

FACT SHEET

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SOYBEAN DISEASES

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Soybean diseases reduce yields in Texas by an average of 15 percent each year. Disease severity ranges from light in the high plains to moderate in the northeast and severe in the Gulf Coast regions of Texas. Disease development is dependent on several factors such as varieties, cropping practices, temperature and moisture. At the present time, the most economically damaging soybean diseases are caused by fungi. Recent developments in the use of fungicides require that growers be proficient in disease identification. The following descriptions should aid producers in the early recognition and treatment of disease problems.

Seedling Diseases

Seed decay and seedling diseases (Most common fungi are *Pythium* sp., *Phytophthora* sp., *Rhizoctonia* sp. and *Diaporthe* sp.)

Poor seed quality, whether due to physical, physiological or pathological causes, predisposes seed to damage by seedling disease organisms. Poor seed quality is the major problem confronting soybean producers at the present time. Mechanical injury may rupture the seed coat and allow various pathogenic organisms to penetrate the seed and injure the embryo. Physiologically, seed quality can be lowered by improper storage conditions such as extremes of moisture or temperature. Both seed- and soil-borne organisms can cause seed decay and seedling diseases.

Seedlings infected with *Pythium* or *Phytophthora* usually develop a watery rot of roots and lower stems. *Rhizoctonia* causes a dry rot with reddish-brown lesions typical of "sore-shin."

Cool, wet soil conditions contribute to the development of seedling diseases. Soybeans should be planted on a slight bed in poorly drained soils and when soil temperatures have warmed up enough for rapid ger-

mination. Plant only high quality soybean seed. If seed germination is below 80 percent, a seed treatment fungicide will increase germination. See the seed treatment chart for specific recommendations.

Root Diseases

Charcoal rot (fungus - *Macrophomina phaseoli*)

Charcoal rot is usually found in mid-summer, and mostly on sandy soils. This fungus attacks the roots and lower stem of young plants. The disease is characterized by small, black, pimple-like fruiting bodies under the bark of the roots and stem base, and black streaks inside the woody portions of the roots and stem base.

Southern blight (fungus - *Sclerotium rolfsii*)

Southern blight usually develops erratically, and generally only individual plants are affected. Like charcoal rot, southern blight produces a rot of the roots and stem. Plants may be affected at any stage of growth. The first symptom is sudden wilting followed by death of the plant. The fungus produces a cottony growth on the stem base and sometimes on the ground around the stem. Sclerotia about the size of mustard seeds appear on the cottony mold. The sclerotia are the resting stage of the fungus and can remain in the soil for years. The fungus is common in many soils and survives on almost every type of organic matter. Plowing under of crop residues will help reduce losses from this disease.

Phytophthora root and stem rot (fungus - *Phytophthora megasperma* var. *sojae*)

This disease attacks all stages of plant growth. Symptoms in young plants include a soft rot and collapse of the roots and stems. Seedlings are killed rapidly. Older plants first exhibit a yellowing of the lower leaves; then the leaves wilt and the entire plant dies and turns brown. By the time the plant dies, the root system, with the exception of the tap root, has been almost completely destroyed.

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Damage is more severe on heavy clay soils than on lighter soils. The disease is prevalent in cool, wet weather and is most severe in poorly drained fields. Using resistant varieties, leveling fields to insure adequate drainage and planting on lighter soils, if possible, will help prevent the disease.

Cotton root rot (fungus - *Phymatotrichum omnivorum*)
The disease occurs suddenly in early summer, and causes rapid wilting followed by death of the plant within a few days. Usually the leaves of the plant are not shed. The disease kills plants in circular areas ranging from a few square yards to an acre or more in size. In affected plants the whole root system decays and plants are easily pulled from the soil. Unlike plants affected by verticillium or fusarium wilt, the tap root bark of root rot damaged plants twists off easily, revealing a reddish to wine colored stain along the white woody tissue. Vascular streaking is not present as in the wilt diseases. Fine, brownish strands of fungal threads (Rhizomorphs) are usually found on the roots. Under moist conditions spore mats may appear on the soil surface near diseased plants. These are 2 to 12 inches in diameter, first snow-white and cottony, later tan and powdery. Controls include management and cultural practices, as no chemical treatment economically controls cotton root rot. Deep plowing 12 to 18 inches with a mold board plow, early planting to escape the disease, addition of organic matter or green manure, and crop rotation have proved to be the most effective control methods. To achieve maximum control an integrated program involving all these practices is recommended.

