides **only** according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

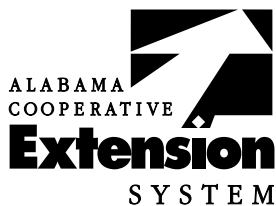
The pesticide rates in this publication are recommended **only** if they are registered with the Environmental Protection Agency and the Alabama Department of Agriculture and Industries. If a registration is changed or cancelled, the rate listed here is no longer recommended. Before you apply any pesticide, check with your county Extension agent for the latest information.

Trade names are used **only** to give specific information. The Alabama Cooperative Extension System does not endorse or guarantee any product and does not recommend one product instead of another that might be similar.

For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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