Seedling disease is a problem wherever cotton is grown. Over the past 20 years, losses to seedling disease have averaged slightly over 3 percent in the United States. In Alabama, seedling disease is responsible for losses ranging from 3 to 11 percent annually. 

Seedling disease occurs when developing seedlings are unable to overcome damage caused by invading seedborne or soilborne pathogenic fungi. Under ideal growing conditions, cotton seedlings resist and outgrow damage from the ever present seedling disease fungi; but succumb to seedling disease when their growth is slowed or halted.

In Alabama, the fungi most often implicated in seedling disease are Rhizoctonia, Pythium, and Fusarium. These fungi are present in most Alabama cotton fields (Figure 1).

They can attack cotton at any stage of development from the seed through the seedling stage (Figure 1). Thielaviopsis which causes black root rot occurs less frequently but appears to be growing in importance.

Factors that influence seedling development include seedling vigor, the condition of the seedbed, nematodes, early season insects, herbicides, and prevailing weather conditions at and following planting. Planting too early in a cold, wet seedbed is one of the most common factors responsible for cotton seedling disease in this state. Cotton grows best at temperatures above the mid 70’s F. Below 65° F growth is severely inhibited and comes to a complete halt below 60° F.

**Symptoms**

Nematode and early season insect injury also play an important role in predisposing cotton seedlings to seedling disease. This explains why the use of in-furrow insecticides/nematicides to control these pests alleviates or reduces seedling disease damage.

For ease of identification, cotton seedlings are classified into the following three categories.

**Seed Rot.** Several pathogenic fungi attack cotton seed before or during germination, causing a soft, watery decay. Pythium and Fusarium are the two predominant genera involved in seed rot. These fungi can spread rapidly from seed to seed.

Saprophytic fungi can also infect seed and cause decay by entering through wounds caused by mechanical injury made during harvest or in storage. Some common saprophytic fungi include Rhizopus, Aspergillus, Alternaria, and Pestalotia.

**Preemergence Damping-Off.** This stage of seedling disease occurs between seed germination and prior to seedling emergence from the soil. Damage may occur as a soft rot on the expanding roots or on the stem. Pythium and Fusarium are primarily involved in this stage.

**Seedling Root Rot and Postemergence Damping-Off.** This stage occurs after the seedlings have emerged from the soil. Affected seedlings first turn light green and are stunted. As the disease progresses, seedlings wilt and then die. Symptoms on the affected seedlings vary according to the causal fungus involved.
Fusarium and Thielaviopsis fungi cause a dry, dark rot of the roots which moves up the root into the stem as the disease progresses (Figure 2).

![Figure 2. Black root rot seedling disease. Note coal-black tap root.](image1)

Pythium causes a watery, straw colored decay of the roots. This fungus rots the cortical tissue which can easily be striped off—leaving the central stele of the tap root intact (Figures 3 and 4). Pythium seedling disease is most severe during cool, wet conditions.

![Figure 3. Pythium seedling disease.](image2)

![Figure 4. Pythium seedling disease. Note straw-colored, water-soaked Note: cortical tissue sloughed off roots. from central stele of root.](image3)

Rhizoctonia attacks the seedling, forming dark, reddish brown, sunken lesions on the hypocotyl near soil level. The fungus often invades and girdles the stem, giving it a "wire stem" appearance. This condition is referred to as "soreshin" (Figure 5).

![Figure 5. "Soreshin" seedling disease of Rhizoctonia root rot. Note reddish-brown sunken lesion on main stem and root near soil line.](image4)

Rotate Crops. If possible, do not plant cotton in the same field for 3 years. Rotation prevents the buildup of many disease-causing organisms in the soil.

Lime Acid Soils. Apply lime as recommended by the Soil Testing Laboratory. Seedling growth is restricted in acid soil which favors the development of seedling disease.

Plant High-Quality Seed. Poor-quality seed usually produces low-vigor seedlings. These are more susceptible to attack by fungi that can cause seedling disease. Plant seed with a minimum of 80 percent germination. Plant the most vigorous seed early in the season when seedling disease pressure is the greatest.