Leaf Diseases

Frogeye leafspot (fungus - *Cercospora sojina*)
This disease usually appears late in the growing season. The fungus may infect leaves, stems and pods but is most conspicuous on leaves, where it causes an "eyespot" lesion composed of a gray or tan central area surrounded by a narrow, reddish border. Badly infected leaves fall prematurely. The disease is seed-borne and may also overwinter on diseased leaves and stems. Infected seed germinate poorly and may produce weak seedlings. Control measures include planting disease-free seed, plowing under crop residues, rotating crops and applying a foliar fungicide. Varieties vary in their resistance with Lee being the most resistant.

Downy mildew (fungus - *Peronospora manshurica*)
The first symptom is indefinite, yellowish-green areas on upper leaf surfaces. Later these areas become light to dark brown spots with yellowish-green margins. Grayish downy tufts of mold appear on the lower surface. Severely infected leaves fall prematurely. The fungus may grow within the pods, covering the seeds with a white crust of spores. The disease is spread by infected seed and overwinters on plant debris. Practice crop rotation, use disease-free seed and plow under plant residues to reduce disease losses.

Target spot (fungus - *Alternaria* sp.)
Infection occurs primarily on leaves, but may also

occur on pods and stems. Spots on the leaves are reddish-brown circles and vary in size from very small to more than ½ inch in diameter. Larger spots are composed of concentric rings. The fungus is a weak parasite and usually attacks plants too late in the season to cause serious damage. Planting disease-free seed, rotating crops and plowing under plant residue are the most effective means of control.

Pod and Stem Diseases

Purple seed stain (fungus - *Cercospora kikuchii*)
A pink to purple discoloration of the mature seed coat identifies this disease. The discoloration may cover a small area or the entire seed surface. Affected seed may be cracked, rough and dull. Seed quality is lowered. This fungus attacks other plant parts and overwinters in diseased leaves, stems and seed, as well as in crop residue. When infested seed are planted, the fungus grows from the seed coat and infects the seedling. Wet weather during the growing season favors development of the disease. Crop rotation, use of disease-free seed, burial of crop residues and use of a foliar fungicide will aid in preventing the disease.

Anthracnose (fungus - *Colletotrichum truncatum*)
The fungus infects stems, petioles and pods of plants nearing maturity. Dark brown or reddish-brown areas may cover the surfaces of infected stems and pods. Later the infected areas may become black with the fruiting bodies of the fungus. Dark brown sunken cankers develop on the cotyledons of young seedlings. Lower branches may die. Seed in infected pods may be shriveled and moldy or show no external sign of the disease. The fungus is carried over on the seed, and germinating seed may be killed before emergence. The fungus also overwinters on infected plant residues. Use of disease-free seed, crop rotation, burial of crop residue and applications of a foliar fungicide will inhibit the disease. Seed treatment improves the stand, but will not eliminate the fungus.

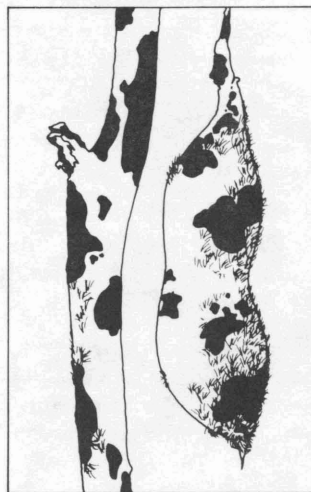


Fig. 1. Anthracnose – Dark or gray areas cover the surfaces of infected stems and pods.

Pod and stem blight (fungus - *Diaporthe phaseolorum* var. *sojae*)

Pod and stem blight attacks and kills older plants near maturity. The disease is identified by the appearance of numerous small black fruiting bodies (pycnidia) on stems and pods of infected plants. The pycnidia are arranged in linear rows on the stems and scattered on the pods. The fungus infects the seed and causes them to be shriveled, moldy and small. Infected seed may appear normal, but when infected seed are planted, the embryo may be killed before emergence or the seedlings may be killed at an early stage. Delayed harvest results in an increased incidence of the disease, especially if high moisture and temperature conditions prevail. Prompt harvesting when weather conditions permit is the most effective method of reducing losses. Using a foliar fungicide will also reduce losses. (See the section on foliar fungicides for further information.)

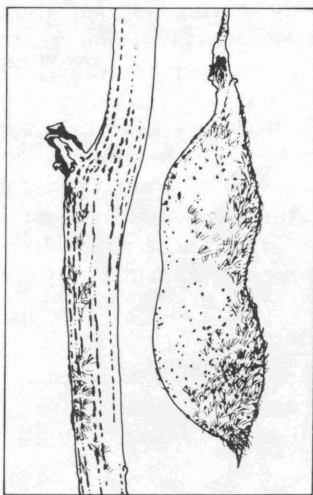


Fig. 2. Pod and Stem Blight – The disease is characterized by black fruiting bodies arranged in linear rows on the stem.

Stem canker (fungus - *Diaporthe phaseolorum* var. *caulivora*)

This disease is often confused with Phytophthora root and stem rot. However, unlike Phytophthora rots, plants affected with stem canker retain their leaves. The first indication of the disease is the appearance of dead plants with leaves still attached. These plants show a slightly sunken brown area on the stem or base of a branch or petiole. These lesions usually are found close to the soil line, but may occur higher on the stem. The disease is usually scattered throughout a field. The fungus is seed-borne, and recommended control measures include planting disease-free seed, rotating crops and plowing under crop residue.

Other Disease Problems

Bacterial blight (bacterium - *Pseudomonas glycinea*)

This is usually one of the first diseases to appear on young plants. Small, angular spots varying from yellow to brown develop on the leaves of infected plants. The brown area usually is surrounded by a water-soaked

margin. These spots later dry and portions of the leaf drop out, giving a torn, ragged appearance. The disease also occurs on stems and pods. Cool, wet weather favors development of this seed-borne disease. The bacteria may overwinter in crop residue. Plant disease-free seed, bury crop residue and rotate with non-susceptible crops.

Bacterial pustule (bacterium - *Xanthomonas phaseoli*)

This is primarily a disease of the leaves, although it may also infect the pods. The first symptom is small, yellowish-green spots with reddish-brown centers on the upper leaf surfaces. The center of each spot appears slightly raised and develops into a small pustule, especially on the underside of the leaf. Several infections on the same leaf produce a large, yellow or brown area dotted with small, dark-brown spots. Severe infections will cause defoliation. The brown, dead areas of older leaves may break up and cause a ragged appearance. In later stages, the pustules rupture and dry; when this happens, it may be difficult to distinguish this disease from bacterial blight. However, in earlier stages bacterial pustule does not have the water-soaked area around the lesion found in bacterial blight. The disease overwinters in infected plant debris and is carried over to some extent on infested seed. Crop rotation and burial of crop residues are the most effective methods of control.

Soybean mosaic (virus)

This is the most common virus disease in Texas. Infected plants show a yellow vein-clearing in the small branching veins of developing leaves. Infected leaves are narrower than normal; the margins turn down and later become ruffled. Blistering occurs along the veins. Leaves become leathery and brittle. Infected plants also produce misshapen pods and fewer seed than normal. Symptoms may be masked during high summer temperatures. The virus is carried in the seed and transmitted by aphids. There is no known control.