Plant In Warm Soil. For best results, plant when the soil temperature at a 4-inch depth remains at least 65° F for 3 consecutive mornings and when warm weather is forecast for the next 7 days. The National Weather Service at Auburn reports soil temperatures along with a cotton planting advisory through many radio and television stations in Alabama.

Plant On Well-Prepared Seedbeds And In Well-Drained Soils. Wet soils favor the growth of many soil fungi and retard or slow the growth of cotton seedlings.

Avoid Chemical Or Mechanical Injury. Excessive rates of herbicides, fertilizers, insecticides, or fungicides applied in the drill area can injure seedlings, making them more susceptible to seedling disease. Using

Control Recommendations

Seedling disease can be reduced by the following practices:

**Destroy Crop Residue.** Plow cotton stalks under immediately after harvest to hasten stalk and root decomposition. This practice reduces seedling disease pathogens, nematodes, and soil insect populations by depriving them of a place to overwinter.
high rates of dinitroanaline herbicides or incorporating them too deeply can inhibit root growth and increase seedling disease.

**Plant Only Treated Seed.** Seed treatment will kill most fungal pathogens on the seed coat and protect the seed during germination. Practically all seed sold by commercial seed producers are treated with a fungicide.

If you save your own seed, treat them with a recommended fungicide. Since several fungi cause seedling disease, two or more fungicides may be needed for control. Demosan, Baytan, Thiram, captan, chloroneb, and Terraclor (PCNB) are effective against Rhizoctonia but not against Pythium. Baytan is the only fungicide that retards black root rot (Thielaviopsis). Apron (metalaxyl) and Terrazole (ethazol) are effective against Pythium but not the other fungi.

For a current, detailed list of recommended seed treatments, contact your Extension agent for a copy of the publication IPM-415, “IPM Cotton Insect, Disease, Nematode, Weed Control Recommendations.”

**Use Soil Applied Fungicides At Planting Time.** Soil applied fungicides provide added protection in fields where there is a history of seedling disease. They are not intended to replace fungicide seed treatments, but to supplement them. These fungicides can be applied as granules or as sprays and are applied in the seed furrow and covering soil during the planting operation.

Many growers prefer granular fungicides because they can be applied with granular applicators thus eliminating the need for additional spray equipment and water. Some granular fungicides also contain a systemic insecticide to control early-season insects. Fungicides applied as sprays provide slightly better protection; because they can be distributed more evenly in the soil than granules. According to studies conducted in the Mississippi Delta, soil applied fungicide sprays provide 10 to 15 percent better protection against seedling disease.

For best results, apply fungicides in a minimum spray volume of 5 gallons per acre. Use two nozzles. Mount the front nozzle just behind the seed-drop tube to treat the soil immediately surrounding the seed. Direct the rear nozzle to treat the soil as it falls into the seed furrow. The choice of soil applied fungicides, like fungicide seed treatments, depends upon the type and inoculum potential of seedling disease fungi present in individual fields. Since Rhizoctonia is almost always present in most Alabama cotton fields, soil applied fungicides should always contain a fungicide which is active against Rhizoctonia. A soil applied fungicide with activity against Pythium should be included if the field contains heavier soils that tend to be cold natured and hold excessive moisture.

Unfortunately most fungicides which are active against Rhizoctonia do not control Pythium. Likewise, fungicides with activity against Pythium do not control Rhizoctonia or other soilborne fungi. The two granular formulations of soil applied fungicides contain fungicide combinations that are active against both Rhizoctonia and Pythium. Terraclor Super X contains PCNB which is active against Rhizoctonia and ethazole which controls Pythium. Ridomil 11G PC contains PCNB and metalaxyl for Pythium control.

The emulsifiable formulations for sprays are more specific and contain a single active ingredient. Terraclor 2E controls only Rhizoctonia and Ridomil 2E controls only Pythium. Therefore, these fungicides should be used in combination in fields where both Rhizoctonia and Pythium are a problem.
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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