Bean pod mottle virus (virus)

The first symptom is a yellowish-green mottling during the primary leaf stage. This may fade and then reoccur later in the growing season. Cool weather contributes to disease development. The virus is transmitted by the bean leaf beetle, and there is no known control.

Nematodes

Soybeans are attacked by several kinds of nematodes, the most common being the root-knot nematode. The cyst nematode has not been a problem thus far in Texas.

Rhizobium - induced chlorosis

A chlorosis ranging from light green to nearly white may occur about 6 to 8 weeks after planting, when the plants are making rapid growth. This chlorosis is most apparent in the top 2 or 3 leaves and is nitrogen-induced, or caused by an insufficient number of nodule-forming bacteria. The chlorosis is usually temporary; plants will appear normal by flowering and there is usually no yield reduction. Correct application of inoculum will prevent this condition.

Cultural Control

- Crop rotation** Rotate with other crops, preferably corn, cotton or rice. This will prevent a heavy buildup of disease-causing organisms in the soil.
- Deep plowing** Turn soybean residue under deeply as soon after harvest as possible. When turning the soil, bury surface trash and stubble at least 6 inches deep.
- Drainage** Plant soybeans in well-drained fields, and avoid fields where cotton root rot is known to be a problem.
- Weed control** Conduct a good weed control program. Removal of weeds will help control leaf and pod diseases by allowing more air movement through the soybeans and reducing moisture retention on the leaves and within the canopy.
- Disease-free seed** Most soybean diseases can be transmitted by seed. Fungi carried both externally and internally are the main causes of reduced germination and poor stands. The best indicator of healthy seed is the germination test. Seed lots below 80 percent germination should be avoided. If seed with germination less than 80 percent must be planted, use a seed treatment or hopper box fungicide.

Chemical Control

- Seed treatment** Seed treatment fungicides protect against seed-decaying fungi and also help seedlings ward off soil-borne organisms that attack before or just after emergence. When cool, wet weather follows planting, seed rots and pre-emergence seedling blights may cause heavy losses in stands. Demonstrations in Texas indicate that seed treatments can increase germination of poor quality seed from 10 to 20 percent, but there is little or no effect on high quality seed. Seed treatments have no serious effect on nodulation where soybeans have been grown previously. Seed treatment is *not* recommended where soybeans are to be planted for the first time, or where there is any doubt about an adequate supply of root-nodulating bacteria in the soil, as judged by performance of past soybean crops. The following materials are recommended for use in Texas.

Hopper box materials - graphite base

<u>Material</u>	<u>Rate</u>
Captan	.4 oz. to 1.75 ozs./100 lbs.
Terraclor + Terrazole	.8 oz. + .2 oz./bu.
Thiram	1.0 oz. to 1.66 ozs./100 lbs.

Seed treatment materials

<u>Material</u>	<u>Rate</u>
Captan	.7 oz. to 1.3 ozs./100 lbs. slurry, .8 oz. to 2.0 ozs./100 lbs. dry
Terraclor + Terrazole	.4 oz. + .1 oz./bu.
Thiram	.93 oz. to 1.8 ozs./100 lbs. slurry, 1.0 oz. to 1.66 ozs./100 lbs. dry
Zineb	.74 oz./bu. slurry

- Foliar Fungicides** The use of a foliar fungicide to control soybean diseases is a new concept, and recommendations should be followed closely to obtain maximum results. The only material currently recommended for use in Texas is Benlate®. Two applications should be made, the first at "early pod set" and the second 14 to 21 days later. "Early pod set" can be defined as that stage of growth when approximately 60 percent of the pods are set on the plant. During this stage of growth the pods will range in size from 1/4 to 1 inch, with some blooms on the plant. Benlate® should be applied by aerial application using 5 to 7½ gallons of water. As beans approach maturity, differences between the treated and non-treated beans will become evident. Benlate® helps control anthracnose, diaporthe pod and stem blight, and cercospora purple seed stain.

Foliar fungicide recommendations:

<u>Material</u>	<u>Rate</u>
Benlate®	½ to 1 lb./acre

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